DISCUSSION PAPERS

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Aging, Health Expenditure, Proximity of Death and Income in Finland

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Abstract

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The study revisited the debate on the 'red herring" i.e. the claim that population aging will not have a significant impact on health care expenditure (HCE), using a Finnish data set. We decompose HCE into several components and include both survivors and deceased individuals into the analyses. We also compare the predictions of health expenditure based on a model that takes into account the proximity of death with the predictions of a naive model, which includes only age and gender and their interactions. We extend our analysis to include income as an explanatory variable. According to our results, total expenditure on health care and care of elderly people increases with age but the relationship is not as clear as is usually assumed when a naive model is used in health expenditure projections. Among individuals not in long-term care we found a clear positive relationship between expenditure and age only for health centre and psychiatric inpatient care. In somatic care and prescribed drugs, the expenditure clearly decreased with age among deceased individuals. Our results emphasise that even in the future, health care expenditure might be driven more by changes in the propensity to move into long-term care and medical technology than age and gender alone as often claimed in public discussion. Thus the future expenditure is more likely to be determined by health policy actions than inevitable trends in the demographic composition of the population.

Keywords: aging, health expenditure, proximity of death, projections for health expenditure

Contents

INTRODUCTION

Health care expenditure has usually been seen as a function of the size of the population, its age composition and age/-sex specific utilisation rates. According to this "naive" approach health expenditure will increase when population increases in size or people move from an age group of lower health expenditure to an age group of higher expenditure. This view has been widely challenged. In a seminal study Zweifel *et al*. (1999) argued that the main demographic driver of health-care costs may be time to death rather than age. The relationship between age, time to death and health expenditure has been extensively studied in recent years, using data from different countries(Seshamani and Gray, 2004a and 2004b; Stearns and Norton, 2004; Zweifel *et al*., 2004;Werblow *et al.,* 2005). However, its precise effects are not clear and due to the different methodologies of data gathering, calculation and coverage of cost, the results vary significantly (Economic Policy Committee and European Commission, 2006).

More over, it is currently well recognized that health expenditure is not only determined by aging or other demographic factors such as sex distribution, but by a complex series of demand and supply side factors such as health status of the population, economic growth, new technologies and medical progress, organisation and financing of the health care system and health care resources. For example, two recent projections of health expenditure assumed that income is the main non-demographic driver of future health expenditure (Economic Policy Committee and European Commission, 2006; OECD, 2006). This is based on results of numerous studies on income elasticity of health care expenditure. But there are concerns with this approach. Income elasticity tends to increase with level of aggregation, i.e. the higher the level of aggregation, the higher the elasticity. In the studies using individual-level data, income elasticises are usually small or even negative. The high positive income elasticises (above unity) found in macro studies may result from a failure to control many important factors such as prices and health status. It can also be assumed that at the aggregate level, income is closely related to the use of new technology and products. For example, in Finland as in other developed countries expenditure on pharmaceuticals has increased more rapidly during the last decade than other health expenditure or GDP. The main driver for the increase has been the introduction of new and more expensive medicines.

The relationship between health expenditure and income is important also from a broader perspective. Many developed countries finance the majority of essential health services from public finance sources and endorse the equity principle that these services ought to be allocated on the basis of need, and not on the basis of willingness or ability to pay for services. Willingness or ability to pay is usually measured by income.

This paper has two aims. First we revisit the debate originally introduced by Zweifel *et al.* (1999) on the 'red herring", i.e. the claim that population aging will not have a significant impact on health care expenditure (HCE), using a Finnish data set. As in a Swiss study (Werblow *et al.*, 2005), we decompose HCE into several components (including long-term care) and analyse both survivors and deceased individuals. We also compare the predictions of health expenditure based on a model that takes into account the proximity of death with the predictions of a naive model, which includes only age and gender and their interactions. Secondly, we extend our analysis to include income as an explanatory variable. This allows us to analyse at the individual level the effect of income on health expenditure and also relate it to the proximity of death. In addition, for non-institutionalized individuals we have information on need for services (morbidity). Thus we will evaluate the equity aspects of health care utilization.

The paper is organized as follows. Firstly, we briefly describe aspects of the Finnish health care system that are relevant to these analyses. This is followed by a description of the data and methods. Our results section starts with an analysis of individual components of health care expenditure and finishes with an analysis of total expenditure. After that we use our results for projecting the health expenditure. This is followed by an analysis on the effect of income, while the final section discusses the findings and conclusions.

Finnish health care system

In its institutional structure, financing and goals, the Finnish health care system is closest to those of other Nordic countries and the UK, in that it covers the whole population and its services are mainly produced by the public sector and financed through general taxation. Finland's 432 municipalities (local government authorities) are responsible for providing "municipal health services". Municipal taxes, state subsidies and user charges finance the municipal health services. Municipally provided services include primary (mostly services produced in health centres) and specialist health care. Municipalities are responsible for other basic services, such as nursing homes and other social services for the elderly, child day care, social assistance and basic education. In addition, National Health Insurance (NHI) subsidises the use of specific private health services and outpatient medicines.

In Finland, the hospitals (i.e. university, central and regional hospitals) owned by hospital districts (federations of municipalities) produce most of the specialised outpatient and inpatient services. However, some municipalities produce some specialist services themselves in their own health centres. In addition, some health centres also provide long term-care services. Municipalities (public hospitals and nursing homes) pay for the drug expenditures of in-patient care, while in outpatient care, both the patients and the NHI contribute to the expenditure.

User charges and cost-sharing play a prominent role in funding health services. Cost-sharing is lower for municipal services than for the privately provided services and products, particularly prescribed medicines, which are eligible for NHI reimbursement. For example, user charges represent about 10% of the total cost of services provided by health centres, about 5% of the cost of hospital services, but about 35% of the cost of drugs prescribed outside hospitals. If patients need long-term care in a health centre ward or an "old peoples' home", up to 80% of their income will be charged for their accommodation, provided a (low) minimum amount is available for their own use.

DATA AND METHODS

Data

As a data source, we used a 40% sample of the Finnish population aged 65 and over at the end of 1997 (N = 285 317). Follow-up for death, hospital and medication use was until the end of 2002. With an individual-level unique identification code Statistics Finland linked data from their own Population Registration System, as well as data from the Finnish Hospital Discharge Register, Finnish Death Register, registers of the Social Insurance Institution (SII) and data from the Finnish Hospital Benchmarking Project (Järvelin *et al.*, 2003; Junnila, 2004). The individual level data included information on all use of inpatient services (both hospital and nursing home), outpatient services for somatic (i.e. non psychiatric) specialized care, cost and use of outpatient prescribed medicines, socioeconomic status (e.g. family income linked directly from tax files), region (hospital district/hospital area) of the individual and day and causes of death. In addition, for non-institutionalized persons we had information on morbidity. This is based on SII records of all patients entitled to specially reimbursed, free or nearly free medicines, for certain chronic (in total about 45) diseases.

The utilisation information of hospital inpatient care was converted into costs using Finnish standard costs for different types of bed days (Hujanen, 2003).The somatic and other acute hospital inpatient admissions were first grouped according to the Finnish version of the (NordDRG) i.e. Nordic Diagnosis Related Groups. Each admission was then converted into costs using average costs per inpatient day specific to each DRG groups. The outpatient visits in specialist hospitals were converted using average cost per visits specific to each speciality and type (emergency /elective) of visit. Our expenditure measure is a total cost measure i.e. it also includes the share paid by patients/consumers. In addition, we also include expenditure on long-term services for the elderly.

