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LONGEVITY – CAN WE AFFORD IT? THE PROBLEM OF HOUSEHOLDS’ DIRECT HEALTH CARE EXPENDITURES IN POLAND

INTRODUCTION

Longevity can be defined as a long individual lifespan or as population aging. The latter is a resultant of various demographic tendencies, including: the former longevity – increasing life expectancy, as well as decreasing fertility. These factors result in the growing share of elderly persons and the age median in the population. We observe rising longevity, expressed according to both connotations, overall in the world. Children born in 2014 are expected to live on average (CIA 2014):

- up to almost 90 years in Monaco (the highest value),
- slightly less than 85 years in Macau, Japan, and Singapore,
- less than 76 years in Poland (which ranks 76th in the world),
- under 50 years in Guinea-Bissau, South Africa, and Chad (the lowest values).

These projections show that, on the one hand, longevity is becoming a fact in most developed countries, while on the other hand, disparities in life expectancy are still considerable across the globe. A longer life can be attributed to the modern lifestyle, advances in medicine, knowledge and technology, social policies as well as the transfer of information over the Internet. These factors allow people to avoid, eliminate, diagnose, and cure an increasing number of diseases. They also contribute to improving people’s quality of life and health care and, therefore, their health itself, which determines life expectancy.

Over the decades, the human lifespan has lengthened. However, breakthroughs in life-saving and life-expanding sciences do not go hand in hand with health improving progress. We will probably live longer than our ancestors, but the advanced stages of life may not be as comfortable and dignified as one would wish. Moreover, individual

longevity is often accompanied by the process of population ageing. The populations of the most developed countries are ageing rapidly as the age median and the share of the elderly in the population continue to increase, which weighs heavily on labour markets, health care systems, public budgets, family structures, and social roles, as well as on many other social, economic, and cultural aspects on the micro and macro levels. This entails the need for important changes in social policy.

The two types of longevity, measured at the individual and the population level, together with the age-induced deterioration of health influence the level of public health care expenditures. In USA the elderly population increased by 13 million between 1966 and 1998, while public medical expenses of Medicare program for acute help to the elderly rose from 0.6% of GDP to 2.3% in 1999. The research by Lubitz et al. (2001) shows that public and private indirect health care expenditures for the elderly population increased at a greater rate than expenditures for the group under age 65. Still, however, the public expenditures are not sufficient to cover the medical needs of the elderly or those of the rest of the population, which entails a consistent increase in private direct expenses paid by households.

Increasing longevity may or may not directly stimulate additional medical expenditures, total and per capita. Studies have not been unanimous or unequivocal on that question. However, it is reasonable to assume that with older age, health status deteriorates and that the elderly demand more extensive health care and more pharmaceuticals than young adults. In this context several studies focusing primarily on the group of elderly have been carried out. Sole-Auro et al. (2012) analysed the differences between public expenditures for native and immigrant elderly people and found that socio-economic variables influence medical habits and needs. Meara et al. (2004) indicated that medical expenses tend to increase over time, however, important differences across age groups can be noticed. It is reasonable to expect that the level of medical expenditures differ between the elderly and non-elderly. On the one hand, the elderly are likely to use more services. On the other hand, some empirical evidence indicates that the health (especially concerning disability) of the elderly is improving while deteriorating among the non-elderly. Consequently, the causal relationships between determinants of health status may be varying among the age groups.

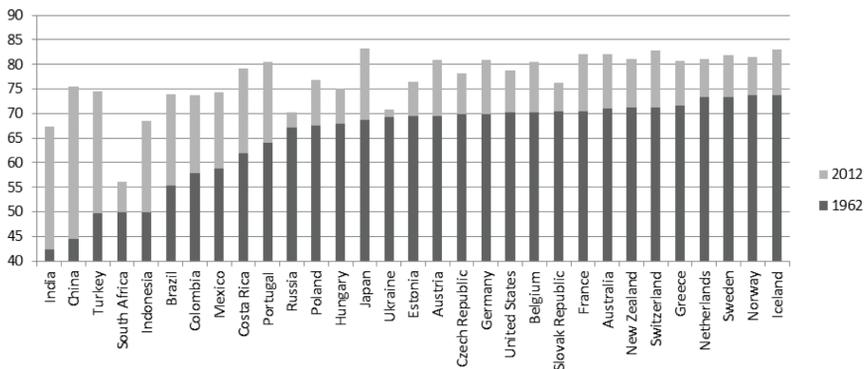
The aim of this paper is to verify (using theoretical and empirical tools) the existence and the level of the longevity cost. This paper is an attempt to test three hypotheses: (1) the medical expenditures increase with longevity, (2) households of the elderly spend more on health than others, (3) determinants of private direct medical expenses differ between households of the elderly and the others. To verify this, first, the demographic analysis is used to present the long-term tendencies in the process of population ageing. Secondly, the literature review examines the socio-economic costs of longevity in the macroscale. Third, a statistical analysis on a representative sample of Polish households is performed in order to verify the differences in health care spendings between the elderly and the non-elderly. Finally, a microeconomic

model is used to estimate the influence of selected socio-economic variables on the value of households' direct health care expenditures in Poland. This research is carried out for the years 2003 and 2013 to determine whether the factors are stable over time, and for the group of elderly and non-elderly in order to identify possible similarities and differences between these two demographic groups. The empirical part is focused on the out-of-pocket expenses on the health care, that is, not reimbursed by the public insurance. Since the health care system in Poland is mainly publicly funded (approx. 70% of all health care costs) and private indirect expenditures constitute marginal part (less than 5%) of the total expenditures on the health care, the level of direct households' input is considerable (around 30% of total expenditures). Studying direct private expenses on the health care is important for two main reasons. First, they constitute a significant financial burden on the household budget and, unlike other sources of health care expenses (covered by the public or private insurance), they do not create the illusion of "free-of-charge" services. Second, high share of the out-of-pocket expenses in the Polish health care financing structure may serve as an indicator of the efficiency (in a broad sense) of the whole medical system and the health care policies.

