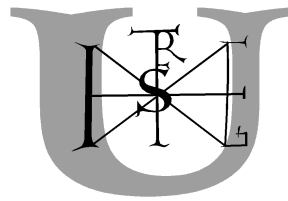


SZENT ISTVÁN UNIVERSITY, GÖDÖLLŐ

Management and Business Administration Ph.D School



Ph.D. Thesis

**The mortality of the recipients of pension
and main pension-type benefits
according to major pension types**

Written by:

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INTRODUCTION

Our love for Life is the most powerful love; the most important question of our lives is how long we live. There are not many things found in the world whose probability is 1. Death is such, mathematics call this event sure. Human life is finite. The question here is not whether it happens or not, its uncertainty does not manifest itself in its occurring, but at what age it occurs. The length of each human life is unpredictable; however, the mortality of a sufficiently large number of people is possible to estimate. Demographers say at least a population of one hundred thousand is required to calculate probabilities of death by sex and age. Hungarian mortality levels are high; you should also consider its internal differences, as huge differences can be found here.

The Hungarian Central Statistical Office (CSO) prepares life tables by sex every year. It is a general trend that the mortality rate of females is much better than that of males. Demographers have shown the differences in life chances, trends and changes over time between different levels of education. From the lowest educational achievement towards the highest, there is a drastic reduction observed in mortality. There are scientific works available, which give mortality differences according to regions/counties. In Hungary, towns and cities have lower, thus more favourable mortality values within the population than people living in villages. There is an important difference in mortality dependent on marital status. Considering the year 2006-2007, at the age of 30, the life expectancy of married men is 8.3 years higher than that of unmarried men. Among women, the difference is 6.2 years.

The analyses so far have also included the causes of death. Cardiovascular diseases are considered the leading cause of death, while the proportions of cancerous diseases have increased in recent decades. Besides these findings, I will add one more aspect to the mortality studies listed in the following.

In my dissertation, I am looking for the answer to the question, whether there is a demonstrable difference in the mortalities of the retired according to their sorts of pension-type benefits. In 2008, the annual mortality of old-age pensioners, disability and survivor pensioners are a lot different from each other, from the whole group of pensioners and the Hungarian population. These concepts correspond to the pension supply system in 2008. I have created the life tables by sex and pension-type benefits (old age, disability and survivors' pensions) Using the tables obtained as a result of summarising the calculations based on two indicators of mortality rate, (probability of death, life expectancy), I will describe the significant differences in life chances.

The importance and current nature of the subject

The current importance of the issue as I see is that in many countries of the world, a revision of pension systems is on the agenda today.

The subject is essential in the respect that pension funds should know for how many more years various types of benefits are to be paid. Knowing this is vital for financing the pension system not only in Hungary, but in the European Union as a whole. One of the uses of my life tables prepared is just the sustainability of the pension system.

I judge my results to potentially serve as a basis for the calculation of health insurance as well.

I find it indispensable to know mortality for the preparation of forecasts as much as for planning in the medium-and long-term. In my opinion, my subject is a prerequisite of pension models.

I also think seniors' mortality is an important issue besides social insurance (pension insurance, health insurance) for life insurance undertakings and pension funds themselves. Annuities, life insurance venture and access may be calculated on the basis of the mortality data for each group (risk community) in terms of their survival, probability of mortality and known life expectancy.

The calculated values can be valuable for any person who feels responsible for their own financial future planning, dealing with self-care. I mean it may be interesting for broad layers of society to know for how many more years the members of various groups will receive different benefits, on the average, until what age they will live and how many more years of age they can expect on average – not only in terms of national values of mortality but also of their different pension-type benefits.

The Preliminaries

I started to deal with the subject of my dissertation at the Central Administration of the National Pension Insurance in 2007. First I worked on the recipients' details, in May, I wrote the studies entitled " The Ratios of Recipients of Pension of Retirement and Pension-type Benefits in the Population, (2004-2005) and "The Mortality of Recipients of Pension of Retirement and Pension-type Benefits (2004)". My colleague, dr. Judit Marosi Hollósné helped me in my work.

We published an article on the results of our calculation entitled "The Mortality of Recipients of Pension of Retirement and Pension-type Benefits in 2004" in the September issue of the Statistical Review in 2008.

We also dealt with county and regional data, we completed the regional and county life tables for pension of retirement, pension-type benefit recipients, old-age and disability pensioners.

This means that more than a hundred life tables had to be prepared. To do this, we summarized the results of the calculations, our study can be found in the January issue of Regional Statistics in 2010 "Geographic Differences in the Mortality of the Recipients of Pension of Retirement and Benefits in Hungary."

At this point, I started the processing of the 2006 data. I continued the research work by processing the data of 2008. Applying the data of pension, I finished my study entitled "The Recipients of Pension-Type Benefits in Hungary in 2008 and 2009 ". Here, an investigation was carried out by gender, counties and pension-type benefits.

It continued through my work "The Death of Recipients of Pension of Retirement and Pension-Type Benefits in Hungary in 2008 (An Analysis of Sex, Benefits and Counties)". I completed my work presenting the life chances of pensioners entitled: " The Mortality of Recipients of Pension of Retirement and Pension-Type Benefits in Hungary (2008)".

The objectives of my research work

During my research, my general objective is to detect differences in mortality among pensioners of retirement, disability and survivor pensioners and the entire Hungarian population by sex. For this, I will prepare life tables using domestic and international methodologies. For making life tables, I will produce the necessary beneficiaries and mortality data.

In order to achieve my main objectives, I will examine the following.

1. I will process the stock data for pensioners by sex and type of main benefits, which includes the data of approximately 3 million pensioners of retirement and beneficiaries of pension-type benefits. My goal is to calculate the proportion of recipients in the population of by the age completed on 1 January 2009, dealing with the ratio of old-age and disability pensioners in the population as well as the ratio of pensioners.
2. I will examine the data of disability pensioners in terms of their age completes according to their degrees of disability, I will draw the age pyramid of disability pensioners in terms of their degrees of disability. I will try to find out if there is a difference in the numbers of males and females in terms of the seriousness of disability.
3. I will process the data of nearly 120 thousand people who are retired, receiving retirement benefits at the time of their death (mortality data). I will give the number of the old-age and disability pensioners dying in 2008, by this I will point out the difference between the two types of benefits. I'll give you the number of disability pensioners dead, according to age and disability groups. I will calculate and include in a table the number of the recipients dead, their average age of death and their average time spent in retirement broken down by the major types of allowance. I will determine the average age of death for men and women and their time spent in retirement, and the difference between them. I'm looking for the reasons for a worse, thus lower age of death of men than women, the causes of their worse life chances. In my research, I will examine what proportion disability pensioners dying make out among all the recipients.
4. My plan is to calculate the proportion of men and women died among the recipients of disability pension. In the case of disability pensioners died, my aim is also to calculate the average age, their time spent in retirement for women and men. I will consider the distribution of the time spent in retirement, I will also find the year of maximum for both sexes.
5. It is the main aim of my research work to prepare the life tables on the basis of the international and domestic methodology of retirement for all beneficiaries of pensions, old-age, disability pensioners, widower and widows, considering both, males and females. A life table serves for describing the mortality of the population in detail, it gives us the level of mortality for ages. In my dissertation, it is my aim to give the probability of death by age and to analyse on and demonstrate and represent in a chart at what age there is a major peak for men and women died receiving pension and pension-type benefits. My goal is to show the differences of the probabilities of death given on the basis of my calculations of beneficiaries of

pension and pension-type benefits, old-age and disability pensioners annually from each other and the national average.

6. My aim is to give the life expectancies to be foreseen by age. It is my objective to show in what way probabilities of death and the life expectancy of recipients of pensions of old-age, disability and pension-type benefits differ from the national average and each other by years of age.

