Subjective survival probabilities and supply of regional health systems

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Self-assessed survival probability is a variable crucially affecting subjective wellbeing and individual (consumption, saving, retirement) economic choices. We investigate the role of Regional Health Systems (RHSs) on it and find that density of physicians (number of doctors per inhabitant) at regional level has a positive and significant effect on the dependent variable. Our finding is robust when we instrument our main variable of interest with parliament political composition. We as well find confirmation of an "objective" channel through which respondents' predictions are validated since density of doctors at regional level has a significant and positive effect on the quality of health systems proxied by the rate of amenable deaths.

Keywords: Regional Health Systems, subjective survival probability.

JEL Numbers: I10, I14.

1. Introduction

Physicians play a key role in the health sector. For this reason the density of doctors (number of doctors per inhabitants at local level) is a measure widely tested in the literature as a determinant of health outcomes. Grubaugh and Santerre (1994) show a negative correlation with infant mortality, Cremieux et al. (1999) find that health care spending improves both mortality and life expectancy. The positive impact on life expectancy has been confirmed by Shetty and Shetty (2014). Basu et al. (2019) using US data find that every 10 additional primary care physicians per 100,000 inhabitants are associated to a 51.5-day increase in life expectancy. The literature also provides evidence suggesting that density of doctor tends to be associated with better health outcomes and responsiveness across countries. Or (2000) shows that the number of physicians per capita is inversely associated with avoidable mortality across OECD countries, other things being equal. In terms of responsiveness, the OECD project on waiting times indicates the existence of a statistically-significant, inverse relationship between physician density and waiting times for elective surgery across a small sample of countries (Hurst and Siciliani, 2004).

As far as we know, there are no studies regarding the impact of the density of doctors on subjective survival probability. This variable is of crucial importance since self-assessed life horizons play a fundamental role in economic choices for at least three reasons. First, SSP is what matters when people take economic decisions on retirement, saving and consumption (Bloom et al., 2007; Coile et al., 2002; Delavande and Willis, 2008; Gan et al., 2004; Hurd et al., 2004; Salm, 2010), consistently with what predicted by life-cycle theories where the expected life horizon affects time length and quantity of saving and dissaving decisions (Alessie and Kapteyn, 2001; Bloom et al., 2004). Second, objective survival measures are inevitably average sample distribution measures,

while self-assessed individual life expectancy forecasts are exactly what matters for that given individual. Third, previous empirical research has shown that self-assessed life expectancy measures have robust predictive power on individual actual survival (Hurd and McGarry, 1995 and 2002) and match the shape of actual survival curves (Hamermesh, 1985; Hurd et al., 2009).

The research hypothesis formulated in this paper is that subjective survival probabilities are significantly affected by characteristics of the Regional Health Systems (RHSs) and, more specifically, by the density of doctors. The topic of our research is of increasing interest given that the decentralisation processes occurred in most countries increased the power and scope of regional authorities and produced the effect of differentiating qualities of Health Systems at regional level. The observed and perceived differences in Regional Health Systems drive patients migration,[1] [2] thereby producing additional differences in terms of wellbeing among patients, coupled with differences in regional health budgets of top and bottom regions due to the clearing systems that regulate interregional patient migration.

For all these reasons an investigation on the effects that different measures of supply in RHSs have on perceived health is of paramount importance for understanding the effects of inequalities in this domain and, with them, the potential room for policy measures aimed to address the observed differences and converge to the best practice regional frontier.

Our main variable of interest to test our research hypothesis is the number of doctors per inhabitants at regional level (density of doctors per inhabitant). We use regions at the highest available level of dissagregation and in particular: NUTS2 for Austria, Belgium, Switzerland, Spain, Greece, Croatia, Italy, Poland, Sweden and Slovenia; NUTS1 for Germany and France; NUTS0 (country level) for Denmark, Estonia and Luxembourg. The variable is per se an indicator of supply but, as we show in the paper, is also affecting a measure of quality of Regional Health Systems (amenable deaths). The density of doctors is at the centre of a controversial debate since undersupply of doctors limits access to health services while oversupply may induce demand for health (Paris et al., 2010). Given that the market of doctors is highly regulated (i.e. access quotas for medical students) an analysis of the effects of changes in the density of doctors is quite important and likely to inspire policy decisions. More specifically on this point, Paris et al. (2010), in their survey on 29 OECD countries, show that the number of doctors is not regulated only in four countries while 21 countries declare they have implemented policies to address shortage of doctors and 21 countries regulatory policies to address geographical misdistribution. With our analysis on the role of density of doctors on subjective survival probability we explore one of the potential and so far unexplored benefits that may arise from these two types of policies in terms of self-assessed life expectancy.

Our findings show that the impact of doctor density at regional level on subjective survival probability is statistically significant and robust when we control for endogeneity with an instrumental variable approach. In the final part of our paper we find an objective validation of

[1] The literature on patient migration starts from the removal of the assumption of pure agency models (Mc Guire, 2000) between the uninformed patient and the local doctor. More informed patients can acquire information that leads them to reduce informational asymmetry on the quality of local health systems. In presence of strong heterogeneity among local health systems and of a serious pathology the expected gain from migrating overcomes migration costs. The empirical literature on patients' migration uses gravitational models to explain interregional migration flows based on this model (Levaggi and Zanola, 2004).

[2] Patients migration is an important consequence of decentralisation of power to local administration and of the competition among them to attract citizens who decide to "vote with their feets" choosing the highest quality regional health system according to their evaluation (Prud'homme, 1995; Donahue, 1997; Martínez-Vázquez and McNab 2003; Tiebout, 1956 and Oates, 1972).

respondents' forecast showing that density of doctors at regional level has a significant and negative impact on the rate of amenable deaths.

2. Our research hypothesis

The claim that funds our research hypothesis is that density of doctors has a positive impact on self-assessed life expectancy in the current mixed (public/private) health systems for several reasons. First, shortage of doctors means longer queues for patients choosing the public service where administered prices (lower than the market clearing equilibrium price) lead inevitably to excess demand, rationing and queues. Second, shortages of doctors may therefore make delays longer thereby seriously affecting diagnosis, therapies, recovery and health. Longer queues are a factor directly observable by patients that is likely to translate into a more pessimistic evaluation of their recovery probability in case of illness, thereby affecting their subjectively formulated survival probabilities. The maintained assumption here is that there are many circumstances in which the other "production factors" of health services are not scarce (i.e. hospital beds, other personnel, medical apparels, etc.) and therefore lack of doctors is the binding constraint. If this is the case a higher density of doctors can significantly reduce queues and the distance between demand of visit and the visit itself, thereby reducing time for formulating diagnosis. These considerations seem confirmed by Becchetti et al. (2018) showing that self-perceived health has stronger predictive power on the insurgence of chronical diseases in subsamples of respondents reporting on average lower number of doctor visits. Even though there may be also demand side rationales for this evidence, supply side rationales should prevail in aggregate and lead to interpret the nexus between the two variables in terms of delays in matching between patients and their diagnosis. A lower number of doctors per inhabitants can crucially affect health through this channel.

3. Data and specification

The most convenient source to run an analysis on the effects of Regional Health Systems on subjective survival probability is a dataset with ample and detailed information on health of aged population across different countries and regions. We therefore choose as data source for our work the "Survey of Health, Ageing and Retirement in Europe (SHARE)" a panel containing six different waves with information on respondents aged 50 and above from 20 different countries (Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Luxembourg, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and Switzerland). SHARE detailed health information includes diagnosed pathologies together with index of functionalities and ample information on self-reported symptoms and overall health status. Controls include information on wealth, income, social activities, job and marital status. As it usually occurs in empirical research using the SHARE dataset we exclude wave 3 since it represents a discontinuity with respect to the other waves being concentrated on a special focus concerning respondents' past memories.

Our dependent variable is built on the following SHARE question

"What are the chances you will live to be age "T" or more?" to which the answer can range from 0 to 100 where 0 indicates "absolutely no chance" and 100 indicates "absolutely certain".

The SHARE database constructs life expectancy target age differently conditional to the respondent's age, with the distance between target and current age (forecast horizon) being not less than five and not higher than 25.[3] In order to control for differences in forecast horizon that are obviously likely to affect subjective survival probability we introduce forecast horizon (the difference between the respondent's target age and actual age) as control variable in our estimates.