THE PROCESS OF POPULATION AGEING

Over the last decades life expectancy at birth has been increasing in most developed and developing countries. Data for selected countries (Fig. 1) suggest that the increase over last 50 years was from 1.7 years (Ukraine) to 31 years (China), while in the European Union (EU) from 5.8 years (Slovak Republic) to 16.4 years (Portugal). The percentage change in life expectancy over the last half century reached 50% in Turkey, 59% in India, and 70% in China. In Europe the relative change of life expectancy was the highest for Portugal – 25%.

Figure 1. Life expectancy at birth, selected countries, 1962 and 2012

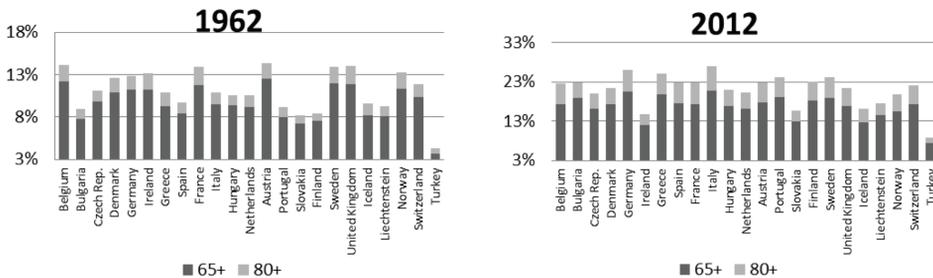


Source: own elaboration based on OECD and Worldbank database (2017).

The average length of life in the USA increased from the 1900s to the 1980s by almost 30 years. This is mostly the result of eliminating premature deaths (that is, occurring in age lower than the life expectancy). In fact, the hazardous impact of chronic diseases, which are the main causes of premature deaths, may be postponed due to advancement in medicine. The latter compresses the period spent in a bad health to the last years of life.

Increasing life expectancy contributes to the process of population ageing, defined as the growing proportion of the elderly or as increasing median age in a population. Over the last half of century, the proportion of elderly people, that is aged 65 and over, considerably increased. In some countries, such as Bulgaria, Finland, and Portugal, the increase reached 140%. At the same time, the percentage of people older than 80 doubled in some states (such as Bulgaria, Czech Republic, Germany, Greece, Hungary, the Netherlands, Slovakia, and Switzerland), tripled in others (Spain, Italy, and Portugal) and even quadrupled (Finland) (Fig. 2). In Europe, the median age increased by 4.3 years in the UK (from 35.5 in 1962 to 39.7 in 2012), 14.1 years in Portugal (from 28 in 1962 to 42.1 in 2012), 13.9 years in Liechtenstein (from 27.7 in 1962 to 41.6 in 2012), and 13.7 years in Finland (from 28.5 in 1962 to 42.2 in 2012). In 2012, Germany was the oldest population in Europe, with 50% of inhabitants no younger than 45, while the youngest was Ireland (median age of 35 years) and Turkey (29.7). Thus, the majority of European populations are now at least 10 years older in contrast to the youth of 50 years ago (Fig. 3).

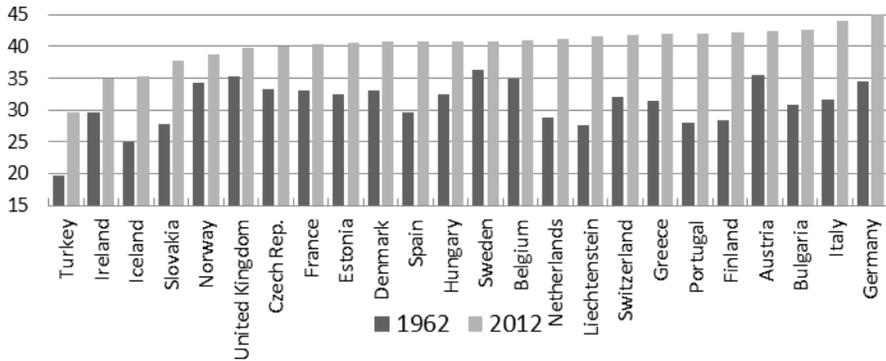
Figure 2. Proportion of the population aged 65 and over and 80 and over in selected European countries, 1962 and 2012



Source: own elaboration based on Eurostat (2017).

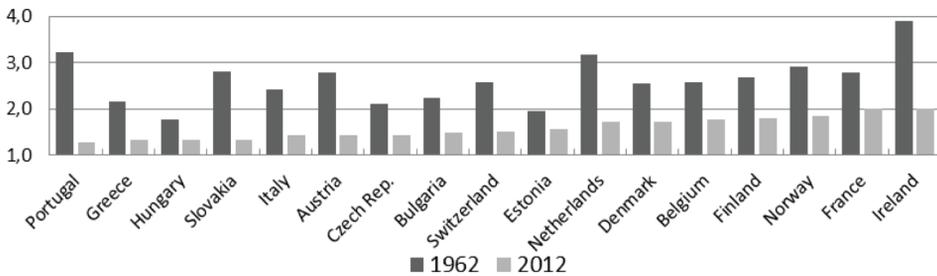
Population aging is mainly caused by the increasing life expectancy, but also the declining fertility is an important factor as it limits the number of children in the population. In many developed and developing countries, fertility rates declined by 50%–60% over the last 50 years, for instance, in Ireland, Austria, Slovakia, and Portugal (Fig. 4). Currently, in most regions the rates are far below the value of 2.1, which ensures the replacement of generations. In Poland, the fertility rate equals to 1.3 and is the 13th lowest in the world (CIA, 2014).

Figure 3. Median age in selected European countries, 1962 and 2012



Source: own elaboration based on Eurostat (2017).

Figure 4. Total fertility rate in selected European countries, 1962 and 2012



Source: own elaboration based on Eurostat (2017).

AGEING AS A FACTOR OF SOCIO-ECONOMIC COSTS, SOCIAL POLICIES, AND HEALTH EXPENDITURES

The ageing of a population and the changing age structure influence and unbalance the socio-economic situation in most countries. On the micro level, these processes change the structure of families and households, including their income and expenses and the status of caregivers and caretakers. On the macro level, more elderly people translate into increased public expenditures on pensions and some health care categories, as well as lower revenues from taxes. Retirement pensions are typically in the form of a guaranteed life annuity; thus, increasing longevity constitutes a risk to public and private financial institutions. As for the former, the more pensioners there are, the higher the fiscal burden on every person of productive age; as for the latter, the longer the time when the pension is paid, as compared to constant fee-paying-period of individuals at their productive age, the lower the future pensions. This applies also to hybrid pension systems, like the Polish one. At

some point, the level of pensions is bound to outweigh collected payments (current for the public social system or past for private accounts), which may impair the pension system and make pensioners require public aid.

