GEN - Governance and Economics research Network

GEN Working Paper B 2018 – 1
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January 2018

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ABSTRACT

This paper examines health care utilization among elderly people in sixteen European countries using the last wave of the Survey of Health, Ageing and Retirement in Europe (SHARE). Negative Binominal regression is conducted to study the main driving factors behind health care utilization (visits to the General Practitioners, GP; Hospital Stays, HS). The empirical results suggest that age, gender, education level, self-assessed health, health limitations and status and other socioeconomic variables are the main driving factors. We also show that socioeconomic variables do not play the same role in every country. From a policy economic approach, we propose important information to the current debates both in the health economics and social welfare literature. Our findings are relevant and have several implications for policy purposes to enhance efficiency, equity and quality of health care that it can be provided.

JEL Codes: I10; I18

Keywords: Aging; Discrete choice methods; Count Data Methods; Health; Health Care Utilization; SHARE; Europe

1. INTRODUCTION

Population aging has become one of the most important topics in our society since it is expected that the ratio of elderly people over all the population rises from 18% to 28% by 2060 [1]. The European Union is concerned about how these projections are going to affect health care services [2, 3] because elderly people are prone to use more the health care system [4-5]

Therefore, the future of the European health care services depends on national provision of care and the ways that they are organized and financed [6-10]. These health care systems (National Health Services or Social Security Systems) have a great relevance since there is some evidence that the use of health care services differs between public and private sector [11]. Besides, depending on the country, a prescription by the GP is needed to visit a specialist [12] and this waiting time can increase the use of emergency services. These differences can be related with income inequalities [13], which is an important factor determining the health care services utilization. A low-income household must wait till the public system can provide them an appointment but a high-income one can use the private sector and get a faster health care service [14]. The economic status is also a factor behind some mental diseases [15] like dementia or depression which are proved to be the most typical conditions affecting elderly people [16-20].

Hence, the purpose of this study is to examine the main drivers of health care utilization measured by the visits to the General Practitioners (GP) and the Hospital Stays (HS). Once an analysis for the European Union as a whole is done, we focus on the 16 member states which we have data for based on a multinational Survey, the last wave of the Survey of Health, Ageing and Retirement in Europe (SHARE), which provides comparable Gross National individual data. The SHARE sample is nationally representative of individuals who are 50 years old and over. This is an important fact since that using SHARE it is possible to disentangle whether all Member States follow a European pattern in the use of healthcare system.

Our main contributions are as follows. Firstly, the drivers of the visits to the GP and the hospital stays are based on the last wave (6^{th}wave) of the SHARE. It does not only include an analysis for each Member State because we also treat the European Union as a whole. Secondly, we analyze if there is a similar pattern in the European Union Member States, proposing that similar policy recommendations for the European Union Member States is not always a good idea (One-size-fits-all policy)

The paper is organized as follows. The second section is based on the theoretical framework, methodology and data where our topic is analyzed. The third section is focused on the empirical analysis and a discussion of the results can be found. And finally, the final one presents the conclusions and policy implications.

2. METHODOLOGY AND DATA

Methods

Count data methods are often used to explain the healthcare utilization [21-24] and it is useful for cases like the European health care services (Table 1). Our aim is explaining the variables *GP* (number of visits to the General Practitioner) and *HS* (hospital stays understood as number of nights a person is hospitalized). The estimation is based on two different distributions that are both estimated by maximum likelihood: Poisson and Negative Binomial. Since Poisson models have the property of equidistribution and has heterokedasticity a parameter capable to capture the randomness is introduced. The binomial negative function of density is the following:

$$\Pr(Y_i = y_i|x_i) = \frac{\Gamma(y_i + \nu_i)}{\Gamma(y_i + 1)\Gamma(\nu_i)} \left(\frac{\nu_i}{\nu_i + \mu_i}\right)^{\nu_i} \left(\frac{\mu_i}{\nu_i + \mu}\right)^{y_i} \quad (1)$$

Where

$$\mu_i = E(Y_i|x_i) = exp(x_i\beta) \quad (2)$$

$$\nu_i = \frac{1}{\alpha}\mu_i{}^t \qquad t = 0,1 \quad (3)$$

Depending on the way we define the variance there are two possibilities:

$$\nu = (1/\alpha) \quad (4)$$

Then

$$E(Y_i|x_i) = exp(x_i\beta) \quad (5)$$

$$Var(Y_i|x_i) = (1 + \alpha)exp(x_i\beta) \quad (6)$$

Or

$$Var(Y_i|x_i) = exp(x_i\beta)(1 + \alpha exp(x_i\beta)) \quad (7)$$

If the parameter α tends to 0, then it would be a Poisson distribution. It can be tested with a equidispersion contrast (H0: $\alpha = 0$). If $\alpha > 0$, then overdispersion and infra dispersion if $\alpha < 0$