We divided cost into four categories:

1. Somatic specialised care
   - All inpatient care given in specialised hospitals (except psychiatry)
   - Outpatient visits in specialised hospital
   - Acute (i.e. lasting for under 21 days) hospital inpatient care given in health centres
2. Health centre and psychiatric inpatient care
   - Health centre inpatient care (lasting from 21 days to 3 months), psychiatric inpatient care and inpatient rehabilitation given in specific institutions
3. Long-term care (lasting for more than 3 months)
   - All long-term care given in health centres, psychiatric institutions, nursing homes and other institutions giving 24-hour service
4. Prescribed medicines
   - All outpatient prescribed medicines fully or partly reimbursed by NHI.

Altogether our data included information on about 80% of total expenditure on health care and services for the elderly. The most important excluded categories were visits to primary care as well as home care and home services. For these services we do not have nationwide register data.

Methods

Most of the earlier studies (Zweifel *et al.*, 1999; Seshamani and Gray, 2004a and 2004b; Stearns and Norton, 2004) on the effects of proximity of death to health expenditure have used data in which the explanatory variable has been cost per a specific time interval (i.e. one month, two months, three months or a year) before the death (or end of follow-up). The data have been based on several cost observations from the same person. The regressions have included many dummy variables representing time to death. This approach has been criticized on methodological grounds as it may suffer from multicolinearity between and endogenity of the explanatory variables (Salas and Raftery, 2001; Seshamani and Gray, 2004). For example, endogenity arises from the fact that time to death might be influenced by current and previous use of services (expenditure). Much of the methodological critique can be taken into account using an approach applied in two previous studies(Zweifel *e. al.*, 2004; Werblow *et al.*, 2005), in which health expenditure in one year is studied and time to death is measured from the end of that year as a single explanatory variable. This approach can also be extended to include patients who survive to the end of the follow-up period, since concern has also been that the effect of age may be different for the survivors than it is for the deceased. In addition, using this approach it is quite easy to make health care expenditure projections, since the explanatory variable (annual health expenditure person years) is the same as that available in routine statistics.

Table 1 Expenditure on health care and care of the elderly among population over 65 in 1998 according to year of death (based on the sample and calculated at the whole country level)

Expenditure item	Expenditure of all individuals		Died in 1998	Died in 1999	Died in 2000	Died in 2001	Died in 2003	Survivours (after 2002)
	Euro million	% of total expenditure	% of expenditure	% of expenditure	% of expenditure	% of expenditure	% of expenditure	% expenditure
Long-term care individuals								
Total expenditure, of which:	1713	55.2	14.3	22.8	16.3	11.7	9.3	25.6
-Long-term care	1427	46.0	13.4	22.9	16.9	12.0	9.4	25.3
-Somatic specialised care	166	5.3	19.0	22.0	13.4	9.8	8.5	27.3
-Health centre and psychiatric inpatient care	100	3.2	20.2	22.9	13.3	10.3	8.5	24.8
-Prescribed medicines	20	0.7	7.2	18.0	14.1	11.1	10.0	39.5
Non-long-term care indviduals								
Total expenditure, of which:	1390	44.8	14.0	10.0	7.3	6.5	6.0	56.2
-Somatic specialised care	901	29.0	15.0	10.7	7.4	6.5	6.0	54.5
-Health centre and psychiatric inpatient care	175	5.7	28.1	13.1	8.8	7.4	6.5	36.1
-Prescribed medicines	313	10.1	3.2	6.6	6.2	5.9	5.8	72.3
Total expenditure of all individuals	3103	100.0	14.2	17.1	12.3	9.3	7.8	39.3

In this study we calculated health care expenditure for each person for 1998 (Table 1). We followed individuals for death until the end of 2002. Since most of our standard cost information (used for costing the services) was from 2000 or 2001, they were deflated to 1998 prices using the municipal health care price index. The costs of prescribed medicines were based on information on actual reimbursements at prevailing prices.

A two-part model (logit/probit+ OLS) is a usual way to analyse health expenditure. However, in our case the sample included both long-term care (LTC) and non-long-term care (non-LTC) individuals. It can be assumed that age and time of death affects the expenditure of the two groups in a different way. In addition, we wanted to analyse separately the effect of proximity of death to the main components of health expenditure. This therefore resulted in having to estimate eight different models (Figure 1). The first model analyses the likelihood of being an LTC patient and the rest of the models are estimated separately for LTC patients (model 2) and for non-LTC individuals (models 3–8). For the latter group[1] (non-LTC) we applied a two part model, in which the first parts (models 3, 5 and 7) model the likelihoods of the use of the three main categories of health expenditure and the second parts (models 4, 6 and 8) model the expenditure of those individuals who have used the services. It can be assumed that the three expenditure categories are to some extent related to each other (either complements or supplements). This can be taken into account by applying SUR (seemingly unrelated) estimation. Since in this case the samples are unbalanced (i.e. the equations have an unequal number of observations) we applied a procedure developed for Stata statistical software (McDowell, 2004). We used a linear functional form of expenditure, because it allows for a simple calculation of expected costs.[2] In the econometric analysis (N = 282 668) we excluded those who died in 1998, since we want to have expenditure data for the whole year.

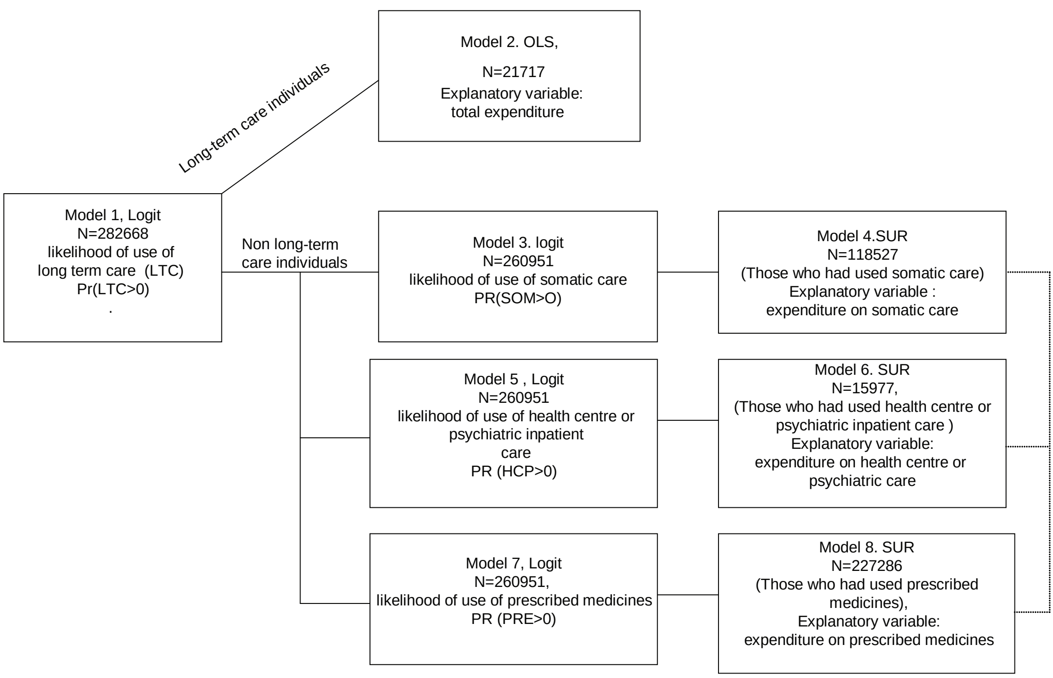

Figure 1. The eight part model

We estimated three (basic, naive and extended) specifications for each of the eight models. The basic specifications include four independent variables (age, gender (= 1, if female), time to death (TTD, days from 31 December 1998 to death, maximum 1460 if survived until end of 2002), death (= 1, if an individual died prior to the end of 2002)). We do not have complete theoretical guidance on functional forms (square, cubic) of the four variables and their interactions. Thus we performed a specific-to-general specification search with the aim of finding a model that fits the data well and in which the parameters are significant. We started from a specification using

1 We did not separately analyse the expenditure categories for LTC patients, since over 80 % of their expenditure was on long-term care services (Table 1).

