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Patterns of active inpatient care expenditures for the Hungarian elderly in the last year of life

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Abstract: *This study describes acute hospital-based service utilization during the last year of life by the Hungarian elderly (aged 65+ years) who died in a 12-month period. The aim of this study is to expand our knowledge on the expenditures related to the end-of-life care given to elderly patients. The main findings of this study are: (i) The active inpatient expenditures start to increase from the 7th month before death; (ii) In the last twelve months of life, active inpatient care expenditures show a significant decline between the age groups; (iii) Men have higher active hospital spending then women in the last 12 months of life.*

Key-words: *aging, health expenditure, active inpatient care, elderly, last year of life*

1. Introduction

The usage of healthcare services is sometimes necessary during our lifetime, but towards the end of life is almost inevitable. The health services received at the end of life tend to be expensive and complex and affect not only the suffering individuals, but also their family members and the society as a whole.

Because of their size, knowing the behaviour of these costs is important to anticipate the future development of health spending. Health care costs are higher for the elderly than for any other age group, since the elderly are usually the closest to death, so higher costs associated with death will mainly appear in their case. Therefore, it is essential how the demographic aging phenomenon is taken into account in the forecasts. We may think that population aging can have important consequences for the sustainability of future healthcare systems.

In recent years, there is an increasing literature on the health expenditures of the pre-death period. Though the results differ, the studies agree with the fact that during a person's life the costs of health treatments are accumulated in the years or moths before death, irrespective of the individual's age at the moment of death. So, as the end of life approaches, there is a significant increase in health spending.

The health expenditures of the last years of life have been in the focus of interest for researchers and decision-makers since the 1980s. For several decades,

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analysts have been disputing why health expenditure is rising with age. The answer seems to be obvious: as people age, their health status deteriorates and health costs are growing accordingly. Health spending per capita is therefore higher for older generations. When we plot the age composition of expenditure, we get a J-shaped curve (Fig. 1). The per capita cost is high at a very early age, then it starts to decline and stays low for the middle-aged population and then re-emerges after 50 years of age. Figure 1 depicts the age distribution of per capita health expenditures as a percentage of GDP in 28 EU Member States (data for 2014).

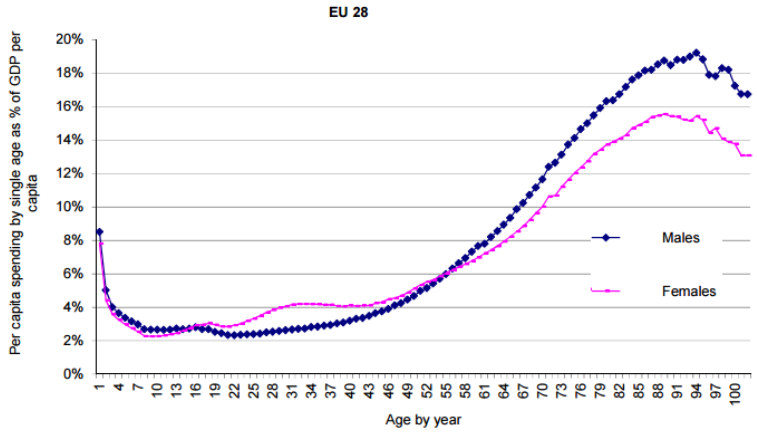

Fig.1. *Age-related expenditure profiles of health care provision (spending per capita as % of GDP per capita)*

Source*: European Commission, The 2015 Ageing Report*

However, in recent years there is a paradigm shift in the viewpoint of researchers. More and more people argue that the population aging will not have so serious consequences as previously assumed, because the most significant cost occurs due to death, that is, in the last year or last months of life, and not because of old age as a condition.

The new approach in literature is that health expenditures do not depend on the time elapsed since birth, but on the time remaining until death. In other words, the average health care cost increases as a function of age, just because the number of people who are closer to death increases with demographic aging. As life expectancy increases over time, the curve of healthcare costs as a function of age will become less and less steep, as in the future, 65-year-olds will not be in the same stage of their life-cycle as they were a few decades ago.

