THE EFFECTS OF EDUCATION AND SEX ON HEALTH ABOVE AGE 50 IN POLAND

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Abstract

Poland will experience advanced population ageing driven by improvements in longevity, low fertility and approaching old age by baby boom cohorts. Given the higher morbidity prevalence observed at older ages, the demand for the elderly care is expected to increase considerably.

The study focuses on the dynamics of health of people aged 50 and over in Poland. We aim to verify how the risks of the health status change are shaped over age and what the impact of gender and education is.

The empirical analysis makes use of a multi-state model for transitions in health. The age-specific health transition probabilities accounting for the individual level variables are estimated based on the European Union Statistics on Income and Living Conditions (EU-SILC) panel data for the years 2008–2011.

As a result, we assess age profiles for health transitions with respect to gender and education. The results confirm the well-known regularities in research on health: the risk of being unhealthy is increasing with age, while the probability of recovery is decreasing. Women have a higher risk of the onset of disability than men, whereas recovery to health is similar for men and women. The effect of education on health is positive, higher educated are less likely to become unhealthy and more probable to recover than lower or medium educated.

Key words: health transitions, education, multistate models

JEL Code: I12, J11

Introduction

Population ageing is a common phenomenon in developed countries. The increase in the number of the elderly and their proportion in the total population that is to be witnessed for the next decades will undoubtedly lead to economic and social pressures. One of them is the growing demand for care among the elderly. From the perspective of individual health, it has

been shown that physical abilities of men and women gradually diminish with advancing age, with women being more disabled than men (Andersen-Randberg et al., 1999). As noted by (Doblhammer & Ziegler, 2006), by 2030, the baby boom cohorts will reach ages in which the likelihood of disability and need of care increases. Surely, we can argue whether the compression of morbidity (Fries, 1980) or expansion of morbidity (Olshansky, Rudberg, Carnes, Cassel, & Brody, 1991) is observed, but the increase in the demand for care is a future challenge that needs to be managed. Any projections informing about future care needs should include information about health dynamics at individual level.

This study aims to describe the health dynamics by age and to understand better the interrelationships between health and sex, education and living arrangements at individual's level. Specifically, the following research questions will be addressed: how is the risk of health improvement/deterioration changing with age? What are the health pattern differences between men and women? Are there educational disparities in health? Is there any effect of living arrangements on health?

Poland, a Central European country, is a case study of a rapidly ageing country. The old-age dependency ratio in Poland is expected to triple in years 2014-2060 (Eurostat, 2014). Population projections show that the number of people aged 65 and over will increase from nearly 5.5 m in 2014 to 10.9 m in 2060 translating into an increase in share of total population from 14% to 33% respectively. It determines the change not only in the relation between the number of producers and consumers but also between the number of potential caregivers and care recipients.

As pointed by Ross, Masters, & Hummer (2012) level of education has a beneficial influence on health. The beneficial effect is reflected in better health and lower mortality thanks to accumulation of advantages throughout the life-course thanks to higher education, e.g. more economic resources or flexible employment. It is especially important for Poland as the socio-economic transition after 1989 resulted in sharp increases in the level of education in society (Antonowicz, 2012) leading Polish higher education system to the highest enrollment in tertiary education in Europe in 2010 (Kwiek, 2013). The increasing demand for the elderly care would be therefore mitigated to some extent by education and health improvements among the elderly.

While the supply of formal care in Poland is by far underdeveloped, the elderly in need rely strongly on the family care provision. However, family changes result in remarkable shifts in living arrangements, shrinking kinship networks and reducing potential of family care provision (Kotowska & Jóźwiak, 2012). As also noted by Iacovou (2000), the growth of

the number of elderly across developed countries together with surging proportion of solitary living have considerable implications for social policy in these countries.

1   Data and methods

The study is based on the European Union Statistics on Income and Living Conditions (EU-SILC) panel conducted on yearly basis. Poland is a case study with data covering years 2005-2012. Even though the EU-SILC is designed as a four-year rotating panel which allows to observe each individual for at most 4 years, it is suitable for the analysis as we are interested in obtaining average profiles by age. While gathering information about individuals of different ages, we obtain a synthetic life history that provides a picture of collective experience of individuals that could be treated as age profile (Willekens, 2014).

We distinguish two possible health states based on question how individual is (subjectively) rating her/his own health in general. Individual is considered to be Healthy[H] when is reporting "very good", "good" or "fair" health. Answers "bad" and "very bad" are classified as being in Unhealthy[UnH] state. In the sample we observe 31494 respondents with 9728 health transitions (4994 from [H] to [UnH] and 4734 from [UnH] to [H]). We focus on respondents aged 50 and more.