2 A Box-Cox test rejected both linear and logarithmic functional forms for all expenditures categories (models 2, 4, 6 and 8). However, use of other than linear functional forms creates the problem of retransformation back to the original scale expenditure measurement (Manning, 1998). An alternative would be to use generalised linear model (Manning and Mullahy, 2001) but this will complicate application of SUR estimation. Since our sample is large we can assume that linear functional form will produce robust results.

the four variables in their original linear form. This resulted in different specifications for each eight models. The naive specifications use the same variables than the basic specifications except those which are related to death. The extended specifications use all variables included in the basic model as well as 25 dummy variables describing the hospital district where the individual lives and for non-LTC individuals, 18 dummy variables describing chronic illness. In addition, the extended specifications include family income in 1997 (divided by OECD consumption unit scale) and its significant transformations and interactions with the four factors from the basic specification (age, gender, time to death and death).

The estimated model coefficients are very difficult to interpret, since the same factor is included in many variables and in different parts of the models (Appendix tables 1–5). Thus we illustrated the results by calculating the expected expenditure for the individuals that had died in the different years according to age. In these calculations the time to death was fixed to average time for each year of death (for example to 177 days for those who died in 1999). The expected expenditure for both genders was calculated from gender specific estimates by using weighting for the share of each gender in each age group.

RESULTS

Long-term care (LTC) patients

Although the share of LTC patients of the population over 65 was only 7% they used 55% of total expenditure. Age has an important positive and increasing effect on the probability of being an LTC user (Appendix Table 2). But the share is also related to time to death: those who died in 1999 had a 10 percentage points higher probability to be an LTC user than those who survived. The relative difference between the two groups increases to 30 percentage points among those aged 90. After this age the difference reduces slightly. As can be seen from Figure 2 the naive model overestimates the age relationships: its curve increases considerably faster than the curves where the time of death is fixed. Females had a higher risk of using LTC than males and the difference between genders widens as age increases.

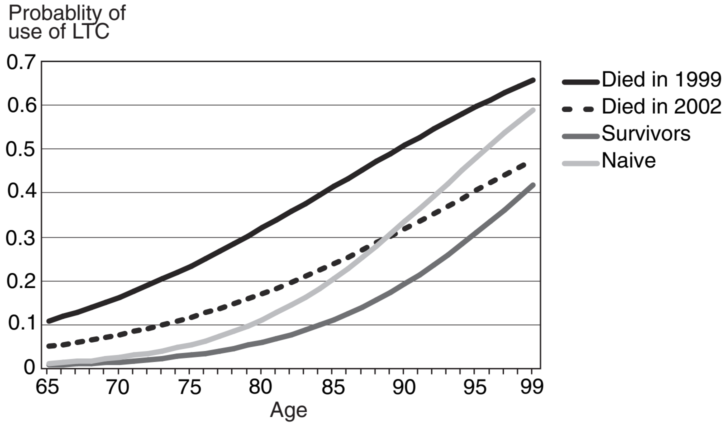

Figure 2. Probability of use of LTC of deceased and survived individuals as a function of age, both genders.Based on model 1, basic and naive specifications.

Annual average total health costs of LTC patients were 27 400 euros i.e. 2250 euros per month. When time of death was fixed these costs were in an U-shaped relation with the age minimum being 75 years of age (Figure 3A). For example, annual expenditure of a 90-year-old LTC patient who died in 2002 was about 16500 euros (7%) higher than the expenditure of a 75-year-old LTC patient who died in the same year. Our models show that both time to death as well as gender have a greater effect on expenditure than age. The annual expenditure of an LTC patient who died in 1999 was 9000 euros higher than among those who survived until the end of 2002. According to the results of basic specification female expenditure was about 2400 euros higher than male i.e. about 7–11% higher depending on the age and survival status of an LTC patient.

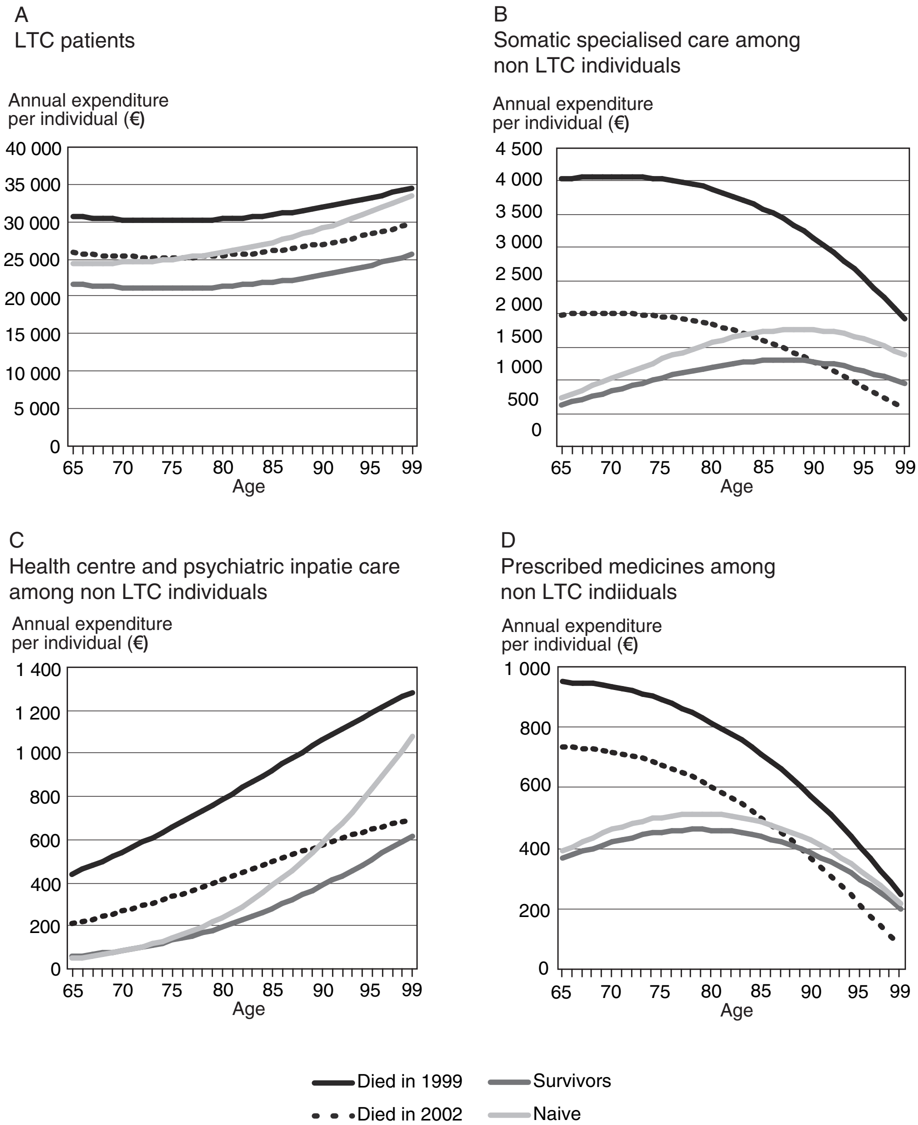

Figure 3. Expected total expenditure of LTC individuals (Figure 3A), and expected expenditure on somatic care (Figure 3B), health centre and inpatient care (Figure 3C) and prescribed medicines of non LTC individuals (Figure 3D) as function of age among deceased and survived individuals. Based on model 2 (Figure 3A), models 3 and 4 (Figure 3B), models 5 and 6 (Figure 3C), models 7 and 8 (Figure 3D); basic and naive specifications.

