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Healthy, Wealthy and Insured? The Role of Self-Assessed Health in the Demand for Private Health Insurance*

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Abstract
Both adverse selection and moral hazard models predict a positive relationship between risk and insurance; yet the most common finding in empirical studies of insurance is that of a negative correlation. In this paper we investigate the relationship between *ex ante* risk and private health insurance using data from the 2001 Australian National Health Survey (NHS). The Australian health system provides a setting where the relationship between risk and insurance is more transparent than many other institutional frameworks; private health insurance is not tied to employment; community rating limits the actions of insurers; and private coverage is high for a country providing free public hospital treatment. We find a strong positive association between self-assessed health and private health cover. We use the detailed information available in the NHS to investigate whether we can identify factors responsible for the negative correlation between risk (lower SAHS) and insurance cover. However this relationship persists despite the inclusion of a large set of controls for personal and socio-economic characteristics, risk-related behaviours, objective health measures and an index of mental health. The opposite effect of self-assessed health and long-term conditions on coverage suggests that SAHS is capturing factors such as personality or risk preferences.

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1) Introduction

Both adverse selection and moral hazard models predict that riskier individuals are more likely to be insured and purchase contracts with higher cover; yet the most common finding in empirical studies is that of a negative correlation between risk and insurance coverage (e.g. Cawley and Philipson [1], Chiappori et al [2], Chiappori and Salanie [3], Ettner [4], Monheit and Vistnes [5], Propper [6], and Shmueli [7]). Furthermore, the fact that this empirical result is found for different types of insurance (e.g. car, health, life) and in different countries (e.g. France, US, UK, Israel) suggests a fundamental relationship involving private information, consumer preferences and provider behaviour. The most common explanation for the counterintuitive result offered in recent papers is that of heterogeneity in risk aversion; the degree of risk aversion is negatively correlated with risk class [8].

In this paper we provide information on the relationship between ex ante risk and private health insurance (PHI) in Australia. Several features make the PHI market in Australia particularly interesting in this context. There is universal access to a system of high-quality public hospitals yet the PHI coverage for private hospital treatment is high (about 45%); community rating excludes the tailoring of premiums to individual characteristics (except for age to a limited extent); and health insurance contracts are not tied to employment. We would expect the adverse selection effects to be stronger in the presence of a universal public insurance system such as the one in Australia [9]. Community rating implies that providers have limited opportunities to exclude or separate different risk types. Finally, since health insurance is not provided by or through employers, there is no selection into employment to consider in studying health insurance coverage. Hence, the demand for insurance in this market is simplified and the possibility of strategic behaviour by insurers is reduced.

We look at the demand for private health insurance in Australia using the National Health Survey (NHS) 2001. The NHS is a large representative survey containing information on demographic and socio-economic characteristics including income, employment, and labour force status, health-related aspects of lifestyle and different measures of health (health status, long term medical conditions and recent injuries). The presence of a large number of controls on socio-economic factors and health related variables is important in isolating the role of risk. Previous studies of the Australian private health insurance include Cameron et al [10], Savage and Wright [11], Barrett and Conlon [12]and Ellis and Savage [13].

Several measures of health are considered in the analysis, but we focus mainly on the relationship between insurance purchase and self assessed health status (SAHS). SAHS is often used as a measure of risk on the grounds that it is a good predictor of mortality and morbidity (Idler and Benyamini [14], McCallum et al [15], Hurd and McGarry [16]) and more general continuous measures of health Gerdtham et al [17], Wagstaff and van Doorslaer [18]). Since SAHS is arguably more likely to capture the social and mental aspects of well-being, it is also consistent with a broader notion of health than more objective measures such as the presence of long-term conditions. SAHS may also be more sensitive to variation over the whole distribution of health than objective measures such as serious long-term conditions.