Transition rates and probabilities of health status are estimated with use of non-parametric multi-state methods (Nelson-Aalen estimator for transition rates and Aalen-Johansen estimator for transition probabilities) assuming the underlying process is Markovian and continuous (Willekens, 2014).

To measure the effects of coefficients between two types of transition, Markov stratified hazards model is used (Putter, Fiocco, & Geskus, 2007). The hazard for transition $i \rightarrow j$ for a subject with covariate vector $\boldsymbol{Z}$ is then given by

$$\lambda_{ij}(t|\boldsymbol{Z}) = \lambda_{ij,0}(t)\exp(\boldsymbol{\beta}_{ij}^T\boldsymbol{Z}) \qquad (1)$$

where $\lambda_{ij,0}(t)$ is the baseline hazard of transition $i \rightarrow j$, and $\boldsymbol{\beta}_{ij}$ is the vector of regression coefficients that describe the effect of $\boldsymbol{Z}$ on transition $i \rightarrow j$. As for covariates, we consider impact of gender, education and living arrangements on the health transitions controlling for period and cohort.

2.   Results

Firstly, the results of cross-sectional analysis of the outcome variable is presented. Figure 1 depicts the deterioration of subjective health with age. We can see that according to the

assumed definition of being healthy, close to 85% of respondents aged 50 are in good health while 15% are in bad health. The proportion changes with age. In the last age group only 40% respondents declare being healthy, whereas 60% are feeling unhealthy.

**Fig. 1: Subjective meaasure of general health by age, average for years 2005-2013.**
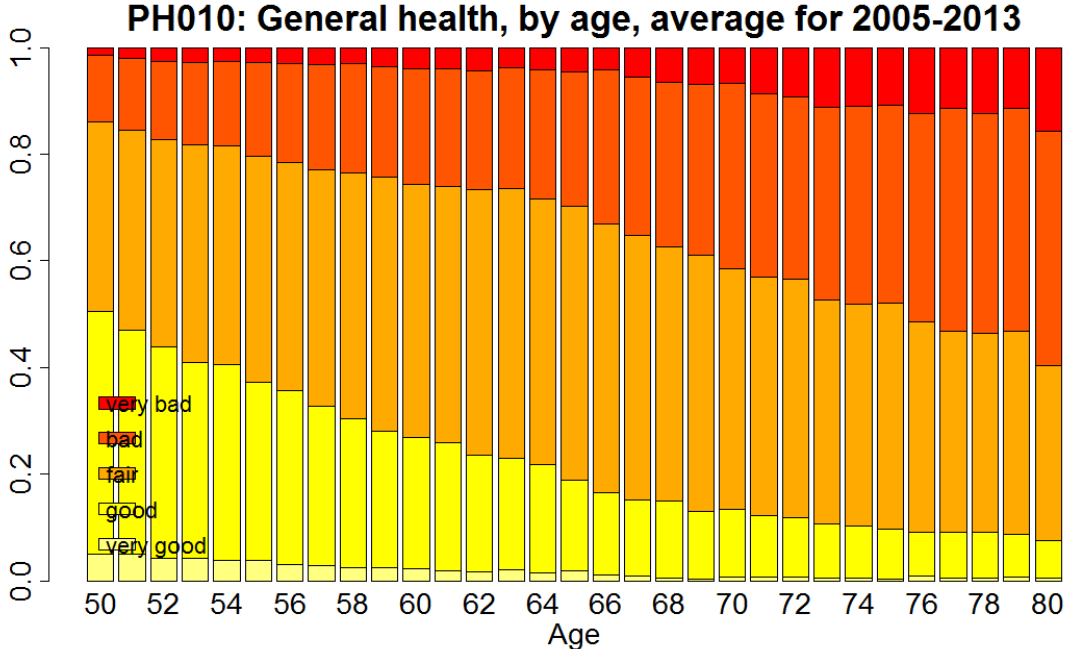
Source: own elaboration based on EU-SILC cross-sectional data.

Nextly, we move on to the results of longitudinal analysis. The estimation of transition probabilities allow us to find a clear general age-specific pattern. The health trajectiory for the recovery transition (move from unhealthy to healthy) is decreasing. With age, an unhealthy person has less and less chances to improve his/her health. For example, women's intensity to recover halves from around 23% to 11%. On the opposite, becoming unhealthy is more probable when ageing (see Figure 2). The increase in transition probability seems to be more sharp than in the other transition. For instance, the transition probability for women jumps from around 5 to almost 25 percent. If we were to put the trajectories of both transitions on the same graph, they would cross in the middle seventies (onset of bad health perception exceeds the recovery). At age 50, ratio of transition probabilities of both transition types is 4.2 and 5.5 for women and men respectively. At age 80+ the beforementioned ratios turn to 0.44 and 0.65.