Non long-term care (non-LTC) individuals

In somatic specialized care the proximity of death determines the relationship between age and expenditure very strongly. The expenditure is highest among persons who died in 1999 (Figure 3B). In this group the expenditure also most clearly declines with age. The expenditure of individuals who lived 4 years (died in 2002) are clearly lower than those who have died before them but even among these groups expenditure reduces when age increases. Only among the survivors does expenditure increase with respect to age until the age of 85. The expenditure of a 65-year-old person who died in 1999 is about 6.5 times higher than the expenditure of a person of same age but who had survived. When age increases, this ratio decreases and is about 2.5 among 90-year-old persons. In somatic specialized care the naive model gives a totally different picture on the relationship between age and expenditure than models which take account of proximity of death.

For inpatient care in health centres and psychiatric wards, the expenditure increases with age but again the inclusion of the proximity of death diminishes the relationship (Figure 3C). Age mostly clearly reduces expenditure on prescribed medicines (Figure 3D). This effect is strongest among those who have died in the following year (1999). On the other hand, among the survivors, expenditure on prescribed medicines increase along with age until the age of 80 years and after that age it starts to decline.

Total expenditure

Figures 4A and 4B show the results of calculations for expected total expenditure including both LTC and non-LTC individuals. They are based on models 1–8 by first estimating gender-specific costs of the expenditure categories for person who died in different years according to age. After that we calculated gender-specific total cost and finally the total cost for both genders by weighting their share in the sample. Since over half of total expenditure is devoted to LTC patients, Figure 4a is quite similar to Figure 2 in describing the probability of use of LTC. The probability for LTC was higher among females and thus their total costs were also higher than male costs. The difference between the genders widens as age increases but also this reflects the gender differences in the probability of being a LTC user.

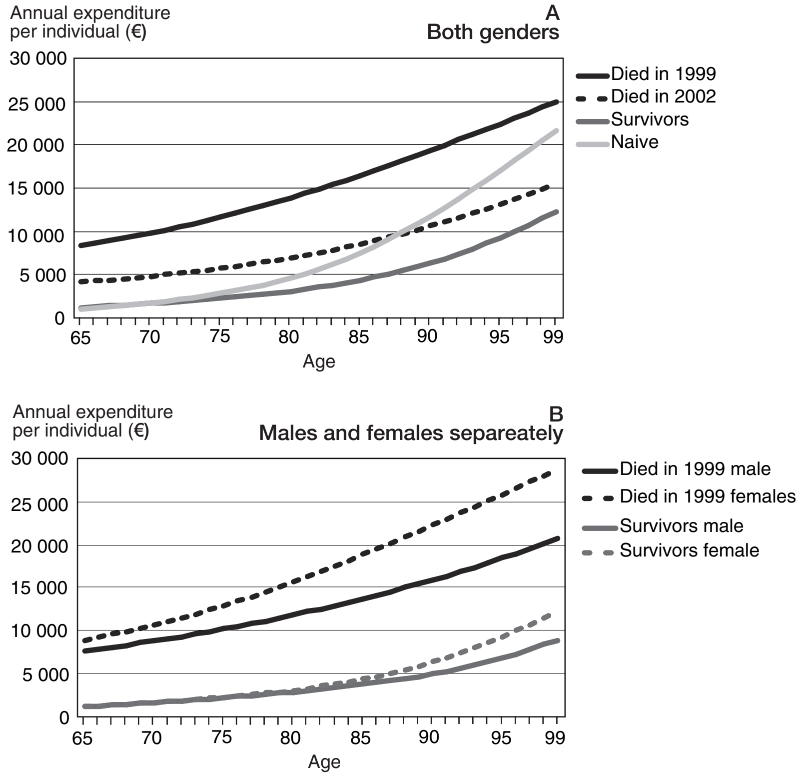

Figure 4. Expected total expenditure of deceased in 1999 and survived individuals (both LTC and non LTC) as function of age both genders (figure 4A) and separately by males and females (Figure 4B). Based on models 1–8, basic and naive specifications.

Projections for health expenditure

We combined our gender-specific age-expenditure profiles with a Statistics Finland population forecast (Statistics Finland, 2004) by age and gender to estimate the purely demographic impact of population change on per capita health expenditure in the over 65-year-old population for the years 2016 and 2036. As a first step, we extracted gender specific expenditure data (expenditure per individual) for each expenditure category according to survival status (i.e. died in first year, second year, third year, fourth year or survived until the end of forth year) by one-year age group from the previous analyses. The expenditure projection was derived by multiplying the projected number of persons in 2016 and 2036 in each age and gender specific survival status category by their respective expenditure and then aggregating according to each expenditure category and finally adding all together to obtain total expenditure.

Our previous models were based on an individual who lived in the beginning of 1999 i.e. we excluded those who had died during 1998. However this latter group consumed about 14% of total expenditure (Table 1). In order to take this into account in our expenditure projections we also calculated health expenditures for these individuals by age, gender and expenditure category from our sample. These costs were then included in the overall health expenditure projection in the way described previously.

We made projections using the naive[3] approach and the basic specification, which takes in account the proximity of death. In the previous section we found that our total expenditure is strongly dependent on the probability for the use of long-term care (LTC) services. Thus we also made a third projection which (in addition to proximity of death) assumes that the probability to use LTC services will be delayed by three years. We assume, for example, that the probability of a 70-year-old female (in each survival category) being in LTC care in 2016 and 2036 is the same as the respective probability of a 67-year-old female in 1998.

Table 2 shows the results of the three projections for 2016 and 2036. According to the naive projection, expenditure will increase annually by 2.2 per cent by 2036. The projection based on the basic specification (taking into account the proximity of death) reduces the average annual growth to 1.9% and gives a 12% lower projection for total expenditure than the naive approach for 2036. The difference between the two projections is largest for expenditure on inpatient care in health centres and psychiatry (23%) and in somatic specialized care (14%) and smallest for prescribed medicines (3%). The assumption concerning the probability of the use of LTC seems to be particularly crucial to the results of the projections. If the use of LTC services can be delayed for three years (for example by decreasing dependency) the projected expenditures will decrease by about 25% as compared to the naive model. Compared with the basic specification the assumed change will decrease the expenditure on LTC by 672 million euros (i.e. 12%) and increase the expenditure on other cost categories by 55 million euros (2%).

3 The naive projection was based on simple age and gender specific expenditure (per person) estimates derived form our sample. We also calculated the naive projections using estimation results and age and gender specific expenditures for those who died in 1998. Both of these approaches give similar projections results.

Table 2: Projection results for expenditure on health care and care of the elderly (over 65 years)

	Expenditure item	1998	2016			2036			Share of total		
		million euros	million euros	index 1998=100	average annual growth 1998-2016 (%)	million euros	index 1998=100	average annual growth 1998-2036 (%)	1978	2016	2036
Naive projections	Expenditure of LTC patients	1713	2566	149.8	2.3	4155	243	2.4	55.2	56.6	59.4
	Somatic specialized care (non LTC patients)	901	1266	140.5	1.9	1837	204	1.9	29.0	27.9	26.3
	Health centre and psychiatric inpatient care (non LTC patients)	175	249	141.9	2.0	405	231	2.2	5.7	5.5	5.8
	Prescribed medicines (non LTC patients)	313	456	145.6	2.1	594	189	1.7	10.1	10.1	8.5
	Total expenditure	3103	4537	146.2	2.1	6991	225	2.2	100.0	100.0	100.0
Project inions including proximity of death	Expenditure of LTC patients	1713	2323	135.6	1.7	3740	218	2.1	55.2	55.5	59.8
	Somatic specialized care (non LTC patients)	901	1199	133.0	1.5	1611	179	1.5	29.0	28.6	25.8
	Health centre and psychiatric inpatient care (non LTC patients)	175	222	126.5	1.3	328	187	1.7	5.7	5.3	5.3
	Prescribed medicines (non LTC patients)	313	444	141.9	2.0	574	183	1.6	10.1	10.6	9.2
	Total expenditure	3103	4188	135.0	1.7	6253	202	1.9	100.0	100.0	100.0
Projection including proximity of death and a decrease in LTC users	Expenditure of LTC patients	1713	1899	110.9	0.6	3067	179	1.5	55.2	50.0	54.4
	Somatic specialized care (non LTC patients)	901	1218	135.2	1.7	1641	182	1.6	29.0	32.1	29.1
	Health centre and psychiatric inpatient care (non LTC patients)	175	229	130.4	1.5	340	194	1.8	5.7	6.0	6.0
	Prescribed medicines (non LTC patients)	313	453	144.7	2.1	588	188	1.7	10.1	11.9	10.4
	Total expenditure	3103	3800	122.5	1.1	5636	182	1.6	100.0	100.0	100.0