The influence of individual longevity and population ageing on health expenditures is more difficult to diagnose and predict. It is generally believed that medical expenditures increase with age and / or with an increasing proportion of elderly in the population. The population ageing and increasing longevity result in predictions of sizeable growth in the long-term care expenditures. Both acute medical treatment and long-term health care expenditures rise with age mainly for two reasons: (1) chronic disease incidence and prevalence increase with age, and (2) mortality increases with age. The implications of increasing longevity for health care expenditures, therefore, depend critically on the future trends in morbidity, as expressed in the competing theories of compression or expansion of morbidity. Both rising life expectancy and increasing prevalence in the old age will have consequences for health care expenditures (Fries 1980; Stearns et al. 2007). Indeed, this tendency has been observed for both EU and OECD states (European Commission 2012, Saastamoinen and Verho 2013). However, it may not be age *per se* that is the root of the problem. The European Commission (2012) highlights that public health care expenses depend, among other things, on population size and structure, especially the age structure. The proportion of elderly in the population influences the amount of total and public health expenditures because older people often develop multi-morbidity conditions that require expensive medical care. Age-related expenditure profiles (defined as the relationship between the age of an individual and his/her demand for health care) reported by the European Commission and the Economic Policy Committee show that expenses generally increase with a person's age, especially after the age of 55. This result is confirmed in other studies, e.g. by Saastamoinen and Verho (2013) for Finland, who indicate that the distribution of health care expenditures is skewed, as only a small fraction of patients account for most of the costs. In Finland, 5% of the population generate over 50% of the total costs. The research by Alemayehu and Warner (2004) for the USA indicates that 30% of lifetime medical expenditures per capita occur during the middle age and subsequent 50% in the old age. Therefore, acknowledging the rapid aging of the population, understanding and addressing the interaction between aging and health care expenses is vital for managing and plaining health care policies.

It has been also suggested that increasing life expectancy is a result of decreasing mortality rates at all ages, including among older people. However, in some cases, mortality reduction is transformed into increasing morbidity, as more years are spent with chronic illnesses. Historical data are not sufficient to conclusively establish whether longevity is generally accompanied by good health. Therefore, the EU forecast scenarios include the following possibilities: (a) decreasing mortality is accompanied by an increase in morbidity and disability (the 'expansion of morbidity' hypothesis); (b) bad health is compressed towards the latter period of life

at a faster pace than mortality, so people are expected to live longer while healthy (the ‘compression of morbidity’ hypothesis); (c) decreasing prevalence of chronic diseases and decreasing fatality rates from diseases lead to a longer prevalence of disability that counterbalance each other (the ‘dynamic equilibrium’ hypothesis) (European Commission 2012).

Although it is inconclusive which hypothesis reflects real trends in morbidity and longevity, all of them prerequisite that health care expenditures will continue to increase in the coming decades due to the population ageing. However, studies concerning this issue remain ambiguous whether age is the best and most direct indicator of increasing health expenses among the elderly.

As the populations of most of the developed and developing countries get older, the knowledge regarding the distribution of private and public health care costs between different age groups is crucial to forecast future health care expenditures. In analysing the health care expenditures of the elderly, two hypotheses are often mentioned: *red herring* and *steepening*, but neither has been decisively proven or disproven. Indeed, it is possible that both effects coexist to some extent (Gregersen 2013). The *red herring hypothesis* states that health care expenditures are driven by time to death, not by age *per se*. Higher costs related to old age are in fact accumulated just before the death, so extended life should not increase (or even decrease) the overall expenditures (Zweifel et al. 1999, Werblow et al. 2007, Stearns and Norton 2004). For instance, in Japan the ratio of health care expenses to the GDP is relatively low, while life expectancy is the third longest in the world, which indicates a lack of influence of age on health care expenses (Sato and Fushimi 2009). In the USA the end-of-life care covers a large proportion of the total services funded by the US Medicare program, accounting for over 25% of Medicare expenditures for the elderly (Lubitz and Riley 1993, Riley and Lubitz 2010).

The *steepening hypothesis*, conversely, states that the increase in health care expenditures for older people is higher than for the rest of the population. Thus, living longer means that people are elderly for an extended period of time, which increases the overall costs (Buchner and Wasem 2006). Recent studies suggest that increasing life expectancy results in higher health care expenditures (Breyer et al. 2014, Jagger 2000). For developed countries, an increase in the percentage of the elderly causes an increase in per capita health care expenditures because individual health care expenditures are an increasing function of age. This influence of age on medical expenses does not appear, however, always significant in macro-level analyses.

An analysis for the USA shows that elderly population had been growing faster than initially projected, which becomes the reason for a major debate on Social Security policies in the 1980s. The evidence was inconclusive (1) if the period of life afflicted with chronic morbidity and disability to remain relatively constant or even decline, or (2) if chronic morbidity and disability incidence remained unchanged, with life expectancy increases above 65 largely due to improved medical treatments,

causing an increase in the period of life spent disabled. Therefore mix strategies had to be introduced in the USA legislation with scheduled necessary revisions before large numbers of post-World War II baby boom cohorts pass the retirement age between the years 2011 and 2030 (Manton et al. 1997, Manton and Gu 2001).

