SUPPLEMENTAL HEALTH INSURANCE AND EQUALITY OF ACCESS IN BELGIUM

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Summary

It has been suggested that the unequal coverage of different socio-economic groups by supplemental insurance could be a partial explanation for the inequality in access to health care in many countries. We analyse the situation in Belgium, a country with a very broad coverage in compulsory social health insurance and where supplemental insurance mainly refers to extra-billing in hospitals. We find that this institutional background is crucial for the explanation of the effects of supplemental insurance. We find no evidence of adverse selection in the coverage of supplemental health insurance, but strong effects of socio-economic background. A count model for hospital care shows that supplemental insurance has no significant effect on the number of spells, but a negative effect on the number of nights. This is in line with patterns of socio-economic stratification that have been well documented for Belgium. It is also in line with the regulation on extra-billing protecting patients in common rooms. For ambulatory care, we find a positive effect of supplemental insurance on visits to a dentist and on number of spells at a day centre but no effect on visits to a GP, on drugs consumption and on visits to a specialist.

Keywords: supplemental insurance, adverse selection, moral hazard, hospital spells, equality of access, health care use.

Introduction

In recent decades, many European countries have experienced a growing pressure on the financial resources of their public health care systems and a parallel increase in the importance of different forms of voluntary health insurance (Mossialos and Thomson, 2002; OECD, 2004). There are worries that this development threatens the ideal of equality of access in these countries, as voluntary health insurance seems mainly concentrated among the better-off groups in society. Related to this is the concern about the pro-rich inequity in the probability of seeing a specialist found in many European countries (van Doorslaer *et al.*, 2004) and the question of whether this phenomenon can be explained by the unequal distribution of supplemental insurance coverage (Van Doorslaer *et al.*, 2002; Buchmueller *et al.*, 2004; Rodriguez and Stoyonova, 2004; Van Doorslaer and Masseria, 2004; Jones *et al.*, 2006).

As emphasized by Jones *et al.* (2006), a good diagnosis of the situation requires that one is able to distinguish carefully between the different factors influencing the link between supplemental insurance and health care consumption. If there is adverse selection, i.e. if those with higher health care risks are more likely to take out supplemental insurance, it becomes crucial to disentangle this selection effect from the insurance effect.[1] More specifically, higher health care consumption of those with supplemental insurance may be due either to the fact that they are less healthy, or to the fact that they have supplemental insurance, or to both. From the point of view of equity, distinguishing

[1] In addition to the traditional "moral hazard" effect, Jones *et al.* (2006) mention a series of other "insurance" effects: risk reduction, income transfer and access. Empirically, it is impossible to distinguish between all these and we will use the terms "moral hazard" and "insurance" effect interchangeably.

these effects is essential. However, it is well known that their identification raises difficult methodological issues, especially when only cross-section data are available (Holly *et al.*, 1998; Vera-Hernandez, 1999; Schellhorn, 2001; Buchmueller *et al.*, 2004; Gardiol *et al.*, 2005; Jones *et al.*, 2006). While previous empirical work gives much evidence for the existence of a moral hazard (or utilization) effect, the results with respect to adverse selection are mixed. The strongest effects seem to be found for the free choice of deductibles in Switzerland (Schellhorn, 2001; Gardiol *et al.*, 2005). This is not very surprising, given the institutional setting in Switzerland with a strong tradition of private health insurance.

The latter point suggests an important insight, i.e. that "the nature of demand for private health insurance itself depends on the institutional context in which that insurance operates" (Harmon and Nolan, 2001, p. 135). It is indeed obvious that both the degree of adverse selection in the voluntary insurance system and the (voluntary) insurance effect on health care consumption will crucially depend on the degree of population, service and cost coverage in the public (compulsory) system and thus the type of voluntary insurance. The wide variety of possible arrangements has been described in the international comparison reports (Mossialos and Thomson, 2002; OECD, 2004), but until now there have not been many structured attempts to formulate and test specific hypotheses which are linked to these institutional differences. In fact, a careful analysis of the institutional setting may in some cases lead to empirical predictions of an insurance effect that does <u>not</u> in the first place induce increased consumption.

In this paper, we analyse the take-up and the consumption effects of voluntary health insurance in Belgium. Belgium has a social insurance system with a very broad coverage. The importance of voluntary insurance is growing, mainly in the form of supplemental hospital insurance covering additional costs of single rooms, co-payments and extra-billing in the hospital sector. It also covers some dentistry and the co-payments of ambulatory pre- and post-hospital care. It is very uncommon in Belgium that a supplemental policy covers all ambulatory co-payments. We will describe the Belgian system in more detail in the next section and we will argue that it leads to specific predictions on the effect of supplemental insurance.

It is worth emphasizing that our data – taken from the Belgian Health Interview Survey for 2001 – have two major advantages. First, they contain very rich information on the health situation of the individuals, which is useful in distinguishing the adverse selection effect from the insurance effect. Second, inpatient care is recorded as the number of spells and the number of nights per spell during the last year. To the best of our knowledge (Pohlmeier and Ulrich, 1995; Deb and Trivedi, 1997 & 2002; Gerdtham, 1997; Gurmu, 1997; Deb and Holmes, 2000; Schellhorn *et al.*, 2000; Gerdtham and Trivedi, 2001; Jiménez-Martín *et al.*, 2002; Riphahn *et al.*, 2003; van Doorslaer *et al.*, 2004; Van Ourti, 2004; Winkelmann, 2004; Bago d'Uva, 2005 & 2006), the literature on the determinants of the number of contacts with the medical sector has only focused on modelling the total number of contacts/nights without distinguishing between the spells. The most popular models are two-part and latent class count data models, or combinations of both. The former models assume a single spell, whereas the latent class models only distinguish between so-called "high"- and "low"-users. A notable exception is Santos Silva and Windmeijer (2001), who propose modelling strategies to account for multiple spells if only the total number of contacts/nights is known. However, we observe the number of spells and the number of nights per spell directly, which allows us to model the individual decision process more explicitly.

In the following section we describe our data. Next, we present our results for the demand of supplemental insurance and the effects of supplemental insurance coverage on health care use. We distinguish between inpatient care (number of spells and number of nights per spell) and outpatient care and argue that the results are well in line with what could be expected within the Belgian institutional context. We also discuss the issue of endogeneity of supplemental insurance. The final section concludes.

Supplemental health insurance in Belgium

Belgium has a system of compulsory health insurance, covering the entire population (with some restrictions for the self-employed, to which we will return).[2] Health insurance is organized through private, non-profit sickness funds. Membership of a sickness fund is compulsory, but the choice of sickness fund is free. By law, the compulsory health insurance market is closed to new entrants. The service and cost coverage within the compulsory system and the social contribution rates levied are identical for all funds.

[2] More detailed information on the Belgian health care system and on recent reforms can be found in Schokkaert and Van de Voorde (2005).

Compulsory health insurance is combined with independent medical practice. Payment is mainly fee-for-service and patients have a large degree of freedom in their choice of provider. Hospital care is provided either by private non-profit or by public hospitals. The system of hospital financing distinguishes between medical and non-medical services. The latter refer to the general hospital costs and to accommodation expenses (also including costs of equipment and nursing staff). The medical services are fully integrated into the system of health insurance and are covered by the sickness funds. Here also, remuneration is mainly fee-for-service. Perhaps due to the dominance of fee-for-service (but certainly also because of the relatively large number of providers per capita), there are hardly any waiting lists.