Effect of income

Family income turned out to be significant in almost all (except model 6) of the estimated extended models. Also the coefficients of income were very difficult to interpret, since income was included in many of the estimated variables and in different parts of the models. In order to illustrate income effects we calculated expected expenditures for two types of individuals: i) for a person whose family income was at the lowest decile of income distribution and ii) for a person whose family income was at the 2nd highest decile. The expected expenditures were calculated from expanded specifications in a similar way for persons who died in different years of follow-up and for survivors (as explained earlier in method section) by fixing income to the two alternative[4] values. The expected expenditure for both genders was calculated from gender specific estimates by weighting the share of genders in each age and income group.

In addition, we also fixed the regional and morbidity (for non-LTC) variables. We fixed all regional variables to zero. Thus we calculated expected expenditure for a person who lived in south-western Finland (Hospital district of "Varsinais-Suomi", the reference region). For non-LTC individuals we fixed all except one (coronary heart disease) morbidity variable as zero i.e. the expenditures have been calculated to a person who has coronary heart disease but no other chronic illness. Coronary heart disease is the most prevalent chronic disease in Finland.

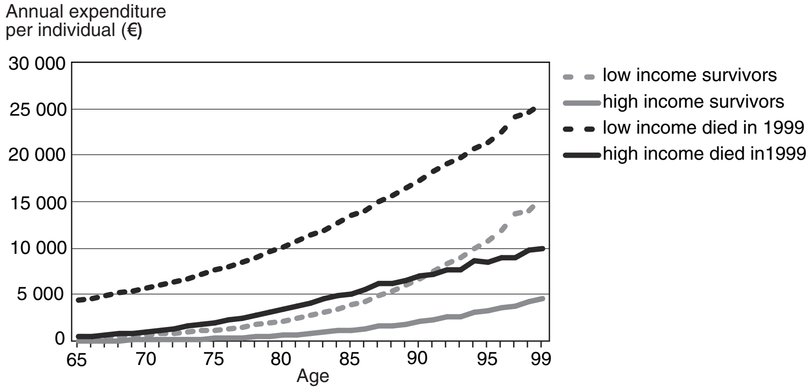

Figure 5. Figure 5. Expected total expenditure of deceased in 1999 and survived LTC individuals as a function of age according to income level. Based on models 1 and 2, extended specifications.

4 The value at first and ninth deciles income was calculated for LTC patients (Figure 5) from the whole sample whereas for non-LTC patients (Figures 6A and 6B) we used the non-LTC sample.

The total expenditure of LTC patients is concentrated in low income patients. As can be seen from Figure 5 the absolute differences (in term of euros) between high and low income individuals increases as age increases both among surviving individuals as well as those who have died in 1999. It should be noted that we did not have the possibility to adjust these figures for need factors (such as functional dependency or health status). Almost all persons who had used LTC services are interpreted as living "alone" and thus their family income equals their own income. Income thus reflects to a great extent their early work position and work history. The poorest group included persons who had been in early retirement (because of disability) and thus it is quite possible that among LTC individuals income is highly and negatively correlated with high dependency and poor health.

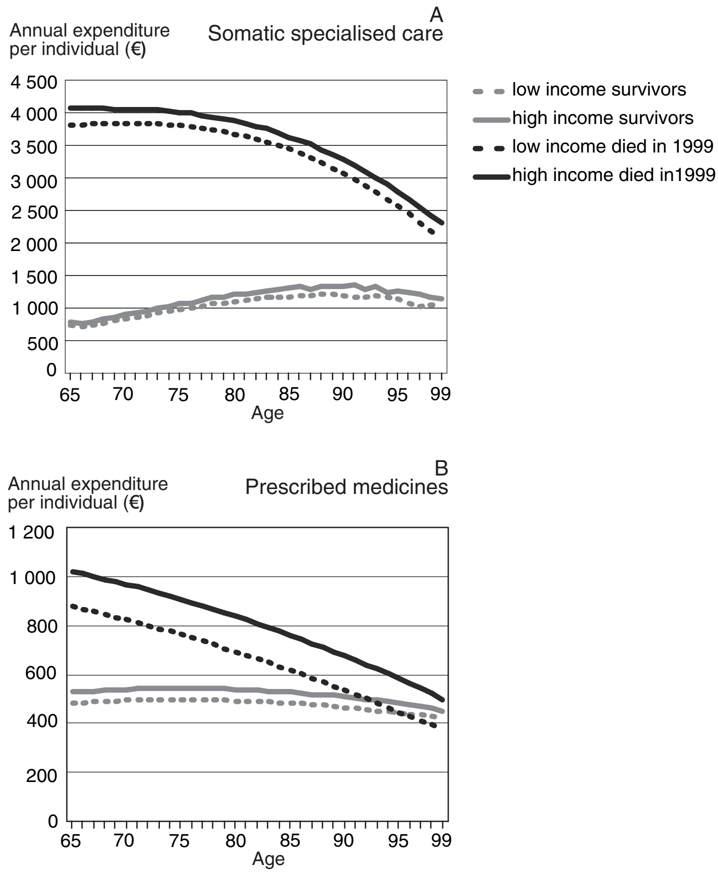

Figure 6. Expected total expenditure on somatic specialised care (Figure 6A) and prescribed medicines (Figure 6B) of deceased in 1999 and survived individuals as function of age according to income (estimated for chronic heart disease patients). Based on models 3 and 4 (Figure 6A), models 7 and 8 (Figure 6B); extended specifications.

In contrast to LTC, an individual's income had a positive effect on expenditure for somatic specialised care and use of prescribed medicines (Figures 6A and 6B). However, in somatic care the effect is quite small: for example expenditure for a 75-year-old high income person who died in 1999 is about 200 euros (8.5%) higher than the expenditure for a low income person of the same age who died in the same year. Among the survived persons of the same age the relative difference between the extreme income groups was about the same, but the absolute difference was smaller (80 euros). Only for the use of prescribed medicines did we find clear differences in the effect of income among those who had died and those who had survived. For a 75-year-old person, the difference between the two extreme income groups was about 149 euros (19%) among those who had died in 1999 and 46 euros (9%) among those who had survived.[5] For inpatient care health centres and psychiatric wards, we find a small negative effect of income on expenditure: the corresponding differences for a 75-year-old person were 31 euros (10%) among those who died in 1999 and 10 euros (19%) among those who survived.

5 Relatively differences are higher when they are estimated for individuals with no chronic illness. For a 75 year old persons with no chronic heart disease (all morbidity variable fixed at zero) the correspondent difference in expenditure on prescribed medicines between the two extreme (high and low income) is 139 euros (33 %) among those died in 1999 and 46 euros (23 %) among those survived.

CONCLUSION AND DISCUSSION

In this study we have analysed the relationship between health expenditure, age, and time before death in a nationally representative and much larger sample than has been available in previous studies. In addition, we were able to analyse expenditure on a whole range of services in health care as well as care of the elderly. According to our results total expenditure on health care and care of the elderly increases with age but the relationship is not as clear and strong as is usually assumed when a naive model is used in health expenditure projections. Our conclusion that age still has an effect on expenditure is due to the fact that we have included use of LTC services in our analysis; for LTC services, increasing age is clearly associated with increasing expenditure, although this association is attenuated when proximity to deaths is accounted for. Among non-LTC persons we found a clear positive relationship between expenditure and age only for health centre and psychiatric inpatient care. Further, these age relationships are attenuated when proximity of death is taken into account. On the other hand, for somatic care and prescribed drugs the expenditure clearly decreased with age among deceased individuals.