Zero-inflated model are used for *NH*. The weight given to fact that the probability the variable equals zero is higher in comparison to the other specifications [25] and it is assumed tha (8) not generated by the same process than the other observations [24]. It can be specified as follows:

$$P(Y_i = 0) = f_1(0)$$

$$P(Y_i = y_i) = \big(1 - f_1(0)\big)\frac{f_2(y_i)}{1 - f_2(0)} \qquad y_i = 1,2,\ldots \quad (9)$$

Where $f_1()$ and $f_2()$ are probability functions and $1 - f_2()$ is used to truncate on zero.

Data

Our data came from the 6th wave of the Survey of Health, Aging and Retirement in Europe (SHARE) [26,27]. One of the novelties of this new wave is that a new country has been included: Croatia. The SHARE survey is the result of the aim of the European institutions to have a deeper and strongest cooperation with Member States to have good data on elderly people. It covers data from health to socioeconomic status passing through lifestyle which will helps us to include more determinants of the health care utilization system. In the Table 2, there is a summary of the most important statistics for each relevant variable. Our dependent variables are based on two health care indicators (*GP* and *HS)*.

Moreover, since age has a major impact on the health care utilization and it is different among different groups of age, for the EU we have distinguished between four groups: 50-65, 65-75, 75-85 and +85. In the case of each European country, we include the age as an independent variable with the addition of another variable *AGE2* that is the squared of *Age* in order to consider the quadratic relationship of this variable along lifecycle with our dependent variables.

As previous studies [12, 16, 22], we include gender *(Female)*, marital status (*Single)*, participation in the labor market *(InLabFor)* and the level of education (*PriEduc*, *SecEduc and TerEduc*), as relevant variable although this last one could be correlated with the socioeconomic level of individuals. Because of among the European Union there are different health care systems, we include a dummy variable related with a supplementary insurance (*SupInsu*) could be interesting to understand whether having it or not would affect to the use of the public service.

Multimorbidity has been captured through some proxies: the Number of Chronic Diseases a person has (*NCD*), and the number of limitations in Activities of Daily Living a person has (*ADL*). The self-assessed health has been included in the case of being with good health (*SPGH*). Physical characteristics determine the physical health status and we have included four dummies: Underweight (*UW*), NormalWeight (*NW*), Overweight (*OW*) and Obese (*O*bese). At this regard, we use the Body Mass Index (BMI) that is included in the SHARE survey and then people were classified depending whether their BMI was under 18.5 (*UW*), between 18.5 and 25 (*NW*), between 25 and 30 (*OW*) and more of 30 that corresponds to people suffering from obesity [28]. Hence, the importance of obesity has a double side: first, the direct effect that the illness has and the second is the propensity that people included in this condition could suffer from diabetes or other sicknesses which can make citizens request to have a higher coverage that includes specialists like dieticians or psychologists. [29-32]. Finally, Lifestyle is also important in the predisposition of getting ill and in this case the proxy variable selected was related to smoking (*Smoke*).

3. EMPIRICAL RESULTS

Visits to General Practitioner *(GP)*

In this section, we compare our findings with those concerning with health care utilization using count data models. Our estimates show in Tables 3 and 4 that , being a female is related to more possibilities of going to the GP that men since they are more likely to be ill from disabling conditions [33]. This gender gap decreases along our sample and turns negative for the group of people of more than 85 years old. It could be possible since women have a longer life expectancy than men, 83.3 and 77.9 respectively [34]. It mean that those men that are older than 85 has subjective health that it continues to be substantially worse than women which leads them to visit more to the GP as previous studies has demonstrated [35,36].

Being single has different effects along the cohorts. It produces more GP visits in those people aged 50-65 and +85 and less in the other cases. Marital status is not relevant in any country (excepting for Croatia and Czech Republic) and it does not have a similar slope because in some countries it is negative an in others it is positive probably due to the heterogeneity in cultures

Moreover, active people are less prone to visit GPs and this effect increases when people gets older. This result is consistent with some previous literature where it was proved that unemployed people were more alike to use the health care services [37]. The fact of having a supplementary insurance is related with more visits to the GPs and education variables also are important.

Self-assessed health, number of chronic diseases and limitations of daily living are statistically significant in all the elderly groups which mean that they are main driving factors of health care utilization. It is important to notice that most of their values get reduced when changing the cohort but continue having the same relevance. More chronic diseases and limitations increase the probability of visit the GP and having a good self-assessed health has the opposite effect. Besides, when *smoke* is significant, we can observe that it has a positive slope which is consistent with the previous literature. The same can be argued to those people that do not have a normal BMI. Generally, there are more likely to visit the GP than those with a normal weight.