At the same time, the Belgian system is characterized by large co-payments, covering overall about 20% of total health expenditures. There are no supplemental insurance policies available which fully cover these co-payments. However, the Belgian government introduced social protection mechanisms for the poor and the sick, the most important being a “maximum billing” ceiling, linked to income.

The (compulsory) insurance package and the official fees are defined explicitly through a complex process of negotiations, involving the sickness funds, the providers, the government and the representatives of employers and employees who are the payers of the system. Compared to most other countries, the service coverage is very broad, including e.g. many dentistry items and care in nursing homes for the elderly. The complicated decision procedure leads to a rather long delay between medical innovation and inclusion in the compulsory cover. This is especially striking for new pharmaceuticals. Other items not included in the compulsory cover are orthodontics, some less necessary pharmaceuticals, some physiotherapy and non-traditional therapies such as acupuncture and homeopathy. Patients can buy supplemental insurance for these treatments, but the importance of this remains rather limited.

Supplemental insurance plays a much more important role in another respect. The Belgian system allows in some cases for extra-billing ("supplements" in the Belgian terminology). Extra-billing plays an important role in hospital financing. On top of co-payments, patients can be charged a part of the price of the materials used. Mainly those opting for a single room can also be charged room and fee supplements. Physicians who do not subscribe to the officially negotiated fees are allowed to raise supplements irrespective of room choice for all patients with the exception of some vulnerable groups. While average co-payments per hospital stay in a single room in 2003 were between €150 and €200, supplements were on average above €800.[3] Supplemental ("hospital") insurance covers these costs – and in addition usually the co-payments and supplements in the ambulatory sector, which are linked to the stay in the hospital. This "hospital insurance" is by far the most important type of supplemental health insurance in Belgium and the only one analysed in this article.

Both sickness funds and private insurers provide supplemental insurance. Given that for-profit insurers cannot enter the market for compulsory insurance, traditional sickness funds have huge informational and scale advantages. In the private sector, both group contracts and individual contracts are offered. However, the private market share

[3] More information about supplements in Belgium can be found in De Graeve *et al.* (2006).

in supplemental health insurance has remained rather limited and private insurers focus on the higher-income market segment. According to Berghman and Meerbergen (2005), supplemental insurance by the sickness funds and by private insurers covered in 2001 – the year of our data – about 2.35% and 0.65% of total health care expenditures, respectively. However, since 2001, the importance of supplemental insurance has certainly grown.

It should be clear that this institutional background will influence both the coverage of the supplemental health insurance and its impact on health care use. As mentioned before, there are hardly any waiting lists and patients with and without supplemental insurance are treated in the same hospitals. Supplements in hospitals are strictly regulated for patients in two-person and in common rooms and it can reasonably be expected that most patients in single rooms have supplemental insurance. While a stay in a single room will undoubtedly be more comfortable, it is much less obvious that it will also imply a larger consumption of health care or a better quality of care – in any case, if there is an effect, it must be due more to differences in provider behaviour than to reactions by patients on price differences. Moreover, given the broad coverage of the compulsory system, we would only expect minor effects of supplemental insurance in the ambulatory sector – mainly for the few items which are not covered and perhaps for ambulatory treatment related to a hospital stay. We will analyse whether these predictions are confirmed by the data.

In addition to supplemental hospital insurance, there is also in Belgium some "substitutive" voluntary health insurance (Mossialos and Thomson, 2002) for the self-employed. For them, the benefits package in the compulsory system is more restricted in that it does not include the so-called minor risks (such as ambulatory care, medicines, dental care). The sickness funds (and one private insurer) offer voluntary insurance for these minor risks. In this paper, we do not analyse the effects and the coverage of this substitutive system. In fact, it has been decided by the Belgian government that the compulsory coverage for the self-employed will be harmonized with the overall system in the following years, so that the substitutive voluntary health insurance will soon disappear.

Data

Our data come from the Health Interview Survey (HIS)[4] in 2001, a Belgian health survey that was set up by the Scientific Institute of Public Health. The main objective of the HIS is to provide information on health status, lifestyle and utilization of preventive and health care services of the whole population residing in Belgium. All analyses in this paper make use of sampling weights provided by the HIS.

The respondents of the HIS provided information on supplemental insurance. They first received some background information to help them to answer the question adequately, i.e. “the personal contribution in case of hospitalization can be heavily reduced in case of a supplemental insurance for hospitalization. Such insurance can be at your own cost or at the initiative of your employer. The insurance can be provided by a sickness fund or a private insurer”. Next, the respondents had to answer the actual question: “Do you have such supplemental hospitalization insurance at your own cost or provided by your

[4] More information on the HIS can be found in Demarest *et al.* (2002).

employer?" We decided to focus our analysis of the take-up at the individual (and not at the household) level, because health status is supposed to be a crucial variable and can be defined adequately only at the individual level.[5] We therefore omitted from the sample the respondents that were still going to school, because the supplementary insurance question did not apply to them. We lost additional observations due to item-non-response in the independent variables. However, the share of individuals with supplemental hospital insurance (62.30%) in our estimation sample (n = 6441) hardly deviates from that in the total sample.[6]

We will now summarize the data on health care consumption, on individual (non-health) characteristics and on individual health. Summary statistics for the estimation sample are given in Table 1. For categorical variables we indicated the reference category with an asterisk.

Table 1 about here

[5] For the analysis of the determinants of health care consumption, we constructed a variable at the individual level indicating whether the individual or a family member has supplemental health insurance for hospitalization. Indeed, all common supplemental insurance policies in Belgium include coverage of household members.

[6] There is no good information to cross-validate this percentage in Belgium. Statistical analysis of the differences between the total sample and the estimation sample gives no reasons to question the assumption of exogenous sample selection.

Health care consumption

The HIS contains information on utilization of the general practitioner, the specialist, emergency department, dentist, prescribed and non-prescribed drugs, and hospital care.[7] GP and dentist care are recorded as the number of visits during the last two months. The same holds for emergency department and specialist care, although the former does exclude contacts with an emergency department that resulted in hospitalization, and the latter excludes (i) contacts during hospitalization and day care and (ii) contacts at an emergency department. Utilization of hospital care refers to general and psychiatric hospitals, but excludes hospital visits due to deliveries. Visits to day centres are not included in the definition of hospital care, but are taken up as a separate question. The information on hospitalizations allows us to define at the individual level the number of hospital spells (with a maximum of three) during the last year and the number of nights during each hospitalization. This allows us to improve on the single spell hypothesis which has been common in previous research (see e.g. the discussion in Santos Silva and Windmeijer, 2001).

Individual (non-health) characteristics

Table 1 summarizes the available demographic information (male, age, family type, nationality). With respect to the construction of the dummies on family type, the HIS defines children as household members who are 18 years or younger. A complex household was defined as a household which cannot be attributed to one of the other four groups (e.g. three adults or more).

[7] Note that in Table 1 there is additional item-non-response for some items of health care consumption.