Most previous studies of insurance look at the relationship between insurance and measures of ex post risk or utilisation and in that case the correlation between insurance and risk should capture both adverse selection and moral hazard effects. In our analysis, we include controls for the presence of detailed long term conditions and regard SAHS as capturing variations in health due to other factors such as frailty, senescence, psycho-social effects, the incidence of early, or simply undiagnosed conditions [19]. Self assessed health is interpreted as ex ante risk (we address the issue of timing of the purchase of insurance below) and hence the relationship should reflect adverse selection but not moral hazard.

Since insurers cannot base provision or features of the insurance contract on personal characteristics, the relationship between observed characteristics of the consumer and the decision to purchase insurance reflects consumer preferences rather than insurers' reaction to adverse selection. In other words, we do not have to condition the analysis on observable (to the insurer) risk-related consumer characteristics as in Chiappori et al [2], and Finkelstein and McGarry [8]. There are two exceptions to this: there is a waiting period of one year for insurance claims by purchasers for pre-existing conditions, and reforms introduced in 2000 allowed insurers to base premiums on age in a limited and regulated fashion for new entrants. We include long-term conditions and age in the analysis to control for the possibility of selection by insurers on these characteristics. We also estimate separate models for long-term and recent purchasers of insurance.

We estimate a series of probit regressions with the purchase of insurance as the dependent variable. Without conditioning on any other factors, we find the not unexpected negative empirical relationship between risk (lower SAHS) and the probability of insurance. This relationship is strong, monotonic and significant. A change from poor to excellent SAHS increases the average probability of insurance by 27 percentage points (ppts). After controlling for demographics, income and other socio-economic variables, the relationship is reduced somewhat but remains monotonic and significant. Adding risk related behaviours (smoking, drinking, exercise and body mass index) also reduces but does not eliminate the relationship between risk and insurance. With all controls included, the relationship remains monotonic and significant but the difference in probabilities falls from 27 to 9 ppts. We conduct sensitivity analysis estimating models on different subsamples, including a mental health index, and conditioning on the time of purchase. The results remain robust.

One of the interesting results is the different impact of long-term conditions on self-assessed health and insurance: the presence of long-term conditions lowers SAHS and increases the probability of insurance coverage. In addition we find that risky behaviours are associated with less insurance and lower SAHS. This suggests that the relationship between SAHS and insurance cover is dominated by the correlation between SAHS and more general personality traits rather than ex ante health risk per se. In this sense our study supports the hypothesis that unobserved risk aversion is generating the empirical relationship between insurance and risk.

The paper is organized as follows. A brief description of the institutional aspects of the private health insurance market in Australia is provided in the next section. This is followed by a discussion of the data. Section 4 discusses the models and section 5, the empirical results. Finally, concluding remarks are offered in section 6.

2) Institutional Framework

All Australian residents are entitled to free public hospital treatment anywhere in the country. Public patients treated in public hospitals forego the choice of medical provider and are treated by specialists paid by the hospital. Patients covered by private insurance have access to private hospitals and private treatment in public hospitals. Private patients have choice over their medical provider and can face shorter waiting times for many procedures. Private health insurance can also be used to cover other procedures and items such as prostheses and devices provided to private in-patients, ancillary services which include dental care, allied health services and complementary care. Private inpatients are funded by a mix of private insurance, out-of-pocket payments and public subsidy to medical services.

Insurers offer a menu of contracts and these include a waiting time for treatment of pre-existing conditions. Insurance funds (with the exception of a few restricted membership funds) must accept all purchasers for each policy type offered. Until recently, premiums were community-rated and could not be tailored to particular individuals. Annual premiums vary depending upon the extent of cover, the front-end deductible and the state of residence. All increases in premiums must have government approval and applications for increases are considered once each year. There is also a reinsurance pool that redistributes between funds on the basis of the share of the insured population aged over 65 and the number of long hospital stays. Although we would expect insurers to try to attract a favorable selection of clients with the packages they offer, competition for clients also means offering a broad range of services. Also, we expect the profit motive to be somewhat lessened in the Australian private health insurance market as currently over 85% of the insurance companies are non-profit funds owned mutually by policy holders.