Macro-level analyses concern predominantly public and private indirect expenditures. These include the costs of elderly acute and long-term care, such as geriatric wards and specialist medical doctors. In Poland specialist health care for the elderly is practically non-existent. Currently, there are approximately 270 geriatricians (7 geriatricians per 1 million inhabitants), but only half of them work in this domain. In Sweden, for example, there are more than 75 geriatricians per 1 million inhabitants, while in Slovakia and Czech Republic approximately 30 per 1 million inhabitants. There are also very few geriatric hospital beds in Poland: 1.5 per 100,000 inhabitants, in contrast to 75 in Sweden, 14 in Slovakia, and 6 in Czech Republic (Ministry of Labour and Social Policy 2013, Kokoszka-Paszko 2013, Derejczyk 2013). At the same time, however, the Global AgeWatch Index report (2013, 2014) indicates that the quality of life for the elderly in Poland has been improving. In 2013, Poland ranked 62nd out of 91 countries, and in 2014, it advanced to 32nd out of 96 states. But in the category of health status, Poland ranked 87th in 2013 and 48th in 2014. These rankings confirm that the Polish health care system is not coping well with the longevity of its ageing population. In relation to this development, geriatrics facilities should be a leading direction for medical education and investment, and they should be treated as basic and fundamental, not as an extravagance non-affordable through the public financing. When the institutions and policies that should provide medical care to the elderly do not perform well, the burden falls on the families and households. This generates private expenditures, mainly out-of-pocket, but also nonmonetary costs.

Subsequently, correlation of age and medical expenses can be observed in studies based on microdata, except if proximity to death is taken into account due to the *red herring* effect (Dormont et al. 2006). On the micro level, per capita health expenditures for the elderly are higher than for younger age groups, and in many countries they increase at more rapid rates than those of other age groups (O'Connell 1996). The majority of health care expenditures are covered by public financing, as the health care is for the most part publicly funded; therefore, many countries have introduced or considered cost-containment policies that are targeted at lowering the amount of public funding which may transfer the burden to the private expenditures (Saastamoinen and Verho 2013). Studies show that despite many governmental attempts at health care system reforms directed at lowering medical expenses, households' out-of-pocket expenditures tend to increase. This effect is generally stronger for lower income groups and for households with a higher demand for health care, that is, with elderly and / or disabled persons. This result is unintuitive, as expenditures generally tend to increase with higher income (Erus and Aktakke 2012, Matsaganis et al. 2009). Some studies also show (Guindon and

Contoyannis 2012) that health expenditures may also vary by region, by health and socio-economic status.

Rising life expectancy at birth and low fertility contribute and will contribute to the process of population ageing. Due to the strong positive association between age and health care expenditures, the current demographic trends are expected to affect the level of these expenses in coming years. Measuring the temporal relationships between socio-economic, medical, and geographic factors and the elderly's medical expenditures can be useful for forecasting future values and adjusting policies accordingly. It is difficult to conclude whether age is the conclusive determinant of higher expenditures or whether it is a manifestation of other intangible factors, such as proximity to death, life expectancy, or health. However, because there are often no data on these variables, especially in household surveys, age or a more general age-differentiating division must be implemented (Shang and Goldman 2008).

DIRECT HEALTH CARE EXPENDITURES IN POLAND: DATA AND STATISTICAL ANALYSIS

Since direct health care expenses burden individual budgets of the population, the empirical analysis is focused on out-of-pocket expenditures of households. Poland's health care system is mostly publicly funded, but almost 30% is financed by households through out-of-pocket expenditures, which is one of the highest rates of private direct funding in Europe (CSO 2013, 2012, Eurostat 2017). Services financed by public resources appear to patients as free of charge, while private indirect funding, is voluntary and predictable and, therefore, less noticeable over time, as opposed to direct expenditures. Out-of-pocket expenses diminish people's everyday budgets and usually substitute for other expenses. These expenditures are often not planned or foreseeable and, therefore, are the most visible for household members, who often face budget constraints that may limit their accessibility to health care services and goods and consequently weaken their health status.

In studying the elderly's private direct health care expenditures, datasets from the "Social Diagnosis 2000-2013 Objective and Subjective Quality of Life in Poland" survey were incorporated in the study. The survey provides a diagnosis of the conditions and quality of life of Poles. Data collection started in 2000 and has been carried out biannually (since 2003) in March-April to investigate households' economic, social, medical, and cultural status. Households were selected randomly, on the basis of two-step sampling procedure, that is at the level of voivodships¹ and within the class of place of residence (Czapiński and Panek 2013).

¹ A voivodship is a province in the NUTS 2 classification and is the main unit in Poland's regional administrative division.

In the Social Diagnosis survey, expenditures on health care and socio-economic characteristics are recorded on a household level rather than on an individual level, which is typical for many datasets (Matsaganis et al. 2009, Erus and Aktakke 2012). Several categories of health expenses (on a three-month basis) are defined: medicine and other pharmaceuticals, payments at public hospitals, gifts as a form of genuine gratitude for treatment, informal payments, and officially paid treatment and diagnosis. Combining all of the above-listed categories and calculating their average yearly value allows for a dataset that contains fewer zero-expenditure observations, than a typical dataset with individual observations (Erus and Aktakke 2012)².

Potential explanatory variables include the following:

- last month's real net income per person, which allows us to calculate the average yearly income per person,
- whether the household took loans for medical expenses,
- whether anyone was admitted to the hospital,
- whether anyone attended a private medical facility,
- voivodship of residence,
- class of place of residence (size of the residence city, town, village by the number of population).

As there is no information concerning the age of each household member, the households were divided based on the main income source. Households living off pensions are treated as those of the elderly, and the remainder are the control group. If a household's income is earned mostly by pensioners, it is assumed that the majority of the expenditures are made by them as well.

The research is carried out to determine the average yearly total health care expenditures of a household expressed in Polish zlotys (PLN)³ and their potential determinants over time, regions, and income sources (pensions vs. otherwise). The representative samples of households for 2003 and 2013 from the Social Diagnosis survey were divided into four groups by year and income source: (1) pensioners (elderly) in 2003; (2) non-pensioners (non-elderly) in 2003; (3) pensioners (elderly) in 2013; (4) non-pensioners (non-elderly) in 2013.

First, a statistical analysis is carried out to determine the spatial distribution of expenditures and income, as well as their dynamics over time. This research includes statistical inferences to determine whether expenditures, income, and household structure were the same for the pensioner and non-pensioner groups. To analyse whether households had limited demand for pharmaceuticals⁴ due to budget

² Medical expenses include pharmaceuticals (which constitute the highest share of total expenses), ambulatory, hospital, and informal expenses. Since non-pharmaceutical expenses have very unusual distributions, with 90–98% observations with null costs, it is difficult to analyse and model them separately, therefore, the aggregated expenses are introduced.