The fully-augmented fixed effect specification used to test our research hypothesis is

$$(1)\quad SSP_{i,t} = \alpha_0 + \alpha_1 LnDoctorDensity_{i,t} + \alpha_2 TargetAge_{i,t} + \sum_{\lambda} \beta_\lambda\, DAge\ class_{\lambda,i,t}$$

$$+ \sum_{j} \gamma_j\, DEducation_{j,i,t} + \sum_{k} \delta_k\, DMarital\ Status_{k,i,t} + \sum_{l} \theta_l\, DJobStatus_{l,i,t}$$

$$+ \alpha_3 LnIncome_{i,t} + \alpha_4 LongTermIllness_{\ i,t} + \alpha_5 NChronicDiseases_{\ i,t}$$

$$+ \sum_{m} \mu_m\, DAdla_{m.i,t} + \sum_{n} \nu_n\, DIadla_{n,i,t} + \alpha_6 LowSelfPerceivedHealth_{i,t}$$

$$+ \alpha_7 EverSmoked_{i,t} + \alpha_8 NormalWeight + \alpha_9 OverWeight + \alpha_{10} Obese_{i,t}$$

$$+ \sum_{s} \varphi_s\, DYear_s + \eta_i + \varepsilon_{i,t}$$

where the dependent variable $SSP_{i,t}$ is the subjective survival probability measured in wave t as the self-assessed likelihood that the i-th respondent is alive at the target age (defined as in footnote 3). Our main variable of interest is the density of doctor at regional level measured as the log of doctors per 100,000 inhabitants. Non-health related regressors include target age in the subjective survival probability question, five-year age classes to take into account nonlinearities in the impact of age on the dependent variable, dummies for ISCED education levels, marital status dummies, job status dummies and the log of per capita household income (see Table 1 variable legend for details). Health related controls include a dummy for respondents with long term illness, a variable measuring the number of chronic diseases for which the respondent received a diagnosis from a doctor, Adla[4] and Iadla[5] levels capturing physical and more general functionalities, a dummy taking

[3] More specifically, target age is 75 if respondents are aged less than 65, 80 if aged 65-69, 85, if aged 70-74, 90 if aged 75-79, 95 if aged 80-84, 105 if aged 95-95, 210 if aged 100-104 and 120 if aged above 104. In rare cases (e.g. if age was ex post corrected due to an interviewer remark) the gap between age and target age may deviate from this rule. See http://www.share-project.org/fileadmin/pdf_documentation/SHARE_release_guide_6-1-0.pdf: accessed on 24/03/2019. We consider target ages deviating from this rule as measurement errors and drop them from our sample.

[4] Activities of Daily Living index measuring respondent's self-evaluated performance on the following tasks: dressing, bathing or showering, eating and cutting up food, walking across a room and getting in or out of bed. Values ranges from from 0 to 5, ascending order means highest difficulties in performing the task.

[5] The Instrumental Activities of Daily Living (IADLA) index, evaluates cognitive abilities. It is based on respondent's self-assessment of her/his skills in performing the following tasks: telephone calls, taking medications and managing

value one if the level of self-perceived health is not excellent or very good,[6] a dummy picking up smokers and weight classes according to standard Body Mass Index (BMI) value ranges. The presence of self-perceived health status and of functionality (Adla and Iadla) dummies helps to reduce the risk of not measuring health related dimensions not captured by diagnosed illnesses. We finally include year fixed effects in the estimate. Standard errors are clustered at country level.

4. Descriptive and econometric findings

Our descriptive statistics are presented in Table 2. The sample is almost gender balanced (46 percent males). Only 21 percent of respondents have a tertiary education title, while 57 percent of them retired from work. 20 percent are above the BMI (Body Mass Index) obese threshold.

In Table A1 we provide descriptive evidence of the average (last wave) distribution of the supply of doctors and hospital beds showing the presence of ample variability in the density of doctors across regions within the same country and across countries. The highest within country regional gap is between Attiki and Makedonia in Greece with density of doctors being almost three times larger in the first vis-à-vis the second region. The highest density region in the overall sample is Attiki 865, while the lowest density region is Wielkopolskie in Poland with 151 doctors. The variable is measured at regional level for each wave with an average of 114 observations for 5 waves. We therefore have 570 observations for the econometric estimate testing our research hypothesis.

Given that we estimate a fixed effect model what we measure is the within effect of regressors on the dependent variables net of the cross-sectional effects captured by our fixed effect dummies. Results are presented in Table 3 with specifications that progressively introduce health regressors up to the augmented specification of column 6. Findings of our base regression in fixed effects show that an increase in the log of the number of doctors per inhabitant has a significant and positive effect on the subjective survival probability (Table 3 column 1). In terms of economic significance one standard deviation change in the log of the number of doctors (approximately one fourth of the unit change measured by the regression coefficient as shown by Table 2 descriptive statistics) produces in our fully augmented specification of column 6 around 2 percent higher probability of subjective survival probability, net of the impact of the other controls.[7]

Among other controls the distance between age and target age in the SSP question is negative and significant as expected. Education dummies are not significant since, in a fixed effect estimate, they pick up the few changes in education status of respondents who completed their studies at older age. Retirement produces a positive effect, while death of partner (widowhood) a negative effect on the dependent variable. Objective (long term illness and number of chronical diseases) and subjective (low self-perceived health) negative health measures have the expected negative effect. Weight categories have a weak positive impact vis-à-vis the underweight omitted benchmark which is most likely to be another good proxy of bad physical or psychological health conditions and therefore

money. The index takes values in ascending order according to the growing difficulty in performing the task. It ranges from 0 to 3.

[6] As shown by the literature this variable is a good predictor of the insurgence of chronic diseases. The rationales are those of lags between patient entry into illness and doctor diagnosis. We therefore include this variable among regressors to control for unobservable health factors

[7] Doctors density is as well significant in a pooled estimate of our model where the variable captures both cross-sectional and within effects. Results are omitted for reasons of space and available upon request.

contributes to eliminate omitted variable problems on this crucial variable. The two (ADLA and IADLA) functionality indexes have as expected more negative effect for higher level dummies capturing worsened physical functionalities and cognitive skills.

5. Robustness checks

As is well known when individual formulate subjective probabilities tend to concentrate their answers around some focal points (Hurd and McGarry, 1995; Hurd et al., 1998; Hurd et al., 2005). Focal responses are generally interpreted as responses with lower accuracy and reliability (Lillard and Willis, 2001; Kézdi and Willis, 2003; Hill et al., 2004) or stronger uncertainty and lower knowledge of the dependent variable (de Bruin et al., 2000; Manski and Molinari, 2010; Delavande and Rohwedder, 2011).

We analyse the distribution of our dependent variable and find four main focal points (around the values of 0, 80 and 100). We therefore propose a robustness check where we exclude observations with focal points from our estimate, thereby reducing considerably the number of observations in our sample. Our main findings is unchanged with density of doctors positively and significantly affecting subjective survival probability (Table 3 column 7)

We re-estimate our benchmark model for sample splits based on gender, income and self-perceived health status (Table 4). We find that density of doctors remains positive and significant in all subsamples but that of high income, presumably because the rich are aware they have more resources to overcome queues and limits of the regional health systems. Gender does not seem to modify significantly our main result while, as expected, individuals with long term illnesses and low self-perceived health register stronger positive impact of density of doctors than their complementary samples.

6. Identification and instrumental variables

Endogeneity can produce biased findings since third drivers affecting both our main regressor of interest and the dependent variable may create a spurious correlation between them.

Our identification strategy for instrumental variable estimates relies on parliament political composition. More specifically, we look at the share of center-left wing parliament members after the last election preceding our sample wave measure. The rationale for the relevance of the instrument is that center-left parties are more likely to invest in public health in order to improve wellbeing of low income classes and for their equity concerns (Immergut, 1992, De Donder and Hindricks, 2007, Potrafke, 2010, Herwartz and Theilen, 2014). We as well expect the instrument to be valid since there is no reason to expect that the weight of center-left wing members in the parliament is going to affect per se subjective survival probability of the individual respondent in our sample.

When we estimate our base specification for the overall sample and for the sample splits proposed in Table 4 with an instrumental variable approach we find that density of doctors is again significant and positive with a coefficient magnitude that is remarkably similar to that of non-instrumented estimates (Tables 5 and 6).

7. Density of doctors and amenable deaths

In order to check whether respondents' predictions are consistent with objective data we estimate a specification where the dependent variable is the number of amenable deaths per 1,000 inhabitants. The variable is both a proxy of the quality of health services and a measure of the specific component of mortality determined by bad quality of health services. Amenable deaths are defined by Eurostat as deaths caused by diseases and conditions that could have been potentially avoided with optimal quality health care. The process to calculate them is in two steps. In the first step a list of conditions and diseases (conditional to patient's age and up to an age limit of 75) is formulated by a task force of health care experts. In the second step the final indicator is calculated as the sum of all deaths occurred under conditions and diseases included in the list.[8]

We keep on using individual data and the previous specification (obviously excluding the target age variable) in this estimate. The interpretation of coefficients therefore can be read here as the effect of the regional sample value of a given sociodemographic characteristic (age, education, etc.) on the dependent variable. Estimates findings show that density of doctors at regional level has a negative and significant effect on amenable deaths (Table 7). The coefficient magnitude implies that one standard deviation change in the density of doctors produces an impact of around 0.3 percent on the share of amenable deaths per thousand inhabitants in our sample. If we consider that one standard deviation in the amenable death variable is around 0.53 the effect is not small.

We repeat our estimate by collapsing data at NUTS level thereby reducing redundancy of observations given that our dependent variable changes at NUTS level only. The significance of doctor density is confirmed. The coefficient magnitude is remarkably stable and slightly larger than in the corresponding non collapsed estimate (Table 8).

Overall, these findings coupled with those previously described show that individual respondents' perception captured by subjective survival probability therefore matches with "objective" evidence on amenable deaths.