Beginning in 1997 the government introduced a series of incentives to increase private health insurance coverage in order to take pressure off the public hospital system. The reforms were a reaction to the steadily declining membership level in private health insurance which had fallen to around 30% in the late 1990s. The reforms included a 30% subsidy to insurance premiums, a tax surcharge for the high-income uninsured and Lifetime Health Cover. The last policy regulated a premium increase of 2% for every year of age over 30 (up to a maximum of 70%) for those who joined after July 2000. The proportion of individuals covered by private insurance increased to about 45% in late 2000.

The strict regulation of premiums suggests limited scope for screening by insurers. However, screening is still possible through the package of treatments offered in the private sector. There is some evidence to support this conjecture. Private hospitals attract relatively low cost consumers and the length of stays for similar procedures is lower in private than public hospitals. [20, Supplementary Tables S8.1 and S8.2]. There is anecdotal evidence that patients with co-morbidities, who are expected to require more complex and longer-term care, are discouraged from admission to private hospitals despite insurance coverage. (These decisions are usually made by the physicians). Contracts between insurers and private hospitals can also specify maximum lengths of stay for particular procedures. Longer stays then become the financial responsibility of the private hospital and the patient. In such an environment individuals with longer expected hospital stays might not find existing insurance contracts attractive and choose

not to purchase cover. Also waiting times for pre-existing conditions might reduce the value of the private insurance contract for those consumers with previously diagnosed long-term conditions requiring treatment.

3) Data

The 2001 Australian Bureau of Statistics (ABS) National Health Survey is a representative sample of 17,918 private dwellings across Australia. Within each household, information was gathered concerning one adult (age greater than 18) nominated by the household, all children aged 0 – 6 years, and one child aged 7 – 17 years. Trained ABS interviewers conducted personal interviews with the nominated adult. A total of 26,862 confidentialised person records are included in the data set.

The survey collected information on health status, long term medical conditions and recent injuries, use of health services and medications, health-related aspects of lifestyle (smoking, alcohol consumption, exercise and body mass index), demographic and socio-economic characteristics including employment, income, and labour force status. From the initial sample of 26,862 individuals we delete observations corresponding to persons aged 18 or less, dependents, and those with missing information for SAHS. Since we study the purchase of health insurance, it is not appropriate to consider children and other dependents as independent observations. The remaining sample consists of 17,694 observations.

There is a considerable number of missing values for income, either personal or for the person's income unit. (An income unit consists of a single adult or couple, with or without dependent children, living in the same dwelling.) Missing income data is not unusual for general household surveys not specifically designed to elicit information on income or wealth. In our analysis sample, 7% of the observations have missing values for personal income and 18% for income unit income. To avoid selection bias, we do not exclude these observations but rather include them in the analysis with the use of dummy variables. Specifically, two dummy variables take on the value of one for the observations with missing information on personal and other income respectively. For those observations, income values are set at the overall mean for the variable, hence the coefficients on the dummy variables measure shifts around the mean. Sensitivity checks are conducted on this issue.

The question eliciting information on SAHS is formulated as follows: "In general, would you say that your health is Excellent, Very Good, Good, Fair or Poor?" Only one category can be chosen. Table 1 presents sample proportions by SAHS categories. Almost 63% of the respondents place themselves in the good or very good categories. Only 5% consider themselves in poor health, however given the large sample size, this still amounts to over 900 observations.

Table 1 also provides sample proportions by insurance cover. Private health insurance status indicates cover for private treatment in hospital. A small number of households have cover for ancillary services without hospital cover (less than 3% of our sample). Since we interpret the results in terms of access to private treatment in hospital, these individuals are classified as uninsured. Table 1 shows that just over 47% of the sample are insured. The raw data also show that insurance coverage increases with good health.

Of those who declare themselves in excellent health 54% are covered, while only 27% of those in poor health have insurance. The relationship is monotonic. In the following analysis, we are interested in whether this relationship can be reversed by adding controls for personal, economic and health-related characteristics.