On the basis of my aims, I have the following hypotheses:

1. Above retirement age, the proportion of the beneficiaries of pension or pension-type benefits is above 95% - according to their age completed on 1 January 2009.
2. Considering disability pensioners, there is a difference between men and women about the degree of disability.
3. Considering their age of death, there is a significant difference between old-age and disability pensioners of both sexes.
4. Considering the time spent in retirement, old-age pensioners spend more time in the pension system than disability pensioners both with men and women.
5. The probabilities of death of the beneficiaries of different pension types significantly differ from each other and the population by years of age, in both sexes.
6. The life expectancies of the beneficiaries of different pension types significantly differ from each other and the national value at different ages, in both sexes.

MATERIALS AND METHODS

The stock data applied in this study come from the statistics of the Central Administration of National Pension Insurance (CANPI) appearing on a regular basis. I use the stock statistics registered after the pension rises in January 2008 and 2009, which include the number of a variety of recipients by sex, year of birth and type of benefits - grouped by types.

The mortality data have been available from the file of the Pension Payment Directorate (PPD). Here, I also had access to the years of birth, sex, types of service and the dates of retirement of the recipients died.

I also made use of the annual mortality data of 1 January 2008 to 2009 of the Hungarian Central Statistical Office.

Pensioners with benefits provided abroad for them, have been left out of consideration in all cases in my analysis, as they cannot be considered the beneficiaries of the Hungarian pension system either according to their places of residence or any other living conditions of theirs. Only domestic pension benefits are considered to be values valid for Hungary. Thus, stocks and mortality data considered in the analyses do not include benefits paid abroad.

Internationally, the data of retired beneficiaries are collected by EUROSTAT (Statistical Office of the European Union, based in Luxembourg). The data relating to pensioners belong to ESSPROS (European System of Integrated Social Protection Statistics) an independent

module. According to the international practice, retired beneficiaries include retirement benefits, which are listed below.

The statistical data of the Central Administration of National Pension Insurance staff collectively provide the following retirement benefits (*Pension benefits* total).

- Old-age pensions, above retirement age
- Old-age, under retirement age
- Disability, above retirement age
- Miners' and early retirement pension
- Disability pension under retirement age
- Accident-related disability pension under retirement age
- Rehabilitation annuity
- Temporary widow(er)s'
- Widow(er)s' above retirement age
- Widow(er)s' under retirement age
- Parents'
- Orphan benefits

Further *pension-type benefits*:

- Annuity for members of agric. co-op's
- Accident annuity
- Social annuities of the health damage persons
- Disability annuity
- Spouse supplement, spouses' income supplement
- Other pensions and annuities, etc.

I have listed pensions and pension-type benefits. Their total make out *Pensions and pension-type benefits*.

The basis of comparison between the types of benefits is based on the legally defined general retirement age. The pension paid to beneficiaries above age of retirement belongs among old-age pensions. Accordingly, disability pensioners reaching the standard retirement age are called old-age disability pensioners.

I treated disability pensioners under age separately. Internationally, disability pensioners under retirement age, and the disability benefit paid for them belong to the function according to their ESSPROS methodology. Disability pensioners reaching the age of retirement are listed to the function of old age in the Eurostat database. In my dissertation for 2008, I followed the annual national practice when I considered the proper classification data concerning Hungarian pensioners. This I could apply for the preparation of the life tables as well.

I named disability pensioners reaching the general retirement age disability pensioners above retirement age. (From 2012 onwards, according to the new statutory provisions, the Hungarian practice has also changed.) I treated disability pensioners under retirement age separately.

When carrying out the mortality analysis, I naturally cannot treat each type of care separately, because some of them have only few beneficiaries. I usually summarized the detailed list of pensions, and below, I will refer to them by the names given here.

- The beneficiaries of pensions and pension-type benefits include all the recipients of the benefits above.
- Old-age pensioners are named those who receive old-age pensions, above retirement age, old-age pension under retirement age, Miners' and early retirement pension as a main pension.
- Disability pensioners are called Disability pensioners above retirement age, disability pensioners under retirement age, Accident-related disability pensioners under retirement age, including the beneficiaries of rehabilitation annuity.
- Survivors' pensions include Widow(er)s' above retirement age, Widow(er)s' under retirement age, however, here I do not consider Temporary widow(er)s' even though they receive it as a main benefit. I only examined female survivor pensioners separately, as widows' benefits are merely received by a few thousands of men as a main benefit.

The definition of disability groups in the dissertation happens in the following manner:

Disability group III includes disabled but not totally incapacitated.

Disability group II is completely unable to work, but does not need extra care from others.

Disability group I is completely unable to work and wants total care from others.

The methodology used

The main aim of my dissertation is editing the annual life tables. I have reviewed the method description of abundant literature and followed the normal procedure. The methods currently used originate from the 1970s, using Böckh's formula, we have an opportunity to make life table based on the data for a particular calendar year.

Life table functions:

x : age at last birthday

l_x : the number of people surviving to exact age x

d_x : the number of deaths between exact ages x and $x+1$

p_x : probability of survival

q_x : probability of death (the probability that a person dies between exact age x and within $x+1$ years)

L_x : the number of person-years lived between exact ages x and $x+1$,

T_x : the number of person-years lived after exact age x ,

e_x^0 : the average number of years of life remaining at exact age x

$x + e_x^0$: expected age of death (at what age a person aged 'x' will die on average).

Life tables published in the Hungarian Demographic Yearbooks usually contain ten columns (the number of deaths figures in two columns), similarly my tables contain a great number of columns, although even the knowledge of fewer values assures sufficient understanding.

The most important lines of the life table are the following:

Age at last birthday: x .

Graduated probabilities of death: \overline{q}_x

the average number of years of life remaining at exact age x s, expressed using this formula:

$$e_x^0 = \frac{\sum_{i=1}^w l_{x+i}}{l_x} + \frac{1}{2}$$

I made the graduation in the following way:

I also considered the method applied for the national population by the Central Statistical Office

1. For ages 30 and 75 the Karup-King osculatory interpolation is used. The pivotal values are

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

the formula used is $Z_x = \frac{\sum_{i=-2}^2 q_{x+i}}{5}$

Then the graduated values are calculated by the formula

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

where α_{nj} is the $(n+1)$ st entry in the 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

2. For ages 76 and over I applied a Gompertz–Makeham function:

$$1 - \overline{q}_x = \overline{p}_x = e^{a+bc^x}$$

First I estimate the parameter c using the following formula:

$$c = \sqrt[5]{\frac{H_3 - H_2}{H_2 - H_1}}, \quad \text{ahol} \quad H_k = \sum_{i=0}^4 \ln p_{76+5(k-1)+i}, \quad k = 1, 2, 3$$

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

RESULTS

In my PhD study, I put the focus on the mortality data and indices of the recipients of pensions and pension-type benefits for the year of 2008 - taking into consideration the providing system effective in 2008. Accordingly, I will examine supply groups in my dissertation, and I also use headings that reflect the 2008 supply system. I'm planning to apply the annual changes of 2012 in the annual mortality studies of 2012, at the time of writing the present study, the necessary data for this were not all available yet. I primarily proceeded from the hypothesis that the mortality of the recipients of beneficiaries would significantly differ from that of the population. The main aim of my research was to highlight such differences. To achieve this, I had prepared mortality tables and by using them, I added graduated mortality probabilities related to various ages, benefits and genders as well as life expectancies regarding certain years of age. On their basis, I made comparisons between the mortality of the totality of those in receipt of pensions and pension-type benefits, that of old-age, disability and widow(er)'s pensioners – exclusively main benefits with regard to the latter – and population mortality.

1. Data of beneficiaries

The starting point of my PHD research was to use the stock data of those receiving pensions and pension-type benefits for January 2009. I disregarded benefits paid abroad, thus I only took domestic pension benefits into account concerning Hungary-related values.

The used stock data originate from the regularly published stock statistics of the Central Administration of National Pension Insurance which contains headcounts per year of birth, gender and type of benefit.

65 years of age or older are 16.4% of the population in Hungary. For women it is 19.8 %, for men 12.6 % in value. Hungary as a whole in terms of the proportion of the 65 year old and older makes up 23.8% of the working-age population.