As for the socio-economic variables, we know monthly disposable household income in Belgian Francs (1€ = 40.3399 BEF). We equivalized income using the modified OECD scale that weighs the first individual with 1, subsequent individuals with 0.5 and children (defined as 13 or younger) with 0.3, and then categorized it into a set of six income ranges in order to allow for a flexible functional form. Education is captured by five dummies on the highest degree ever obtained. Occupational status is measured with a set of six dummies.[8] We also observe whether an individual qualifies for lower co-payments due to preferential treatment (‘verhoogde tegemoetkoming’) – such preferential treatment is provided by the compulsory health insurance system to patients with a weaker socio-economic background.

Finally, we dispose of information on lifestyle: sports activities, smoking and alcohol consumption.

Health variables

One of the main strengths of the Belgian HIS is the large battery of questions on health status. First, we use self-assessed health (measured on a five-point scale) and a dummy indicating whether the individual suffers from a chronic illness or is handicapped.

Second, we calculated the body mass index on the basis of the available information on height and weight. We construct four regions of the body mass index (see e.g. Garrow,

[8] The HIS does not inform on job characteristics. This is unfortunate since Berghman and Meerbergen (2005) have shown that these characteristics are important for the take-up of employer-provided insurance policies. The latter are more often taken out/provided to employees with a long-term contract, working in large firms and working in specific sectors.

1992): an index between 18 and 25 indicates regular weight, while (>=25) <18 indicates (over-) underweight, and >=30 indicates obesity.

Third, the survey includes two ‘constructed’ health indicators. The first – GHQ12 – aggregates information from 12 questions on general well-being into one index (Goldberg *et al.*, 1997). Higher values of the index correspond to more severe states of well-being. The second – SF-36 physical functioning score – is based on 10 questions and captures physical functioning with higher values corresponding to better physical functioning.[9]

Fourth, we have information on 38 chronic and 3 acute diseases. Instead of including separate dummies for each of these, we included two dummy variables measuring the presence of at least one acute and one chronic disease.[10]

Finally, the HIS includes 42 questions on health complaints during the last week: e.g. having had a headache, breathing difficulties, problems to breath, having unpleasant thoughts, pain in chest, etc. Each question has 5 categories, ranging from ‘no problems at all’ to ‘many problems’. These questions are a subset of the 90 questions of the “Symptom Checklist-90-Revised” which has been used to evaluate psychological problems in the medical literature (see e.g. Derogatis *et al.*, 1981). We have decided to

[9] The questions on the other SF-36 domains were not included in the HIS.

[10] Counting the number of diseases was not considered as it assumes equal weights for each of the diseases.

reduce the number of dimensions from 42 to 2 using factor analysis.[11] The first factor measures mood, while the second is an indicator of pain, with higher values indicating worse mood/pain.

Who takes up supplemental health insurance?

Since the take-up of supplemental health insurance is recorded as a dummy variable, we use a binary probit model to analyse the take-up decision, i.e. we specify

(1) $$P\left(I_i = 1 \middle| x_i\right) = \Phi\left(x_i^{'}\beta\right)$$

where the subscript $i = 1,...,n$ stands for the i^{th} individual, I_i takes the value 1 if the individual has supplemental health insurance (and 0 otherwise), x_i is a vector of explanatory variables, β a vector of parameters to be estimated and $\Phi(.)$ is the standard normal cumulative distribution function. Although estimation of the probit model in equation (1) boils down to estimating the parameters β, we are not in the first place interested in the estimates of these parameters as such, but rather in the effect of

[11] More information about this factor analysis can be obtained from the authors on request. We did not apply factor analysis to the other health variables (SAH, chronic, BMI, GHQ12, SF36 physical functioning, acute, chron) for two reasons. First, self-assessed health, the dummy on chronic illnesses, and the body mass index have a clear interpretation. The properties of the 'constructed' indices GHQ12 and SF36 physical functioning score are well known (e.g. Goldberg *et al.*, 1997, www.sf-36.org), and summarizing the questions on acute and chronic illnesses into two dummy variables has some intuitive appeal. Second, factor analysis is inadequate for variables with fewer than five categories (see e.g. Johnson and Wichern, 2002). Obviously, this does hold for some of the health variables used in this paper.

the determinants x_i upon the probability of having supplemental health insurance. In the case of a continuous variable x_{ik}, we calculate this effect as:

$$\text{(2)} \qquad \left. \frac{\partial \hat{P}\left(I_i = 1 \middle| x_i\right)}{\partial x_{ik}} \right|_{\bar{x}} = \phi\left(\bar{x}\hat{\beta}\right)\hat{\beta}_k$$

where hats are used for estimates and $\phi(.)$ denotes the standard normal density function. This expression gives the change in the probability of having supplemental health insurance for an individual with average (upper bar) characteristics resulting from a one-unit change in the variable x_{ik}. In case of a dummy variable x_{id}, we calculate its effect $\Delta\hat{p}_{id} = \hat{P}\left(I_i \middle| x_i; x_{id} = 1\right) - \hat{P}\left(I_i \middle| x_i; x_{id} = 0\right)$ on the probability of having supplemental health insurance by:

$$\text{(3)} \qquad \Delta\hat{p}_{id} = \Phi\left(\ldots + \hat{\beta}_{d-1}\bar{x}_{d-1} + \hat{\beta}_d + \hat{\beta}_{d+1}\bar{x}_{d+1} + \ldots\right) - \Phi\left(\ldots + \hat{\beta}_{d-1}\bar{x}_{d-1} + \hat{\beta}_{d+1}\bar{x}_{d+1} + \ldots\right)$$

Table 2 about here

Estimates of expressions (2) and (3) are given in Table 2. Statistical inference is based on the ‘sandwich estimator’ of the covariance matrix and corrects for clustering at the household level. Regional (district) dummies are included as controls, but the results for these dummies are not reported. The RESET-test (based on the joint significance of the square and cube of the predicted linear index $x_i^{'}\hat{\beta}$ in equation (1)) has a p-value of 0.202 which rejects the alternative hypothesis of misspecification (Peters, 2000) and we found no indications of heteroskedasticity using a probit model with multiplicative variance function. To test the robustness of our findings, we also estimated the model with all kinds of interaction effects included. Most of these interaction effects were insignificant, and none led to convincing results which would necessitate a reinterpretation of the findings of the simple model.[12]

Let us now turn to the interpretation of the results in Table 2. First, we find that among the demographic variables, only age, being single without children and being a non-EU member are relevant determinants of supplemental insurance. Compared to the reference age category of 40–44, persons aged between 50 and 70 are more likely to have supplemental insurance. This finding seems to be demand-driven, whereas the decline in insurance coverage for the 70+ (compared to those between 50 and 70) might result from exclusion restrictions in insurance policies or from higher prices offered to the elderly. Unsurprisingly, singles are less likely to have supplemental insurance and the same holds for non-Belgians, although the effect is much stronger for individuals originating from outside the European Union.