8. Conclusions

Policies aimed to address shortage of physicians and to correct geographical misdistribution are in act in most OECD countries (OECD, 2010). Our research provides an original quantification of the effect that the reduction of such shortage can generate by estimating its impact on subjective survival probability of local respondents. Empirical findings from testing our research hypothesis show that one standard deviation increase in the density of doctors per inhabitants raises by around 2 points the probability that respondents attach to be alive in the target year. This average effect is higher in subsamples of low income respondents or among respondents reporting low self-assessed health or a long term illness. In our final estimate we show that respondents' subjective assessment

[8] https://ec.europa.eu/eurostat/statistics-explained/index.php/Amenable_and_preventable_deaths_statistics

find confirmation in objective evidence on the quality of health systems since density of doctors has a significant and negative effect on the share of amenable deaths.

Our findings therefore provide empirical support for policies aimed at addressing such shortage such as quotas and regulation to correct the geographical misdistribution of physicians quantifying their benefits on a specific domain.

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Table 1. Variable legend

Variable	Description
	Dependent Variable
SSP (Subjective survival probability)	Self-assessed probability of being alive at the life expectancy target age formulated by the respondent (0-100 percent)
Amenable deaths	Number of amenable deaths of residents per thousand inhabitants
	Health related variables
Doctor Density	Number of medical doctors per hundred thousand inhabitants
Long Term Ill	Dummy variable = 1 if the respondent has chronic or long-term health problems and 0 otherwise.
N. chronic diseases	Number of the following chronic diseases: heart attack, high blood pressure or hypertension, high blood cholesterol, a stroke or cerebral vascular disease, diabetes or high blood sugar, chronic lung disease, cancer or malignant tumor, stomach or duodenal ulcer, peptic ulcer, Parkinson disease, cataracts, hip fracture or femoral fracture.
	Socio-demographic and other variables
Male	Dummy variable = 1 if the respondent's gender is male and 0 otherwise.
Age class	0/1dummies for the following age groups: Age 50-54; Age 55-59; Age 60-64; Age 65-69; Age 70-74; Age 75-79, Age 80-84; Age 85-89; Age 90+
Education	ISCED (International Standard Classification of Education) levels: Zero level of education meaning no education or unfinished first level of education. First level (primary education or first stage basic education), second level (lower secondary or second stage of basic education), third level (upper secondary education), fourth level (post-secondary non tertiary education), fifth level (first stage of tertiary education), sixth level (second stage of tertiary education).
Marital status	Marital status categorical variable: 1=Married, 2=Registered Partner; 3=Separated; 4=Never Married; 5= Divorced; 6=Widowed.
Job status	Categorical job status variable indicating: Retired, Employed or self-employed, Unemployed, Other Job status
Ln Income	Yearly equivalized (OECD scale) household income after taxes and social insurance contributions transformed in logarithms.
ADLA	Activities of Daily Living Index ranging from 0 to 5 with increasing values indicating higher difficulties of the respondent. It covers five main tasks: dressing, bathing or showering, eating, cutting up food, walking across a room and getting in or out of bed.
IADLA	Instrumental Activities of Daily Living Index ranging from 0 to 3 with increasing values indicating higher difficulties of the respondent. It covers the following activities: telephone calls, taking medications and managing money
Low Self perceived health	Dummy taking value one if self-perceived health status is not excellent or very good (0 otherwise)
Ever smoked	Dummy variable = 1 if the respondent has ever smoked and 0 otherwise.
Under Weight	Dummy variable=1 if the respondent is underweight (BMI<18.49), 0 otherwise
Normal Weight	Dummy variable=1 if the respondent is normal (BMI between 18.5 and 24), 0 otherwise
Over Weight	Dummy variable=1 if the respondent is overweight (BMI between 25 and 29.9), 0 otherwise
Obese	Dummy variable=1 if the respondent is obese (BMI>34.9) , 0 otherwise
Target age	Difference between target age proposed by the questionnaire to the responders and age of the responder.
Center Left Lag1	The share of left-wing parliament members, one-year lagged.
Year	2004, 2006, 2010, 2013 and 2015.
Country	The countries where the surveys were realized: Austria, Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Israel, Czech Republic, Poland, Ireland, Hungary, Portugal, Slovenia, Luxembourg and Estonia.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
SSP	213042	62.228	29.735	0	100
Male	384731	.463	.499	0	1
Age class					
Age 50 - 54	390378	.074	.262	0	1
Age 55 - 59	390378	.122	.328	0	1
Age 60 - 64	390378	.131	.337	0	1
Age 65 - 69	390378	.121	.326	0	1
Age 70 - 74	390378	.101	.301	0	1
Age 75 - 79	390378	.080	.271	0	1
Age 80 - 84	390378	.056	.230	0	1
Age 85 - 89	390378	.030	.169	0	1
Age 90 +	390378	.285	.451	0	1
Education					
No education	255823	.044	.205	0	1
Primary	255823	.205	.404	0	1
Lower Secondary	255823	.178	.383	0	1
Upper Secondary	255823	.320	.467	0	1
Post Secondary	255823	.042	.201	0	1
Lower Tertiary	255823	.202	.402	0	1
Upper Tertiary	255823	.007	.085	0	1
Marital status					
Married	257341	.689	.463	0	1
Registered	257341	.015	.122	0	1
Separated	257341	.012	.109	0	1
Never Married	257341	.054	.227	0	1
Divorced	257341	.080	.271	0	1
Widowed	257341	.150	.357	0	1
Job status					
Retired	256931	.547	.498	0	1
Employed	256931	.273	.445	0	1
Unemployed	256931	.029	.170	0	1
Other job status	256931	.150	.357	0	1
Ln Income	256853	9.074	1.465	-7.225	15.439
Long term Ill	259279	.511	.499	0	1
N. of chronic diseases	259166	1.167	1.237	0	10
ADLA					
1	259269	.057	.233	0	1
2	259269	.025	.155	0	1
3	259269	.013	.115	0	1
4	259269	.009	.095	0	1
5	259269	.010	.098	0	1
IADLA					
1	259269	.033	.177	0	1
2	259269	.011	.105	0	1
3	259269	.013	.115	0	1
Low Self-perceived health	259231	.741	.438	0	1
Ever smoked	227428	.459	.498	0	1
Under Weight	251487	.013	.113	0	1
Normal Weight	251487	.365	.481	0	1

Over Weight	251487	.414	.493	0	1
Obese	251487	.207	.405	0	1
Doctor density (regional)	183337	361.464	98.957	143.98	865.01
Target age	229534	14.510	3.997	0	25
Center Left Lag1	345152	.339	.115	.016	.574
Amenable deaths	269208	1.287	.529	.752	2.882

Table 3. The effect of density of doctors at regional level on subjective survival probability – non instrumented - fixed effect estimates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6) Full	(7) Focal point
LnDoctorDensity	7.623***	7.699***	7.875***	7.614***	7.778***	8.267***	13.043***
	(1.589)	(1.587)	(1.584)	(1.586)	(1.589)	(1.587)	(3.229)
Target Age	-1.493***	-1.500***	-1.511***	-1.505***	-1.502***	-1.505***	-1.601***
	(0.085)	(0.085)	(0.085)	(0.085)	(0.085)	(0.085)	(0.233)
Age 50 - 54	24.007***	24.192***	23.654***	23.978***	24.396***	22.749***	19.693***
	(2.676)	(2.678)	(2.673)	(2.680)	(2.673)	(2.676)	(6.994)
Age 55 - 59	22.486***	22.634***	22.076***	22.364***	22.818***	21.237***	21.060***
	(2.520)	(2.522)	(2.518)	(2.525)	(2.518)	(2.522)	(6.404)
Age 60 - 64	19.414***	19.534***	18.912***	19.179***	19.625***	18.150***	18.225***
	(2.403)	(2.405)	(2.401)	(2.408)	(2.401)	(2.405)	(5.965)
Age 65 - 69	17.326***	17.461***	16.704***	16.960***	17.424***	16.037***	16.604***
	(2.330)	(2.331)	(2.329)	(2.336)	(2.328)	(2.332)	(5.646)
Age 70 - 74	15.161***	15.391***	14.567***	14.769***	15.336***	13.934***	14.212***
	(2.278)	(2.279)	(2.277)	(2.285)	(2.277)	(2.280)	(5.459)
Age 75 - 79	10.015***	10.235***	9.459***	9.576***	10.194***	8.888***	9.699*
	(2.210)	(2.211)	(2.209)	(2.217)	(2.209)	(2.212)	(5.221)
Age 80 - 84	4.972**	5.170**	4.539**	4.591**	5.107**	4.150**	8.652*
	(2.102)	(2.103)	(2.100)	(2.107)	(2.101)	(2.102)	(4.896)
Age 85 - 89	1.430	1.608	1.375	1.133	1.587	1.111	9.645**
	(1.936)	(1.936)	(1.934)	(1.938)	(1.935)	(1.933)	(4.442)
Primary	4.802	4.291	3.686	4.914	4.904	3.553	-9.200
	(9.864)	(9.845)	(9.830)	(9.842)	(9.863)	(9.844)	(18.961)
Lower Secondary	8.138	7.743	7.684	8.474	8.342	6.850	-0.186
	(10.223)	(10.204)	(10.186)	(10.199)	(10.222)	(10.202)	(19.560)
Upper Secondary	8.502	8.151	7.523	8.448	8.346	6.765	18.851
	(9.840)	(9.821)	(9.806)	(9.817)	(9.840)	(9.822)	(18.906)
Post Secondary	9.269	9.353	8.511	9.579	9.904	7.276	-8.559
	(11.929)	(11.905)	(11.886)	(11.905)	(11.926)	(11.906)	(23.949)
Lower Tertiary	10.622	10.188	9.894	10.920	10.414	8.910	7.692
	(10.051)	(10.033)	(10.015)	(10.028)	(10.051)	(10.032)	(19.155)
Upper Tertiary	6.483	6.618	6.066	6.962	6.295	4.798	-2.532
	(18.185)	(18.161)	(18.131)	(18.157)	(18.183)	(18.143)	(53.688)
Registered partnership	-4.454	-4.393	-4.491	-4.484	-4.910	-4.546	11.711
	(4.492)	(4.493)	(4.486)	(4.493)	(4.492)	(4.482)	(16.082)
Separated	-6.659*	-6.472*	-6.734*	-6.762*	-6.790*	-6.809*	13.802
	(3.662)	(3.663)	(3.657)	(3.663)	(3.661)	(3.653)	(15.079)