The impact of age on health spending at the end of life and the use of health care services has been widely studied. The different studies reached different conclusions: usage and spending increased with age, usage and spending decreased with age, and both show an increase with age until a certain threshold after which they start to decline.

It is important, however, to mention that the effect of age changed depending on what features of health care services were included in the analysis because each component behaves differently. The cost of inpatient care showed the most accentuated decrease with age. The costs for patients over 85 years are 50% below the 65-69 age group in case of Medicare expenditures (Yang et al., 2003). In Denmark, for example, this ratio is even higher, reaching 70% (Madsen et al., 2002).

2. Objectives

The international literature in this field is relatively scarce. Most previous studies have been restricted to a sample of population or to decedents with certain diseases. This topic has not yet been addressed by the Hungarian literature. No investigation exists based on micro-data about the health expenditures incurred before death. For this reason, I consider my work as a niche research that contributes to a better understanding of the impact of demographic aging in our country.

This study attempts to find the answers to the following questions:

- Is there any change in the active inpatient health expenditure for the elderly, as individuals are approaching death?
- Is there a difference in active inpatient health expenditure at the end of life between the age groups of the elderly population?
- Are there gender differences in active inpatient health care expenditures for the elderly population?

The analysis relies on administrative data from the Hungarian public medical insurance fund, which covers the entire Hungarian population, and allows conducting such an analysis because it provides a comprehensive coverage for outpatient and inpatient medical services.

3. Data and methods

I used the database of the Hungarian National Health Insurance Fund. From the database, I obtained health insurance claim information during the year prior to death for those individuals who died in fiscal year 2014 and were at least 65 years old.

The privacy rights of research subjects should be protected. This is not just a legal but also a moral obligation. For privacy reasons the data used was fully anonymized. For the purpose of anonymizing the data, the TAJ identifiers (social insurance identification number) were encrypted to a pseudo-TAJ identifier that is equally suitable for personal identification so that data of the same individual can be linked. A person has the same pseudo-TAJ throughout his life so that his entire path of illness can be traced.

The total cohort included 95.850 persons. 43.5% of the population is male (41.671 individuals) and 56.5% female (54.179 individuals). For each individual the gender, birth year, postal code of residence, date of death have been filtered. In the case when the patient died in a health care institution, the postal code of the institution was included in the database. Available data on hospital utilization included the day of admission and the day of discharge.

The analysis is concentrating on active hospital utilization expenditures which represent the largest share of total health care costs.

From the viewpoint of financing a care is considered to be active, if it aims to restore the health status as soon as possible. The duration of active care can usually be planned and in the majority of cases it is a short-term treatment (Government Decree 43/1999 (III.3.)).

The active inpatient care provision is funded according to the type and severity of the inpatient case, based on the HBCS (Homogeneous Disease Groups) classification system. This financing method was introduced in 1993, and it means that the inpatient facility providing the active care receives funding on the bases of weight numbers assigned to the HBCS. HBCS is a case classification system that classifies inpatient cases that have the same or similar intensity of intellectual and financial cost in homogeneous groups, taking into account their medical professional content. Since the performance value is considered to be the same in a given HBCS, a single fee will be assigned regardless of the number of medical interventions performed in the therapy, so the amount to be financed is determined before the service is performed. A cost-weighting number (number of points), was defined for each group of diseases, and the hospitals' monthly output in terms of HDGs is financed according to the total number of HDG points multiplied by the monetary value of 1 point, the so-called national base rate. The national base rate is set in advance and it applies to all hospitals equally.

For the active inpatient care, each of the nursing cases is encoded with a unique key. The database contains the patient's pseudo-TAJ number, date of admission, date of discharge, and HBCS weight for each nursing case. As a difference between the date of entry and departure, the number of nursing days for each case was determined. The next step was to count back from the date of death twelve 30-day months periods and for each of these periods I had to assign the weight of the active inpatient care given in that month. Since a nursing case could last for more than 30 days, it was necessary to allocate the HBCS weight of the entire case pro rata temporis.