Second, there are strong socio-economic differences. Individuals with a university and higher education degree are more likely, and individuals with no or primary education are less likely, to have supplemental insurance. The results suggest that the relationship is non-monotonic, i.e. individuals with a university degree are less likely to have supplemental insurance than individuals with a higher (non-university) education degree. For equivalent income, a similar pattern is found, i.e. insurance take-up is associated with higher income, but again the pattern is non-monotonic. This non-

[12] We checked the predictive power of the model by analysing the percentage of correct predictions in the sample and by implementing an out-of-sample forecasting exercise along the lines of Jimenez-Martin *et al.* (2002). The latter was based on 100 random subdivisions of the sample in a training (80%) and a forecast sample (20%). The model performs well and we found no evidence of over-fitting.

monotonicity at the top is hard to explain, but should not detract from the main conclusion that there is a clear socio-economic gradient in the take-up of supplemental insurance. This is confirmed by the findings for the occupational groups. Employees are more likely than any other occupational category to have supplemental insurance. Among the other categories, we observe in decreasing order the self-employed, retired, sick, others not working and the unemployed. The finding for the self-employed is reasonable since – compared to some employees – they have to finance their insurance policies privately. The lower degree of risk pooling due to the absence of collective contracts probably implies higher insurance premiums. Finally, whether an individual is eligible for reduced co-payments is not important.

Third, the results with respect to health and lifestyle variables are mixed. Compared to individuals in good self-assessed health, individuals in very good health are less likely to buy supplemental health insurance, which may point to some adverse selection. However, individuals in fair and poor health are also less likely to take out insurance.[13] This does not necessarily imply that there is no adverse selection at all, since the (a priori positive) effect of the lower health status may be offset by the (negative) effect of the pricing and selection behaviour of the insurers (see, e.g. Shmueli, 2001), but it nevertheless suggests that the adverse selection effect is not very strong. Moreover, and more importantly, none of the other health indicators is significant at the 5% level. With respect to the lifestyle variables, we find that practicing sport has a positive effect,

[13] The insignificance of the effect for those in very poor health is not surprising, since the number of respondents in very poor health in the sample is very small.

whereas the effect of smoking is negative. This might capture inter-individual differences in health awareness.

Summarizing our results, we find only weak evidence of adverse selection and much stronger evidence for socio-economic inequalities in take-up. This is well in line with what could be predicted on the basis of our description of the Belgian institutional setting, characterized by the very broad coverage of the compulsory system and the (relative) luxury character of the items covered by supplemental insurance. One does not need supplemental insurance to be treated well when ill or to avoid waiting lists. However, when one can afford it, taking supplemental insurance may lead to a more comfortable (and less expensive) stay in the hospital. Let us now see whether we find some effects of supplemental insurance coverage on health care use.

Supplemental insurance and health care use

We first analyse inpatient care consumption. We use a model that distinguishes between the number of spells and the number of nights per spell. In the second subsection we analyse the results for the categories of outpatient care that are available in our data. In these two subsections we treat the supplemental insurance dummy as exogenous. We will return to that assumption in a third subsection.

Inpatient care

The HIS informs on the number of spells and the number of nights per spell during the last year. This allows us to model the individual decision process more explicitly than is traditionally done in the literature on the determinants of hospital nights. This may be important, since it can be argued that the decision on the number of occasions to go to the hospital (i.e. to “start” a spell) is different from the decision on the number of nights, in that the patient has much less decision power on the latter than on the former decision. We stick to the popular independence assumption of two-part models, but account for spells, i.e. we assume that the data generating process of the number of spells is independent from the data generating process of the number of nights per spell. We further assume that the data generating process of the number of nights per spell is similar for each spell and independent between spells (see further for additional argumentation). Both independence assumptions enable us to estimate the number of spells and the number of nights per spell separately, rather than jointly, which is easily seen from the conditional density:

(4)
$$\begin{aligned} f\left(n_{is}\right) &= P\left(s_i = 0\right)^{1\left(s_i=0\right)} \cdot \prod_{k=1}^{\infty} \left\{ P\left(s_i = k\right) \cdot \left[\prod_{l=1}^{k} P\left(n_{il} \left| n_{il} > 0\right.\right)^{1\left(s_i=l\right)} \right] \right\}^{1\left(s_i=k\right)} \\ &= \underbrace{\prod_{k=0}^{\infty} P\left(s_i = k\right)^{1\left(s_i=k\right)}}_{number\ of\ spells} \cdot \underbrace{\prod_{k=1}^{\infty} \left[\prod_{l=1}^{k} P\left(n_{il} \left| n_{il} > 0\right.\right)^{1\left(s_i=l\right)} \right]^{1\left(s_i=k\right)}}_{number\ of\ nights\ per\ spell} \end{aligned}$$

where we have for ease of exposition not explicitly accounted for conditioning on explanatory variables. n_{is} denotes the number of nights individual i spends in the hospital during spell s, s_i is the number of spells, $1(.)$ is an indicator function.

To analyse the *number of spells*, we use the negative binomial density.[14,15] This model assumes that the number of hospital spells of individual i is Poisson distributed, conditional on the Poisson parameter μ_i:

(5) $$P\left(s_i \left| \mu_i\right.\right) = \frac{\exp\left(-\mu_i\right)\mu_i^{s_i}}{s_i\,!}$$

The negative binomial regression model is then obtained by assuming that the Poisson parameter μ_i can be parameterized as an exponential function of the explanatory variables y_i and a gamma distributed random component (v_i):

(6) $$\mu_i = \exp\left(y_i^{'}\chi + v_i\right)$$

where χ is a vector of parameters to be estimated and v_i follows a gamma distribution with unit mean and variance α . It can be shown that the conditional mean and variance of the number of spells are then given by

(7) $$E\left(s_i \left| y_i;\alpha\right.\right) = \exp\left(y_i^{'}\chi\right)$$

(8) $$V\left(s_i \left| y_i;\alpha\right.\right) = E\left(s_i \left| y_i;\alpha\right.\right)\left[1+\alpha E\left(s_i \left| y_i;\alpha\right.\right)\right]$$

Equation (8) shows that the conditional variance is allowed to be larger than the conditional mean – a commonly observed characteristic of health care data – if $\alpha > 0$

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[14] We did not correct for censoring in the number of spells at 3 as it only concerns 44 individuals. Nor did we correct for censoring in the number of hospital nights during the last spell (i.e. ongoing hospitalizations during the time of the interview) since it only concerns 24 spells.

[15] We checked the performance of a two-part count data model consisting of a probit to explain whether there is at least one spell, and a truncated at zero negative binomial model explaining the number of spells. Based on the Akaike Information Criterion (i.e. 6163 and 6214 for, respectively, the negative binomial and the two-part model), we preferred the negative binomial regression model.

and $E\left(s_i \middle| y_i;\alpha\right)>0$. If $\alpha=0$, the conditional mean and variance are equal and the model reduces to the Poisson regression model.