Hospital Stays *(HS)*

There are wide variations across European countries in Hospital Stays differences as it shows Tables 5-6. Being female is related to have less hospital stays than men and being single, although is only statistically relevant in the general European Union analysis increases the probability of having more hospital stays. As in the case for *GP* visits, age is the main driving factor of health care utilization but here we observe that…

Being in the labor force reduces, in general, the probability of being hospitalized. For the group of people aged between 75 and 85 it is not a relevant factor, something that can be explained because there are not so many people working at that age, and those who continue active in the labor market may have a fantastic health status.

The health care system (National Health Services or Social Security System) could be also behind the differences in the effect of having a supplementary insurance and its influence over health care utilization. Hence, poor people cannot get a supplementary insurance as the people with a higher socioeconomic status. Related with the proxies of the socioeconomic status, we can point out that those people with tertiary education have less probability of having hospital stays than those with a lower education. Being hospitalized can be consequence of not have treated correctly an illness.

Finally, health status measured by multimorbidity and limitations of daily living and the self-assessed health are main driving factors of health care utilization according to our findings which are consistent with previous literature [36-38]. The first two ones have a clear positive effect on the probability of being hospitalized but a good self-assessed health decrease the probability of being hospitalized. Variables related to BMI are not relevant enough although not having a normal BMI increase HS. The same happens with the variable related with smoke proxy because it is only significant in the first group of age and in some countries although their slope is generally positive.

4. CONCLUSIONS

The comparison of the elderly people and some socioeconomic variables regarding their health care utilization in Europe is studied here in order to provide new empirical evidence. We demonstrate that the drivers behind the visits to the General Practitioner and Hospital Stays by using the 6thwave of the SHARE are quite similar to those described in the previous literature. Our findings point to the fact that there is a similar pattern in the European Union Member States.

Being older increase the health care utilization and being part of the labor force reduces the use of the healthcare system. People with chronic diseases and limitations in their daily activities make them visit more the General Practitioner and to have longer Hospital Stays. But other factors as education, marital status, gender or supplementary insurance can influence health care utilization in order to reduce it.

The results of this research add to our understanding of the behavior about health care utilization of elderly people across Europe. We really think that health campaigns, a better use of digital medicine or to empower patients to take care by themselves should be designed to explain to the people how health care (primary and hospital) should be used. Because of the heterogeneous nature of General Practitioner visits and Hospital Stays in Europe and the increasing pressure of a growing elderly population, more effort in this direction has to be carried out in order to enhance efficiency, equity and quality of health care systems.

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Country	Acronym	System
Austria	AT	Social security. 99%of population is covered. Financed by sickness funds (59%), taxation (24%), private insurance (7.5%) and co-payments
Belgium	BE	Social security. Entire population is covered. Financed by social health insurance, general taxation and out-of-pocket payments
Croatia	CRO	Mandatory Health Insurance. Universal coverage. Financed by compulsory contributions (75%) and state budget (15%) and debt.
Czech Republic	CR	Statutory Health Insurance. Compulsory membership. Financed by wage-based contributions,
Denmark	DE	National Health Service. Entire population is covered. Financed by general taxation
Estonia	ES	Estonian health system. Universal access. Financed by social payroll tax and public budget.
France	FR	National Health Insurance. Entire population is covered. Mix between private and public. Financed by employees' payroll taxes, co-payments
Germany	GE	Compulsory social insurance. Financed by compulsory and voluntary contributions to statutory health insurance (60%), general taxation (21%) and other payments
Greece	GR	Compulsory social insurance. Financed by general taxation and social insurance.
Italy	IT	National Health Service. Universal access. Financed by social insurance (40%), general taxation (35%) and co-payments.
Luxembourg	LU	Assurance Maladie. Financed by contributions to social sickness funds 50-50 employer and employee
Poland	PL	Social Health Insurance. Universal coverage. Financed by SHI contributions
Portugal	PO	National Health System. Universal coverage. Financed by general taxation (62%) and social insurance
Slovenia	SL	Health Insurance Institute of Slovenia. Universal coverage
Spain	SP	National Health System. Universal coverage. Financed by general taxation (80%), work-related contributions (18%) and co-payments.
Sweden	SW	National Insurance Scheme. Universal coverage. Financed by income taxes (65%) the rest state funds, subsidies and private insurance

Table 1. Health care models in the European Union (Countries)

Source: Authors´ elaboration from ´[39-45]: European Parliament (1998),Sagan et al (2011), Kinkorova (2012), Lai et al (2013), Dzakula et al (2014), Alexa et al (2015), and OECD Health Systems Characteristics Survey (2016)