In Hungary, 30% of the population received regular provisions in the form of pensions and pension-type benefits in 2008. More than one-fourth (27,3%) of the country population was in receipt of regular cash benefits in the form of pensions, where the female proportion amounts to 20 per cent more than that of men. 3 053 827 people received pensions and pension-type benefits in January 2008 (3 032 286 people considered), among these, 39.9% is men, 60.1% is females. Women have a significantly larger percentage as they spend a longer time in the data stock, and also get in at a younger age.

On analysing the proportion of beneficiaries inside the whole population, I have found the following: in younger age groups, in the case of those completing their years 17, 18, 19 on 1st January, there is 6% of beneficiaries of orphan benefits, by the year of age 25, this value falls back to 1%, later, there is another rise observed, at the age of 44, the value is over 7% (mostly disability pensioners). At the age of 62, the proportion of pensioners compared to the population reaches 96.8%, and from this age on, it keeps taking on a value approaching this. There is an important difference between males and females in this proportion at the age of 57, 58, 59, in early old-age pension because of the difference between the two sexes.

Among pension and pension-type benefit recipients, 56.9 per cent received old-age pension, 11.9 per cent attained retirement age, the number of disability pensioners under the retirement

age amounted to 14.2 per cent, whereas 4.4 per cent gained widow(er)'s pension as main benefit.

The percentage of old-age retired beneficiaries of the population of the national average is 17.2% among them, there are 24.3% more women than men. Within the group of retirement pension recipients, 62.9% receives old-age and retirement-type benefits.

The percentage of disability pensioners above retirement age and disability pensioners under retirement age altogether are 7.8% of the population in Hungary. The total of disability retirees under age and over age make up 28.4% of the retirement pension recipients in Hungary. The proportion within the group of disability retirees under age are reported to have a value of 4.2% of the national average. The ratio of disability retirees under age compared to the population of working age represent a value of 6.1%. I found the proportion of disability pensioners below the age within the group of all retirement pension recipients in Hungary to be 15.4%. In 2009, considering the proportion of disability pension recipients when checked annually in the total population, the values gradually increase until the age of 61, at this age. Disability group I comprises 0.54 % of the population, Disability group II 3.55 %, whereas Disability group III has 24.73 % of the population. The values for other ages get continuously reduced. Within disability pensioners, the number of recipients belonging to Group I is even lower than two percent by (1.85 %) , Disability group II includes 12.9 % in January 2009. The most notable group, III, includes 85.3% of all disability pensioners

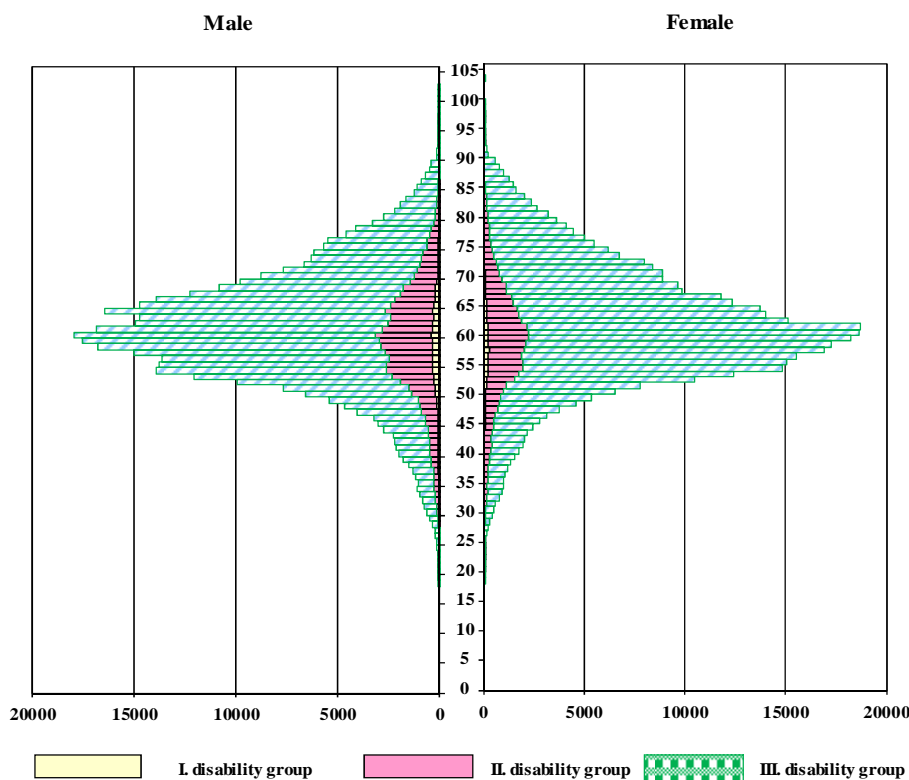


Figure 1

The number of disability pensioners represented according to age, sex and disability group (January 2009)

Source: calculated and structured by the author, CANPI data

The proportion of Widows above and under retirement age is 4.3% of all beneficiaries of pension.

2. Data of death

I will examine the data of death of beneficiaries of pensions or pension-type benefits in 2008. These mortality data do not include benefits paid abroad. All these data are related to Hungary and I will refer to them as domestic, national or total data. My research continued with the usage and analysis of mortality data, the analysis of which gave results of pensioners died in 2008, which proved to be interesting for further examinations, as well. While proceeding with analyses I have always taken special consideration to the fact that pension and pension-type benefit recipients have shown considerable variety in their totality. They are different in their benefits (old-age, disability, survivors etc.), their ages which have obvious correlations also with the benefits paid. For instance, young beneficiaries are mainly disability pensioners.

Mortality data have been taken from the stock data of PPD (Pension Payment Directorate), where I also had information on the years of birth, genders, types of benefit and retirement dates of deceased beneficiaries.

The main results are related to the mortality data listed below:

During 2008, **117 755** people died among those in receipt of pensions and pension-type benefits, nearly the half i.e. 48,4% of whom were male, whereas 51,6 per cent were female.

When analysing pensioner mortality for 2008, I was able to get to the conclusion that the proportion of the deceased reached 57,2% for old-age, 17,3% for disability pensioners above retirement age, whereas it amounted to 11,6% for disability pensioners under retirement age and 8,8% for those in receipt of widow(er)'s pension as main benefits. Most beneficiaries of old age pension died around the age of 82, while disability pension recipients at a much younger age, mostly at the age of 56-59.

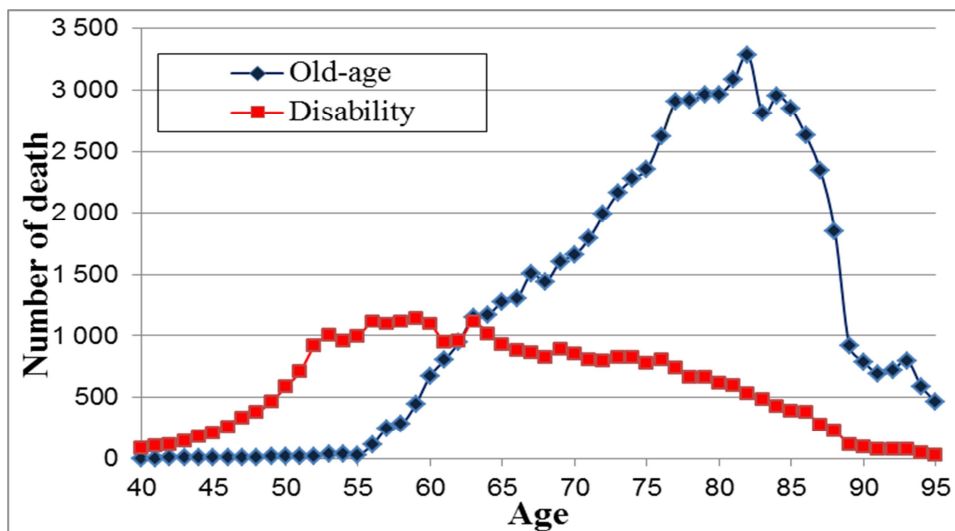


Figure 2

Differences between old-age and disability death numbers in 2008

Source: calculated and structured by the author, CANPI data

In disability group I, most people died at 57-58 years of age as it is shown in Diagram 2, while in disability group II, between 52-58 years of age. For those of group III, the number of deaths shows a constantly high value between 56 and 81 years of age.