We are not interested in the estimates of the parameters χ as such, but in the effect of the determinants y_i upon the number of spells s_i. Using (7), we summarize the effects of continuous and dummy variables (say y_{ik} and y_{id} respectively) as:

(9) $$\frac{E\left(s_i \middle| y_{i1},\ldots,y_{i,k-1},y_{ik}+1,y_{i,k+1},\ldots,y_{im};\alpha\right)}{E\left(s_i \middle| y_i;\alpha\right)}=\exp\left(\chi_k\right)$$

(10) $$\frac{E\left(s_i \middle| y_{i1},\ldots,y_{i,d-1},1,y_{i,d+1},\ldots,y_{im};\alpha\right)}{E\left(s_i \middle| y_{i1},\ldots,y_{i,d-1},0,y_{i,d+1},\ldots,y_{im};\alpha\right)}=\exp\left(\chi_d\right)$$

Equation (10) shows that the exponent of a coefficient of a dummy variable can be interpreted as the proportional change in the number of spells if the dummy goes from zero to one. Equation (9) shows that a similar interpretation can be given to the coefficient of a continuous variable, i.e. the exponent of the coefficient measures the proportional change in the number of spells resulting from a one-unit increase of the continuous variable.

The second variable, i.e. the *number of hospital nights per spell*, can only take strictly positive and integer values.[16] We therefore analyse this variable with the truncated at zero negative binomial regression model. The conditional density for the number of hospital nights per spell is written as:

[16] Note that the unit of analysis is here the spell (hence the subscript *il*), whereas it was the individual for the number of spells.

(11) $$P\left(n_{il} \left| n_{il} > 0, z_{il}; \alpha'\right.\right) = \frac{\exp\left(-\lambda_{il}\right)\lambda_{il}^{n_{il}}}{n_{il}!\left[1-\exp\left(-\lambda_{il}\right)\right]}$$

with Poisson parameter $\lambda_{il} = \exp\left(z_{il}^{'}\delta + \varpi_{il}\right)$, where z_{il} is the vector of explanatory variables[17], δ is a vector of parameters to be estimated, and ω_{il} follows a gamma distribution with unit mean and variance α'. Analogous to equations (9) and (10) we will present the estimation results in the form of exponentiated coefficients, which can be interpreted as the proportional increase in the *untruncated* number of nights.

The estimation results are shown in Table 3. All statistical inference is based on the 'sandwich estimator' of the covariance matrix and corrects for clustering at the household level. Again, we did include but do not report the regional (district) controls. The columns (1a) and (1b) give the results for the number of spells; columns (2a) and (2b) give the results for the number of nights per spell. In both cases we introduced a dummy indicating whether the individual was living in a household with at least one member having supplemental insurance (ins_family). In fact, we know that all common supplemental insurance policies in Belgium include coverage of household members (see data section). Recall that utilization refers to general and psychiatric hospitals, but excludes hospital spells for deliveries. The RESET-tests (p-values of 0.805 and 0.814 for the number of spells and the number of nights per spell respectively) do not point to misspecification (Peters, 2000), and the estimates of α show that the (truncated) negative binomial model is preferred to the (truncated) Poisson model.

[17] In the empirical exercise, we have only explanatory variables at the individual level. Nevertheless, the use of the *l* subscript is justified since we also include dummy variables for the second and third spell.

Table 3 about here

Let us first look at the results for the number of spells in the columns (1a) and (1b). First, the number of spells is smaller for the unemployed and for the smokers. These two effects weakly suggest some socio-economic bias (which would then not be captured by education and income, that do not play a significant role). Second, the health variables are significant in explaining the number of hospital spells. Having an acute or a chronic illness, or a poor level of self-assessed health, increases the number of spells and the same is true for 'worse physical functioning' as measured by SF-36. Third (and most importantly), the number of hospital spells is not related to whether the individual or one of his/her family members has supplemental health insurance for hospitalization.

Let us now turn to the estimation results for the number of nights per spell (columns 2a and 2b). We included in the model dummies for the second and third spell (the first spell is the reference category). These dummies are jointly insignificant, which gives some justification (i) for our assumption of independence between the data generation process of the number of spells and the number of nights per spell, and (ii) for assuming that the data generating process of the number of nights per spell is similar for each spell (instead of having a separate equation for each subsequent spell). Compared to columns (1a) and (1b), other determinants play a role now. We find that males, the elderly and the age category 30–40 spend more nights in hospital. Singles have more nights which might have to do with lack of family support. We further observe that an equivalent income above 80.000 BEF a month (about € 2.000) is correlated with fewer nights. The effect of the health variables is slightly weaker here than for the number of spells. Self-assessed health is not significant, but a BMI below 18 and SF-36 have significant and expected effects. When interpreting this finding, one should take into account that our dependent variable is the number of nights per spell and not the intensity of treatment.

The most striking result is the strongly negative effect of having a supplemental insurance on the number of nights per spell.[18] We do not find the slightest indication of moral hazard in the form of an increase in the number of days spent in the hospital. Remember that this is not surprising in the Belgian context, in which the supplemental insurance covers luxury services and the ambulatory treatment after having left the hospital. If supplemental insurance leads to a higher intensity (perhaps even a better quality) of care in one-person rooms, shorter spells are not really surprising. Note in this respect that many hospitals have a shortage of one-person rooms, and therefore no strong incentives to keep their patients for a longer period. Quite the contrary, if supplemental insurance is taken up by the better educated and higher-income groups, a shorter stay in single rooms may be good for the reputation of the hospital among the groups concerned.

Outpatient care

Let us now have a look at the effect of supplemental insurance on outpatient care consumption. As mentioned before, HIS contains information about the number of visits

[18] This result is very robust when we change the specification of the model by omitting some of the included variables.

to the general practitioner, the specialist, the emergency department, or the dentist during the past two months, about the number of spells in a day centre during the past year and about the number of prescribed and non-prescribed drugs used during the past two weeks. We estimated negative binomial regression models for each of these outpatient care categories, but the negative binomial model did not fit well for visits to the general practitioner, the specialist, and the number of prescribed and non-prescribed drugs.[19] For the latter four categories, we estimated a two-part model consisting of a probit model (Probit) (see equation (1)) and a truncated at zero negative binomial regression model (Negbin0) (see equation (10) without the l subscript), which fitted the data considerably better. The estimation results are presented in Table 4. Again, regional controls are included but not reported.

Table 4 about here

The results for the different categories speak for themselves and are generally in line with what could be expected a priori. Again, the results for the supplemental insurance dummy can easily be explained with the Belgian institutional background in mind. There is no effect on visits to a GP or to a specialist, and on consumption of prescribed pharmaceuticals. All these are covered in the compulsory system and there are no waiting lists, while supplemental insurance in general does not cover co-payments. Supplemental insurance has a positive effect on dentistry – remember that orthodontic treatment is only incompletely covered in the compulsory system. The lower tendency

[19] The p-values of the RESET-test (Peters, 2000) were 0.000 (gp, spec and med_p), 0.003 (med_np), 0.801 (emdep), 0.383 (dent), and 0.395 (daycentre).

to go to an emergency department and the higher tendency for the use of day centres are in line with the attitude towards the hospital system that also resulted in the shorter spells that were found in Table 3.

The endogeneity of the health insurance dummy

All our results in this section were derived within a model in which we assumed that the dummy on supplemental health insurance at the family level could be seen as an exogenous independent variable. In fact, correcting for endogeneity is not trivial in the count models that we used. However, we do not think that this invalidates our results. Our most important argument for that claim is that, compared to other econometric work in this area, we have used very rich information on the health status (and the lifestyle) of our respondents and it would be highly surprising indeed if there was much unobservable health variation left.[20]

Moreover, the statistical results do not suggest that there is a problem. First, the probit model in the section on supplemental insurance uptake gives hardly any evidence for adverse selection. Second, the insurance dummy is by far the most significant in the model for the number of nights per hospital spell, and its effect is strongly negative (contrary to what one would expect on the basis of the endogeneity hypothesis).