Table 2. Variables and summary of statistics

Variable	Mean	Stand. Dev	Description
Dependent Variables			
GP	6.7	9.136	Number of visits to the General Practitioner in 365 days
HS	1.781	9.1667	Hospital Stays: Number of Nights at Hospital in 365 days
Independent Variables			
Age	67.865	10.059	Age (years)
Female	0.560	0.496	1 if female, 0 otherwise
Single	0.291	0.454	1 if single, 0 otherwise
InLabFor	0.272	0.445	1 if in labor force, 0 otherwise
SupInsu	0.347	0.476	1 if has a supplementary insurance, 0 otherwise
PriEduc	0.367	0.481	1 if Primary School, 0 otherwise
SecEduc	0.538	0.498	1 if Secondary School, 0 otherwise
TerEduc	0.095	0.293	1 if Tertiaty Education, 0 otherwise
ADL	0.280	0.939	Number of Limitations in Activities of Daily Living
NCD	1.896	1.623	Number of Chronic Diseases
SPGH	0.591	0.492	1 if Self-Assessed (Good Health), 0 otherwise
UW	0.011	0.106	1 if UnderWeight, 0 otherwise
NW	0.344	0.475	1 if NormalWeight, 0 otherwise
OW	0.418	0.493	1 if OverWeight, 0 otherwise
OB	0.226	0.418	1 if Obese, 0 otherwise
Smoke	0.448	0.497	1 if ever smoked, 0 otherwise

Source: Authors' calculation based on SHARE 6th wave (N=62,554).

Table 3. Negative Binomial estimates. European Union. GP as dependent variable

Variable	**50-65 years**	**65-75 years**	**75-85 years**	**+85 years**
Female	0.139 *** (0.016)	0.015 (0.017)	0.002 (0.024)	-0.077 (0.051)
Single	0.059 *** (0.019)	-0.025 (0.018)	-0.034 (0.023)	0.059 (0.045)
SupInsu	0.145 *** (0.016)	0.087 *** (0.017)	0.025 (0.022)	0.089 ** (0.040)
SecEduc	0.029 (0.018)	-0.001 (0.017)	0.046 ** (0.021)	0.035 (0.040)
TerEduc	0.115 *** (0.028)	0.054 * (0.030)	0.097 ** (0.044)	0.208 ** (0.088)
ADL	0.137 *** (0.015)	0.087 *** (0.012)	0.098 *** (0.011)	0.082 *** (0.012)
NCD	0.257 *** (0.006)	0.184 *** (0.006)	0.141 *** (0.006)	0.115 *** (0.011)
SPGH	-0.511 *** (0.019)	-0.439 *** (0.018)	-0.295 *** (0.023)	-0.226 *** (0.042)
UW	0.164 * (0.090)	0.151 * (0.087)	0.136 (0.091)	0.054 (0.121)
OW	-0.054 *** (0.018)	0.044 ** (0.019)	0.022 (0.024)	-0.031 (0.041)
OB	-0.011 (0.021)	0.058 *** (0.021)	0.006 (0.027)	-0.028 (0.055)
Smoke	0.002 (0.015)	0.015 (0.016)	0.045 * (0.023)	0.078 * (0.046)
constant	1.463 *** (0.032)	1.620 *** (0.029)	1.728 *** (0.034)	1.769 *** (0.062)
alpha	0.775 (0.012)	0.650 (0.011)	0.677 (0.013)	0.747 (0.025)
N	26,976	21,063	12,436	3,305

*Notes: Standard deviations are in parentheses. ***, **, *, are the significance at level 1,5 and 10% respectively*

Table 4. Negative Binomial estimates. European Countries. GP as dependent variable