As a result of my calculations, the deceased had an average age of death at the age of 74,9 years, whereas their average retirement period amounted to 19,3 years. On examining the two genders separately, the average age of death of men was 71.7 years with 16.5 years spent in retirement, whereas the former for deceased women reached 77.9 years with 22.0 years of retirement period, so that on average, females received benefits for 5.5 years longer than males.

As regards old-age pensioners above retirement age, their average age of death is 79.2 years of age with 77.9 years for males and 80.4 years for females. As I concluded, the difference amounts only to 2.5 years for the benefit of females. Life expectancies for beneficiaries, who had become part of the system as old-age (and not disability) pensioners attaining pension entitlement with the required service time, are more favourable. With the passage of years of age, the difference in life expectancies of males and females are gradually disappearing.

In the retirement ages for disability pensioners I did not find any significant differences in the average age of death, with men 72.9 years and with women 75.2 years. However, these averages are five years lower than those of old -age pensioners.

Nearly half of males died under retirement age, while the proportion of those under age for women is roughly one-third of all disability pensioners. The number of males died under retirement age is much higher than that of females compared to their stock data.

For men, the proportion of those died as disability pensioners among all the beneficiaries are much higher than for women. In my opinion, this may be one of the reasons for a lower average mortality age for male pensioners; moreover, a worse male life expectancy may also be seen in the higher degree of their disability.

The average retirement period for disability pensioners amounts to 16.1 years with 14.6 years for men and 19.1 years for women; however there is a considerable difference between such periods for the deceased died under or above retirement age. Examining the repartition of retirement periods, I can state regarding both genders that the mortality peak is in its first year. *This means that a significant part of disability pensioners dies within a relatively short period of time following their retirement.* In case of men, 25 percent of this repartition falls for the 6th year, i.e. one-fourth of them would die within 6 years after retiring. Regarding women, this 25 percent falls on the 9th year.

In the case of disability groups, I also investigated the average age of pensioners died and their time spent in retirement. As I expected, I have found a significant difference between the life expectancies of Groups I-II and III. For Groups I -II, the average age of death for men is 70.1 years, for women 70.9 years. The same data for Group III are 73.6 and 75.9 years respectively, so retirees in Group III live 3-5 years longer on average compared to those more severely disabled. Besides, the life expectancy of disability pensioners above retirement age belonging to Group III is also considerably less favorable compared to old-age pensioners. Old-age pensioners, however, have an average age of death at 77.9 years (men) and 80.4 years (women) , which is more than four years higher than the values of the disability pensioners in Group III .

In the respect of the average time spent in retirement, there is little difference between groups of more severe and less severe disabilities: both with men and women, there is a difference of approximately one year, Group III spends so much longer in retirement than Group II. Disability pensioners of Groups I and II spend essentially the same amount of time in retirement as old-age pensioners (their period of retirement begins much earlier, but it also ends much earlier). III. Group spends only about 1 to 1.5 years more in retirement than old-age pensioners.

In Figure 3, I have represented the time spent in retirement of beneficiaries of pensions and pension-type benefits died in 2008 – in every two years. Their average time was 19.3 years. It can be seen in Figure 4, there were a lot of them dying a little after retiring, the peak values are between 17-20 years, with significant frequencies up to 30 years. It is important to notice that there was a high number of people receiving the benefits for 39 years or more.

Old age pensioners, on the other hand, show a completely different picture. The main difference is in their more even distribution of ages, the proportion of very short benefit provision is much lower, and there are many fewer cases needing a long time of provision. On the basis of Figure 5, we can observe that the vast majority of pensioners received their benefits for 15-30 years among old age pensioners above retirement age died in 2008. Their average time spent in retirement was 21.5 years.

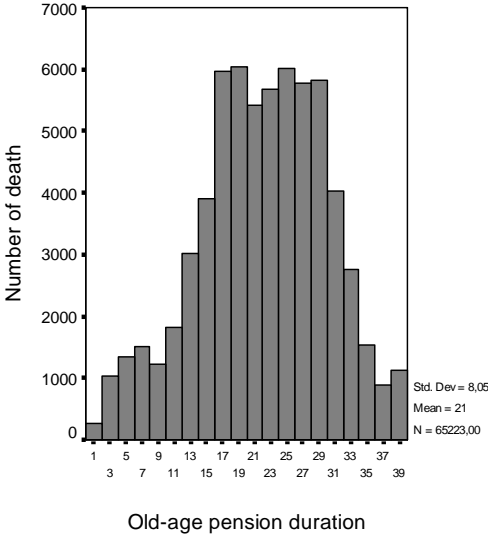
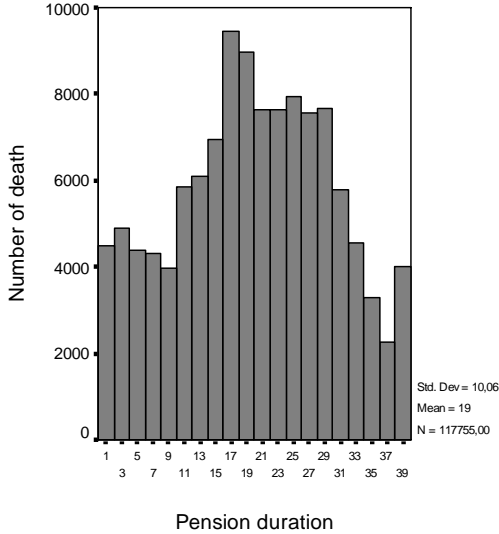


Figure 3 *The beneficiaries of pensions and pension-type benefits died in 2008*

Figure 4 *Old-age pensioners died in 2008*

Source: calculated and structured by the author, CANPI data

On examining the distribution of old-age male pensioners above retirement age, I can see that above the official age of retirement, the number of deaths is important, but most of them died between 77 and 85 years. Their average age of death was 77.9. For females, the peak of the number of deaths was between 84 and 87 years, but there was also a high number of women reaching an age above 90. Their average age of death was 80.4 years.

I will represent the time spent in retirement of old-age male pensioners above retirement age in Figure 5. Many of them died within a few years after retirement. Most of them received their benefits for 17-20 years, but some of them for more than 30 years. Their average time spent in retirement was 18.6 years. On analysing the time spent in retirement of women (Figure 6), I find that the maximum is 29 years, but there is another significant peak at 39 or after. (Considering men, this peak cannot be observed, as they were able to become pensioners at a higher age and did not live until this high age. The average time spent in retirement is 24.1 years with women.