4. Results and discussions

For the purpose of the analysis, the individuals were divided into 6 age groups according to their age in the year of death (2014):

1. age group: 65-69
2. age group: 70-74
3. age group: 75-79
4. age group: 80-84
5. age group: 85-89
6. age group: over 90

The age distribution of the 95.850 individuals is shown in Figure 2.

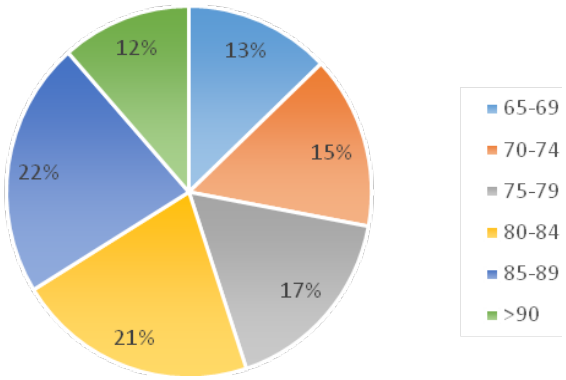

Fig. 2. *The age distribution of the analyzed population*

Among decedents aged 65 years and older, 68,3% ($n = 65.469$) had at least one hospitalization recorded during their last year of life. When I computed the hospital episodes, the average number of episodes per person was 3 (Fig. 3) and the average length of each episode was 6 days.

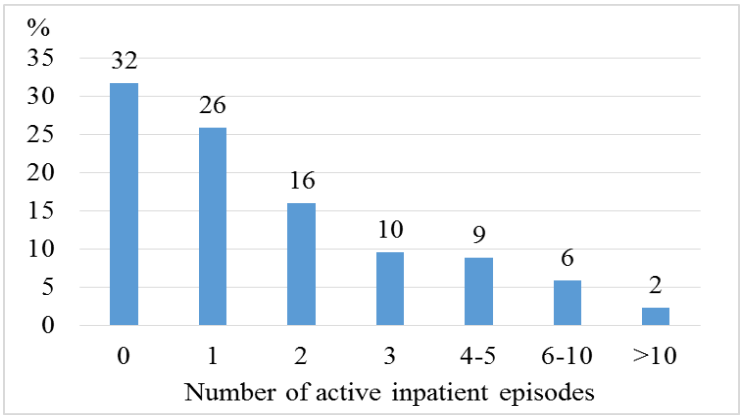

Fig. 3. *Hospital episodes in the last year of life for decedents aged 65 years or more*

During the last year of life, the average time in hospital was 21 days per person and only 15 % of decedents spent more than 30 days in hospital (Fig. 4).

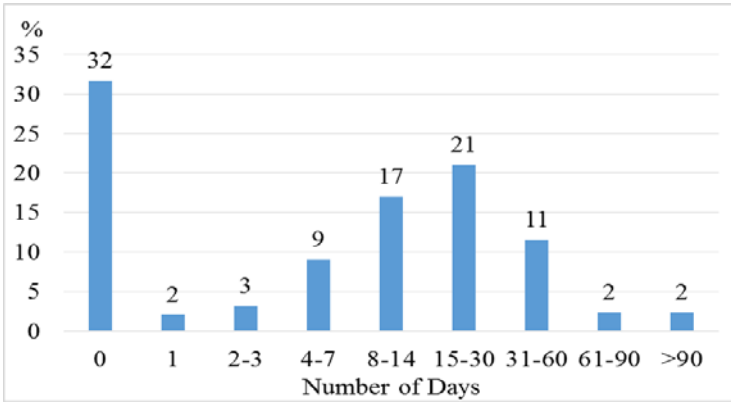

Fig. 4. *Total number of days in hospital in the last year of life for decedents aged 65 years or more*

My first hypothesis was that active inpatient health expenditures are concentrated in the last few months of life, that is, as an individual approaches death, he increasingly uses active healthcare provided by hospitals, so a significant increase can be observed in health expenditure.