Variable	AT	BE	CRO	CR	DE	ES	FR	GE
Age	0.041 *** (0.004)	-0.093 *** (0.021)	0.043 *** (0.005)	0.047 *** (0.003)	0.034 *** (0.005)	*0.045* *** *(0.003)*	0.043 *** (0.004)	-0.054 ** (0.024)
Age2	-0.001 *** (0.000)	0.001 *** (0.000)	-0.001 *** (0.000)	-0.003 *** (0.000)	-0.001 *** (0.000)	-0.004 *** (0.000)	-0.001 *** (0.000)	0.001 ** (0.000)
Female	0.066 (0.041)	0.113 *** (0.034)	0.084 (0.054)	0.036 (0.029)	0.049 (0.042)	0.045 (0.038)	0.059 * (0.034)	0.045 (0.034)
Single	0.017 (0.044)	0.014 (0.033)	0.024 (0.081)	-0.022 (0.031)	0.033 (0.043)	-0.044 (0.036)	0.001 (0.037)	0.019 (0.041)
InLabFor	0.003 (0.064)	-0.312 *** (0.049)	-0.039 (0.071)	-0.088 ** (0.042)	-0.031 (0.059)	-0.074 * (0.044)	-0.003 (0.049)	-0.179 *** (0.051)
SupInsu	0.137 *** (0.047)	0.174 *** (0.039)	0.326 *** (0.326)	-0.012 (0.058)	0.006 (0.043)	0.111 (0.085)	0.075 (0.109)	0.093 ** (0.038)
SecEduc	0.046 (0.042)	-0.078 * (0.042)	-0.094 * (0.055)	0.076 ** (0.037)	0.117 * (0.063)	0.014 (0.042)	0.049 (0.037)	0.076 (0.053)
TerEduc	0.039 (0.069)	-0.046 (0.057)	-0.109 (0.142)	0.124 ** (0.049)	0.147 * (0.086)	0.213 *** (0.077)	0.069 (0.056)	0.146 ** (0.071)
ADL	0.126 *** (0.025)	0.124 *** (0.024)	0.030 (0.032)	0.069 *** (0.020)	0.095 ** (0.038)	0.093 *** (0.016)	0.108 *** (0.020)	0.073 *** (0.021)
NCD	0.187 *** (0.013)	0.155 *** (0.010)	0.306 *** (0.018)	0.188 *** (0.010)	0.276 *** (0.276)	0.204 *** (0.011)	0.136 *** (0.012)	0.165 *** (0.012)
SPGH	-0.332 *** (0.043)	-0.521 *** (0.038)	-0.397 *** (0.054)	-0.343 *** (0.031)	-0.571 *** (0.056)	-0.496 *** (0.047)	-0.483 *** (0.045)	-0.533 *** (0.039)
UW	0.445 ** (0.205)	0.093 (0.116)	0.212 (0.364)	-0.355 ** (0.154)	0.194 (0.189)	-0.029 (0.122)	-0.001 (0.096)	-0.148 (0.147)
OW	-0.039 (0.047)	0.085 ** (0.036	-0.038 (0.063)	-0.001 (0.036)	0.076 (0.047)	-0.027 (0.043)	0.010 (0.039)	0.052 (0.037)
OB	0.029 (0.055)	0.068 (0.044)	0.026 (0.071)	-0.018 (0.039)	0.065 (0.057)	0.069 (0.047)	0.043 (0.043)	0.061 (0.049)
Smoke	0.024 (0.041)	0.075 ** (0.033)	-0.062 (0.055)	-0.005 (0.028)	-0.034 (0.042)	0.031 (0.036)	0.058 * (0.033)	-0.002 (0.033)
alpha	*0.688 (0.029)*	*0.623 (0.020)*	*0.979 (0.044)*	*0.470 (0.017)*	*0.705 (0.030)*	*0.753 (0.027)*	*0.399 (0.024)*	*0.587*
N	*3,266*	*5,370*	*2294*	*4,612*	*3,499*	*5,356*	*3,718*	*4,233*

Notes: Standard deviations are in parentheses. ***, **, *, are the significance at level 1,5 and 10% respectively. Table 1: what countries correspond to each acronym

Table 4. Negative Binomial estimates. European Countries. GP as dependent variable (continuation)