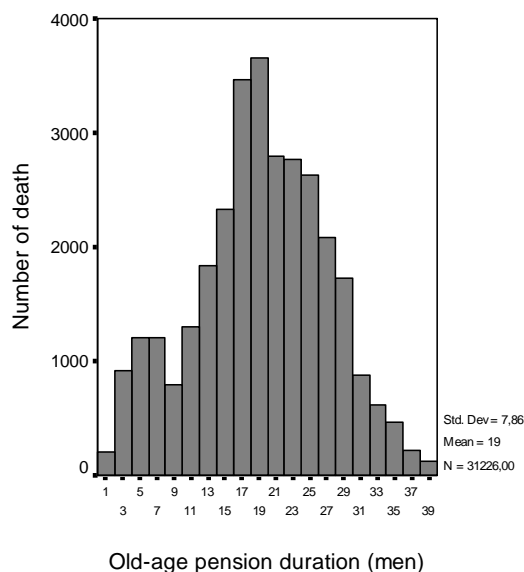


Figure 5 *Old-age male pensioners died in 2008*

Source: calculated and structured by the author, CANPI data

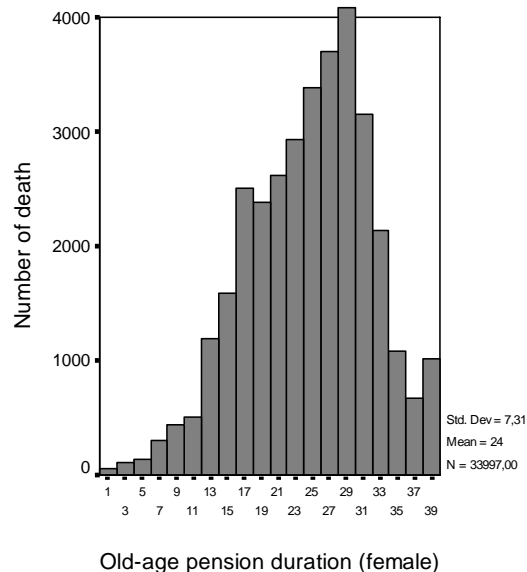


Figure 6 *Old-age female pensioners died in 2008*

I have examined the number of deaths of pensioners died in 2008 and found that among pensioners died, there were 57.2% of old-age pensioners, 17.3% above retirement age, 11.6% disability pensioners under retirement age and 8.8% widows.

Among male pensioners died in 2008, there were 57% old-age pensioners, 22.7% above retirement age, 16.6% disability pensioners under retirement age.

Among female pensioners died in 2008, there were 57.4% old-age pensioners, 12.2% above retirement age, 6.9% disability pensioners under retirement age and 16.8% widows.

The proportions of beneficiaries and number of deaths in terms of years of age and the population

I have examined the proportion of deaths of the population by years of age, and also the proportion of pensioners compared to the population by years of age. Above 62 years, in all ages, the proportions both in the number of deaths and pensioners are approaching 100%, for women and men alike. This corresponds to my expectation, as above 62 years, almost all the population receives pensions or pension-type benefits. An important part of those dying young is disability pensioners or the beneficiaries of other benefits provided at a young age. The ratio is the lowest for under 40 years for those dying in 2008 receiving pension or pension-type benefits compared to the total number of deaths in Hungary. This phenomenon is present with males much more significantly than with females. In these cases, death occurred in the lack of a precedent entitling the person to have an allowance (e.g. disability).

Monthly mortality values

In 2008, the monthly frequency of pensioners and the number of deaths of the country population change parallelly. The daily average numbers of deaths both for pensioners and the population are higher during the winter months than in summer time. Monthly mortality data are not different for the two sexes or different types of benefits.

3. Mortality analysis

After analysing the data of mortality, I continued my research preparing the life tables.

I elaborated the working method on the basis of the methodology to be applied. I prepared the life tables for 2008 for the beneficiaries of pension, pension-type benefits, beneficiaries of pension, disability pensioners, for male and female old-age pensioners and widows receiving a main benefit.

Among the values of life tables, I will examine two in detail, graduated probability of death and life expectancy. The indicators of death are made on the basis of mortality observed in a given year and show the way the mortality of pensioners or another chosen group varies in the given calendar year.

I expect the correlations of mortality mentioned above to reoccur here during my analysis of mortality, in the probabilities of death calculated for the different types of pension and in life expectancies.

I will use the results of my calculations and analyse the graduated probabilities of death for both males and females receiving pension, pension-type benefits, disability pensioners, old-age pensioners and widows receiving a main benefit. I will place particular emphasis on the average life expectancy of the different groups of the population of a certain age, which I consider one of the major issues of mortality analysis.

In Table 7, I present the graduated probabilities of death of pensioners and the residual life expectancy. The difference between men and women is clearly visible. Considering the male curve, the graduated probabilities of death have an increasing volume up to 52-55 years of age and in these age groups, we can see high graduated probabilities of death (equal to 69 years of age). The curve shows better (lower) rates between 55 and 62 years of age, then it reaches the former level by the end of the sixties, which is followed by a steep increase. The same tendency for women runs at a lower level and at relatively lower ages. In this phenomenon, higher graduated probabilities of death are presented for disability pensioners as at preliminary ages under retirement age only the minority of old-age pensioners occur in the stock data.

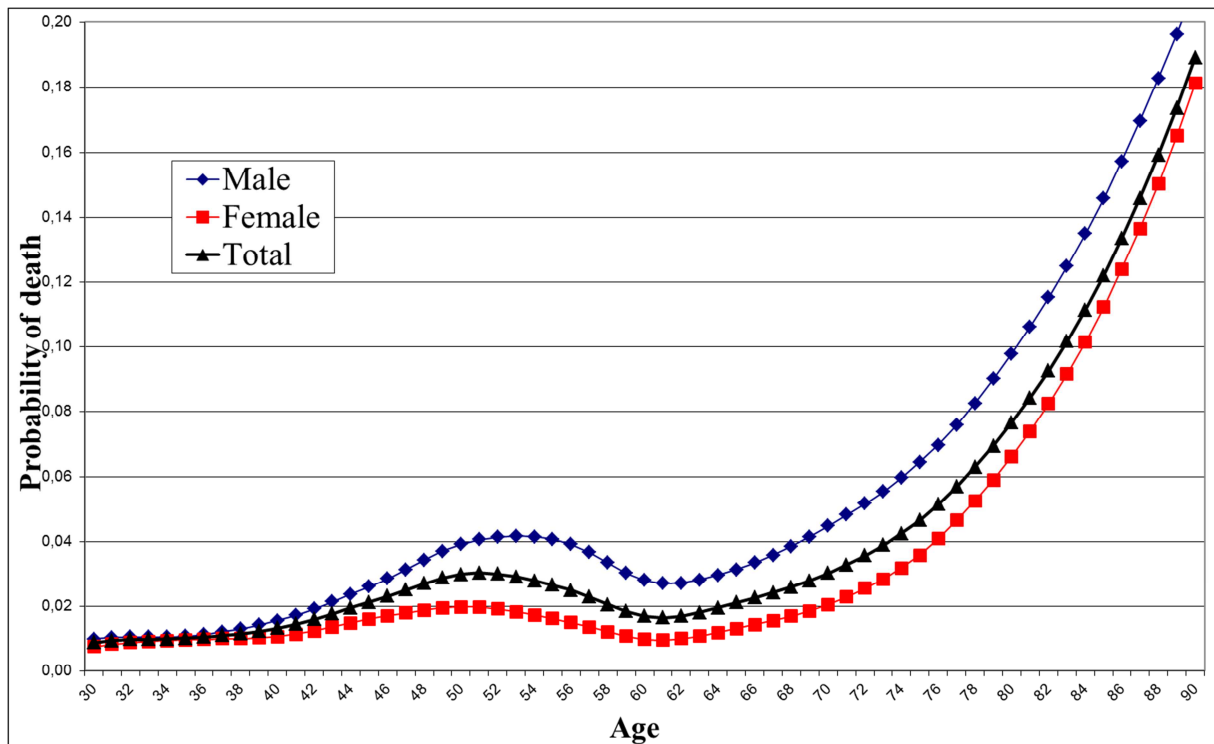


Figure 7
The graduated probabilities of death of pensioners in 2008
 Source: calculated and structured by the author, CANPI data

The data presented as the results of my calculations show that residual life expectancy at 30 for men – due to their age involved basically disability pensioners – is 30,9 years, whereas it is 39,6 years for women. The difference between genders amounts to approximately 9 years which gradually decreases with age advancement, so that it is only 1,3 years at 80. Regarding the totality of pensioners, life expectancy is 30 to 35 years.