Never married	-7.295*	-7.517*	-8.041*	-8.038*	-7.840*	-7.510*	-8.726
	(4.257)	(4.256)	(4.248)	(4.254)	(4.256)	(4.248)	(9.549)
Divorced	-4.076	-4.164	-4.345*	-4.367*	-4.368*	-4.180	5.669
	(2.621)	(2.620)	(2.616)	(2.620)	(2.620)	(2.615)	(7.063)
Widowed	-4.395***	-4.350***	-4.209***	-4.264***	-4.452***	-4.106***	-0.440
	(1.213)	(1.214)	(1.212)	(1.214)	(1.213)	(1.211)	(3.267)
Retired	2.675***	2.698***	2.605***	2.681***	2.736***	2.543***	2.341
	(0.728)	(0.728)	(0.727)	(0.728)	(0.727)	(0.726)	(2.006)
Employed	1.250	1.255	1.223	1.308	1.278	1.142	-1.384
	(0.847)	(0.848)	(0.846)	(0.847)	(0.847)	(0.845)	(2.530)
Unemployed	-0.389	-0.442	-0.452	-0.340	-0.321	-0.511	1.733
	(1.300)	(1.299)	(1.297)	(1.299)	(1.299)	(1.297)	(4.107)
LnIncome	-0.011	-0.011	-0.031	-0.024	-0.030	-0.023	-0.922**
	(0.139)	(0.139)	(0.138)	(0.139)	(0.139)	(0.138)	(0.365)
Long Term Ill	-2.376***					-2.148***	-0.521
	(0.361)					(0.361)	(1.015)
NChronicDiseases		-0.840***					
		(0.189)					
ADLA_1			-4.222***			-3.908***	-4.963***
			(0.652)			(0.656)	(1.693)
ADLA_2			-5.807***			-5.434***	-5.917**
			(1.087)			(1.093)	(2.913)
ADLA_3			-5.429***			-4.500***	2.237
			(1.647)			(1.672)	(4.112)
ADLA_4			-13.484***			-12.579***	-12.364**
			(2.215)			(2.245)	(5.392)
ADLA_5			-18.109***			-13.978***	-14.114*
			(2.634)			(3.024)	(7.623)
IADLA_1				-2.146**		-0.866	1.813
				(1.014)		(1.023)	(2.584)
IADLA_2				-7.286***		-3.730*	-0.660
				(2.107)		(2.166)	(5.784)
IADLA_3				-14.005***		-7.156**	-0.944
				(2.689)		(3.066)	(7.540)
Low self-perceived health					-2.980***		
					(0.422)		
Ever smoked	-2.112	-2.351	-2.468	-2.657	-2.236	-2.504	-8.761
	(3.400)	(3.394)	(3.388)	(3.393)	(3.400)	(3.393)	(6.564)
Normalweight	3.752**	3.783**	3.666**	3.630**	3.748**	3.662**	-3.575
	(1.836)	(1.834)	(1.828)	(1.831)	(1.830)	(1.832)	(5.317)
Overweight	4.231**	4.244**	4.150**	4.115**	4.317**	4.086**	-5.423
	(1.906)	(1.905)	(1.899)	(1.902)	(1.901)	(1.902)	(5.485)
Obese	3.607*	3.631*	3.486*	3.384*	3.706*	3.488*	-8.310
	(2.002)	(2.001)	(1.995)	(1.999)	(1.998)	(1.998)	(5.755)
Dummy year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	12.688***	12.365***	12.576***	12.455***	12.855***	12.611***	1.571
	(1.608)	(1.602)	(1.599)	(1.601)	(1.608)	(1.604)	(2.653)

Observations	70,288	70,243	70,297	70,297	70,288	70,278	17,532
Number of id	47,282	47,253	47,286	47,286	47,276	47,277	14,785

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The omitted benchmark: aged 90+, no education, married, other job status, underweight, ADLA and IADLA baseline.

Table 4. The effect of density of doctors at regional level on subjective survival probability – non instrumented - fixed effect estimates – sample splits

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Female	Male	Low Income	High Income	Long term Ill	No long term ill	Low self-perceived health	High self-perceived health
LnDoctorDensity	8.407***	7.043**	8.421***	2.837	11.971***	6.821***	9.385**	6.102***
	(1.906)	(2.825)	(3.097)	(2.707)	(3.030)	(2.566)	(4.141)	(1.918)
Target	-1.412***	-1.589***	-1.319***	-1.772***	-1.325***	-1.752***	-1.178***	-1.675***
	(0.113)	(0.129)	(0.226)	(0.107)	(0.147)	(0.163)	(0.190)	(0.121)
Age 50 - 54	19.228***	30.314***	23.953***	27.517***	25.413***	22.599***	33.868***	20.809***
	(3.582)	(4.054)	(7.797)	(3.365)	(5.161)	(5.173)	(7.693)	(3.763)
Age 55 - 59	17.618***	28.801***	24.012***	25.956***	24.079***	21.663***	33.721***	18.531***
	(3.384)	(3.804)	(7.390)	(3.160)	(4.989)	(4.768)	(7.515)	(3.453)
Age 60 - 64	15.045***	25.066***	22.273***	21.225***	22.163***	20.484***	30.529***	16.030***
	(3.234)	(3.612)	(7.101)	(2.996)	(4.832)	(4.500)	(7.354)	(3.266)
Age 65 - 69	12.879***	23.007***	19.952***	18.615***	20.097***	17.782***	27.903***	13.274***
	(3.132)	(3.506)	(6.901)	(2.897)	(4.733)	(4.349)	(7.266)	(3.151)
Age 70 - 74	11.289***	20.198***	17.478***	16.333***	19.698***	15.639***	25.928***	11.516***
	(3.064)	(3.424)	(6.718)	(2.829)	(4.668)	(4.229)	(7.228)	(3.059)
Age 75 - 79	6.094**	15.145***	12.659*	10.070***	15.459***	10.235**	20.324***	7.299**
	(2.966)	(3.327)	(6.513)	(2.743)	(4.571)	(4.094)	(7.121)	(2.960)
Age 80 - 84	0.544	10.657***	7.435	4.115	10.921**	6.245	14.870**	4.037
	(2.812)	(3.177)	(6.248)	(2.593)	(4.363)	(3.880)	(6.875)	(2.808)
Age 85 - 89	-1.954	5.614*	2.304	1.474	5.847	3.405	17.925***	0.825
	(2.613)	(2.888)	(5.732)	(2.390)	(3.988)	(3.625)	(6.624)	(2.587)
Primary	9.618	-5.316	-3.469	22.330	-9.441	6.401	13.313	8.509
	(11.880)	(17.493)	(18.206)	(16.743)	(18.936)	(15.855)	(26.051)	(11.681)
Lower Secondary	12.344	-0.837	-4.644	34.414**	-17.148	0.960	3.117	18.661
	(12.344)	(18.088)	(19.926)	(16.676)	(19.037)	(16.687)	(25.578)	(12.323)
Upper Secondary	6.355	7.643	15.779	26.702	-5.815	10.090	-0.364	18.074
	(12.020)	(17.198)	(20.452)	(16.244)	(18.601)	(15.573)	(24.592)	(11.795)
Post Secondary	8.057	5.560	15.729	29.861*	-8.506	11.175	-7.317	15.148
	(15.679)	(19.472)	(30.480)	(17.666)	(20.476)	(20.498)	(26.403)	(16.824)
Lower Tertiary	15.205	3.650	2.171	34.484**	-2.172	-4.305	4.146	21.126*
	(12.337)	(17.474)	(25.579)	(16.386)	(18.807)	(16.054)	(24.595)	(12.506)
Upper Tertiary	20.161	-5.603	0.000	40.279*	-24.531	11.341	0.000	-5.941
	(25.907)	(26.875)	(0.000)	(22.862)	(35.986)	(25.497)	(0.000)	(25.717)
Registered partnership	-3.928	-4.756	-10.987	-3.700	-9.074	5.423	2.080	-11.462*
	(6.526)	(6.227)	(18.517)	(4.700)	(7.845)	(9.135)	(8.484)	(6.945)
Separated	-5.844	-7.472	-30.072*	-2.149	-13.903**	-4.157	-10.113	-2.255
	(5.497)	(4.938)	(15.973)	(4.394)	(5.717)	(7.027)	(6.950)	(5.678)
Never married	-8.359	-6.358	19.677	-7.087	-5.822	8.677	4.356	-10.859*
	(5.502)	(6.805)	(14.559)	(4.871)	(6.853)	(7.759)	(7.827)	(6.096)
Divorced	-3.356	-4.843	-19.196	-0.722	-3.436	-1.203	-4.521	-2.255
	(3.673)	(3.776)	(12.014)	(2.975)	(3.720)	(5.314)	(4.397)	(4.103)
Widowed	-5.065***	-3.306	-7.763**	-4.322***	-8.598***	-3.346	-3.435	-5.062***
	(1.454)	(2.220)	(3.161)	(1.657)	(2.212)	(2.234)	(3.072)	(1.644)