Variable	GR	IT	LU	PL	*PO*	*SL*	SP	SW
Age	0.025 *** (0.003)	0.053 *** (0.003)	0.055 *** (0.005)	0.051 *** (0.005)	0.027 *** (0.006)	0.051 *** (0.004)	0.045 *** (0.003)	0.037 *** (0.005)
Age2	-0.001 *** (0.000)	-0.001 *** (0.000)	-0.001 *** (0.000)	-0.003 *** (0.000)	-0.0001 (0.000)	-0.004 *** (0.000)	-0.003 *** (0.000)	-0.001 *** (0.000)
Female	0.161 *** (0.041)	0.096 *** (0.037)	0.153 ** (0.063)	0.099 * (0.055)	-0.005 (0.069)	-0.010 (0.043)	-0.043 (0.038)	-0.087 * (0.052)
Single	0.047 (0.043)	0.011 (0.041)	0.152 ** (0.076)	-0.125 ** (0.059)	-0.109 (0.074)	-0.027 (0.050)	-0.022 (0.042)	0.028 (0.057)
InLabFor	-0.232 *** (0.050)	-0.225 *** (0.048)	0.055 (0.084)	-0.337 *** (0.072)	0.009 (0.073)	0.092 (0.063)	-0.210 *** (0.047)	-0.143 ** (0.068)
SupInsu	0.144 * (0.083)	0.003 (0.065)	0.204 *** (0.072)	-0.035 (0.089)	0.133 * (0.069)	0.013 (0.053)	0.176 *** (0.052)	-0.106 (0.066)
SecEduc	-0.009 (0.039)	-0.008 (0.038)	0.023 (0.062)	0.124 ** (0.058)	0.089 (0.074)	-0.038 (0.042)	-0.048 (0.035)	0.052 (0.061)
TerEduc	0.034 (0.082)	-0.035 (0.069)	0.036 (0.092)	-0.043 (0.102)	0.270 (0.191)	0.058 (0.089)	0.001 (0.064)	0.209 ** (0.093)
ADL	0.100 *** (0.029)	0.088 *** (0.019)	0.149 *** (0.041)	-0.035 (0.031)	0.058 * (0.032)	0.014 (0.024)	0.081 *** (0.017)	0.083 ** (0.038)
NCD	0.263*** (0.014)	0.204 *** (0.014)	0.151 *** (0.019)	0.212 *** (0.019)	0.107 *** (0.019)	0.174 *** (0.012)	0.165 *** (0.012)	0.218 *** (0.019)
SPGH	-0.383 *** (0.043)	-0.433 *** (0.041)	-0.531 *** (0.073)	-0.374 *** (0.057)	-0.434 *** (0.074)	-0.517 *** (0.044)	-0.554 *** (0.037)	-0.573 *** (0.062)
UW	0.078 (0.247)	0.215 (0.180)	0.031 (0.219)	0.203 (0.247)	0.237 (0.393)	0.189 (0.252)	0.214 (0.146)	-0.053 (0.229)
OW	0.046 (0.247)	-0.012 (0.037)	-0.110 (0.074)	0.096 (0.066)	-0.136 ** (0.069)	-0.106 ** (0.052)	-0.047 (0.037)	0.018 (0.058)
OB	0.063 (0.047)	0.023 (0.048)	-0.132 * (0.073)	0.120 * (0.063)	0.057 (0.086)	-0.088 (0.058)	0.097 ** (0.045)	0.024 (0.074)
Smoke	0.087 ** (0.039)	0.021 (0.035)	0.124 * (0.061)	-0.045 (0.053)	-0.029 (0.070)	0.029 (0.042)	0.024 (0.038)	0.074 (0.051)
alpha	*0.871 (0.031)*	*0.799 (0.025)*	*0.600 (0.059)*	*0.664 (0.039)*	*0.574 (0.039)*	*0.677 (0.026)*	*0.561 (0.021)*	*0.975 (0.041)*
N	*4624*	*4,944*	*1,472*	*1,639*	*1,481*	*4,007*	*4,942*	*3,708*

Notes: Standard deviations are in parentheses. ***, **, *, are the significance at level 1,5 and 10% respectively. Table 1: what countries correspond to each acronym

Table 5. Zero-inflated negative binomial estimates. European Union. HS as dependent variable

Variable	50-65 years	65-75 years	75-85 years	+85 years
Female	-0.224 *** (0.071)	-0.178*** (0.066)	-0.297 *** (0.075)	0.158 (0.104)
Single	0.413 *** (0.088)	0.207 *** (0.072)	0.209 *** (0.081)	0.123 (0.113)
SupInsu	0.169 ** (0.070)	0.193 ** (0.078)	0.064 (0.071)	1.674 *** (0.161)
SecEduc	0.077 (0.088)	0.252 *** (0.068)	0.129 * (0.072)	-0.241 (0.194)
TerEduc	0.177 (0.133)	0.318 *** (0.124)	-0.008 (0.143)	0.128 *** (0.024)
ADL	0.249 *** (0.041)	0.381 *** (0.039)	0.205 *** (0.028)	0.249 (0.270)
NCD	0.355 *** (0.025)	0.258 *** (0.018)	0.059 *** (0.019)	-0.612 *** (0.141)
SPGH	-1.282 *** (0.076)	-1.246*** (0.066)	-0.769 *** (0.087)	0.378 *** (0.109)
UW	0.622 * (0.333)	0.912 *** (0.311)	0.238 (0.252)	0.110 (0.111)
OW	-0.237 *** (0.087)	0.028 (0.075)	-0.127 (0.082)	0.008 (0.152)
OB	-0.082 (0.096)	0.015 (0.077)	-0.086 (0.088)	0.046 * (0.026)
Smoke	0.237 *** (0.069)	0.072 (0.060)	0.031 (0.071)	0.136 (0.126)
inflate cons	-16.535 *** (0.282)	-17.205 (0.487)	0.921 *** (0.105)	1.538 (0.173)
alpha	22.119 (0.559)	16.971 (0.393)	2.102 (0.220)	21.21 (2.200)
N	(N=26,976)	(N=21,063)	(N= 12,436)	(N= 3,305)