Compared with the naive approach the projection that takes into account the proximity of death gives a 12% lower projection for total expenditure by 2036. This is a somewhat different from that found in previous studies in US (Stearns and Norton, 2004) and Germany (Breyer and Felder, 2004). The differences in results may be due to differences in age structure and population projection methods between the countries. However, in our view a more important explanation for these differences is the relatively strong importance of long-term care services in Finland. Both the US and German studies were unable to take long term care expenditure into account. So far the data on nursing homes have been available only in one Swiss study (Werblow *et al.*, 2005), in which the effect of proximity of death was somewhat higher than in our results. In Finland in 1998 the share of LTC patients of the population aged over 65 was 7% and they used 55 per cent of total expenditure. Our projections clearly indicate that to contain expected increases in expenditure, future health policy should concentrate on actions that maintain the activities of daily living of elderly people and prevent long-term institutional care.

From the point of view of public expenditure the future is not as alarming as is frequently suggested, if the current financing system in long-term care prevails. User charges of LTC patients are income related and richer patients may pay up to about 80 per cent of their income to municipal service providers. This can to some extent explain our results that long-term care is clearly correlated with low income, since there are economic incentives for high income individuals (and their next of kin) to avoid publicly funded nursing homes. As the income level of future elderly generations is likely to be higher there will be more people for whom it might be cheaper to enter private nursing homes or use private home services (instead of public services) with no public subsidy.

We do not find any strong positive association between income and expenditure for most non-LTC categories of health care utilization, which may imply that equity targets are realised at least satisfactorily. Earlier Finnish studies have found income related inequity in surgical operations(Hetemaa *et al.*, 2003; Keskimäki, 2003). However these studies have not concentrated on elderly patients as has this study. Our results of a slight positive effect of income in specialised care and negative effect on other inpatient care (health centres, psychiatric wards and long-term care) parallel earlier results that surgical discharges are concentrated in high income categories and non-surgical discharges in low income categories. However, income was positively related to expenditure on prescribed medicines, in which cost-sharing between the state and the individual is relatively high. This can be seen as an indication of inequity in use, specifically if the higher expenditure is associated with use of more effective medicines. We also found that income was associated with proximity to death so that the effect of income was more important among those individual who were close to death.

According to our projection aging and demographic factors will have less of an increased effect on the use of prescribed medicines than on other expenditure categories. According to a recent Finnish study, during 1993–2004 the expenditure on prescribed medicines has increased annually by on average 7 per cent (at constant prices), of which only 0.7 percentage points (10% per cent) is related to changes in age and gender structure (Hujanen *et al.* 2006). Projections on health expenditure typically assumes that income is the main driver of future health care costs. In this study we find that income has a significant positive effect only on expenditure on medicines i.e. on the item in which expenditure increase has been mainly due to the development and use of new products. Overall, our results clearly emphasise the fact that future health care expenditure might be driven more by changes in the propensity to move into long term care and medical technology than age and gender alone as often claimed in public discussion. Thus the future expenditure is more likely to be determined by health policy actions than inevitable trends in the demographic composition of the population.

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Appendix table 1. Two part estimation of total expenditure of LTC patients

Variable	Model 1. Logit (N= 282668) ,Pr(LRC>0)						Model 2. OLS (N=21717), Total expenditure among LTC users					
	Basic spefication		**Naive specification**		**Extended specification**		**Basic spefication**		**Naive specification**		**Extended specification**	
	coeff	z-score	coeff	z-score	coeff	z-score	coeff	t-score	coeff	t-score	coeff	t-score
CONSTANT	25.21	3.43	24.22	3.29	20.778590	2.83	-82417.99	5.44	-79197.08	-4.35	-69263.75	-4.02
AGE	-1.15	-3.97	-1.13	-3.87	-1.005646	-3.47	3671.11	-5.72	3525.197	4.97	3104.39	4.63
AGE2/1000	17.96	4.74	17.30	4.54	16.227090	4.28	-50083.14	6.14	-52900.62	-5.75	-41877.80	-4.81
AGE3 /1000	-0.09	-5.31	-0.08	-4.97	-0.080738	-4.89	232.23	8.79	275.151	6.93	197.62	5.26
FEMALE	8.26	4.96	8.89	5.35	8.973146	5.38	36000.67	-8.79	49631.38	11.50	34135.65	8.36
FEMALE*AGE	-0.20	-4.56	-0.22	-4.94	-0.220413	-4.93	-955.34	9.82	-1442.826	-12.63	-881.07	-8.14
FEMALE*AGE2/1000	1.28	4.31	1.38	4.65	1.397468	4.68	7031.33	-11.34	10395.7	13.85	6370.08	8.94
DEATH	0.51	9.09			0.319108	4.31	-5913.28	18.44			-3433.76	-6.39
DEATH*AGE							123.15	-33.82			109.33	16.37
TTD	0.00	-7.48			-0.001510	-7.57	-11.47	-33.82			-11.44	-33.95
TTD2	0.00	4.97			0.000001	5.03	0.00	20.68			0.00	20.66
TTD*FEMALE							-2.56	-25.20			-2.36	-23.32
INCOME					0.000038	12.03					0.35	8.98
INCOME2					0.000000	-9.01					0.00	31.26
INCOME*AGE											-0.01	-16.09
INCOME*FEMALE					-0.000007	-2.62					-0.05	-6.79
INCOME*DEATH					0.000023	4.23					-0.16	-17.22
Regional variables (reference: Varsinais-Suomi)												
Satakunta					0.02	0.45					573.61	6.36
Kanta-Häme					0.13	3.45					-244.63	-2.42
Pirkanmaa					0.05	1.80					219.83	2.91
Päijät-Häme					0.08	2.25					-309.69	-3.20
Kymeenlaakso					-0.14	-4.21					-169.57	-1.75
Elelä-Karjala					0.10	2.40					-257.20	-2.33
Etelä-Savo					0.21	4.73					92.13	0.80
Itä-Savo					0.12	2.18					233.70	1.68
Pohjois-Karjala					0.30	7.59					-61.74	-0.62
Keski-Suomi					0.13	3.78					169.91	1.90
Etelä-Pohjanmaa					0.14	3.90					-129.60	-1.38
Vaasa					-0.03	-0.71					433.62	4.30
Keski-Pohjanmaa					0.36	6.12					439.53	3.11
Pohjois-Pohjanmaa					0.35	10.19					87.82	1.03
Lappi					0.18	3.85					365.04	3.01
Kainuu					0.23	4.50					-370.47	-2.79
Länsi-Pohja					-0.03	-0.53					-100.25	-0.65
Helsinki					0.14	4.87					1090.15	14.53
Hyvinkää region					0.12	2.77					444.34	3.87
Porvoo region					0.04	0.82					441.00	3.46
Länsi-Uusimaa					-0.11	-2.08					-587.99	-4.08
Jorvi					-0.02	-0.25					-838.49	-4.98
Peijas					0.05	0.86					-250.33	-1.60
Lohja region					0.03	0.74					81.30	0.64
Pohjois-Savo					0.37	10.34					-82.40	-0.94
R^2/Psedo R^2	0.03		0.0236		0.0339		0.1889		0.0983		0.2002	

Appendix table 2:Two part estimation of somatic specialised hospital care (not LTC individuals)