³ 1 USD = 3.8 PLN and € 1 = 4.2 PLN (06.07.2015).

⁴ In the Social Diagnosis survey database there is only information on “could not buy medicine due to insufficient funds”, there is no analogical variable for others groups of medical expenses.

constraint, fraction tests were performed. In 2003 the group of pensioners and non-pensioners were similar (no statistically significant differences, $p = 0.47$) in the aspect of the share of households with limited access to medical care. However, a one-fraction test confirmed that the proportion of the households with limited access was very high, in fact higher than 30% for the pensioner ($p = 0.003$) and non-pensioners ($p = 0.000$). In 2013 the percentage of households with not sufficient income to buy medical drugs declined. For elderly and non-elderly the share was significantly lower in 2013 than in 2003 (for both groups $p = 0.000$). Overall, in 2013 the proportions of limited medicine access were higher than 15% ($p = 0.000$) and lower than 20% ($p = 0.000$) for non-pensioners and more than 15% ($p = 0.000$) and most likely around 20% (not lower than 20%, $p = 0.19$) for pensioners. However, a two-fraction test for 2013 suggested that elderly households significantly more often had limited access than non-elderly ones ($p = 0.000$). In spite of the fact that the fraction of households with insufficient funds to buy all necessary medical drugs declined over the decade, the inequality in drug access between non-elderly and elderly increased.

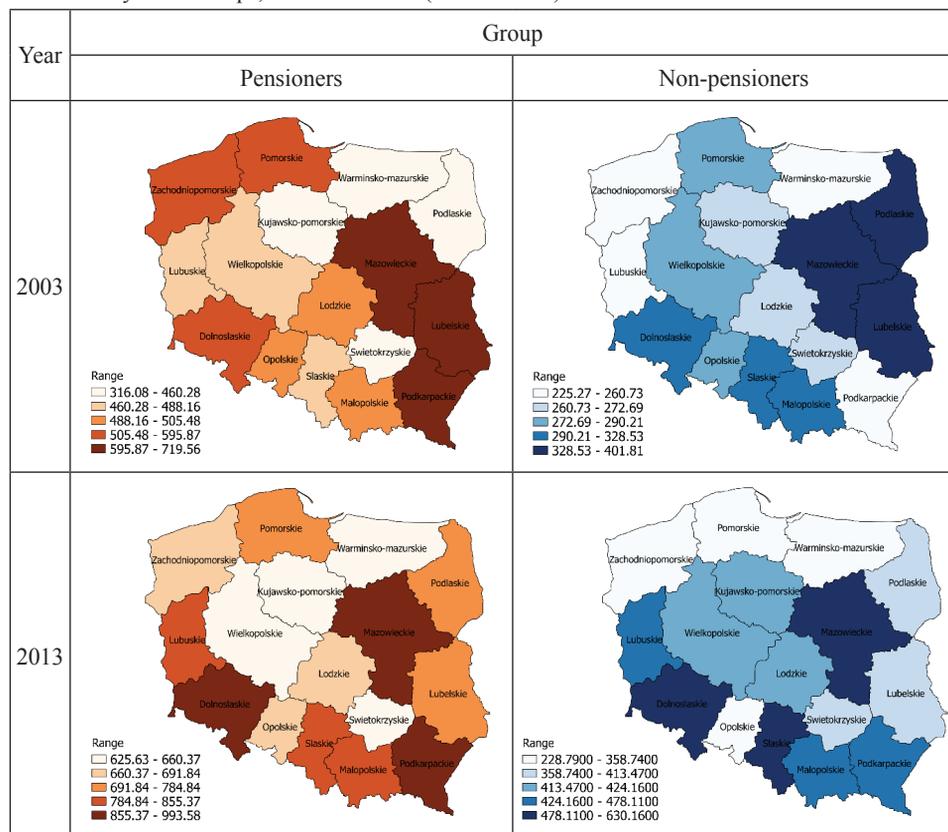
Total health care expenses of households varied over time, region, and income source group. In 2003, pensioners spent annually from 316 PPP USD⁵ in Podlaskie to 720 PPP USD in Podkarpackie, which is from 8 to 20% of an average real net income per capita in a pensioner's household. In the same year, non-pensioners had medical expenditures from 225 to 401 PPP USD, which is by half lower, than those of the elderly. This amount was 6–9% of the yearly real net income per capita of the control group households in each province. In addition, the share of health care expenditures in income was also lower for the non-elderly, despite the fact that the pensioners' incomes were generally higher than those of the control group.

The regional distribution of health care expenditures appears to be irregular. The Mazowieckie province, which is the largest voivodship and includes the capital city of Warsaw, was among the three provinces with highest expenses in both groups of households. The distribution in 2013 differed from that registered 10 years before, but again, there is no clear spatial pattern. The pensioners' expenditures increased to 626–994 PPP USD annually, which represents 9–12% of the real net income per capita in each province. For non-pensioners, health expenditures ranged from 229 PPP USD to 630 PPP USD, that is 3–9% of an average province's yearly real net income per capita. Again, Mazowieckie province was among the regions with the highest expenditures (Fig. 5).

⁵ All current price values in Polish zlotys (PLN) were changed to real prices as of 2013 and PPS USD (purchase power standard) using the World Bank PPP indicator for 2013.

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Figure 5. Households' average annual health care expenditures for pensioners and non-pensioners by voivodships, 2003 and 2013 (in PPS USD)



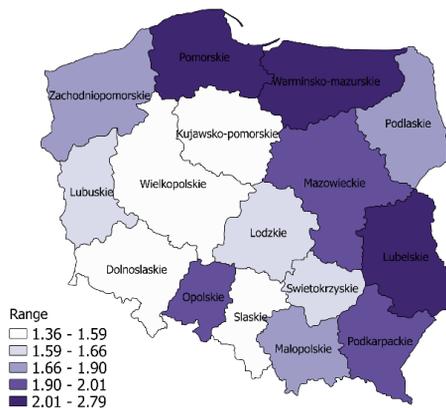
Source: own elaboration based on Czapiński (1998).