*Notes: Standard deviations are in parentheses. ***, **, *, are the significance at level 1,5 and 10% respectively.*

Table 6. Zero-inflated negative binomial estimates. European countries. HS as dependent variable

Variable	AT	BE	CRO	CR	DE	ES	FR	GE
Age	0.041 *** (0.09)	0.002 (0.014)	0.060 *** (0.019)	0.043 *** (0.008)	0.002 (0.017)	0.059 *** (0.015)	-0.017 (0.018)	0.055 *** (0.009)
Age2	-0.001 ** (0.0001)	0.001 (0.000)	-0.001 *** (0.000)	-0.001 ** (0.000)	-0.001 (0.000)	-0.001 *** (0.000)	0.001 (0.000)	-0.001 *** (0.000)
Female	0.026 (0.110)	-0.286 ** (0.141)	-0.153 (0.184)	0.058 (0.105)	0.023 (0.173)	-0.342 ** (0.144)	-0.015 (0.180)	-0.158 * (0.091)
Single	0.082 (0.107)	0.127 (0.148)	-0.129 (0.206)	0.202 * (0.107)	0.212 (0.162)	0.461 *** (0.141)	0.016 (0.181)	0.462 *** (0.106)
InLabFor	-0.214 (0.186)	-0.732 *** (0.197)	-0.293 (0.267)	-0.260 (0.160)	-0.815 *** (0.235)	-0.749 *** (0.202)	-0.779 *** (0.256)	-0.373 *** (0.125)
SupInsu	0.461 *** (0.145)	-0.303 (0.188)	0.714 ** (0.0358)	-0.037 (0.214)	-0.294 * (0.173)	0.048 (0.219)	0.147 (0.396)	0.064 (0.093)
SecEduc	-0.001 (0.112)	0.346 ** (0.137)	-0.143 (0.183)	0.077 (0.118)	0.289 (0.199)	-0.021 (0.141)	0.345 (0.227)	0.102 (0.135)
TerEduc	-0.183 (0.214)	0.128 (0.180)	-0.209 (0.609)	0.031 (0.173)	1.347 *** (0.327)	0.438 (0.267)	0.379 (0.322)	-0.226 (0.184)
ADL	0.119 *** (0.045)	0.289 *** (0.072)	-0.002 (0.054)	0.177 *** (0.033)	0.316 ** (0.124)	0.275 *** (0.048)	0.294 *** (0.076)	0.105 *** (0.035)
NCD	0.184 *** (0.032)	0.163 *** (0.042)	0.129 ** (0.060)	0.089 *** (0.028)	0.344 *** (0.059)	0.169 ** (0.066)	0.143 ** (0.060)	0.156 *** (0.034)
SPGH	-0.771 *** (0.120)	-1.284 *** (0.153)	-1.269 *** (0.296)	-0.643 *** (0.111)	-1.136 *** (0.196)	-1.025 *** (0.223)	-1.715 *** (0.191)	-1.019 *** (0.123)
UW	-0.016 (0.299)	-0.826 ** (0.371)	0.099 (0.440)	0.507 (0.681)	0.741 (0.789)	-0.489 (0.339)	0.654 (0.548)	0.759 *** (0.227)
OW	-0.036 (0.119)	-0.106 (0.154)	0.207 (0.202)	-0.146 (0.124)	-0.207 (0.199)	-0.353 ** (0.169)	0.206 (0.199)	0.050 (0.105)
OB	-0.029 (0.132)	0.172 (0.178)	-0.037 (0.241)	-0.215 * (0.125)	-0.4431 * (0.252)	-0.386 ** (0.157)	-0.013 (0.241)	0.162 (0.121)
Smoke	0.194 * (0.105)	0.268 ** (0.131)	-0.326 ** (0.181)	0.162 * (0.093)	0.007 (0.169)	0.051 (0.124)	0.449 *** (0.171)	0.073 (0.093)
infl cons	*0.671 *** (0.132)*	*-14.436 *** (0.529)*	*1.442 *** (0.266)*	*1.146 *** (0.067)*	*-14.864 *** (0.268)*	*0.0886 *** (0.296)*	*-13.074 *** (0.534)*	*0.909 *** (0.094)*
alpha	*1.852 (0.339)*	*14.529 (0.694)*	*2.323 (0.927)*	*1.430 (0.181)*	*16.154 (1.134)*	*3.567 (1.287)*	*17.564 (0.063)*	*1.663 (0.237)*
N	*3,266*	*5,370*	*2,294*	*4,612*	*3,499*	*5,356*	*3,718*	*4,233*

Notes: Standard deviations are in parentheses. ***, **, *, are the significance at level 1, 5 and 10% respectively. Table 1: what countries correspond to each acronym