Finally, we have also experimented with a relatively simple model to correct explicitly for endogeneity, i.e. the bivariate probit model that jointly models the probability of at

[20] Note that the information that we used is much richer than the information that is available to the insurers when deciding about policies and premiums.

least one contact/night and the uptake of supplemental insurance (see e.g. Holly *et al.*, 1998). Neither for inpatient care, nor for the outpatient care categories, we could reject the null hypothesis of a zero correlation coefficient of the bivariate normal distribution.[21]

Conclusion

When analysing the effects of supplemental health insurance, it is essential to take into account the overall institutional background of the health care system. Both the take-up of supplemental insurance and the (supplemental) insurance effect on health care consumption will crucially depend on the specific features of the public (compulsory) system. Simplistic international comparisons may therefore be highly misleading. This general idea is well illustrated by our results for Belgium, a country in which the compulsory system has a very broad coverage, where there are no waiting lists in the public system and where supplemental insurance (at least until now) does not buy better health care quality. Moreover, supplemental insurance mainly relates to extra-billing, applied to patients who opt for a single room in the hospital.

This institutional setting leads to specific predictions which are well corroborated in our empirical analysis. There are only very weak indications of adverse selection in the

[21] The lowest p-value was obtained for the bivariate probit model for prescribed drugs where we included all regressors in the supplemental insurance take-up equation and excluded all regressors except male, age, income and education from the utilization equation, i.e. 0.081. For other health care categories or other assumptions on the exclusion restrictions, we always got a higher p-value.

take-up of supplemental insurance, but there is a strong socio-economic gradient. Moreover, a count model for hospital care that explicitly accounts for the number of spells shows that supplemental insurance has no effect on the number of hospital spells and a significantly negative effect on the number of nights per spell. The latter result is in line with the finding of socio-economic stratification in supplemental insurance and in the ensuing choice of rooms. The results for outpatient care also confirm the theoretical predictions: no effect on the number of visits to the general practitioner or the specialist; a positive effect on dentistry (including orthodontics, which are not covered in the compulsory system); and a tendency to go for a qualitatively better "use" of the hospital sector (more visits to day centres, less visits to emergency departments).

In Belgium, therefore, supplemental insurance as such can most probably not explain the pro-rich inequity in the use of specialist care. However, the overall pattern of socio-economic bias in the take-up of supplemental insurance raises subtle questions about socio-economic differences in the quality of treatment. At this stage, we have no indications that the quality of medical treatment depends on the type of room and hence *de facto* on the socio-economic group (van de Glind *et al.*, 2007). But what is the relative importance of medical and non-medical factors in defining quality? And how to define what should be included in the compulsory coverage and what can be left to private decisions? The Belgian experience suggests that such more subtle questions should also be considered when analysing the growing importance of supplemental insurance.

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Table 1: summary statistics of variables in HIS

Variable	Description	Obs	Mean	Stdev
Health care consumption – inpatient care				
hospspell	number of spells at hospital (1 year)	6386	0.186	0.493
nightspell	number of hospital nights per hospital spell	776	8.360	13.867
Health care consumption – outpatient care				
gp	number of times visited GP in past 2 months	6309	0.932	1.518
spec	idem for specialist	6327	0.456	1.274
emdep	idem for emergency department	6390	0.034	0.201
dent	idem for dentist	6334	0.269	0.903
daycentre	number of visits to a day centre (1 year)	6383	0.040	0.231
med_p	number of prescribed drugs (past 2 weeks)	6441	1.398	1.879
med_np	idem for non-prescribed drugs	6441	0.475	0.885
Demographic variables				
male	1 for male, 0 for female	6441	0.491	0.500
age 15-19	15 <= age <= 19	6441	0.005	0.069
age 20-24	20 <= age <= 24	6441	0.049	0.217
age 25-29	25 <= age <= 29	6441	0.081	0.274
age 30-34	30 <= age <= 34	6441	0.104	0.305
age 35-39	35 <= age <= 39	6441	0.116	0.321
age 40-44	40 <= age <= 44 [*]	6441	0.107	0.310
age 45-49	45 <= age <= 49	6441	0.101	0.302
age 50-54	50 <= age <= 54	6441	0.095	0.293
age 55-59	55 <= age <= 59	6441	0.069	0.254
age 60-64	60 <= age <= 64	6441	0.067	0.251
age 65-69	65 <= age <= 69	6441	0.067	0.251
age 70-74	70 <= age <= 74	6441	0.055	0.227
age 75-79	75 <= age <= 79	6441	0.047	0.211
age: 80-84	80 <= age <= 84	6441	0.020	0.141
age: 85+	85 <= age	6441	0.016	0.124
single	1 if single without children, 0 otherwise	6441	0.179	0.383
single_child	idem for single with children	6441	0.032	0.177
couple	idem for couple without children	6441	0.328	0.470
couple_child	idem for couple with children [*]	6441	0.296	0.456
complex	idem for complex household	6441	0.165	0.371
Belgian	1 for Belgian, 0 otherwise [*]	6441	0.938	0.241
EUmember	idem for non-Belgian EU member	6441	0.046	0.209
nonEU	idem for non-Belgian non-EU member	6441	0.016	0.126
Socioeconomic variables				
eqinc: 0-20	0 BEF<=eqinc<20.0000 BEF	6441	0.038	0.191
eqinc: 20-40	20.000 BEF<=eqinc<40.0000 BEF [*]	6441	0.388	0.487
eqinc: 40-60	40.000 BEF<=eqinc<60.0000 BEF	6441	0.359	0.480
eqinc: 60-80	60.000 BEF<=eqinc<80.0000 BEF	6441	0.159	0.366
eqinc: 80-100	80.000 BEF<=eqinc<100.0000 BEF	6441	0.036	0.187
eqinc: 100+	100.000 BEF<=eqinc	6441	0.019	0.138
no_primary	1 if no or primary school, 0 otherwise	6441	0.182	0.386
secondary	1 if secondary school, 0 otherwise [*]	6441	0.525	0.499
higher	1 if higher education, 0 otherwise	6441	0.203	0.402
university	1 if university, 0 otherwise	6441	0.076	0.265
otherdipl	1 if other diploma, 0 otherwise	6441	0.014	0.116
employee	blue/white collar, civil servant, paid work=other, interrupted paid work without providing last work category [*]	6441	0.497	0.500
self-employed	small self-employed, farmer, professional, CEO, wholesale dealer	6441	0.066	0.248
retired	(early) pensioned	6441	0.254	0.435
sick	disabled or invalid	6441	0.028	0.165