To test my hypothesis, I used the one-way ANOVA analysis. For the purpose of the analyses I separated the total value of individual expenditures for the 95.850 decedents by the time remaining to death. The time remaining until death varies between 1 and 12, and shows the monthly cost of inpatient care received by every individual each month during the 12 months prior to his death (30 days months). So I had 12 samples, each containing 95.850 records.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3,643E15	11	3,312E14	2939,291	,000
Within Groups	1,296E17	1150188	1,127E11		
Total	1,332E17	1150199			

Table 1. *One-way ANOVA by time to death*

Table 1 shows that the *F* ratio is significant, so it can be concluded that a difference between means exists, the different time periods until death have different effects on health expenditure. To determine which specific means are different, the post-hoc analyses was performed.

In the case of active inpatient care expenditure, the seventh month is the period after which a significant difference can be justified in the averages of successive months (Fig. 5). There is no significant difference between the 8th and 9th months.

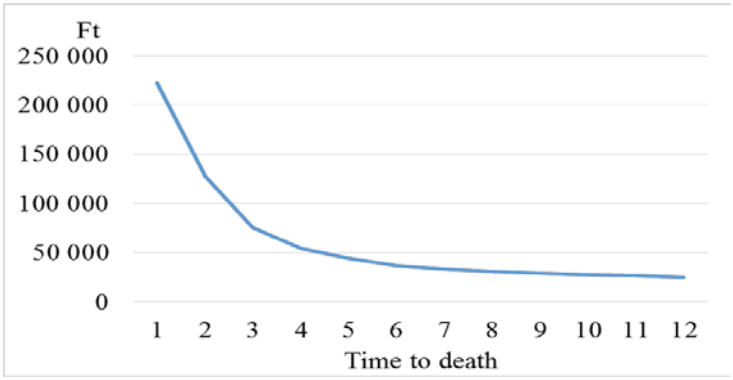

Fig. 5. *The average expenditure of active inpatient care in the 12 months prior to the death*

The total cost of the in-patient care for the 95.850 decedents in the 30 days prior to their death were 21.344.653.961 Ft, almost 9 times higher than the cost in the 12th month before death, when the sum was 2.377.287.272 Ft.

When I examined men and women separately by using the one-way ANOVA analysis, this trend remained (Fig. 6) and only the significant differences between the averages have changed. For women, the annual average expenditures are lower.

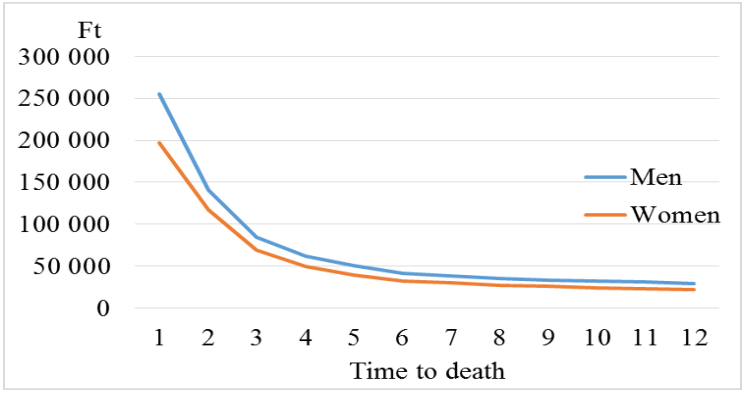

Fig. 6. *The average expenditure of active inpatient care in the 12 months prior to the death as a function of sex*

When answering my second research question, I analyzed how active inpatient health expenditures develop before death for different age groups. My hypothesis

was that, with age, spending is shrinking, so dying at a very old age is cheaper than at a younger age.

The result of the variance analysis (Table 2) shows that in the last twelve months of life, the active inpatient care expenditure records a significant decline between the age groups.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9,253E15	5	1,851E15	811,663	,000
Within Groups	2,185E17	95844	2,280E12		
Total	2,278E17	95849			

Table 2. One-way *ANOVA by age groups*

As shown in Figure 7, the most costly patients are those who die younger. The pattern of decreasing expenditures with age is persisting throughout the last year of life in case of both sexes.