Table 1 near here

4) Literature and Modeling Approach

The basic model of demand for health insurance is the same as for other forms of insurance. Generally, health insurance is treated as a consumer good whose value lies in smoothing consumption across risky states. Adverse selection and moral hazard play an important role in the modeling of the demand for private health insurance. Adverse selection refers to the case where individuals differ according to their risk (of ill health) and when faced with the same menu of insurance options, riskier persons are more likely to purchase insurance or purchase higher coverage since the expected benefits are greater [21]. We expect individuals in worse health to be more likely to purchase insurance ceteris paribus since they have greater expected use of the health care sector and greater health-related expenditures.

Simple models of self-selection support this intuition [3]. For example in models with two risk types, a separating equilibrium would show that insurance contracts taken up by low risk individuals have low premiums and high co-payments as opposed to the contracts chosen by high risk types, characterized by high premiums and low co-payments. These models also predict the likelihood of incomplete markets in equilibrium since the low risk individuals may be driven out of the market. This is more likely in a system that has a universal public insurance system such as that in Australia. Low-risk types may prefer the public system to a private contract offering incomplete insurance [9].

Moral hazard effects occur after the purchase of insurance and refer to the consumers' change of behavior in such a way as to alter the distribution of probabilities across health states. Individuals who are insured have lower costs in the ill health states and take fewer precautions or invest less in preventative measures. This follows the general microeconomic treatment of moral hazard rather than the alternative definition found in Pauly [22] and frequently adopted in the health economics literature.

We focus on the relationship between insurance purchase and self assessed health status, treating SAHS as an ex ante measure of risk. Adverse selection would predict a positive relationship between risk (lower SAHS) and probability of insurance cover.

Variables measuring SAHS are usually interpreted as objective measures of health and are often treated simply as another personal characteristic. However some problems with the use of SAHS have emerged. Evidence of recalibration, or scale of reference bias, has been found in health economics studies Daltroy et al [19], Lindeboom and van Doorslaer [23]. This problem refers to individuals with the same level of true health reporting different SAHS on a simple scale because of differences in the interpretation of the thresholds and the categories of health levels. For example, individuals may increase their

self-assessed health with the length of time following the diagnosis of a serious condition. Also individuals may base their reports on very different comparison groups depending on their culture, peer group, education and income level. This makes the interpretation of the SAHS variable and its impacts problematic.

A separate problem with the use of SAHS is the amount of measurement error it is likely to contain. Framing and the mode of the questionnaire have been found to be particularly important in determining individuals' answers to this question. Studies on this aspect of SAHS are Crossley and Kennedy [24] and Clarke and Ryan [25] The results from the literature on recalibration and measurement errors are still too general to provide an unambiguous prediction of the likely bias caused by these problems in the context of our study, however the classical errors in variables theory would suggest that the effects of SAHS on the demand for insurance are likely to be attenuated. In other words, due to the problems inherent in the measurement of SAHS, we would expect the empirical relationship found between health risk and insurance to understate the true relationship.

In most of the empirical literature, the relationship between risk and demand for insurance is found to be in the opposite direction to the predictions from adverse selection and moral hazard models. This is found in health care settings (health insurance in the US: Monheit and Vistnes [5] and Ettner [4]); health insurance in the UK: Propper [6]; health insurance in Israel: Schmueli [7]; long-term care in US: Finkelstein and McGarry [8]) and other insurance markets (life insurance: Cawley and Philipson [1]; and car insurance in France: Chiappori et al [2]). There are also examples where the expected positive correlation has been found (for example Finkelstein and Poterba [26] in the case of annuities).

The presence of a counterintuitive negative relationship between health risk and insurance has been explained in two ways. First, the measure of risk (in our case SAHS) may capture individual heterogeneity not otherwise controlled for by explanatory variables. The second hypothesis is based on a model of screening: insurers have access to instruments (prices and more generally policy characteristics) that allow them to attract a favourable selection of clients [7]. In the case of health insurance, evidence for this type of behaviour has been found in the US by Ellis and McGuire [27].