unemployed	unemployed	6441	0.063	0.242
other not working	housework, student, not working	6441	0.093	0.290
preftreat	1 if reduction of co-payments, 0 otherwise	6441	0.123	0.328
sport	1 if practising sport, 0 otherwise	6441	0.659	0.474
smoke_dai	1 if daily smoking, 0 otherwise	6441	0.254	0.435
smoke_occ	1 if smokes occasionally, 0 otherwise	6441	0.042	0.201
smokerno	1 if not smoking, 0 otherwise [*]	6441	0.704	0.457
alcohol	1 if drinking alcohol, 0 otherwise	6441	0.819	0.385
Health variables				
sahverygood	1 if SAH very good, 0 otherwise	6441	0.225	0.417
sahgood	1 if SAH good, 0 otherwise [*]	6441	0.521	0.500
sahfair	1 if SAH fair, 0 otherwise	6441	0.211	0.408
sahpoor	1 if SAH poor, 0 otherwise	6441	0.038	0.191
sahverypoor	1 if SAH very poor, 0 otherwise	6441	0.005	0.070
bmi_018	body mass index<18	6441	0.515	0.500
bmi_1825	18<=body mass index<25 [*]	6441	0.338	0.473
bmi_2530	25<=body mass index<30	6441	0.128	0.334
bmi_30+	30<=body mass index	6441	0.307	0.461
chronic	1 if chronic or handicap, 0 otherwise	6441	0.019	0.137
GHQ12	GHQ-12 score	6441	1.289	2.398
SF36	SF-36 score	6441	85.891	24.080
acute	at least one acute disease	6441	0.091	0.287
chron	at least one chronic disease	6441	0.657	0.475
compl_f1	complaints, measuring mood	6441	1.298	0.508
compl_f2	complaints, measuring pain	6441	1.540	0.695

Note: sampling weights of the HIS were used.

Table 2: determinants of supplemental insurance in Belgium in 2001

Variable		Variable	
male	-0.022	no_primary	-0.120**
age 15-19	-0.050	higher	0.098**
age 20-24	-0.091+	university	0.055+
age 25-29	-0.093*	otherdipl	0.026
age 30-34	-0.032	self-employed	-0.071*
age 35-39	-0.026	retired	-0.095*
age 45-49	-0.003	sick	-0.123*
age 50-54	0.117**	unemployed	-0.227**
age 55-59	0.097*	other notworking	-0.179**
age 60-64	0.198**	preftreat	-0.057+
age 65-69	0.124*	sport	0.046*
age 70-74	0.010	smoke_dai	-0.043*
age 75-79	0.027	smoke_occ	-0.076+
age: 80-84	-0.040	alcohol	0.033
age: 85+	-0.174+	sahverygood	-0.080**
single	-0.088**	sahfair	-0.060*
single_child	0.044	sahpoor	-0.092+
couple	-0.022	sahverypoor	-0.034
Complex	-0.056+	bmi_018	0.072
EUmember	-0.051	bmi_2530	0.032+
nonEU	-0.200**	bmi_30more	-0.022
eqinc: 0-20	-0.192**	chronic	0.013
eqinc: 40-60	0.058*	GHQ12	-0.003
eqinc: 60-80	0.077*	SF36	-0.000
eqinc: 80-100	0.142*	acute	0.042
eqinc: 100+	0.074	chron	0.003
Observations	6441	compl_f1	-0.002
Pseudo R2	0.134	compl_f2	-0.001

Note: 38 regional (district) control dummies are not reported. Effects are computed using on equation (2) and (3). Sampling weights of the HIS were used. Statistical inference is based on robust covariance matrices that allow for clustering at the household level: +: significant at 10%; *: significant at 5%; **: significant at 1%; shaded area: jointly not significant at 5%.

Table 3: determinants of hospital spells and nights per spell in Belgium in 2001

variable	number of spells (1a)	number of nights per spell (2a)	variable	number of spells (1b)	number of nights per spell (2b)
male	0.922	1.475**	self-employed	0.840	0.557
age 15-19	1.019	1.683	retired	1.365	0.881
age 20-24	1.760*	1.247	sick	1.355	1.291
age 25-29	1.105	0.960	unemployed	0.599*	1.365
age 30-34	1.129	1.888+	other not working	0.970	1.111
age 35-39	0.818	2.095+	preftreat	0.888	1.032
age 45-49	1.153	0.929	sport	1.143	1.178
age 50-54	1.019	1.953*	smoke_dai	0.824*	0.984
age 55-59	0.890	1.115	smoke_occ	0.572*	0.919
age 60-64	0.721	2.836**	alcohol	0.984	0.751*
age 65-69	0.779	2.535*	sahverygood	0.787+	0.882
age 70-74	0.614	2.852*	sahfair	1.165	1.040
age 75-79	0.798	3.342**	sahpoor	1.754**	0.927
age: 80-84	0.624	2.262+	sahverypoor	1.230	0.865
age: 85+	0.367*	2.069	bmi_018	1.393	2.297**
single	0.836	1.652*	bmi_2530	1.157	1.262
single_child	0.970	0.937	bmi_30+	1.119	1.334
couple	0.769+	0.943	chronic	1.409**	1.152
complex	0.706*	1.059	GHQ12	1.033	1.010
EUmember	0.749	0.938	SF36	0.990**	0.992**
nonEU	1.016	0.913	acute	1.192+	0.821
eqinc: 0-20	0.954	0.878	chron	1.576**	1.018
eqinc: 40-60	0.979	0.804	compl_f1	0.937	1.205+
eqinc: 60-80	0.928	1.087	compl_f2	1.103	0.974
eqinc: 80-100	1.012	0.447*	ins_family	1.015	0.585**
eqinc: 100+	0.533+	0.354**	spell2		0.886
no_primary	0.854	0.726*	spell3		0.802
higher	0.881	0.963	alpha	0.584**	1.072**
university	0.689*	1.190	Observations	6386	776
otherdipl	1.008	0.646	Pseudo R2	0.090	0.083

Note: 38 regional control dummies were added. Effects are computed using equations (9) and (10). Sampling weights of the HIS were used. Statistical inference is based on robust covariance matrices that allow for clustering at the household level: +: significant at 10%; *: significant at 5%; **: significant at 1%; shaded area: jointly not significant at 5%.