Figure 5 indicates that pensioners spend more on health care (as an absolute value or as a ratio to income, where both the expenditures and income is calculated per household member) than the control group. To confirm this result, a series of tests was performed. First, the average income per household member turned out to be higher for pensioners than non-pensioners both in 2003 and 2013 for Poland ($p = 0.0000$) and for each province ($p < 0.01$) except for 2003 in Podkarpackie ($p = 0.02$) and 2013 in Lubuskie ($p = 0.02$), Podlaskie ($p = 0.1$), and Zachodniopomorskie ($p = 0.08$), which shows differences at the significance level of 10%, and Malopolskie ($p = 0.3$) and Mazowieckie ($p = 0.6$), which shows no statistically significant difference⁶. We also tested whether the number of household members was equal in both groups. In general, non-elderly households had more

⁶ In each case, the equality of the variances was verified and dismissed ($p < 0.000$). A mean test was performed accordingly.

members than elderly households in 2003 and 2013 in Poland ($p = 0.000$)⁷. Therefore, in elderly households the income is divided by fewer members. However, even with higher income, the elderly spent relatively more by 2–3 percentage points. We also tested whether the absolute value of the expenditures on health care was indeed different for both types of households. In 2003 in Poland ($p = 0.000$) and in 10 provinces ($p < 0.01$), pensioners spent significantly more than non-elderly persons. In Małopolskie ($p = 0.01$), Opolskie ($p = 0.08$), Podkarpackie ($p = 0.04$), Świętokrzyskie ($p = 0.02$), and Warmińsko-mazurskie ($p = 0.03$), the same conclusion can be drawn with a significance level of 10%. The only exception is Wielkopolskie ($p = 0.8$), which shows no difference. In 2013, pensioner households had higher health care expenses than the control group for Poland ($p = 0.000$) and in 13 provinces ($p < 0.01$) with the exception of Kujawsko-Pomorskie ($p = 0.02$), Podkarpackie ($p = 0.02$), and Pomorskie ($p = 0.1$), which can be included if the significance level is 10%⁸.

Figure 6. Medical expenditures of pensioners in relation to expenditures of non-pensioners by voivodships, 2013



Source: own elaboration based on Czapiński (1998).

Therefore, it has been demonstrated that health care expenditures are generally higher for pensioner households than for non-pensioner households. The difference is the largest in the northern and eastern provinces, where the elderly spend twice as much as the control group. In the central provinces, where the ratio of elderly to non-elderly expenses is the lowest, there is still a difference of 35% (Fig. 6). In addition, medical expenses (in absolute real values and relative to the income) increased in

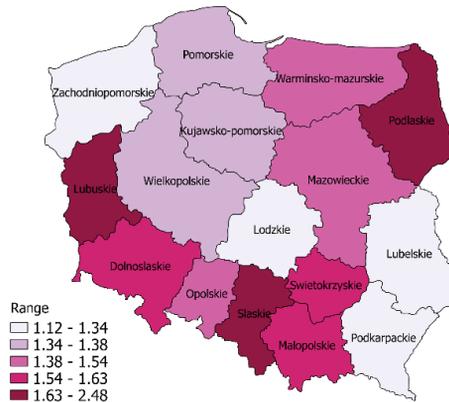
⁷ The equality of the variances was verified and dismissed ($p < 0.000$) for both years. A mean test was performed accordingly.

⁸ In each case, the equality of the variances was verified and dismissed ($p < 0.000$). A mean test was performed accordingly.

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2013 as compared to 2003. The total value of expenditures of the elderly over the decade in question increased from 12% to 150%, by province, compared with 2003. The fastest increase was observed in the southeast of Poland. This effect is slightly slower for non-pensioner households (Fig. 7).

Figure 7. Ratio of Pensioners medical expenditures in 2013 to value in 2003



Source: own elaboration based on Czapinski (1998).

The statistical analysis suggests that the members of elderly and non-elderly households behave differently concerning health care expenditures. The changes over time also differ for the two groups. These expenses, their increase over time and the ratio of the medical expenditures to income for the pensioners' to non-pensioners vary by Polish region and do not necessarily correlate with the spatial distribution of households' income. Therefore, it is possible that the determinants of health care expenditures and the significance of their influence are different for the elderly than for the rest of the population. Therefore, an econometric model was introduced to verify this hypothesis.

MICROECONOMETRIC MODEL OF POLISH HOUSEHOLDS' DIRECT HEALTH CARE EXPENDITURES

A microeconomic model of the same general structure was specified and estimated for each of the four groups. This approach should permit us to define similarities and differences between elderly households and the control group, as well as possible changes over time in the significance and strength of the determinants of out-of-pocket health care expenditures. Many approaches assume that expenditures are exponential and/or log-linear function of the explanatory variables. This approach seems to be in particular appropriate when considering total expenditures on health

care, as opposed to selected category of them (Hill and Miller 2010)⁹. Therefore, the considered model is a power-exponential function that is specified as follows:

$$ME_i = I_i^{\alpha_1} \cdot e^{\alpha_0 + \alpha_2 L_i + \alpha_3 H_i + \alpha_4 PF_i + \sum_{j=1}^{15} \alpha_j P_{ji} + \sum_{k=1}^5 \alpha_k C_{ki} + \varepsilon_i} \quad (1)$$

where ME_i is the real (in 2013 prices) yearly ‘out-of-pocket’ expenditure on health care per person, I_i is the real (in 2013 prices) yearly household income per person, L_i is a binary variable equal to 1 if the household took a loan for medical expenses (and 0 otherwise), H_i is a binary variable equal to 1 if anyone in the household was admitted to hospital, PF_i is a binary variable equal to 1 if anyone in the household attended private medical facility, P_{ji} is a binary variable equal to 1 if the household is located in the j^{th} province, C_{ki} is a binary variables equal to 1 if the household is located in the k^{th} city size, and ε_i is the random error.

The parameters of each of the four models – Pensioners 2003 (P03) with 998 observations, Non-pensioners 2003 (NP03) with 2,964 observations, Pensioners 2013 (P13) with 3,827 observations, and Non-pensioners 2013 (NP13) with 8,528 observations, were estimated independently, and the set of explanatory variables was chosen from the group of significant variables in order to fit the data best. The estimations were performed using the STATA MP software and GMM robust estimators (White-corrected standard errors). This method should adjust for the strong possibility of heterogeneity and heteroskedasticity of the micro data.