Retired	2.287***	3.985***	5.270***	2.181**	2.246*	2.383*	-1.446	3.313***
	(0.844)	(1.464)	(1.828)	(0.981)	(1.347)	(1.267)	(1.959)	(0.985)
Employed	0.456	2.996*	-2.438	1.089	1.898	0.161	-2.827	0.538
	(1.058)	(1.552)	(2.417)	(1.138)	(1.471)	(1.647)	(2.040)	(1.235)
Unemployed	-0.546	0.545	-3.922	1.208	2.780	-3.303	-0.558	-1.033
	(1.736)	(2.079)	(2.940)	(2.125)	(2.225)	(2.641)	(3.249)	(1.837)
Log (Income)	-0.094	0.095	-0.223	1.076**	-0.350*	0.245	-0.648**	0.042
	(0.185)	(0.210)	(0.260)	(0.483)	(0.213)	(0.309)	(0.319)	(0.195)
Long Term Ill	-2.350***	-2.358***	-2.231**	-2.488***				
	(0.483)	(0.545)	(1.004)	(0.456)				
Ever smoked	-4.827	2.828	4.856	-0.427	-2.189	-3.345	3.027	-3.170
	(4.649)	(5.068)	(9.496)	(3.577)	(4.644)	(5.926)	(5.520)	(5.045)
Normalweight	3.192	6.040	6.136	2.931	-2.184	10.952***	3.746	4.054
	(2.015)	(4.367)	(4.976)	(2.295)	(3.334)	(3.180)	(4.085)	(2.514)
Overweight	4.103*	5.972	6.194	4.526*	-3.351	11.377***	5.190	4.847*
	(2.130)	(4.435)	(5.167)	(2.391)	(3.444)	(3.331)	(4.248)	(2.619)
Obese	3.140	5.763	5.326	3.500	-3.478	10.298***	6.648	3.714
	(2.273)	(4.538)	(5.337)	(2.552)	(3.636)	(3.502)	(4.625)	(2.744)
Dummy year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	14.490***	10.450***	2.349	11.619***	13.767***	5.091*	10.951***	11.471***
	(2.092)	(2.529)	(5.344)	(1.573)	(2.244)	(2.672)	(2.416)	(2.244)
Observations	39,016	31,265	17,023	40,799	27,254	27,387	13,595	44,775
Number of id	26,090	21,191	12,767	28,727	20,237	20,607	10,234	32,041

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The omitted benchmark: aged 90+, no education, married, other job status and underweight.

Table 5. The effect of density of doctors at regional level on subjective survival probability – second stage instrumented estimates (*Doctor density is instrumented in the first stage with share of center-left members in the Parliament*)

	Instrumental variable regression					
VARIABLES						
LnDoctorDensity	2.257***	2.067***	1.819***	1.890***	1.728***	2.155***
	(0.407)	(0.406)	(0.406)	(0.409)	(0.404)	(0.404)
Target age	-1.235***	-1.252***	-1.233***	-1.227***	-1.253***	-1.239***
	(0.045)	(0.045)	(0.045)	(0.046)	(0.045)	(0.045)
Male	-1.924***	-1.655***	-1.744***	-1.731***	-1.967***	-1.851***
	(0.152)	(0.151)	(0.151)	(0.152)	(0.151)	(0.151)
Age 50 - 54	45.666***	44.166***	42.559***	43.608***	44.657***	41.660***
	(1.045)	(1.047)	(1.056)	(1.060)	(1.039)	(1.056)
Age 55 - 59	41.145***	39.831***	37.803***	38.848***	40.252***	37.073***
	(0.932)	(0.935)	(0.945)	(0.948)	(0.926)	(0.946)
Age 60 - 64	36.914***	35.988***	33.635***	34.762***	36.121***	32.803***
	(0.841)	(0.843)	(0.854)	(0.857)	(0.835)	(0.857)
Age 65 - 69	31.871***	31.395***	28.653***	29.810***	31.231***	27.755***

	(0.816)	(0.818)	(0.830)	(0.832)	(0.810)	(0.832)
Age 70 - 74	25.529***	25.543***	22.303***	23.267***	25.019***	21.639***
	(0.825)	(0.827)	(0.838)	(0.840)	(0.819)	(0.840)
Age 75 - 79	16.711***	17.078***	13.508***	14.285***	16.225***	13.182***
	(0.832)	(0.834)	(0.843)	(0.845)	(0.826)	(0.845)
Age 80 - 84	8.330***	8.778***	5.721***	6.179***	7.968***	5.618***
	(0.848)	(0.850)	(0.857)	(0.859)	(0.842)	(0.857)
Age 85 - 89	2.534***	2.917***	0.709	0.919	2.348***	0.779
	(0.903)	(0.905)	(0.911)	(0.913)	(0.897)	(0.910)
Primary	0.416	0.681	0.342	0.489	0.891*	-0.078
	(0.456)	(0.455)	(0.454)	(0.458)	(0.456)	(0.452)
Lower Secondary	0.974**	1.127**	0.873*	1.058**	1.161**	0.309
	(0.466)	(0.466)	(0.465)	(0.469)	(0.466)	(0.463)
Upper Secondary	2.087***	2.279***	2.104***	2.272***	2.221***	1.302***
	(0.466)	(0.465)	(0.465)	(0.468)	(0.465)	(0.463)
Post Secondary	2.368***	2.666***	2.389***	2.610***	2.322***	1.500***
	(0.583)	(0.582)	(0.581)	(0.586)	(0.580)	(0.578)
Lower Tertiary	2.819***	2.999***	2.922***	3.215***	2.312***	1.938***
	(0.510)	(0.510)	(0.509)	(0.512)	(0.508)	(0.506)
Upper Tertiary	1.769**	1.789**	1.722*	2.097**	0.830	0.798
	(0.884)	(0.882)	(0.884)	(0.889)	(0.877)	(0.877)
Registered partnership	-0.391	-0.363	-0.047	-0.310	-0.357	-0.162
	(0.551)	(0.551)	(0.551)	(0.555)	(0.547)	(0.549)
Separated	-2.784***	-2.761***	-2.496***	-2.784***	-2.652***	-2.470***
	(0.628)	(0.629)	(0.630)	(0.635)	(0.631)	(0.623)
Never married	-3.192***	-3.426***	-3.159***	-3.221***	-2.967***	-2.974***
	(0.303)	(0.302)	(0.303)	(0.305)	(0.301)	(0.301)
Divorced	-1.087***	-1.243***	-1.029***	-1.322***	-1.156***	-0.832***
	(0.266)	(0.265)	(0.266)	(0.268)	(0.264)	(0.264)
Widowed	-2.724***	-2.642***	-2.623***	-2.712***	-2.803***	-2.473***
	(0.233)	(0.233)	(0.233)	(0.235)	(0.232)	(0.232)
Retired	2.838***	3.181***	2.836***	3.209***	3.029***	2.330***
	(0.244)	(0.243)	(0.243)	(0.244)	(0.243)	(0.242)
Employed	6.220***	6.702***	6.945***	7.666***	6.506***	5.505***
	(0.257)	(0.256)	(0.256)	(0.257)	(0.254)	(0.256)
Unemployed	2.546***	2.520***	2.505***	3.034***	3.109***	1.840***
	(0.456)	(0.455)	(0.457)	(0.458)	(0.453)	(0.454)
LnIncome	0.687***	0.662***	0.616***	0.609***	0.583***	0.658***
	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)
Long Term Ill	-8.321***					-7.217***
	(0.142)					(0.143)
N. chronic diseases		-3.654***				
		(0.065)				
ADLA 1			-9.221***			-6.871***
			(0.329)			(0.333)
ADLA 2			-11.923***			-8.634***
			(0.530)			(0.538)
ADLA 3			-15.784***			-11.762***
			(0.768)			(0.785)
ADLA 4			-18.600***			-14.232***

			(1.066)			(1.099)
ADLA 5			-17.249***			-12.395***
			(1.246)			(1.445)
IADLA 1				-9.745***		-4.683***
				(0.496)		(0.506)
IADLA 2				-12.917***		-4.918***
				(0.944)		(0.973)
IADLA 3				-13.446***		-2.280
				(1.206)		(1.392)
Low Self-perceived health					-10.763***	
					(0.153)	
Ever smoked	-1.255***	-1.156***	-1.513***	-1.627***	-1.205***	-1.200***
	(0.143)	(0.143)	(0.144)	(0.144)	(0.143)	(0.143)
Normalweight	6.090***	6.644***	5.948***	6.379***	5.870***	5.466***
	(0.662)	(0.660)	(0.663)	(0.665)	(0.661)	(0.655)
Overweight	6.789***	7.743***	6.267***	6.555***	6.696***	6.160***
	(0.666)	(0.665)	(0.667)	(0.669)	(0.664)	(0.659)
Obese	5.349***	6.803***	4.652***	4.288***	5.192***	5.184***
	(0.677)	(0.676)	(0.677)	(0.680)	(0.675)	(0.669)
Dummy country	Yes	Yes	Yes	Yes	Yes	Yes
Dummy year	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-98.091***	-87.386***	-70.457***	-77.033***	-60.954**	-85.688***
	(24.712)	(24.668)	(24.651)	(24.833)	(24.530)	(24.552)
Observations	160,645	160,573	160,656	160,656	160,638	160,627
R-squared	0.198	0.202	0.199	0.190	0.208	0.209

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The omitted benchmark: aged 90+, no education, married, other job status, underweight, ADLA and IADLA baseline.