Table 4: determinants of other health services in Belgium in 2001

	gp		spec		emdep	dent	day	med_p		medp_np	
	Probit	*Negbin0*	*Probit*	*Negbin0*			**centre**	*Probit*	*Negbin0*	*Probit*	*Negbin0*
male	-0.079**	0.995	-0.072**	1.184	1.241	0.719**	0.790	-0.211**	0.775**	-0.124**	0.966
age 15-19	-0.264*	1.121	-0.116	0.254	0.813	0.045**	0.000**	0.176	1.412	-0.075	0.502
age 20-24	0.018	1.046	0.054	2.688**	3.617**	1.321	2.137	0.048	0.836	0.007	0.545+
age 25-29	0.009	1.008	0.087**	1.384	2.911**	0.833	1.216	-0.039	0.932	0.069+	0.667
age 30-34	0.039	0.803	0.048	0.943	2.285*	0.785	1.471	-0.032	1.006	0.046	0.830
age 35-39	0.013	0.798	0.011	0.894	0.857	1.058	0.985	-0.030	0.963	0.007	1.295
age 45-49	-0.057	1.043	0.039	0.753	0.971	0.888	1.203	0.088*	1.018	-0.026	0.829
age 50-54	0.006	0.824	0.034	0.764	0.482	1.017	1.081	0.177**	1.111	-0.030	1.035
age 55-59	0.092*	0.832	0.051	0.452*	1.089	0.833	0.840	0.174**	1.219+	-0.109**	0.864
age 60-64	0.058	0.878	-0.015	0.364**	0.385+	0.770	0.432+	0.212**	1.146	-0.094*	0.955
age 65-69	0.121*	0.913	0.025	0.309**	0.224*	1.059	0.484	0.221**	1.219	-0.100*	1.204
age 70-74	0.095	0.840	0.010	0.205**	0.661	0.803	0.428	0.281**	1.286*	-0.130**	1.101
age 75-79	0.176**	0.679+	-0.030	0.149**	0.492	0.774	0.450	0.305**	1.273+	-0.157**	0.688
age: 80-84	0.300**	0.988	-0.089+	0.071**	0.038**	0.357+	0.221+	0.319**	1.235	-0.139*	0.256*
age: 85+	0.260**	0.885	-0.129**	0.243*	0.924	0.208+	0.011**	0.174+	1.051	-0.238**	0.288*
single	0.008	1.175	-0.023	1.158	1.302	0.752+	1.510	-0.021	1.073	0.036	1.055
single_child	0.033	1.796**	-0.017	1.110	0.563	1.697+	2.119+	-0.044	1.427*	0.020	0.720
couple	0.031	1.106	-0.026	1.058	1.080	0.949	1.294	0.007	1.084	0.009	0.793
complex	-0.024	0.948	-0.052*	0.828	0.748	0.964	0.803	-0.066*	1.013	-0.059*	1.069
EUmember	-0.024	1.001	0.003	0.741	1.166	1.049	0.223**	0.013	1.001	-0.020	0.951
nonEU	-0.140*	2.438**	0.043	0.438*	1.578	2.976**	0.319	0.020	1.012	-0.093*	0.857
eqinc: 0-20	-0.058	0.928	-0.053	1.333	0.695	0.802	1.066	-0.070	0.930	-0.035	0.778
eqinc: 40-60	-0.021	0.987	0.026	0.835	0.819	1.107	0.841	0.043+	1.061	0.018	1.079
eqinc: 60-80	-0.027	1.059	0.034	0.991	0.712	1.438*	1.026	0.046	1.116	0.039	1.171
eqinc:80-100	0.021	0.664+	-0.003	0.990	1.213	0.765	0.749	0.079+	1.100	-0.014	1.028
eqinc: 100+	0.104+	1.200	0.017	0.426+	0.391	0.813	0.612	0.122+	1.071	-0.013	0.783
no_primary	0.044	1.047	-0.047*	1.118	0.776	0.673**	0.894	-0.032	0.971	-0.028	0.401**
higher	-0.058*	0.868	0.043*	0.950	0.801	1.003	0.919	-0.026	1.031	0.021	1.229
university	-0.076*	0.923	0.010	0.959	0.683	1.099	0.893	-0.020	1.087	0.043	1.622*
otherdipl	0.089	0.831	0.026	0.648	1.114	0.594	0.459	-0.019	1.071	0.035	1.524
self-employed	-0.011	0.824	0.001	1.006	1.973+	1.100	0.785	-0.003	0.992	0.046	1.337
retired	-0.020	0.839	0.050	1.987*	1.289	1.188	1.425	0.046	1.092	0.029	0.958
sick	-0.023	1.074	0.108*	0.972	0.836	2.063*	1.588	0.097	1.192*	-0.035	0.378**

unemployed	-0.104**	0.891	-0.021	1.362	1.436	1.016	0.605	-0.026	1.166	0.026	1.116
other not working	-0.099**	0.931	-0.034	1.954*	0.870	1.107	1.065	-0.072*	1.059	0.022	1.083
preftreat	0.046	1.118	0.023	0.812	1.264	0.980	0.804	0.003	1.069	0.023	1.712*
sport	0.037+	0.861+	-0.010	1.197	1.273	1.432**	1.135	0.030	0.946	0.009	0.971
smoke_dai	-0.036+	0.931	-0.038*	0.844	1.141	0.956	0.761	-0.040+	0.958	-0.022	0.983
smoke_occ	-0.035	0.803	-0.027	0.432**	0.627	0.873	0.541	0.038	0.941	0.010	1.054
alcohol	-0.019	0.879+	0.034+	0.822	1.248	1.215	1.506	0.005	0.976	0.017	0.889
sahverygood	-0.143**	0.795+	-0.052**	1.068	0.689	0.781*	0.760	-0.119**	0.749**	-0.055**	1.074
sahfair	0.113**	1.396**	0.074**	1.344+	1.049	1.300+	1.084	0.133**	1.264**	-0.007	0.836
sahpoor	0.211**	1.621**	0.129**	1.219	1.070	0.881	2.668*	0.223**	1.334**	-0.039	0.732
sahverypoor	0.193+	1.591**	0.024	0.564	1.903	1.849	0.000**	0.275*	1.104	-0.093	0.558
bmi_018	-0.113	1.355	0.013	1.390	0.495	1.067	0.779	-0.018	1.031	0.048	2.327+
bmi_2530	-0.007	1.037	-0.007	0.680**	0.961	1.157	1.002	0.002	0.976	0.007	0.721*
bmi_30+	0.055+	1.121	-0.022	0.626**	1.760*	0.798	0.721	0.072*	1.036	-0.025	0.754
chronic	0.111**	1.120	0.061**	1.478*	1.168	0.989	0.923	0.183**	1.224**	-0.025	1.098
GHQ12	0.015**	1.024	0.010**	1.171**	1.147**	1.007	0.948	0.007	1.013	0.007+	0.972
SF36	-0.002**	0.995**	-0.001**	0.986**	0.992+	1.002	0.991*	-0.001	0.995**	0.000	0.997
acute	0.090**	1.393**	-0.003	0.979	0.937	1.023	1.074	0.048	1.338**	0.102**	1.549**
chron	0.181**	1.339*	0.054**	0.917	1.205	0.870	2.981**	0.254**	1.702**	0.102**	1.722**
compl_f1	-0.027	1.020	-0.046**	0.775+	0.643+	0.983	1.209	0.033	1.105**	-0.000	1.117
compl_f2	0.011	1.061	0.043**	1.102	1.024	0.954	1.203	0.034+	1.067*	-0.002	1.529**
ins_family	0.034	1.014	0.014	1.156	0.848	1.414**	1.533*	0.023	1.083+	-0.014	0.951
alpha		0.510**		1.278**	1.120*	3.967**	2.893**		0.075**		1.723**
Observations	6309	3084	6327	1551	6390	6334	6383	6441	3684	6441	2071
Pseudo R2	0.191	0.852	0.120	0.080	0.117	0.047	0.110	0.291	0.140	0.084	0.079

Note: 38 regional control dummies were added. Effects in the columns emdep, dent, daycentre, and Negbing0 are calculated using equation (9) and (10). The effects in the columns Probit are calculated using equation (2) and (3). Sampling weights of the HIS were used. Statistical inference is based on robust covariance matrices that allow for clustering at the household level: +: significant at 10%; *: significant at 5%; **: significant at 1%; shaded area: jointly not significant at 5%.