	Model 3, Logit (N= 260951)						Model 4 ,SUR (N= 118527)					
Variable	Basic spefication		Naive specification		Extended specification		Basic spefication		Naive specification		Extended specification	
	coeff	z-score	coeff	z-score	coeff	z-score	coeff	z-score	coeff	z-score	coeff	z-score
CONSTANT	10.37167	2.22	13.23025	2.87	8.060894	1.68	-5714.538	-3.73	-10967.51	-7.46	-1802.298	-1.17
AGE	-0.546669	-2.99	-0.69168	-3.82	-0.4574598	-2.43	222.2809	5.4	291.7838	7.4	143.5713	3.49
AGE2/1000	8.854809	3.71	10.7694	4.57	7.287402	2.98	-1231.371	-4.5	-1590.166	-6.14	-724.518	-2.65
AGE3 /1000	-0.043935	-4.26	-0.051898	-5.1	-0.0355023	-3.35						
FEMALE	0.455179	4.54	0.41	5.35	0.7598181	7.05	800.8734	9.01	-135.8533	-5.3	659.0195	7.39
FEMALE*AGE	-0.007571	-5.53	-0.007741	4.1	-0.0112037	-7.88						
FEMALE*AGE2/1000												
DEATH	2.271126	17.21			1.937911	14.17	7748.978	21.44			7252.068	20.14
DEATH*AGE	-0.022362	-13.14			-0.0193046	-10.96	-86.77981	-18.59			-82.03928	-17.66
TTD	-0.001603	-16.36			-0.0015097	-14.48	-5.011259	-21.4			-4.988614	-21.42
TTD2	7.40E-07	11.67			7.60E-07	11.61	0.002231	14.31			0.002216	14.29
TTD*FEMALE							-0.557379	-8.41			-0.472686	-7.15
INCOME					3.75E-05	8.13					-0.009896	-3.83
INCOME2					-2.99E-10	-7.06						
INCOME*AGE												
INCOME*FEMALE												
					-5.11E-06	-3						
INCOME*DEATH												
ÍNCOME*TTD					-1.06E-08	-3.56						
Chronic illness variables:												
Diabetes					0.4378727	27.3					616.7579	14.82
Thyroid insuffiency					0.247938	11.25					-38.64454	-0.64
Anemia					0.2544677	7.4					152.2951	1.67
Parkinson's disease					0.8448987	18.92					222.1423	2.17
Epilepsy					0.6225625	14.71					461.9178	4.35
Severe mental disorder					0.1518413	5.5					628.94	7.99
Mental retardation					-0.2455372	-2.31					-275.0403	-0.85
Claucoma					0.6513091	35.75					-286.2429	-6.24
Breast cancer					1.574629	23.75					-246.849	-2.02
Prostatic cancer					1.512455	19.08					-429.0664	-3.14
Leukaemia					1.972309	19.23					1397.929	8.92
Cardiac insuffiency					0.3147188	21.37					351.7071	9.26
Reumathoid arthritis					0.8369633	37.59					752.5688	13.95
Asthma					0.5591068	33.23					490.6138	11.21
Hypertension					0.1451303	16.12					192.717	7.37
Coronary heart disease					0.4285138	37.31					343.995	11.09
Arrhythmias					0.4690211	21.03					287.0399	5.17
Ulcerative colitis and Cronh's disese					1.233879	15.24					185.9097	1.1
Regional variables (reference: Varsinais-Suomi)												
Satakunta					0.2469981	11.15					243.1147	3.65
Kanta-Häme					0.2697729	10.87					-435.6125	-5.92
Pirkanmaa					0.0040308	0.21					-51.41498	-0.88
Päijät-Häme					0.1792916	7.57					-364.8966	-5.1
Kymeenlaakso					0.17	7.19					-343.2906	-4.78
Elelä-Karjala					-0.0219981	-0.8					-506.8757	-5.98
Etelä-Savo					0.1280563	4.46					-200.6787	-2.32
Itä-Savo					-0.5082071	-13.85					612.2874	5.09
Pohjois-Karjala					0.2853461	11.62					-102.1323	-1.42
Keski-Suomi					0.0163389	0.73					-42.83595	-0.63
Etelä-Pohjanmaa					0.2185629	9.45					37.18406	0.54
Vaasa					0.3844856	15.54					-109.7403	-1.51
Keski-Pohjanmaa					0.480246	13.62					-179.6148	-1.83
Pohjois-Pohjanmaa					0.1524662	7.17					-203.869	-3.22
Lappi					0.2423388	8.12					-52.71886	-0.6
Kainuu					0.2819249	8.62					-303.678	-3.2
Länsi-Pohja					0.5781049	15.49					-325.2297	-3.17
Helsinki					0.4193428	22.46					-535.7044	-9.72
Hyvinkää region					0.2836103	10.12					-598.9989	-7.22
Porvoo region					0.0645077	2.05					-398.7201	-4.18
Länsi-Uusimaa					0.1618356	4.62					-851.3743	-8.01
Jorvi					0.2170565	5.29					-482.4163	-3.93
Peijas					0.185416	4.86					-269.7787	-2.35
Lohja region					0.051646	1.63					-712.8186	-7.35
Pohjois-Savo					0.2260742	10.4					-105.8581	-1.64
Psedo R^2	0.0224		0.0104		0.06							

Appendix table 3.Two part estimation of health centre and psychiatric inpatient care(non LTC individuals)

Variable	Model 5 ,Logit (N=260951)						Model 6.SUR (N=15 977)					
	Basic spefication		Naive specification		Extended specification		Basic spefication		Naive specification		Extended specification	
	coeff	z-score	coeff	z-score	coeff	z-score	coeff	z-score	coeff	z-score	coeff	z-score
CONSTANT	-21.8592	-13.17	-24.2563	-14.94	-19.42347	-11.42	14012.76	3.8	15555.42	4.48	8769.353	2.41
AGE	0.447535	10.24	0.487546	11.47	0.3796618	8.56	-331.015	-3.47	-415.084	-4.61	-188.72	-2.01
AGE2/1000	-2.42819	-8.48	-2.63612	-9.52	-2.022586	-6.99	2324.758	3.79	3134.927	5.41	1476.628	2.44
AGE3 /1000												
FEMALE	12.25799	6.08	12.56631	6.33	12.42823	6.12	737.6312	4.39	126.1002	1.93	673.5738	4.05
FEMALE*AGE	-0.30836	-5.87	-0.33105	-6.4	-0.3136933	-5.92						
FEMALE*AGE2/1000	1.956053	5.74	2.141467	6.39	1.985802	5.78						
DEATH	3.550065	16.35			2.821901	12.36	343.0854	2.85			252.4933	2.13
DEATH*AGE	-0.03435	-12.38			-0.0282876	-10						
TTD	-0.00215	-17.38			-0.0021788	-17.34	-0.43722	-3.09			-0.42879	-3.09
TTD2	1.04E-06	12.41			1.06E-06	12.51						
TTD*FEMALE	-0.00017	-4.46			-0.0001607	-4.17	-0.42296	-3.08			-0.47709	-3.54
INCOME					-0.0000649	-2.99					-0.00918	-1.16
INCOME2												
INCOME*AGE					5.79E-07	2.02						
INCOME*FEMALE												
INCOME*DEATH					0.0000173	3.99						
ÍNCOME*TTD												
Chronic illness variables:												
Diabetes					0.3973678	15					167.1323	1.69
Thyroid insuffiency					0.1275896	3					-257.301	-1.59
Anemia					0.1488946	2.57					178.5327	0.82
Parkinson's disease					0.9015575	16.15					1089.299	5.56
Epilepsy					0.7649339	12.12					875.5133	3.78
Severe mental disorder					1.012026	25.47					2977.883	20.48
Mental retardation					0.6433075	4.31					291.8675	0.54
Claucoma					0.0635188	1.93					-16.4623	-0.13
Breast cancer					-0.0342876	-0.34					-224.768	-0.59
Prostatic cancer					0.2263441	2.3					-107.583	-0.29
Leukaemia					0.1004686	0.8					-911.255	-1.96
Cardiac insuffiency					0.2011157	8.44					-168.238	-1.91
Reumathoid arthritis					0.5351322	14.94					-38.5139	-0.29
Asthma					0.2975915	9.81					-430.841	-3.76
Hypertension					0.0795405	4.39					-128.99	-1.85
Coronary heart disease					0.1051712	4.86					-373.75	-4.55
Arrhythmias					0.0933356	2.39					2.778731	0.02
Ulcerative colitis and Cronh's disese					0.1360971	0.98					364.9827	0.69
Regional variables (reference: Varsinais-Suomi)												
Satakunta					0.389231	8.07					-360.611	-1.93
Kanta-Häme					0.420599	8.01					-1004.86	-4.95
Pirkanmaa					0.3706603	8.92					-245.347	-1.51
Päijät-Häme					0.3185638	6.14					-857.514	-4.25
Kymeenlaakso					0.103666	1.87					-889.619	-4.12
Elelä-Karjala					0.248873	4.13					-251.293	-1.07
Etelä-Savo					0.7018173	12.67					-1574.68	-7.36
Itä-Savo					0.6782468	10.34					-1054.74	-4.12
Pohjois-Karjala					0.0077939	0.14					-1129.24	-5.02
Keski-Suomi					0.3168658	6.55					-847.994	-4.49
Etelä-Pohjanmaa					0.4810543	10					-1207.51	-6.49
Vaasa					0.4059025	7.7					-1713.98	-8.41
Keski-Pohjanmaa					0.341805	4.64					-1378.01	-4.83
Pohjois-Pohjanmaa					0.9086279	21.88					-1593.91	-9.96
Lappi					0.5716018	9.51					-1307.26	-5.64
Kainuu					0.3565887	5.18					-1582.01	-5.96
Länsi-Pohja					0.4586483	5.95					-1672.67	-5.65
Helsinki					0.1845738	4.27					65.70199	0.39
Hyvinkää region					0.4633045	7.54					-240.736	-1.01
Porvoo region					0.6195102	10					-796.127	-3.34
Länsi-Uusimaa					0.3494065	4.68					-1445.81	-4.97
Jorvi					0.0502052	0.52					-514.287	-1.37
Peijas					0.052543	0.58					-1366.5	-3.84
Lohja region					0.3497754	4.99					-890.454	-3.26
Pohjois-Savo					0.5049141	11.09					-1070.44	-6.07
Psedo R^2	0.0284		0.014		0.097							