Table 6. The effect of density of doctors at regional level on subjective survival probability – second stage instrumented estimates (*Doctor density is instrumented in the first stage with share of center-left members in the Parliament*) **- sample splits**

	Instrumental variable regression							
VARIABLES	Female	Male	Low Income	High Income	No long term ill	Long term Ill	Low self-perceived health	High self-perceived health
LnDoctorDensity	1.836***	2.774***	2.196***	1.634***	2.525***	1.764***	1.926***	1.729***
	(0.512)	(0.662)	(-0.509)	(0.403)	(0.582)	(0.568)	(0.679)	(0.492)
Target age	-1.210***	-1.290***	-1.237***	-1.228***	-1.057***	-1.387***	-0.936***	-1.360***
	(0.060)	(0.069)	(0.079)	(0.055)	(0.061)	(0.067)	(0.075)	(0.055)
Male			-1.552***	-2.097***	-1.113***	-2.526***	-1.431***	-2.010***
			(0.296)	(0.176)	(0.201)	(0.227)	(0.240)	(0.188)
Age 50 - 54	46.742***	44.594***	41.278***	48.534***	45.683***	46.032***	43.265***	45.405***
	(1.332)	(1.692)	(1.759)	(1.294)	(1.597)	(1.421)	(2.673)	(1.177)
Age 55 - 59	42.109***	40.242***	36.680***	43.960***	41.713***	41.035***	39.749***	40.738***
	(1.178)	(1.529)	(1.536)	(1.166)	(1.469)	(1.233)	(2.559)	(1.026)
Age 60 - 64	37.916***	36.013***	32.630***	39.500***	37.149***	37.233***	35.821***	36.581***
	(1.056)	(1.391)	(1.350)	(1.063)	(1.368)	(1.077)	(2.475)	(0.899)
Age 65 - 69	32.268***	31.793***	26.936***	34.857***	32.193***	31.938***	31.731***	31.264***
	(1.024)	(1.349)	(1.303)	(1.034)	(1.341)	(1.031)	(2.451)	(0.864)
Age 70 - 74	25.829***	25.458***	21.716***	28.065***	26.685***	24.878***	26.658***	24.729***
	(1.037)	(1.360)	(1.318)	(1.045)	(1.353)	(1.044)	(2.463)	(0.875)
Age 75 - 79	16.227***	17.471***	13.140***	19.137***	18.704***	15.677***	18.785***	15.891***
	(1.044)	(1.374)	(1.320)	(1.056)	(1.369)	(1.049)	(2.489)	(0.880)
Age 80 - 84	7.484***	9.326***	6.254***	9.711***	10.249***	7.515***	10.133***	7.872***
	(1.065)	(1.399)	(1.340)	(1.081)	(1.409)	(1.063)	(2.563)	(0.894)
Age 85 - 89	1.960*	3.312**	1.109	3.588***	2.599*	2.762**	-0.002	2.848***
	(1.131)	(1.495)	(1.439)	(1.146)	(1.515)	(1.126)	(2.784)	(0.950)
Primary	-0.495	1.448**	0.829	-0.082	0.595	0.266	2.673**	0.558
	(0.585)	(0.732)	(0.612)	(0.704)	(0.691)	(0.609)	(1.166)	(0.495)
LowerSecondary	-0.120	2.191***	1.334*	0.811	0.846	1.519**	2.245**	1.129**
	(0.598)	(0.753)	(0.692)	(0.699)	(0.693)	(0.637)	(1.143)	(0.514)
UpperSecondary	1.511**	2.374***	2.671***	1.652**	1.656**	2.821***	3.094***	2.140***
	(0.601)	(0.744)	(0.758)	(0.680)	(0.685)	(0.642)	(1.122)	(0.518)
PostSecondary	2.086***	1.859**	2.750***	2.302***	1.869**	3.075***	3.565***	2.066***
	(0.748)	(0.939)	(0.961)	(0.786)	(0.835)	(0.813)	(1.244)	(0.671)
LowerTertiary	2.822***	2.264***	3.983***	2.107***	2.328***	3.594***	2.587**	2.538***
	(0.656)	(0.822)	(0.977)	(0.695)	(0.738)	(0.708)	(1.147)	(0.582)
UpperTertiary	4.470***	-0.533	0.869	1.607	2.672**	1.020	1.551	0.408
	(1.242)	(1.305)	(2.236)	(1.009)	(1.165)	(1.361)	(1.506)	(1.154)
Registered partnership	-0.600	-0.054	-0.727	-0.150	-0.591	0.219	-0.498	-0.284
	(0.754)	(0.799)	(1.206)	(0.610)	(0.675)	(0.902)	(0.776)	(0.729)
Separated	-1.666**	-3.808***	-0.990	-4.012***	-1.062	-4.560***	-2.895***	-2.556***
	(0.804)	(0.982)	(1.002)	(0.796)	(0.816)	(0.952)	(1.056)	(0.773)
Never married	-1.651***	-4.288***	-3.591***	-2.771***	-2.811***	-3.430***	-1.770***	-3.363***
	(0.411)	(0.449)	(0.601)	(0.350)	(0.406)	(0.447)	(0.482)	(0.371)
Divorced	-0.695**	-1.240***	-0.890*	-1.011***	-0.627*	-1.358***	0.015	-1.647***

	(0.342)	(0.420)	(0.519)	(0.305)	(0.358)	(0.388)	(0.422)	(0.328)
Widowed	-1.900***	-2.836***	-2.323***	-2.924***	-2.519***	-2.909***	-2.125***	-2.961***
	(0.274)	(0.479)	(0.381)	(0.294)	(0.339)	(0.318)	(0.472)	(0.264)
Retired	1.429***	4.226***	3.481***	2.243***	1.660***	3.613***	1.344***	3.449***
	(0.283)	(0.601)	(0.383)	(0.318)	(0.347)	(0.338)	(0.463)	(0.280)
Employed	4.865***	8.070***	6.224***	5.511***	2.922***	9.475***	2.110***	8.226***
	(0.307)	(0.581)	(0.427)	(0.333)	(0.361)	(0.367)	(0.446)	(0.307)
Unemployed	2.194***	3.510***	1.875***	3.738***	-0.439	4.738***	-0.152	3.973***
	(0.600)	(0.799)	(0.651)	(0.639)	(0.622)	(0.664)	(0.807)	(0.537)
LnIncome	0.790***	0.593***	0.376***	1.563***	0.632***	0.717***	0.629***	0.519***
	(0.076)	(0.088)	(0.073)	(0.170)	(0.071)	(0.096)	(0.098)	(0.069)
LongtermIll	-8.078***	-8.524***	-8.794***	-7.962***				
	(0.188)	(0.215)	(0.257)	(0.168)				
Ever_smoked	-1.421***	-1.532***	-1.224***	-1.250***	-1.018***	-1.501***	-0.466**	-1.547***
	(0.202)	(0.210)	(0.271)	(0.168)	(0.186)	(0.220)	(0.223)	(0.180)
Normalweight	4.702***	14.285***	6.184***	5.852***	3.555***	7.668***	2.171*	6.772***
	(0.714)	(1.669)	(1.189)	(0.787)	(0.936)	(0.920)	(1.149)	(0.783)
Overweight	4.843***	15.619***	7.270***	6.290***	3.554***	9.051***	2.077*	7.962***
	(0.723)	(1.668)	(1.195)	(0.792)	(0.945)	(0.922)	(1.164)	(0.785)
Obese	3.344***	14.294***	5.595***	5.091***	3.144***	6.871***	1.866	6.156***
	(0.739)	(1.679)	(1.210)	(0.808)	(0.966)	(0.932)	(1.200)	(0.794)
Dummy country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dummy year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-70.974**	-139.662***	-89.332	-70.058***	-112.922***	-77.462**	-73.036*	-71.439**
	(31.151)	(40.015)	(65.853)	(24.657)	(35.389)	(34.441)	(41.397)	(29.839)
Observations	88,529	72,116	59,573	101,072	79,687	80,958	43,635	117,003
R-squared	0.225	0.170	0.167	0.213	0.136	0.184	0.116	0.163

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The omitted benchmark: aged 90+, no education, married, other job status and underweight.

Table 7. The impact of density of doctor at regional level on amenable deaths –overall sample and sample splits.