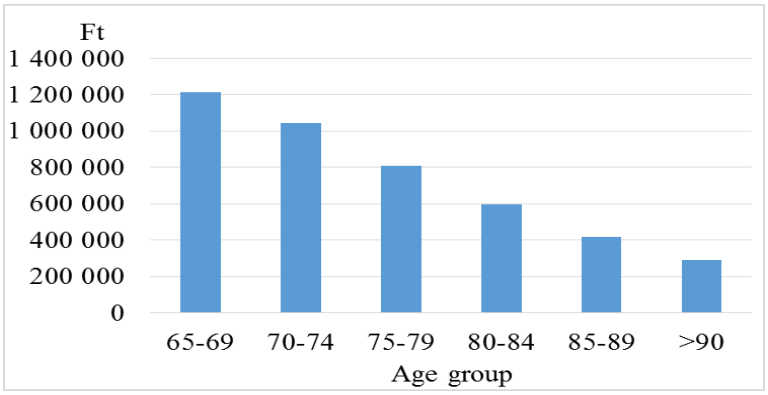

Fig. 7. *The mean active inpatient expenditure by age groups*

In an attempt to look behind this trend I computed the average number of days in hospital in the last year of life for decedents aged 65 years or more.

If only the last year of life is counted, the 65-69 years old accumulate the highest hospital utilization. Younger decedents were treated longer than older decedents in their last year of life (Fig. 8). The average number of hospital days for persons in the final year of life fell continuously from 27 (65-69 age group) to 14 days (90+ age group).

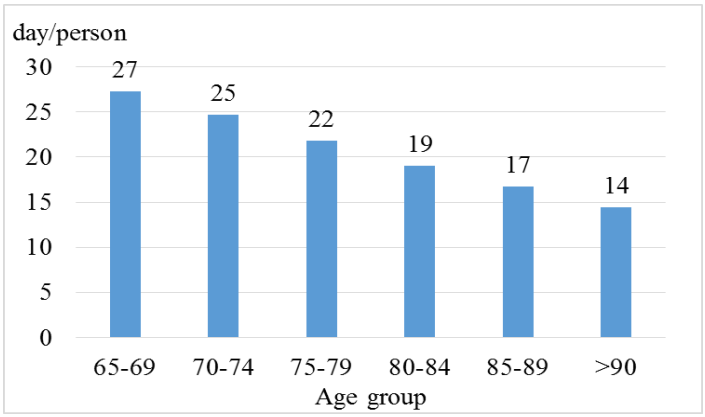

Fig. 8. *Average number of days in hospital in the last year of life for decedents aged 65 years or more*

This trend can be a result of "compression of morbidity", since the older patients record shorter periods of morbidity leading to active hospital treatment before they die.

The decline in end-of-life active hospital care expenditures among the age groups is thought to be caused not only by a decrease in the service use, but due to a decrease in the intensity of care.

The intensity of care is reflected by the cost per day in the last year of life (Fig. 9). As age at (?) death increases, the cost per day of hospitalization decreases, so the oldest age group (90+) recorded a significantly lower cost than the youngest (65-69).

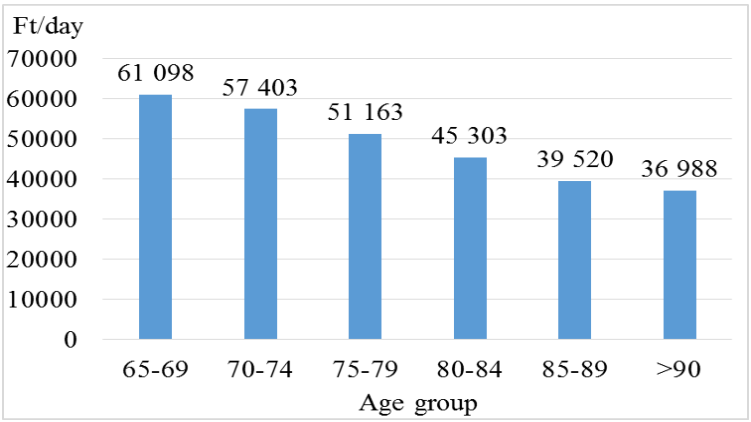

Fig. 9. *Cost per day in the last year of life for decedents aged 65 years or more*

This decreasing tendency in the intensity of care was mostly explained (Brockmann, 2002) by the fact that doctors use less aggressive therapeutic procedures for the elderly than for the younger age groups. This is explained by the fact that doctors consider the relationship between expenditure and treatment effectiveness, so saving older people's lives is not worth as much as saving the younger ones.