Our empirical strategy is similar to that used by Ettner [4] who investigates the presence of adverse selection in the utilization of health care as well as the purchase of private insurance. We begin with a simple model containing only SAHS dummy variables and attempt to eliminate the counterintuitive relationship between SAHS and insurance coverage by adding explanatory variables in order to control for observed sources of heterogeneity across individuals. To prevent or lessen the chance that omitted variables are driving the observed correlation between insurance and SAHS, we include a large number of controls in the demand for insurance. Furthermore, we believe that the inclusion of long term conditions, co-morbidities (the number of long-term conditions) and age should control for much of the possible selection by insurers since these are the likely (observable) characteristics also used by insurers to predict health care costs. For example, one would expect an older person with several long-term conditions to present a higher risk of needing long-term care when entering hospital for treatment.

Since our focus is on the SAHS coefficients, we are not concerned with multicollinearity between other explanatory variables. If the positive relationship between higher self-assessed health and the probability insurance disappears because of the correlation with other controls, we will be able to say something about the source of the counterintuitive SAHS effects by considering the variable(s) responsible for eliminating the effect.

The demand for private health insurance for an individual is modelled as:

$$I_i^* = \beta' X_i + \gamma' S_i + \varepsilon_i \qquad \begin{cases} I_i = 1 \text{ if } I_i^* > 0 \\ I_i = 0 \text{ otherwise} \end{cases} \qquad (1)$$

where I_i^* is a continuous and latent variable measuring the net benefits of private health insurance, I_i is the observed insurance coverage, S_i denotes the vector of SAHS dummies, X_i is a vector of characteristics, β and γ are vectors of coefficients, ε_i measures unobserved factors which influence the demand for insurance and is assumed to be i.i.d. across households in our sample. We assume ε_i to be normally distributed and estimate the coefficients using probit regression.

Before turning to the empirical results we consider the possible endogeneity of the SAHS variable in the demand for insurance. There is limited evidence of the effects of health insurance on health [28-30]. Nevertheless, the omitted variable rationale for the counterintuitive SAHS effect suggests that SAHS may be endogenous to the insurance decision.

Ideally an instrument would be used to identify the causal effect of SAHS on insurance. Since accidents are usually unanticipated exogenous shocks that impact on health status, injury through accidents should constitute a valid instrument. However, questions on the incidence of accidents in the NHS 2001 referred to a short time period (the four weeks prior to the survey) and consequently very few individuals experienced this negative shock. We were unable to find another plausible instrument in the survey. Instead, to investigate the possibility of reverse causality between insurance and SAHS, we condition on the time of purchase of the insurance. Specifically, we estimate separate models for those consumers who are newly-insured (insured less than 5 years) and long-term insured (insured 5 years or more). If insurance cover substantially impacts on self-assessed health, we would expect to find a much stronger relationship for the long-term insured.

A different method is used to highlight the relationship between the explanatory variables and SAHS on the one hand and the correlation between SAHS and insurance cover on the other. We adapt the procedure used to investigate the relationship between self-reported power and wealth in Lokshin and Ravallion [31]. Reduced form models for insurance and SAHS are estimated, each model including all explanatory variables except for SAHS. We then compare the estimated latent variables, the predicted linear indices, for SAHS and insurance purchase. Specifically, the insurance choice is modelled using a binary probit regression as in equation (1) but excluding the S_i dummies:

$$I_i^* = \delta X_i + \varepsilon_i \qquad \begin{cases} I_i = 1 \text{ if } I_i^* > 0 \\ I_i = 0 \text{ otherwise} \end{cases} \tag{2}$$

and self-assessed health is modelled as an ordered probit regression:

$$S_i^* = \pi' X_i + \eta_i \qquad \Pr(S_i = j) = \Pr(k_{j-1} < \pi X_i + \eta_i \le k_j) \tag{3}$$

where i denotes the observation, j the category of SAHS with j=1,…,5; π is a vector of coefficients; k is a vector of cut-off points for the index with $k_0 = -\infty$ and $k_5 = \infty$. η is assumed to be i.i.d. across households according to a normal distribution.