Table 6. **Zero-inflated negative binomial estimates. European countries. HS as dependent variable (continuation)**

Variable	GR	IT	LU	PL	*PO*	*SL*	SP	SW
Age	-0.425 ***	0.014	0.061 ***	0.091 ***	-0.820 ***	-0.223 *	0.023 *	-0.041 ***
	(0.114)	(0.029)	(0.015)	(0.11)	(0.251)	(0.126)	(0.013)	(0.014)
Age2	0.003 ***	-0.001	-0.004 ***	-0.001 ***	0.006 ***	0.002 *	-0.001	0.001 ***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)
Female	-0.773 ***	-0.484 ***	-0.143	-0.036	-0.891 ***	-0.228	-1.003 ***	-0.196
	(0.207)	(0.167)	(0.188)	(0.172)	(0.276)	(0.139)	(0.175)	(0.149)
Single	0.285	0.169	0.462 **	0.219	0.483	0.173	0.548 ***	0.160
	(0.211)	(0.185)	(0.195)	(0.185)	(0.331)	(0.45)	(0.204)	(0.176)
InLabFor	-0.307	-0.301	-0.689 **	-0.512 *	-0.250	-0.729 ***	-1.006 ***	-0.469 **
	(0.246)	(0.232)	(0.285)	(0.279)	(0.364)	(0.261)	(0.231)	(0.209)
SupInsu	0.413	-0.139	0.368 **	0.402	-0.015	-0.149	0.682 **	0.113
	(0.378)	(0.352)	(0.186)	(0.379)	(0.279)	(0.149)	(0.268)	(0.223)
SecEduc	-0.818 ***	0.268	-0.213	0.036	-0.337	-0.233	-0.109	0.084
	(0.210)	(0.193)	(0.166)	(0.158)	(0.326)	(0.142)	(0.167)	(0.166)
TerEduc	-0.673 *	0.149	-0.582 **	0.373	-1.239 ***	-0.582 *	-0.919 ***	0.178
	(0.363)	(0.284)	(0.269)	(0.486)	(0.459)	(0.327)	(0.286)	(0.250)
ADL	0.464 ***	0.271 ***	0.341 ***	-0.022	0.398 ***	0.154 ***	0.379 ***	0.188 **
	(0.095)	(0.091)	(0.077)	(0.041)	(0.111)	(0.059)	(0.089)	(0.085)
NCD	0.307 ***	0.266 ***	0.074 *	0.065	0.191 ***	0.183 ***	0.197 ***	0.234 ***
	(0.064)	(0.072)	(0.045)	(0.042)	(0.071)	(0.052)	(0.053)	(0.049)
SPGH	-1.98 ***	-1.825 ***	-0.829 ***	-0.973 ***	-1.094 ***	-0.918 ***	-1.733 ***	-0.924 ***
	(0.192)	(0.185)	(0.178)	(0.198)	(0.320)	(0.165)	(0.167)	(0.153)
UW	1.150	1.173	1.285 ***	0.636	-0.693	0.391	0.186	0.504
	(0.949)	(0.845)	(0.484)	(0.605)	(0.625)	(0.414)	(0.571)	(0.528)
OW	0.136	-0.181	-0.366 *	-0.380 **	-0.916 ***	-0.344 **	-0.545 ***	-0.008
	(0.207)	(0.178)	(0.202)	(0.181)	(0.283)	(0.156)	(0.192)	(0.174)
OB	0.520 *	-0.242	0.074	-0.291 *	-0.931 **	-0.332 *	-0.239	0.288
	(0.276)	(0.189)	(0.196)	(0.174)	(0.384)	(0.189)	(0.211)	(0.202)
Smoke	0.081	0.034	0.172	-0.059	-0.262	0.184	-0.098	0.113
	(0.195)	(0.148)	(0.178)	(0.156)	(0.278)	(0.129)	(0.169)	(0.148)
infl cons	*-13.354****	*-0.415*	*1.217 ****	*1.239 ****	*-12.636****	*0.951 ****	*-14.716****	*-13.059 ****
	(0.383)	*(2.198)*	*(0.158)*	*(0.093)*	*(1.416)*	*(0.232)*	*(0.368)*	*(2.236)*
alpha	*23.936*	*11.775*	*1.789*	*1.354*	*20.623*	*3.019*	*19.534*	*14.632*
	(0.073)	*(12.363)*	*(0.440)*	*(0.211)*	*(1.895)*	*(0.903)*	*(1.069)*	*(0.089)*
N	*4,624*	*4,944*	*1,472*	*1,639*	*1,481*	*4,007*	*4,942*	*3,708*

Notes: Standard deviations are in parentheses. ***, **, *, are the significance at level 1, 5 and 10% respectively. Table 1: what countries correspond to each acronym