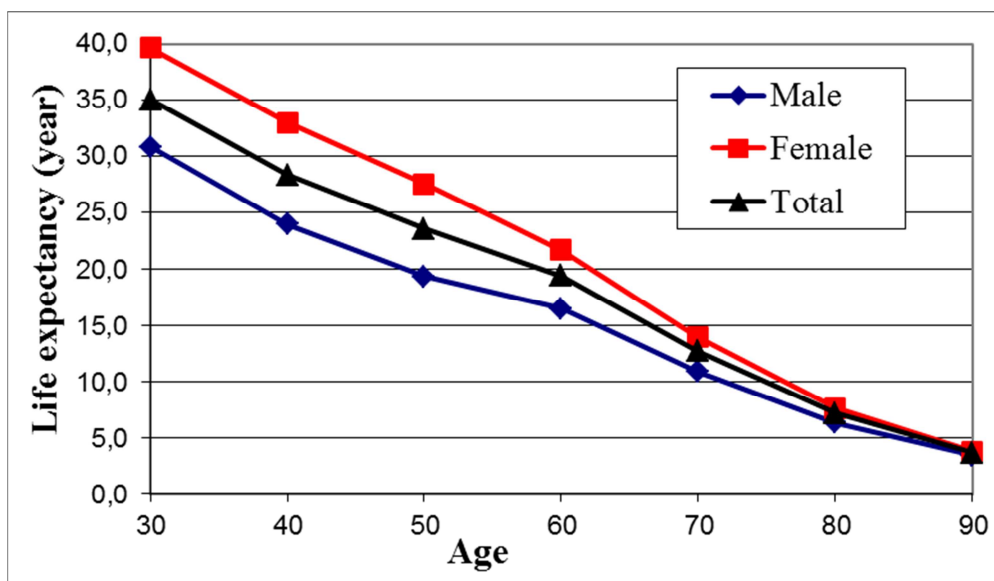


Figure 8
Life expectancy of pensioners in 2008
 Source: calculated and structured by the author, CANPI data

I have carried out similar mortality studies in the case of the beneficiaries of different allowances. In every type of benefit, there is a significant difference between males and females.

My main aim in the following is to examine whether there is a significant difference in the probabilities of death of the beneficiaries receiving different types of pension. I will also prove my hypothesis and show that the probabilities of death of beneficiaries with different types of pension differ from each other and the values of the whole population significantly by year of age.

On Figure 9, I will represent the probabilities of death of beneficiaries of pensions and pension-type benefits, pensioners, old-age and disability pensioners between 40 and 70.

According to my calculations, there is, no big difference between the probabilities of death of beneficiaries of pensions and pension-type benefits above 60 years of age. This is explained by the high percentage of being covered as from 60 on, almost all the population gets some kind of allowance. At the ages examined, the probabilities of death of disability pensioners are a lot higher than those of old-age pensioners.

E.g. at the age of 60 the probability of death of disability pensioners are 3.7 times higher than that of old-age pensioners of 60.

With the number of years increasing, this proportion is decreasing, still it is as high as 1.9 at the age of 75. The curve of old-age pensioners is closer to the one of beneficiaries of pension and pension-type benefits from 60 on, as the proportion of old-age pensioners is dominant among all beneficiaries between 60 and 75.

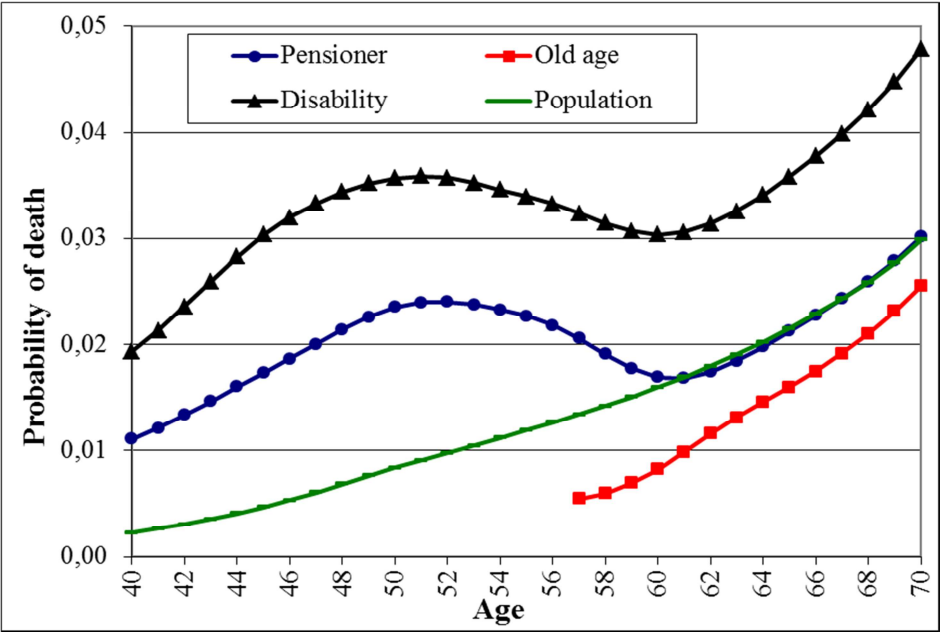


Figure 9

The probabilities of death of beneficiaries of different types of pension in 2008
 Source: calculated and structured by the author, CANPI data

The probabilities of death of disability pensioners at the examined ages are much higher than those of old-age pensioners, at the age of 60, the probability of death of disability pensioners is 3.1 times higher than that of old-age pensioners of 60.

With the number of years increasing, this proportion is decreasing, still it is as high as 1.5 at the age of 75. The curve of old-age pensioners is closer to the one of beneficiaries of pension and pension-type benefits from 60 on, as the proportion of old-age pensioners is dominant among all beneficiaries between 60 and 75.

In women, contrary to men, there is an extra category supplied with benefits, those receiving widow' pension. A higher probability of death of disability pensioners can be perceived here as well, with the proportions moving between 3.1 and 1.5. It is worth highlighting the situation of widows, whose probabilities of death stand closer to disability pensioners than old-age ones. It is also interesting to observe that beneficiaries receiving widows' pension have a higher probability of death up to the age of 60-68 than disability pensioners. After the age of 68, this turns round, so disability pensioners will die more probably. The probabilities of death of disability pensioners are much closer to old-age than to disability pensioners at a really high age (this cannot be seen on the figure). The difference is not significant in itself, still it is an intriguing phenomenon. Like in men, the curve of beneficiaries of pension and pension type benefits is closer to that of old-age ones, here from the age of 60 on, as in women too, the proportion of old-age pensioners will be dominant among all beneficiaries. (In 2008, women's early retirement age was still 57 years, the old-age one was 62 years.)

I will continue my study referring to another important indicator of the life tables prepared by me. After probabilities of death, I compared the life expectancies of beneficiaries of different types of allowance between 40 and 70. My hypothesis here is that the life expectancies of beneficiaries receiving different types of allowance differ from each other and the whole population at certain ages.

On Figure 10, I will demonstrate the life expectancies of beneficiaries of different types of allowance in 2008. It can be seen clearly that old-age pensioners have a lot better life expectancy than disability ones. The life expectancies of beneficiaries of pension and pension type benefits are equal with those of the whole population from 58 years on. At the age of 60, life expectancy is 19.4 years for beneficiaries of pension and pension type benefits, 20.7 for old-age, 15.8 for disability pensioners. The value estimated for the whole population is 19.3. There is a difference of 5 years between old-age and disability pensioners. This difference goes decreasing with age, still there is 1.2 years at the age of 80.