FINANCIAL RESOURCES

Financial resources appeared to be an important determinant of medical expenses (Table 1). The influence of income, which can be perceived as income elasticity of demand for medical goods and services, was the most important factor among all significant variables. In 2003, an increase in income per capita by 1% would cause an increase in medical expenditures by almost 0.8% for pensioners and 0.6% for non-pensioners. In 2013, the same increase would be 0.6% and 0.5%, respectively. This result suggests that the income effect was stronger for the elderly than for the control group and it decreased over time for the whole population.

In households that have taken a loan for medical expenses, these expenditures tend to be higher than in those without loans. For the pensioners, expenditures were higher by 42% in 2003 and 21% in 2013, while for non-pensioners expenditures were higher by 61% in both 2003 and 2013. The influence of medical loans was much stronger for the control group than for the elderly and stable over time for the control group, while it declined for the elderly. The variable indicating whether households

⁹ Modeling separate categories of expenses would require using other microeconomic approaches, such as two-part model or truncated models to estimate expenditure value or, if it would be impossible, modeling the probability of expenses occurrence by bi- and multinomial models (Cameron and Trivedi 2005, Gruszczyński 2010, Żółtaszek 2013).

Table 1. Estimates of microeconomic model of medical expenses for pensioners and non-pensioners in Poland in 2003 and 2013

ME model	Money		Medical help		Province										City size [,000 inhabitants]			R ² [%]
	Income	Loan	Hospital	Private facility	kp	mz	op	pk	pd	pm	sl	sw	wm	zp	over 500	200–500	100–200	
P03	0.77	0.42	0.49	0.47	x	x	x	x	x	x	x	x	x	x	0.29	x	x	20
	***	***	***	***											***			
NP03	0.57	0.61	0.45	0.65	x	x	x	x	x	x	x	x	x	x	x	x	x	21
	***	***	***	***														
P13	0.57	0.21	0.37	0.49	-0.14	0.12	0.18	-0.13	x	-0.12	-0.27	x	-0.3	x	x	0.14	0.16	24
	***	**	***	***	**	**	**	**	*	*	***	***	***			***	***	
NP13	0.47	0.61	0.46	0.55	x	x	x	-0.11	-0.17	x	x	-0.09	-0.4	-0.17	x	x	x	24
	***	***	***	***	**	**	**	**	***	***	**	**	***	***				

Table note: P03 – pensioner households in 2003, NP – non-pensioner households in 2003, P13 – pensioner households in 2013, NP13 – non-pensioner households in 2013; provinces (only those that were significant in any model): kp – Kujawsko-pomorskie, mz – Mazowieckie, op – Opolskie, pk – Podkarpackie, pd – Podlaskie, pm – Pomorskie, sl – Śląskie, sw – Świętokrzyskie, wm – Warmińsko-mazurskie, zp – Zachodniopomorskie; significance test positive by significance level: * – 10%, ** – 5%, *** – 1%, x – variable is not statistically significant, removed from the model. Source: own elaboration based on Czapiński (1998).

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took loans for medical purposes may inform us about substantial expenditures that could not have been covered by current income or savings, and indirectly, about serious and unforeseen health problems. Therefore, the large difference between level of expenditures in households with and without loans seems to be justified. The impact may be smaller for the elderly, as many of their health problems are long-term and predictable. It is also possible that even if pensioners cannot cover their medical expenses from income and savings, they may be less likely to take a loan because their problem will be prolonged and will simply generate more and more expenditures. Therefore, a single loan is not a viable solution to this problem.

STAY IN HOSPITAL OR PRIVATE MEDICAL INSTITUTION

The dataset does not contain sufficient information on household members' state of health; therefore, in order to describe the use of health care facilities we needed to introduce the realized demand for medical assistance. If any member of a household was admitted to hospital, private direct medical expenditures were higher by 49% for pensioners and by 45% for non-pensioners in 2003 (as compared to a household where no one was admitted to hospital), while in 2013 higher by 37% for pensioners and 46% for non-pensioners. It is conceivable, although impossible to verify, that some part of these extra expenses is due to gifts offered to medical personnel as a form of genuine gratitude for treatment or informal payments. It is also likely that a stay in hospital corresponds to general deterioration in one's state of health, which subsequently increases medical expenses on drugs, doctor visits, and/or medical procedures.

Attending private medical institutions, including private specialist doctors' offices, directly influences the level of medical expenses. Although most medical procedures are available free of charge, long waiting lists for medical public services and the requirement of having a referral to specialist facilities make people turn to private health care. The latter, however, do not provide all types of medical care and their prices are not fixed. Thus, if people use private health care, their medical expenditures are considerably higher. For the elderly, the difference was 47% in 2003 and 49% in 2013, while for the control group, the difference was 65% in 2003 and 55% in 2013 (as compared to those who did not use private facilities). The expenses increased more in the case of non-pensioners as compared to pensioners, but for the former this effect declined over time, while for the latter little change over time was observed.

SPATIAL HETEROGENEITY

In our model regional adherence was represented by binary variables for the provinces and the size of location (by number of inhabitants). In 2003, there was no regional effect based on provinces, and the size of location was relevant for

pensioners only in the case of the five largest cities (with no less than 500,000 inhabitants): Warsaw (in Mazowieckie voivodship), Cracow (Malopolskie), Lodz (Lodzkie), Wroclaw (Dolnoslaskie), and Poznan (Wielkopolskie). In these cities, the elderly had average medical expenses that were by 30% higher than in the rest of the country. This difference may be due to the increased opportunity to attend private doctors and health care institutions, which generates more direct expenditures.

In 2013, medical expenditures were significantly lower in some provinces. This effect was in particular strong for both pensioners and non-pensioners in Warminsko-mazurskie province, where expenses were lower by 30% and 40%, respectively. This north-eastern region lacks major cities and economic centres, and it has the highest unemployment rate in Poland, equalling to 21.6% in 2013 as compared to the country's average rate of 13.4%. It also has one of the lowest level of GDP per capita, at 15,789.5 PPP USD, as compared to Poland's overall GDP per capita of 22,105.3 PPP USD in 2012 (CSO 2015). Similar differences in other regions were not substantial. While the non-elderly had lower medical expenses relatively rarely, the elderly living in Mazowieckie and Opolskie spent more than anywhere else, by 12% and 18%, respectively. Mazowieckie is the largest province in Poland, both in land and inhabitants, and it includes Warsaw, which is the largest economic centre in the country. In 2013 the province had the second-lowest unemployment rate of 11% and the highest GDP per capita – 35,157.9 PPP USD. It is difficult to explain however, why in Opolskie the elderly pay more for health care than in any other province.