Appendix table 4.Two part estimation on prescribed medicine (non LTC individuals)

Variable	Model 7, Logit (N=260951)						Model 8 ,SUR (N=227 286)					
	Basic spefication		Naive specification		Extended specification		Basic spefication		Naive specification		Extended specificati	
	coeff	z-score	coeff	z-score	coeff	z-score	coeff	z-score	coeff	z-score	coeff	z-score
CONSTANT	28.05944	4.19	13.23025	4.45	19.98359	2.75	-2630.03	-8.09	-3793.53	-11.8	-792.6512	-2.65
AGE	-1.29899	-4.92	-1.38036	-5.25	-0.9510986	-3.32	88.93485	10.17	115.2131	13.38	30.06487	3.77
AGE2/1000	20.15169	5.83	21.22822	6.18	14.45264	3.85	-583.515	-10	-747.897	-13.07	-199.999	-3.76
AGE3 /1000	-0.09894	-6.57	-0.10335	-6.92	-0.068985	-4.22						
FEMALE	6.847979	4.59	7.277687	4.88	6.459866	4	1014.926	2.6	1242.164	3.16	789.6691	2.22
FEMALE*AGE	-0.16201	-4.06	-0.17383	-4.36	-0.1352533	-3.13	-28.8008	-2.78	-35.9105	-3.43	-19.8046	-2.1
FEMALE*AGE2/1000	0.991869	3.73	1.065952	4.01	0.7041311	2.45	196.4629	2.86	245.0174	3.54	125.445	2.01
DEATH	1.096365	5.21			0.8464181	3.72	1479.922	30.13			1117.671	24.92
DEATH*AGE	-0.01125	-4.06			-0.0111051	-3.72	-16.797	-26.56			-13.24647	-22.95
TTD	-0.00026	-6.44			-0.0001952	-4.41	-0.36019	-10.48			-0.20093	-6.22
TTD2							0.000115	5.06			8.83E-05	4.29
TTD*FEMALE												
INCOME					5.07E-05	18.53					0.020319	14.71
INCOME2					-6.22E-10	-11.33					-5.12E-08	-3.71
INCOME*AGE												
INCOME*FEMALE											-0.002303	-4.05
INCOME*DEATH												
ÍNCOME*TTD											-8.90E-06	-10.12
Chronic illness variables:												
Diabetes					2.257593	30.64					384.8611	76.88
Thyroid insuffiency					2.630279	23.49					49.30565	7.1
Anemia					2.015592	15.73					-5.730224	-0.53
Parkinson's disease					1.749546	13.55					741.3234	55.41
Epilepsy					1.285635	12.48					185.7108	13.99
Severe mental disorder					0.9960336	17.82					146.2871	16.35
Mental retardation					0.8072081	4.06					72.64678	2.15
Claucoma					1.997101	32.78					217.3908	38.24
Breast cancer					1.00239	7.66					458.4632	26.38
Prostatic cancer					2.046127	9.96					1955.406	100.02
Leukaemia					0.9181369	5.93					646.7348	27.71
Cardiac insuffiency					1.293346	26.35					126.5943	27.33
Reumathoid arthritis					1.331768	24.17					223.0746	32.41
Asthma					2.026543	36.9					516.0923	97.46
Hypertension					2.478067	87.44					232.1868	79.4
Coronary heart disease					2.269114	56.07					241.1768	65.79
Arrhythmias					2.169501	22.53					100.3146	14.61
Ulcerative colitis and Cronh's disese					1.836673	8.15					386.4633	16.87
Regional variables (reference: Varsinais-Suomi)												
Satakunta					-1.71E-01	-5.19					2.307926	0.31
Kanta-Häme					-0.0323216	-0.84					-13.67554	-1.64
Pirkanmaa					-0.1032383	-3.65					-15.64292	-2.5
Päijät-Häme					-0.0081935	-0.23					-28.08207	-3.54
Kymeenlaakso					-0.3777407	-11.07					2.608703	0.32
Elelä-Karjala					-0.0543182	-1.3					-25.84788	-2.84
Etelä-Savo					-0.0304102	-0.67					-33.92921	-3.54
Itä-Savo					-0.119507	-2.2					-76.14236	-6.61
Pohjois-Karjala					-0.0431735	-1.09					-21.78165	-2.66
Keski-Suomi					-0.1238478	-3.63					-19.13586	-2.59
Etelä-Pohjanmaa					-0.0258272	-0.72					-15.54504	-2.01
Vaasa					-0.1821485	-4.92					-21.02581	-2.5
Keski-Pohjanmaa					-0.0025043	-0.04					21.38568	1.82
Pohjois-Pohjanmaa					-0.077926	-2.25					-18.87948	-2.68
Lappi					-0.1131574	-2.45					-44.07238	-4.4
Kainuu					-0.082472	-1.58					-44.57625	-4.08
Länsi-Pohja					-0.5826872	-11.04					-46.26023	-3.59
Helsinki					-0.0122161	-0.43					34.69412	5.55
Hyvinkää region					0.0241943	0.56					11.26524	1.2
Porvoo region					-0.1676327	-3.5					21.81776	2.07
Länsi-Uusimaa					-0.089003	-1.74					-14.49789	-1.22
Jorvi					-0.0300321	-0.49					-39.32452	-2.83
Peijas					-0.0574192	-1					-22.44033	-1.74
Lohja region					-0.1407858	-2.95					10.4658	0.99
Pohjois-Savo					0.0760224	2.13					-12.15953	-1.69
Psedo R^2	0.0189		0.0159		0.2122							

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