We compute the correlation coefficients between the predicted δX and πX for the explanatory variables as a whole and for subsets of the X vector of variables.

5) Results

The NHS includes a large number of variables capturing variation in personal, household, and job-related characteristics as well as health-related variables. Table 2 lists the variables used in the analysis and their means and standard deviations by insurance status. Detailed definitions of the variables are provided in the NHS documentation [32]. The uninsured subset of the adult population are younger (25% aged less than 30), more likely to be single or sole parents (58% compared with 32% among the insured), less likely to live in major urban centres, have lower personal and other income, less educated and less likely to be employed, twice as likely to be a daily smoker and more likely to undertake no exercise.

Table 2 near here

We would expect strong relationships between both age and health and age and insurance. Other demographic variables such as sex, marital status, and presence of children have also been found to be correlated with SAHS and insurance purchase. In the analysis age is entered as a spline with break points at 30 and 65 to capture the impact of age-related insurance incentives. Marital status is interacted with a dummy variable for the presence of dependent children.

Attitudes towards risk, specifically stronger risk aversion, should lead to a stronger demand for insurance. It may also lead individuals to adopt healthier lifestyles. We anticipate that SAHS may be positively correlated with the adoption of healthy lifestyles and therefore indirectly with risk avoidance. In our analysis, attitude towards risk is proxied by lifestyle variables directly related to health: smoking, drinking, exercise and body mass index categories.

State governments have responsibility for the supply of public hospital care and regulate other aspects of health care provision. For this reason the supply and quality of services covered by private insurance are likely to vary by region and state. In addition, insurers are allowed to vary premiums by state. In general we would expect geographic location to be related to both SAHS and insurance. We include state indicators and rural/urban

dummies. The inclusion of these variables will also control for variations in wealth not picked up by income (such as property values).

A strong correlation is often found between health and income and, more generally, health and wealth. Income is also a strong predictor of insurance status and insurance has been found to be a normal good for individuals with the same health status [30]. Improperly specified or measured income could result in a spurious positive relationship between insurance and SAHS. We use a general and flexible specification for income. Own and partner's incomes are entered in a quadratic form interacted with the sex of the respondent. Break points in income are also used to allow for the impact of a tax surcharge on the high-income uninsured. A dummy variable for entitlement to a concession card or Department of Veteran Affairs (DVA) pension is included to control for the availability of subsidised health care for specific low income groups. Personal and other household incomes are also entered separately. We use the size of the home (number of persons in the household per number of bedrooms in the home) to proxy wealth over and above income.

We include a variety of variables to capture heterogeneity in education, employment and labour force status. These include occupation dummies, hours of work, including a long hours dummy and a shift work dummy, and dummies representing shifts in the effects of unemployment duration for those who are unemployed. Labour force status variables and some of the hours of work variables are interacted with the sex of the respondent. These variables measure aspects of the socio-economic status of the household not captured directly by the income variables.

We include variables indicating the presence of long-term conditions as objective measures of health and to investigate the possibility of screening by insurers. In one specification we include the number of long-term conditions and indicators for four broadly-defined and commonly found conditions: asthma, cancer, heart condition, and diabetes. In our most general specification, we include indicators for 46 detailed chronic conditions. The specific grouping used for the detailed conditions is based on work conducted by Randall Ellis on US data in predicting the costing of procedures.

Table 3 near here

Table 3 presents coefficients on the SAHS dummies for various specifications of the insurance probit. Detailed results are presented in Appendix Table A1. Each column of results in Table 3 represents a separate probit. Model I includes only the SAHS dummies; five parameters are estimated including the intercept. We find a monotonic relationship between self-assessed health and the probability of insurance coverage consistent with the evidence found in the raw data. Individuals with the lowest health status are less likely to be covered by private insurance. All health categories, except very good, are significantly different from the omitted group (excellent).