The third research question is related to the gender differences in the active inpatient care expenditures. I used the independent samples t-test to compare the means of expenditures for men and women in order to determine whether there is statistical evidence that the population means are significantly different.

The results of the test (Table 3.) indicated that if we look at the expenditure of active inpatient care separately for men and women, there is a significantly lower average spending for women.

Levene's Test for Equality of Variances		t-test for Equality of Means						
							95% Confidence Interval of the Difference	
F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
588,617	,000	17,695	95848	,000	1,77445E5	1,00282E4	1,5779E5	1,9710E5
		17,210	78591,893	,000	1,77445E5	1,03107E4	1,5724E5	1,9765E5

Table 3. *Independent samples test for active inpatient care expenditure grouped by sex*

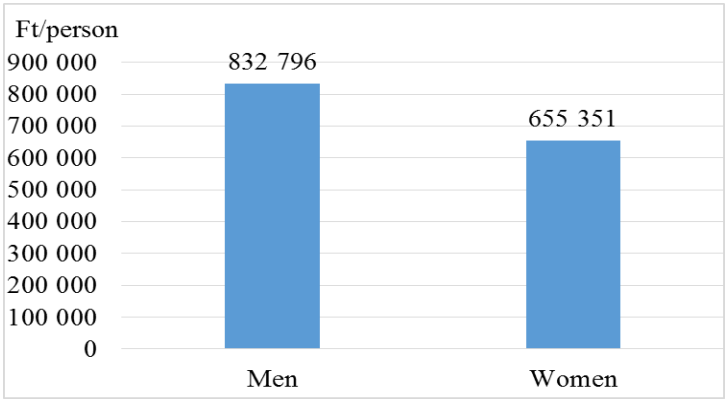

Fig. 10. *Average cost of active inpatient care by gender in the last 12 months of life*

The statistically verified difference between women and men in case of active inpatient care expenditure is 163.470 HUF. The average for women is much lower than that of men. Hospital spending for males was approximately 27 percent more per capita than for females (Fig. 10). The conclusion is that dying women cost less compared with men.

My results are in line with other studies finding that in the last year of life women's spending is either similar or less than men's (Shugarman et al., 2009). This is partially explained by the more frequent occurrence of heart disease in men compared with women. Treatment for conditions involving the cardiovascular system, such as heart failure, is intensive and costly (Cylus et al., 2011). The gender differences are also determined by the fact that men's average life expectancy is shorter than women's, men die younger. As previously demonstrated, earlier age at death is associated with greater cost.

5. Conclusions

The end of life health care expenditures represents a topic of growing interest in academic circles, and in the recent years an increasing number of scientific works addressed the so-called costs associated with death. Although the results are different, they agree on the fact that most of the health costs are accumulated in the last year or last months of life, regardless of the individual's age at the time of death. So the cost of dying represents a significant amount of the total health care costs during the life time.

This study is based on individual-level data about the end of life active hospital services utilization for the entire Hungarian population aged 65+, deceased during a full calendar year. The international literature in this field is relatively scarce. Most previous studies have been restricted to a sample of population or to decedents with certain diseases. This is the first investigation of the health care expenditures incurred at the end of life by elderly Hungarian. No previous research has been carried out using individual level health insurance claims data.

The investigation has focused on differences in active hospital care utilization and expenditures occurred at the end of life. It provides evidence on substantial differences in the utilization of hospital-based services in the last year of life according to time to death, age and gender.

I have come to the conclusion that active inpatient health spending has shown a significant increase in the last seven months of life.

When I investigated gender differences, I found that men have significantly higher health care expenditures in the last twelve months of their life.

It is also an important result that the costs decrease with age and people use less and less care as they are getting older.

Even though the active hospital expenditure represents the largest share of total health care costs, to offer a system-wide perspective all the other sectors of the healthcare system should be studied: long-term inpatient care, outpatient care, primary care, and drug prescriptions.

6. References

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