VARIABLES	All sample	Female	Male	Low Income	High Income	No long term ill	Long term Ill	High SPHUS	Low SPHUS
LnDoctorDensity	-1.334***	-1.302***	-1.307***	-1.826***	-0.337***	-1.666***	-0.918***	-1.474***	-0.490***
	(0.022)	(0.029)	(0.033)	(0.041)	(0.021)	(0.034)	(0.028)	(0.027)	(0.035)
Male	-0.225***			-0.382***	-0.087***	-0.220***	-0.209***	-0.229***	-0.169***
	(0.013)			(0.026)	(0.012)	(0.020)	(0.018)	(0.017)	(0.020)
Age 50 - 54	0.085	0.182**	-0.160*	-0.141	0.026	-0.055	0.122	-0.054	0.345***
	(0.057)	(0.075)	(0.086)	(0.101)	(0.050)	(0.079)	(0.083)	(0.065)	(0.127)
Age 55 - 59	0.271***	0.392***	-0.028	0.175*	0.188***	0.241***	0.218***	0.200***	0.355***
	(0.055)	(0.073)	(0.083)	(0.097)	(0.048)	(0.075)	(0.081)	(0.062)	(0.126)

Age 60 - 64	0.345***	0.426***	0.098	0.260***	0.368***	0.331***	0.264***	0.282***	0.365***
	(0.053)	(0.071)	(0.079)	(0.094)	(0.045)	(0.071)	(0.078)	(0.059)	(0.125)
Age 65 - 69	0.267***	0.270***	0.198**	0.248***	0.380***	0.239***	0.202***	0.245***	0.180
	(0.052)	(0.070)	(0.077)	(0.093)	(0.044)	(0.070)	(0.077)	(0.058)	(0.124)
Age 70 - 74	0.348***	0.355***	0.291***	0.459***	0.276***	0.369***	0.219***	0.362***	0.103
	(0.053)	(0.070)	(0.077)	(0.093)	(0.044)	(0.069)	(0.077)	(0.058)	(0.124)
Age 75 - 79	0.404***	0.450***	0.306***	0.477***	0.220***	0.495***	0.157**	0.441***	0.065
	(0.053)	(0.070)	(0.078)	(0.093)	(0.044)	(0.069)	(0.078)	(0.058)	(0.125)
Age 80 - 84	0.356***	0.376***	0.296***	0.452***	0.123***	0.446***	0.097	0.390***	-0.024
	(0.054)	(0.072)	(0.080)	(0.095)	(0.045)	(0.071)	(0.080)	(0.059)	(0.127)
Age 85 - 89	0.233***	0.268***	0.152*	0.352***	0.081*	0.345***	-0.014	0.262***	-0.073
	(0.057)	(0.076)	(0.085)	(0.102)	(0.047)	(0.075)	(0.085)	(0.062)	(0.133)
Primary	0.660***	0.715***	0.562***	0.805***	0.434***	0.805***	0.430***	0.637***	0.534***
	(0.028)	(0.039)	(0.040)	(0.040)	(0.028)	(0.039)	(0.038)	(0.031)	(0.061)
LowerSecondary	2.092***	1.937***	2.296***	2.830***	1.162***	2.551***	1.415***	2.257***	1.133***
	(0.030)	(0.041)	(0.044)	(0.043)	(0.030)	(0.042)	(0.041)	(0.033)	(0.063)
UpperSecondary	1.967***	1.995***	1.923***	2.973***	1.195***	2.335***	1.441***	2.108***	1.230***
	(0.028)	(0.039)	(0.040)	(0.042)	(0.028)	(0.039)	(0.038)	(0.031)	(0.060)
PostSecondary	3.310***	3.600***	2.883***	4.825***	1.852***	4.115***	2.196***	3.843***	1.375***
	(0.043)	(0.056)	(0.063)	(0.055)	(0.046)	(0.056)	(0.062)	(0.048)	(0.080)
LowerTertiary	1.967***	2.005***	1.916***	3.251***	1.423***	2.292***	1.473***	2.172***	1.287***
	(0.030)	(0.042)	(0.042)	(0.051)	(0.029)	(0.042)	(0.039)	(0.034)	(0.060)
UpperTertiary	1.866***	1.775***	1.892***	3.499***	1.331***	2.447***	1.135***	1.962***	1.323***
	(0.071)	(0.118)	(0.087)	(0.192)	(0.060)	(0.111)	(0.084)	(0.097)	(0.103)
Registered partnership	-0.322***	-0.362***	-0.305***	-0.222*	-0.184***	-0.394***	-0.262***	-0.339***	-0.193***
	(0.044)	(0.063)	(0.063)	(0.114)	(0.033)	(0.072)	(0.053)	(0.060)	(0.052)
Separated	0.182***	0.135	0.199**	0.202**	0.170***	0.034	0.329***	0.242***	0.022
	(0.062)	(0.085)	(0.091)	(0.101)	(0.059)	(0.090)	(0.086)	(0.075)	(0.096)
Never married	-0.065**	-0.162***	-0.075*	0.207***	-0.154***	0.005	-0.140***	-0.003	-0.204***
	(0.028)	(0.039)	(0.038)	(0.051)	(0.023)	(0.041)	(0.036)	(0.034)	(0.038)
Divorced	0.173***	0.203***	0.060*	0.465***	0.040**	0.175***	0.149***	0.246***	0.089***
	(0.023)	(0.030)	(0.036)	(0.043)	(0.020)	(0.033)	(0.031)	(0.029)	(0.033)
Widowed	0.367***	0.404***	0.143***	0.532***	0.261***	0.370***	0.323***	0.401***	0.237***
	(0.020)	(0.024)	(0.038)	(0.032)	(0.019)	(0.027)	(0.028)	(0.023)	(0.037)
Retired	0.986***	1.232***	-0.044	1.328***	0.438***	1.006***	0.913***	0.987***	0.698***
	(0.020)	(0.021)	(0.055)	(0.032)	(0.018)	(0.028)	(0.026)	(0.023)	(0.034)
Employed	0.962***	1.097***	0.155***	1.121***	0.841***	0.980***	0.899***	1.008***	0.548***
	(0.024)	(0.029)	(0.054)	(0.041)	(0.023)	(0.035)	(0.031)	(0.030)	(0.036)
Unemployed	0.535***	0.684***	-0.275***	0.686***	0.450***	0.280***	0.779***	0.408***	0.631***
	(0.044)	(0.059)	(0.075)	(0.060)	(0.045)	(0.065)	(0.058)	(0.052)	(0.077)
LnIncome	-0.575***	-0.584***	-0.550***	-0.038***	-1.047***	-0.765***	-0.416***	-0.606***	-0.373***
	(0.008)	(0.011)	(0.012)	(0.007)	(0.013)	(0.016)	(0.009)	(0.010)	(0.012)
Long Term Ill	0.781***	0.777***	0.715***	0.984***	0.295***				
	(0.012)	(0.017)	(0.019)	(0.023)	(0.011)				
Ever Smoked	-0.099***	-0.264***	0.096***	0.126***	-0.097***	-0.130***	-0.041**	-0.078***	-0.065***
	(0.013)	(0.017)	(0.018)	(0.024)	(0.011)	(0.019)	(0.016)	(0.016)	(0.018)
Normalweight	0.159***	0.216***	-0.372**	0.087	0.239***	0.043	0.337***	0.123*	0.297***
	(0.054)	(0.057)	(0.145)	(0.107)	(0.039)	(0.076)	(0.070)	(0.066)	(0.071)
Overweight	0.385***	0.618***	-0.377***	0.162	0.450***	0.257***	0.586***	0.337***	0.526***
	(0.054)	(0.057)	(0.144)	(0.107)	(0.040)	(0.076)	(0.071)	(0.066)	(0.072)

Obese	0.698***	0.932***	-0.106	0.442***	0.628***	0.629***	0.775***	0.702***	0.692***
	(0.055)	(0.059)	(0.145)	(0.108)	(0.041)	(0.077)	(0.073)	(0.067)	(0.076)
Dummy country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dummy year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	12.700***	12.258***	13.817***	11.319***	11.951***	17.020***	9.115***	14.375***	6.281***
	(0.164)	(0.215)	(0.272)	(0.285)	(0.191)	(0.250)	(0.210)	(0.197)	(0.286)
Observations	144,858	80,611	64,247	55,761	91,987	75,851	69,007	108,446	36,394
R-squared	0.237	0.269	0.211	0.322	0.167	0.276	0.152	0.234	0.125

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The omitted benchmark: aged 90+, no education, married, other job status and underweight.