In Model II a set of 20 demographic variables are added to the probit. These variables include information on age, household composition, sex, country of birth, marital status and language spoken at home. There is very little effect on the relationship between SAHS and insurance. In Model III we add 25 variables representing household income, wealth and geographic location. The pseudo R2 increases dramatically from 8% in Model

II to 20% after inclusion of these controls. We find that about one half of the correlation between SAHS and the insurance index was in fact picking up variation in income and location. Nevertheless the remaining positive relationship between health and insurance is strong and significant.

In Model IV, 24 additional socio-economic variables are included, representing variation in education, employment, hours of work, occupation, labour force status and duration of unemployment. There is a further slight reduction in the correlation between SAHS and the latent insurance index. Model V includes the risk-related behaviours (smoking, drinking and exercise) and weight. This has a slightly stronger impact in reducing the relationship between SAHS and insurance.

Finally in the last two sets of results we add the objective health measures defined by the presence of long-term conditions, broadly defined in Model VI and in detail in Model VII. In the presence of screening, we would expect these variables to explain the positive correlation between SAHS and insurance. In fact, including these variables increases the strength of the relationship. We discuss this further below.

Despite the use of a large number of controls for personal, socio-economic and health-related characteristics, the negative correlation between risk and insurance coverage remains strong and significant.

Table 4 near here

In order to better understand the size of the relationship, we compute the marginal effects of SAHS on the probability of purchasing private insurance. Table 4 presents the average predicted probability of insurance using observed SAHS and the average predicted probabilities obtained by placing all observations in turn in each of the SAHS categories with all other controls at their observed value. The marginal effect is then equal to the difference between the predicted probability for excellent health and that for each of the other SAHS categories. The predicted probabilities are computed based on the coefficients of the two extreme models in Table 3: Model I with only SAHS dummies and Model VII with the maximum number of explanatory variables. When only SAHS dummies are included, the differences in predicted probability of cover across SAHS categories are very large. There is a drop of 27 percentage points between the probability of cover for those in excellent health and those in poor health. After the inclusion of all 125 control variables, the fall in probability of cover is lower but still considerable at over 9 ppts.

In order to investigate the factors driving the correlation between SAHS and insurance cover, and following the procedure developed in Lokshin and Ravallion [31], we compute the correlation coefficients between the predicted δX and πX in equations (2) and (3) above for all explanatory variables and for subsets of the X vector of variables. Table 5 presents the correlation coefficients for the broad groups of variables described in Tables 2 and A1. Including all 125 variables yields a correlation coefficient of 36.6%. This can be interpreted as the percent correlation between the predicted net benefit of insurance cover and the predicted underlying continuous health level.

Table 5 near here

When including only the demographic variables in the correlation, the coefficient is slightly lower but still strongly positive. This is surprising as we would expect age to reduce health and increase insurance purchase. A closer look at the coefficients (detailed results are available from the authors) shows differences in the effects of age and other demographic characteristics. While the effect of age on insurance cover is concave with a peak at 65, the relationship between age and self-assessed health is more or less monotonic and negative except for a positive jump at 65. The effects of marital status and the presence of children are in similar directions and contribute to the positive correlation. Geographical variables have mixed effects. Those living in more rural areas are in better health and are less likely to purchase private insurance.

Table 5 shows the strong positive effect of income on both the probability of having insurance cover and higher health status. The correlation coefficient is 91%. Higher education increases both insurance and health. The employment variables have mixed effects but they tend to be in the same direction. More professional occupations increase both indices of health and insurance benefits. Being out of the labour force or unemployed reduces both indices but the effect is much less for females.