When we move to the analysis of results by sex, there are no visible sex differences for unhealthy to healthy transition. The lines cross each other indicating that none of genders has any advantage over the other. However, females tend to have higher age specific probabilities to go from healthy to unhealthy state, especially after age 65 (right panel of Figure 2).

Fig. 2: Transition probabilities between health states by age, sex and type of transition.
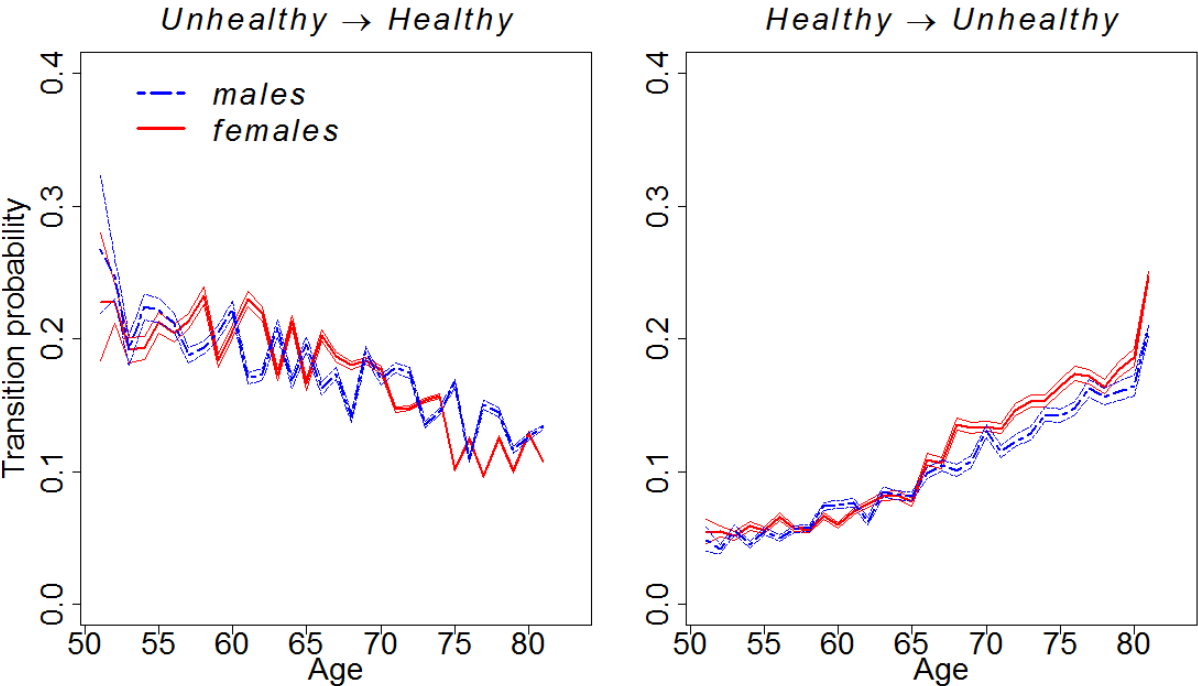
Note: thinner lines represent 95% confidence intervals.

Source: own elaboration based on EU-SILC longitudinal data.

Fig. 3: Transition probabilities between health states by age, sex and educational level by type of transition.
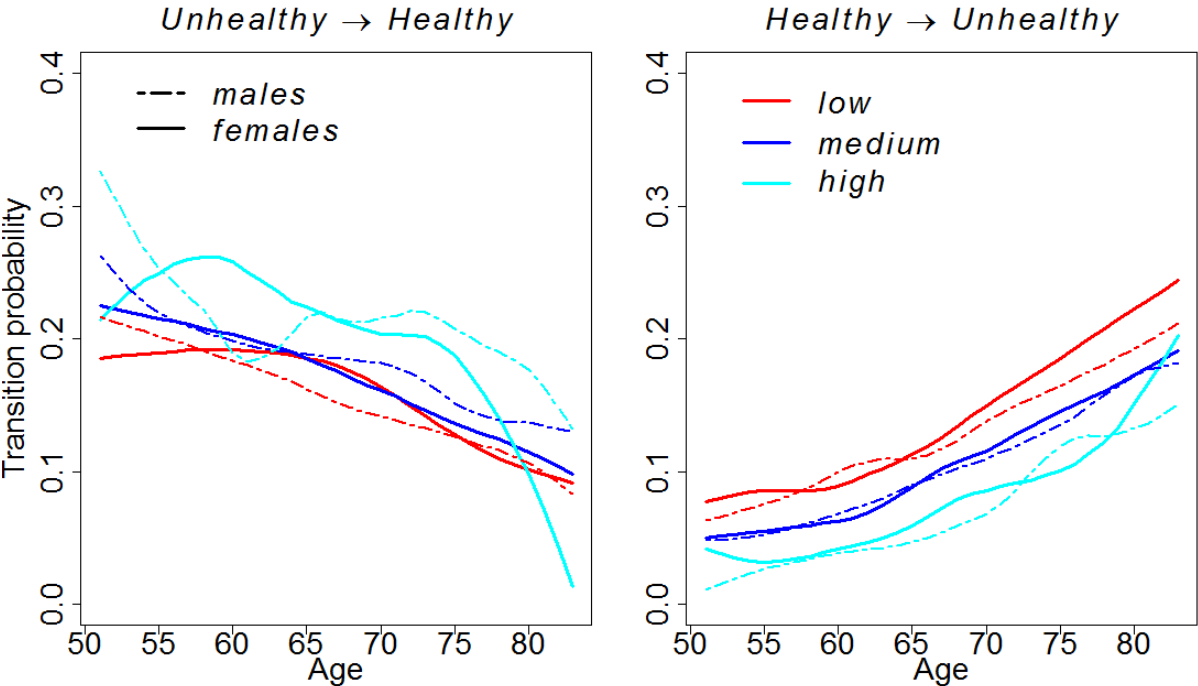
Note: results are smoothed.