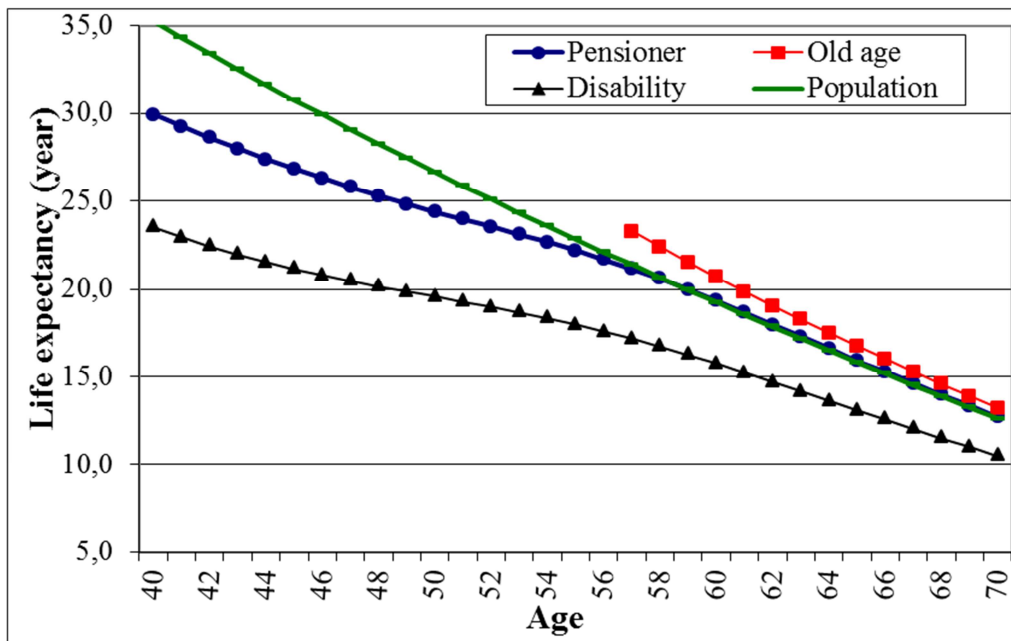


Figure 10

Life expectancies of beneficiaries of different types of allowance in 2008

Source: calculated and structured by the author, CANPI data

Old-age male pensioners have a lot better life expectancy than disability ones. The life expectancies of beneficiaries of pension and pension type benefits are fairly equal with those of the whole population above 60. For the beneficiaries of pension and pension type benefits, life expectancy is 16.5 years, while for old-age pensioners 18.1 and for disability pensioners, it is 13.6. The Demographical Yearbook (2008) has an estimated value for the whole male population, 16.6 years. There are 4.5 years' difference between old-age and disability beneficiaries. This difference goes decreasing with age, still there is 0.9 years at the age of 80.

I have also calculated the life expectancies of women receiving different types of allowance. At the given ages, considering the average life expectancy, we can say that old-age pensioners have the best situation. As a result of my calculations, at the age of 60, it is 21.6 years for beneficiaries of pension and pension type benefits, 22.6 for old age, 18.8 for disability pensioners, 19.1 for widows. There are 3.8 years' difference between old-age and disability beneficiaries. This difference goes decreasing with age, still there is 1.1 years at the age of 80.

As regards retirement, the 62nd year of age has a special role; therefore I carried out additional examinations concerning residual life expectancy at 62 relating to the different types of benefits. In the table below, I will present the results of my calculations. I also indicated the data of the Hungarian population in the last row cited from an HCSO publication [2008]. I have not prepared a life table for widowers, as there are a lot more data necessary for it than their number.

Table

Life expectancy at 62 relating to the different types of benefits

	Total		Men		Women	
	Life expectancy (years)	Expected age of death	Life expectancy (years)	Expected age of death	Life expectancy (years)	Expected age of death
Recipients of pensions, pension-type benefits	18,0	80,0	15,4	77,4	20,0	82,0
Old-age pensioners	19,1	81,1	16,6	78,6	20,8	82,8
Disability pensioners	14,7	76,7	12,7	74,7	17,4	79,4
Beneficiaries of widow(er)'s pension					17,5	79,5
Population	17,9	79,9	15,4	77,4	19,9	81,9

Source: calculated and structured by the author, CANPI data

The life expectancy of the entire population basically corresponds to data similar to those in receipt of pensions and pension-type benefits. This is in line with my previous results where I could see that already 98 per cent of the population had received a certain type of benefit at 62. Males receiving old-age pensioners can expect to live 1.2 years more, females 0.8 years more than the whole Hungarian population. At the same time, according to my calculations, the life expectancy of men receiving old-age pension is 3.9 years longer, while that of women is 3.4 years longer than that of disability pensioners.

4. My new and innovative research results

I will summarise my results as follows:

1. I have elaborated the stock data in terms of sex, main types of allowances, this contains the data of more than 3 million beneficiaries of pension and pension-type benefits receiving regular allowances in the form of pension or pension-type benefits in 2008. More than one fourth of the country's population received allowance in the form of pension (27,3%), and there are 20% more women than men among them. 56.9% of beneficiaries of pension and pension-type benefits got old-age pensions among them, 11.9% were disability pensioners above the age of retirement, while 14.2% disability pensioners under retirement age and 4.4% received widows' pension as a main allowance. I have calculated the proportion of beneficiaries in terms of their ages completed on 1 Jan. 2009. for old-age and disability pensioners both within the population and the group of pensioners. There is a huge difference between men and women in terms of coverage. The reason for this is their different early old age pension age limit. I conclude that the proportion of beneficiaries of pension and pension-type benefits above the age of old-age retirement is above 95% - in terms of their ages completed on 1 Jan. 2009. **Through this, I have justified my first hypothesis.**
2. I have analysed the data of disability pensioners in terms of their degrees of disability and ages completed, I have drawn their age pyramid according to these. The number of men belonging to disability groups I and II is higher at almost all ages. I have found a

significant difference between male and female disability pensioners in terms of the severity of their disability. Through this, **I have justified my second hypothesis.**

3. I continued my research work by elaborating and analysing mortality data (nearly 120.000 items), this had been a field never elaborated before. On analysing the mortality data in themselves, I received results interesting enough for further analysis on pensioners died in 2008. I have given the number of old-age and disability pensioners died in 2008 in terms of their ages, through this, I have indicated the difference between the two types of allowances. My calculations have shown that the average age of death for all types of beneficiaries was 74.9 ys. Old-age pensioners live 3.7 ys longer, disability pensioners 8.9 ys shorter, widows 9.5 longer. The average age of men dying is 71.7 ys, that of old-age pensioners is 5.5 ys more, that of disability pensioners is 6.4 ys less. The average age of women died is 77.9 ys, , that of old-age pensioners is 2 ys more, that of disability pensioners is 10.5 ys less, that of widows is 6.6 ys more. I have indicated a significant difference in terms of the age of death in the case of the beneficiaries of pension and pension-type, old-age and disability pensioners, **which justifies my third hypothesis.** I have searched for the reason for men's lower age of death and worse life prospects than women's. The proportion of disability pensioners died within all the beneficiaries is a lot larger in men than in the case of women. In my view, this is partly the cause of the lower average age of death of male pensioners, and the generally worse life prospects of men also appear in their higher proportion of disability.
4. My calculations have shown that the average time spent in retirement by pensioners died is 19.3 ys. That of old-age pensioners is 1.6 ys higher, disability pensioners have it 3.2 lower, widows 3.5 higher. The average time spent in retirement of males was 16.5 ys. That of male old-age pensioners is 1.6 ys higher, disability pensioners have it 1.9 lower. The average time spent in retirement of females was 22.0 ys. That of female old-age pensioners is 1.6 ys higher, disability pensioners have it 2.9 lower, widows 0.9 higher. Furthermore, women kept receiving their pensions for 5.5 ys longer on average than men. **Thus, I have justified my fourth hypothesis.** Old-age pensioners spend more time in the pension system than disability pensioners. I have also examined the distribution of the time spent in retirement; in both cases I could see the maximum of numbers of death in the first year. This means that a significant proportion of disability pensioners die within a relatively short time after their retirement. The average time spent in retirement of old-age male pensioners above retirement age is 18.6 ys, the peaks are between 17 and 20 ys, women spend 24.1 ys in retirement on average, their peak is at 29 ys, but I have also found an important top at '39 or more' ys. The regulations born at the end of the 50's enlarged the circle entitled to receiving social security allowances by involving the members of co-operatives in the compulsory pension system. That is how the circle of beneficiaries was able to be enlarged after completing 10 ys' service in 1969. I believe this appears in the statistics of mortality.
5. The most important part of my dissertation is analysis of mortality in terms of types of benefits. For this, I first prepared life tables for the total of pensioners, old-age, disability pensioners and widows' pension as a main allowance following the international and Hungarian methodology. On analysing the probabilities of death of males and females according to ages, I have found that in men died at the age of 50-55 receiving pension or pension-type benefits there is a peak to be seen, while females have it at 48-54 years. I have proved that there is a significant difference between men and women under these ages. I have explored that the probabilities of death of the beneficiaries of different types of allowances significantly differ from each other and

national values. **This has justified my fifth hypothesis.** At the age of 40, the probability of death of disability pensioners is 8.6 times more than that of the population, at the age of 50, it is 4.3, at the age of 60, it is 3.7. Above the age of 60, there is no more important difference between the probabilities of death of the population and beneficiaries of pension and pension-type benefits.