In the case of pensioners, the size of the city they live in is significant. People in middle-sized cities of 100,000–500,000 inhabitants spent 14%–16% more than those living elsewhere.

In general, over the last decade, regional heterogeneity increased, most likely due to health care system reforms, the system's inefficiency, and the growing supply of private medical institutions and over-the-counter pharmaceuticals. These factors are diverse over time and groups, which makes it difficult to predict their values in the future through this analysis. Nevertheless, the geographic component plays a significant role in the level of private direct medical expenditures, and as such it cannot be neglected.

CONCLUSIONS

Longevity, expressed directly as long individual lifespan and indirectly as increasing life expectancy is a demographic fact. People both in developed and developing countries live longer than few decades ago. What is more, the shares of elderly, old, and very old in a population are systematically increasing. These demographic changes influence many aspects of life, such as the quality of life, family social structure, market targeting, pension systems, but also health care

system and health care expenditures. Yet, health economists do not fully understand the mechanism of causality between longevity, public health, health care system, and health care expenditures. Therefore, there are numerous theories explaining these relationships, but some of them remain contradictory, and some – complementary. Large body of empirical evidence indicates that, in general, longevity and population aging go hand in hand with increasing health care expenses (total, public and private, direct and indirect) and, specifically, increasing expenses associated with the elderly and the end-of-life. This is a strong argument based on the literature review and the empirical evidence for confirming our first hypothesis (“the medical expenditures increase with longevity”). Financing health care creates a constraint for any health care system. In Poland the system has not been well adjusted to the changing demographic structure. We are lacking geriatric wards, beds, specialists, and equipment. This deficiency will become more and more noticeable in the coming years if no policy improvements are introduced and successfully implemented. In the meantime, part of the unmet demand for health care services is substituted by private direct expenditures of households, mainly on pharmaceuticals and private medical consultations.

The cross-sectional analysis over years 2003 and 2013 for representative households’ samples for Poland gives some intuitively logical conclusions and some surprising ones. Firstly, pensioners, even having higher income per capita, spend more on health care than the control group:

- relatively (share of expenses in income) by 2–3 percentage points,
- in absolute values by 35% (central provinces) to 180% (the northern and eastern provinces),
- the real value of expenses increase over time for all households, but slightly faster for the elderly (by 12% to 148% over 10 years) than non-elderly (from 9% to 117%).

Moreover, although the share of households that could not afford buying medical drugs decreased over the decade from more than 30% for elderly and non-elderly in 2003 to 15–20% in 2013, which is very positive change, economic inequalities of access to medical services were absent in 2003, and visible in 2013. It means that more elderly than non-elderly households had a difficulty with affording drugs from out-of-pocket funding. These conclusions support the second hypothesis, that elderly in fact spend more on health than non-elderly, but also, despite higher income, their needs exceeded financial resources and were more often unmet. Some actions were introduced in order to lower the expenditures on medical drugs, however, most policies are underdeveloped and change with each government.

It reference to the last hypothesis concerning determinants of private direct medical expenses, the microeconomic approach indicates that most factors are common for elderly and non-elderly, but the strength of their influence, and their changes over time vary between groups. The main constraint on households’ health care expenditures is income for both the elderly and the non-elderly, but the income

elasticity is higher for the elderly by 0.1–0.2 percentage points. The elderly have a weaker propensity (than non-elderly) of:

- taking medical loans, as their expenses are usually long-term and singular finance injection is a very short-term solution,
- using private health care, as they are more often in need of regular, long-term medical assistance, whereas long-term private medical services are not common or cheap in Poland,
- being hospitalized, as hospitalization is more often due to accidents and acute medical aid, whereas the elderly suffer mostly from long-term diseases.

Overall, the budget limitation is the key factor of out-of-pocket expenditures for all age groups. If a household's income is low, the requirement to prioritize needs and expenses may eliminate some vital medical drugs or procedures in favour of basic needs. Therefore, it is crucial to provide the elderly and the poor with adequate and specialized health care products and services. The elderly constitute a unique and expanding group of citizens, due to the demographic phenomena of longevity and population aging, with growing medical needs and insufficient financial resources. Polish public health care system is not prepared to cope with the high medical demand of the elderly. Therefore, part of this demand is satisfied by private medical services, which for many is not affordable. This causes a spiral of: lacking medical services – deteriorating public health (of elderly and the total population) – increased demand for health care – lacking funding – lacking medical services. Longevity and population aging must be directly addressed in the social policy, in order to improve quality of life, public health, and social conditions. This need highlights a new direction for the development of Poland's health care system. Otherwise, longevity may be a luxury that not everyone can afford.

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LONGEVITY – CAN WE AFFORD IT? THE PROBLEM OF HOUSEHOLDS' DIRECT HEALTH CARE EXPENDITURES IN POLAND

ABSTRACT

Longevity can be perceived as increasing life expectancy in a population or as the long lifespan of an individual. Longer lifespans and decreasing fertility rates in many countries will cause societies to rapidly grow old. This paper is an attempt to define the determinants of the 'out-of-pocket' medical expenditures of the elderly. In this research statistical tests and micro-econometric modelling were carried out on a sample of the Polish population. The results of the analysis indicate that the elderly with their elevated needs for medical assistance spent more on the health care, than the rest of population (in the absolute value and in relation to income) and that their expenditures are constantly increasing. The main limitation to households' health care expenditures is the income, which suggests that there may be an unrealized demand for medical services and products, especially medical drugs that cannot be obtained entirely free of charge. This highlights a new direction for the development of Poland's health care policy; otherwise, longevity may be a luxury that not everyone can afford.

Keywords: longevity, health expenditures, Polish health care, social policy, health econometrics