Source: own elaboration based on EU-SILC longitudinal data.

Finally, we add level of education into consideration. It has to be noted that results are becoming less stable, especially for the highly educated, as there is lower number of respondents in each educational group to follow. As for the transition from Unhealthy to Healthy, there is not much of a difference between educational levels, particularly the medium and low educated overlap. However, we can see a clearer picture when looking at the Healthy to Unhealthy transition. The lines representing the onset of illness are more parallel between the groups. The rate of growth seems similar but the distance between probabilities looks to be maintained throughout all the ages. If we smooth the results, it appears that the low educated at age 50 have similar probability to transition to state of bad health as the high educated aged 70 (Figure 3). It suggests a strong advantage of higher education over lower education levels. Additionally, the results indicate that education has stronger effect than sex.

In the last part of the study we measure the effect of covariates of transition rates between health states using Cox proportional hazards model. Results are presented in Table 1.

Tab. 1: Covariates' effect on transition rates between health states by type of transition.

	Unhealthy --> Healthy	Healthy --> Unhealthy
SEX (ref. males)		
females	0,996	**1,056 .**
EDUCATION (ref. low)		
medium	**1,128** ***	**0,760** ***
high	**1,445** ***	**0,483** ***
COHORT (ref. 1925-1934)		
1935-1944	0,953	0,939
1945-1954	0,881	0,858
1955-1961	0,887	**0,771 .**
PERIOD (ref. 2005-2008)		
2009-2012	**0,908** **	**0,749** ***
LIVING ARRANGEMENTS (ref. alone)		
living with others	1,043	0,945

Note: the results reported are odds ratios. Significance levels: 0 '***' 0,001 '**' 0,01 '*' 0,05 '.' 0,1 ' ' 1.

Source: own elaboration based on EU-SILC longitudinal data.

The gender effect is statistically significant only for the Healthy to Unhealthy transition. Females have significantly higher odds ratio than males which means that their risk of becoming unhealthy is on average by 6% higher tham for men. The rate of health improvement and health deterioration are both dependent on education, however the effects are transition-specific. Higher education increases the rate of recovery and decreases the intensity to move from good to poor health. Similar to the effecct of sex, cohort is found

significant only for the Healthy to Unhealthy transition with those born later experiencing lower chances to experience bad health that older cohorts. The period effect suggests some improvement happening during the years covered, however it direction is the same for both types of transitions. The effect of living arrangements on health is found to be insignificant.

Conclusion

Results confirm the well-known regularities in research on health: 1) the risk of being unhealthy is increasing with age, while the probability of recovery is decreasing, 2) women have a higher risk of the onset of disability than men, whereas recovery to health is similar for men and women. These results for Poland are in line with similar studies looking at population of older Americans (Beckett et al., 1996; Crimmins, Hayward, & Saito, 1994; Wolf & Gill, 2009). Additionally, we conclude that there is a bonus of high education: higher probability of health improvement and lower probability of health deterioration across all age groups in comparison to lower educated. The effect of living arrangements on health is found to be insignificant.

The estimated transition probabilities provide additional insights into relationships between health and characteristics under considerations. Additionally, they can also serve as an input for further modelling purposes, for example to estimate the demand for care among people aged 50+. Such projections are also considered for the future work. The modelling approach would be to integrate cohort-component population projections and estimates of health and living arrangements transition probabilities by multistate models. With multiple scenarios of health and living arrangements trajectories considered, we could offer what-if scenarios for future needs for care among the elderly.

Acknowledgment

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