6. I have found that in the case of beneficiaries of pension and pension-type benefits, old-age and disability pensioners, the life expectancies received as the results of my calculations differed from each other and the national average. According to my calculations, at the age of 40, the life expectancy of disability pensioners is 11.8 ys lower than the total of pensioners and 5.4 ys lower than that of the population. In terms of retirement, the 62nd year of age has a significant role, that's why I have dealt with the life expectancy at the age of 62 for different types of pension separately. The life expectancy of disability pensioners is 4.4 ys lower than that of old-age pensioners. The life expectancy of the total population (17.9) is basically equal with the data of the beneficiaries receiving pension and pension-type benefits (18.0). All this corresponds to my former results, where I found that 98% of the population receive some type of allowance at the age of 62. **So I have justified my sixth hypothesis as well.** The life expectancies of beneficiaries of different types of allowances differ from each other and national values.

CONCLUSIONS, SUGGESTIONS

The most important issue of my dissertation is how long we will live. The Central Statistical Office provides data on Hungarian mortality and life tables yearly. There are significant differences among certain groups in terms of their mortality. It is well-known that the mortality of females is much better than that of males. Demographers have pointed out differences in life chances, tendencies and changes in time and level of education. There are some scientific works available to give the differences in mortality according to regions. It is known how much mortality data differ depending on marital status. The analyses so far have included different causes of death. However, I have completed the analyses by adding a new aspect.

- In my research, I find that the beneficiaries of pension and pension type benefits need special attention in Hungary, as 30% of the population received regular allowance in 2008, 56.9% of these got old-age pension, 11.9% above age, 14.2% was the proportion of disability pensioners under age, while 4.4% received widows' pension. I call the attention to the fact that during the analyses, you always have to consider that beneficiaries of pension and pension type benefits are a varied group. They have different types of pension (old-age, disability, widows') and these have to be treated separately in analyses.
- On analysing the data of death of pensioners in themselves, I have received some valuable results as well. Considering all types of allowances, the average age of the people died in 2008 is 74.9 years, that of old-age pensioners is 78.6, of disability pensioners 66.0 years, of widows it is 84.4 years. When designing life insurances, pension or health insurances, it has to be considered that the average age of death of old-age pensioners is 12.6 years higher than that of disability pensioners. Regarding all allowances types, the average age of males died is 6.2 years lower on average than in women. In old-age pensioners, this value is 2.7 years.
- I have also calculated significantly different values for their years spent in retirement. Beneficiaries in total spent 19.3 years, old-age pensioners 20.9, disability pensioners 16.1 and widows 22.8 years in retirement on average. On preparing pension models, I recommend that these data should be used. According to my calculations, also here there is a huge difference between the data of males and females. The total of men receiving allowances spent 5.5 years less in the pension system than women. This value is also 5.5 in old-age pensioners; however, women's average lower retirement age needs to be taken into account.
- During my research, I have completed the life tables for beneficiaries of pension or pension-type benefits, pensioner's male and female, old-age and disability pensioners and widows. In my dissertation, I will give you the two columns of life tables by age (probability of death, life expectancy) for further users.
- I have received and presented the mortality of pensioners calculated in terms of their groups in 2008. As a result of my calculations, on the basis of two types of values (probability of death, life expectancy), I have pointed out some significant differences in life chances. I have compared my results also with the similar data of the national

population provided by Central Statistical Office. I have managed to point out, e.g., the graduated probability of death for all pensioners to be 0.021 at the age of 57, it is 0.005 for old-age pensioners, 0.032 for disability pensioners, while 0.013 for the whole population. Thus, the probability of death of pensioners at the age of 57 is 1.5 times the average national value, in the case of disability pensioners, 2.4 times.

- I have received the following values for males: at the age of 57, their graduated probability of death is 0.033, for old-age, it's 0.013, for disability 0.046, for the whole population, it is 0.012. Thus the probability of death of males at the age of 57 is 1.7 times the national value, while for the disabled, 2.4 times.
- I have received the following values for females: at the age of 57, their graduated probability of death is 0.012, for old-age, it's 0.004, for disability 0.019, for the whole population, it is 0.008. Thus the probability of death of female pensioners at the age of 57 is 1.51 times the national value, while for the disabled, 2.4 times
- I suggest considering the significant difference I have found in the case of life expectancies as well. As an example, I would mention the age of 57 here, too. According to my calculations, there are the following values of life expectancy for the beneficiaries of pension, pension-type benefits: 21.2 years, for pensioners 21.1, for disability pensioners 17.2, old-age pensioners 23.3. Central Statistical Office says the national population has a value of 21.4 years. I suggest that on designing life insurances, pension or health insurances, it should be considered that old-age pensioners may expect to live 1.9 years more than the population at the age of 57, which has significant expenses these insurances.
- In 2008, on average, men receiving pension or pension-type benefits could expect to live 17.8 years longer, pensioners 17.8 years, disability pensioners 14.6 years, old-age pensioners 20.4 years. Central Statistical Office provided the data 20.4 for male population. At the age of 57, old-age male pensioners could expect 3.9 years more than the male population.
- In 2008, on average, female beneficiaries of pension or pension-type benefits were able to expect to live 23.8 years longer, disability pensioners 20.7 years, old-age pensioners 25.3, widows 21.2 years. Central Statistical Office provided the data 23.9 for female population. At the age of 57, old-age female pensioners can expect to live 1.4 years longer than the male population. At the age of 57, old-age male pensioners can expect to live 4.9 years less than women. The life expectancy of male population is 5.4 years lower than of women.
- For creating an appropriate regulation at pension funds, it is essential to calculate obligatory allowances, the service provider can only prepare we-based life tables for internal use if it has a large and steady number of clients. At the moment, unlike National Pension Fund, no other service provider possesses one like that. I suggest that the life tables of old-age pensioners produced by me should be applied for making a central life table. The data of life tables prepared during my research are appropriate for making more precise calculations. I find my life tables efficient to use.
- In pension institutes, the calculation of obligatory allowances is important for the right regulation, through this, service providers are able to make life tables for themselves

only if they have a relatively steady number of allowances. At present, no pension institute possesses one like this except for National Pension Fund. I suggest that the life table of old age pensioners completed by me should be applied for the central life table.

- I also believe that an extensive analysis of my results would be essential. Taking care of our pensioners' years, e.g. can be facilitated by knowing that the average age of death for male old-age pensioners above retirement age was 77.2 in 2008, they spent 18.1 years in retirement, women lived for 79.9 years and had 23.6 years in retirement. When thinking about self care, it is important to know that males of 62 can expect to live 15.4 years, pensioners 15.4 years, disability pensioners 12.7 and old-age ones 16.6 on the average. At the same time, among women of 62, beneficiaries of pension and pension-type benefits can expect another 20.0 years, pensioners 20.1 years, disability 17.4, old-age pensioners 20.8 and widows 17.8 ys on average. I find it reasonable to publish my results above.

My work may not stop here, I have elaborated the methodology and however my results will need to be used. I am also keen on carrying out these calculations for the new system of provision, so for mortality examinations of 2012, I will have to follow the new approach (Act LXXX / 1997 valid for 2012). I will continue my work according to this.

LIST OF RELATED PUBLICATIONS

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