Table 8. The impact of density of doctor at regional level on amenable deaths –overall sample and sample splits, data collapsed at regional level.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
LnDoctorDensity	-1.773***	-1.514***	-1.821***	-1.519***	-1.770***	-1.569***
	(0.443)	(0.439)	(0.454)	(0.445)	(0.445)	(0.465)
Male	2.517***	2.245***	2.626***	2.061**	2.495***	2.194***
	(0.803)	(0.788)	(0.820)	(0.808)	(0.903)	(0.837)
Age	-0.239***	-0.253***	-0.241***	-0.260***	-0.237***	-0.251***
	(0.031)	(0.030)	(0.031)	(0.031)	(0.030)	(0.033)
Primary	4.880***	5.256***	5.254***	4.946***	4.809***	5.033***
	(1.476)	(1.431)	(1.489)	(1.448)	(1.467)	(1.492)
Lower Secondary	1.038	1.468	1.131	1.303	1.012	1.173
	(1.440)	(1.409)	(1.458)	(1.427)	(1.438)	(1.457)
Upper Secondary	-1.042	-0.372	-0.770	-1.025	-1.116	-0.950
	(1.438)	(1.404)	(1.451)	(1.409)	(1.423)	(1.459)
Post Secondary	1.791	1.616	1.637	1.515	1.742	1.356
	(2.011)	(1.952)	(2.032)	(1.972)	(2.010)	(2.029)
Lower Tertiary	0.124	0.861	0.409	0.372	0.037	0.292
	(1.607)	(1.564)	(1.642)	(1.575)	(1.583)	(1.648)
Upper Tertiary	-0.009	-0.139	-0.340	-1.228	-0.079	-1.359
	(5.412)	(5.278)	(5.525)	(5.345)	(5.414)	(5.522)
Registered partnership	1.359	1.900	1.252	1.024	1.448	1.139
	(2.608)	(2.526)	(2.605)	(2.574)	(2.595)	(2.624)
Separated	-2.308	-2.673	-2.851	-2.906	-2.373	-3.211
	(3.375)	(3.291)	(3.547)	(3.326)	(3.381)	(3.545)
Never married	-3.162**	-2.997**	-2.737**	-2.853**	-3.180**	-2.667**
	(1.235)	(1.206)	(1.290)	(1.221)	(1.247)	(1.284)
Divorced	-0.736	-0.980	-1.066	-1.188	-0.691	-1.227
	(1.569)	(1.530)	(1.618)	(1.554)	(1.585)	(1.617)
Widowed	0.327	0.012	0.173	0.611	0.249	0.488
	(0.934)	(0.893)	(0.938)	(0.917)	(0.957)	(0.972)
Retired	0.856	1.032	0.810	0.717	0.765	0.623

	(0.813)	(0.742)	(0.774)	(0.745)	(0.757)	(0.823)
Employed	-4.842***	-4.781***	-4.776***	-5.340***	-4.947***	-5.187***
	(0.971)	(0.894)	(0.939)	(0.916)	(0.923)	(1.037)
Unemployed	-3.820**	-3.670**	-3.927**	-3.960**	-3.966**	-3.847**
	(1.819)	(1.714)	(1.779)	(1.735)	(1.755)	(1.861)
LnIncome	0.172	0.116	0.130	0.175	0.177	0.163
	(0.120)	(0.118)	(0.124)	(0.118)	(0.121)	(0.125)
Long Term Ill	0.098					-0.082
	(0.329)					(0.350)
N. chronic diseases		0.572***				
		(0.177)				
ADLA_1			-0.990			-2.487
			(1.471)			(2.510)
ADLA_2			-0.037			-2.145
			(1.914)			(2.750)
ADLA_3			1.062			-1.590
			(2.019)			(2.789)
ADLA_4			-1.184			-2.305
			(2.787)			(3.150)
ADLA_5			-1.447			-2.214
			(2.907)			(3.083)
IADLA_1				0.165		2.210
				(1.466)		(2.682)
IADLA_2				3.984*		5.567*
				(2.030)		(2.875)
IADLA_3				3.420		4.971
				(3.083)		(3.691)
Low self-perceived health					0.024	
					(0.389)	
Ever smoked	0.139	0.269	0.260	0.199	0.274	0.232
	(0.551)	(0.540)	(0.581)	(0.546)	(0.574)	(0.578)
Normalweight	-1.532	-0.344	-1.597	-2.082	-1.666	-1.666
	(3.207)	(3.145)	(3.274)	(3.215)	(3.339)	(3.339)
Overweight	-2.076	-1.391	-2.182	-2.679	-2.266	-2.266
	(3.219)	(3.144)	(3.292)	(3.227)	(3.356)	(3.356)
Obese	-1.756	-1.645	-1.829	-2.210	-1.904	-1.904
	(3.115)	(3.013)	(3.161)	(3.083)	(3.220)	(3.220)
Dummy country	Yes	Yes	Yes	Yes	Yes	Yes
Dummy year	Yes	Yes	Yes	Yes	Yes	Yes
Constant	36.192***	34.320***	37.692***	36.619***	34.199***	36.456***
	(4.661)	(4.581)	(4.933)	(4.976)	(3.961)	(5.187)
Observations	385	385	385	385	385	385
R-squared	0.996	0.996	0.996	0.996	0.996	0.996

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The omitted benchmark: aged 90+, no education, married, other job status, underweight, ADLA and IADLA baseline.

Appendix

Table A1. Number of doctors per 1,000 inhabitants (last wave)

AT11 Burgenland (A)	387	DK0 Danmark	368	ITC1 Piemonte	349
AT12 Niederoesterreich	456	EE00 Eesti	341	ITC3 Liguria	438
AT13 Wien	684	ES11 Galicia	452	ITC4 Lombardia	354
AT21 Kaernten	455	ES12 Principado de Asturias	373	ITH1 Provincia Autonoma Bolzano/Bo	293
AT22 Steiermark	499	ES13 Cantabria	548	ITH2 Provincia Autonoma Trento	321
AT31 Oberoesterreich	414	ES21 Pais Vasco	505	ITH3 Veneto	327
AT32 Salzburg	545	ES22 Comunidad Foral de Navarra	435	ITH4 Friuli-Venezia Giulia	385
AT33 Tirol	515	ES23 La Rioja	512	ITH5 Emilia-Romagna	405
AT34 Vorarlberg	406	ES24 Aragon	461	ITI1 Toscana	421
BE10 Region de Bruxelles-Capitale	379	ES30 Comunidad de Madrid	474	ITI2 Umbria	429
BE21 Antwerpen	252	ES41 Castilla y Leon	454	ITI3 Marche	357
BE22 Limburg (B)	240	ES42 Castilla-La Mancha	315	ITI4 Lazio	444
BE23 Oost-Vlaanderen	276	ES43 Extremadura	349	ITF1 Abruzzo	408
BE24 Vlaams-Brabant	387	ES51 Cataluna	359	ITF3 Campania	373
BE25 West-Vlaanderen	248	ES52 Comunidad Valenciana	355	ITF4 Puglia	357
BE31 Brabant Wallon	497	ES53 Illes Balears	289	ITF5 Basilicata	344
BE32 Hainaut	252	ES61 AndalucÃa	295	ITF6 Calabria	374
BE33 Liege	345	ES62 Region de Murcia	435	ITG1 Sicilia	417
BE34 Luxembourg (B)	224	ES63 Ciudad Autónoma de Ceuta	471	ITG2 Sardegna	472
BE35 Namur	345	ES70 Canarias	330	LU00 Luxembourg	291
CH01 Lake Geneva region	484	FR1 Ile de France	394	PL11 Lodzkie	269
CH02 Espace Mittelland	377	FR2 Bassin Parisien	280	PL12 Mazowieckie	273
CH03 Northwestern Switzerland	449	FR3 Nord - Pas-de-Calais	316	PL21 Malopolskie	230
CH04 Zurich	511	FR4 Est	323	PL22 Slaskie	245
CH05 Eastern Switzerland	338	FR5 Ouest	297	PL31 Lubelskie	251
CH06 Central Switzerland	304	FR6 Sud-Ouest	345	PL32 Podkarpackie	214
CH07 Ticino	409	FR7 Centre-Est	324	PL33 Swietokrzyskie	234
DE1 Baden-Wuerttemberg	399	FR8 Mediterranee	353	PL34 Podlaskie	259
DE2 Bayern	433	EL51 Anatoliki Makedonia, Thraki	497	PL41 Wielkopolskie	152
DE3 Berlin	525	EL52 Kentriki Makedonia	611	PL42 Zachodniopomorskie	244
DE4 Brandenburg	358	EL53 Dytiki Makedonia	298	PL43 Lubuskie	202
DE5 Bremen	521	EL61 Thessalia	505	PL51 Dolnoslaskie	228
DE6 Hamburg	612	EL54 Ipeiros	678	PL52 Opolskie	204
DE7 Hessen	396	EL62 Ionia Nisia	436	PL61 Kujawsko-Pomorskie	233
DE8 Mecklenburg-Vorpommern	416	EL63 Dytiki Ellada	544	PL62 Warminsko-Mazurskie	211
DE9 Niedersachsen	366	EL64 Sterea Ellada	300	PL63 Pomorskie	226
DEA Nordrhein-Westfalen	417	EL65 Peloponnisos	356	SE11 Stockholm	483
DEB Rheinland-Pfalz	378	EL30 Attiki	865	SE12 Ostra Mellansverige	435
DEC Saarland	453	EL41 Voreio Aigaio	373	SE22 Sydsverige	431
DED Sachsen	393	EL42 Notio Aigaio	347	SE31 Norra Mellansverige	355
DEE Sachsen-Anhalt	379	EL43 Kriti	628	SE32 Mellersta Norrland	378

DEF Schleswig-Holstein	404	HR03 Jadranska Hrvatska	303	SE33 Ovre Norrland	430
DEG Thueringen	400	HR04 Kontinentalna Hrvatska	327	SE21 Smaland med oarna	374
				SE23 VÃ¤stsverige	416
				SI03 Vzhodna Slovenija	244
				SI04 Zahodna Slovenija	326

Doctors per inhabitants