The health-related lifestyle variables (smoking, drinking, lack of exercise, and body mass index) reduce both health and insurance indices giving an overall positive correlation. Smoking is the major driver of this result, being strongly negatively associated with insurance and better health. The results involving risk related variables are consistent with the underlying hypothesis of heterogeneous risk aversion; more risk averse individuals are more likely to buy insurance and to be in better health.

The most surprising result concerns long-term conditions, our objective measure of health. The correlation on the effects on self-assessed health and insurance is negative and significant at 24%. The effects of the individual coefficients are mixed but in most cases, the presence of a long-term condition reduces health status and increases the probability of buying insurance. If there is screening on the part of insurers, this result indicates that it is not strong enough to reverse the relationship between overall self-assessed health and insurance cover.

Table 6 near here

Finally, we undertake a number of sensitivity checks. In Table 6 we present the marginal effects of SAHS using excellent as the base category. (Detailed results of the regressions are available from the authors.) Since SAHS may capture mental, as well as physical, aspects of health we include an index of mental well-being, the Kessler score. This is a measure of psychological distress derived from 10 questions about negative emotional states experienced in the four weeks prior to interview. The marginal effect of poor health is reduced from 9% (in Model VII) to 8% but the relationship remains significant. As a check on the influence of measurement error in the income variables when including missing incomes, we re-estimate the model including only observations with no missing income. Again the gradient is significant and slightly smaller than in Model VII.

The model is re-estimated on sub-samples of the data to allow for more general impacts of the variables. The results indicate that families and females have a stronger positive

association between health status and insurance than singles and males, but all sub-samples exhibit a similar relationship.

The last two columns of Table 6 present separate insurance probits depending on the time of purchase. The model 'Insured 5+ years' is estimated on the whole sample treating those insured less than 5 years as uninsured. The model 'Insured <5 years' is estimated excluding those who had been insured at least 5 years at the time of the survey. Reverse causality should generate a stronger relationship for the long-term insured. We do find a slightly stronger relationship for the longer-term insured however, a significant correlation persists for the newly insured.

A different reason for considering the newly insured separately is the implementation of reforms introduced between 1997 and 2000. Allowing all the coefficients to vary for the two groups, we find that the relationship between insurance and health status remains positive and significant.

6) Conclusions and Extensions

In this paper, we find a strong positive association between self-assessed health and private health cover in Australia. Our result goes against the predictions of adverse selection but is consistent with most other empirical findings in the literature on insurance. This relationship persists despite the use of a large set of controls for personal and socio-economic characteristics, risk-related behaviours, and objective health measures. A popular interpretation for this result is that of screening by the insurers. However our results do not support this hypothesis because we also find that the effect of long-term conditions is consistent with adverse selection; the presence of long-term conditions increases the probability of cover while reducing self-assessed health. If there is screening based on observables such as long-term conditions, it is not strong enough to explain the positive relationship between self-reported health and insurance.

The comparison of the effects of long-term conditions and SAHS on the probability of purchasing insurance is interesting for another reason. One could argue that SAHS incorporates more variation across personality types compared to a purely objective health measure. The finding of a negative relationship between SAHS and insurance cover over and above the positive correlation involving long-term conditions supports the hypothesis that the commonly found and counterintuitive result is driven by heterogeneity in personality traits including the level of risk aversion. For example Ettner [4] surmises that the positive relationship found between SAHS and insurance in the US could be measuring a positive attitude to the medical profession and the health care system. Individuals with this attitude could have a more positive attitude overall (and have a higher SAHS). Nevertheless, the finding of a counterintuitive risk-insurance relationship in data involving other types of insurance (e.g. car insurance) suggests that the personality trait responsible for the empirical finding may be more closely tied to attitudes toward risk.

Panel data would be useful in controlling for unobserved and fixed individual-specific effects. However the effects of attitudes towards risk may be more complex than the usual specification of fixed effects would allow. The use of preference models under

uncertainty with more emphasis on the specification of the utility associated with health states and the interaction with insurance would be useful in clarifying the interpretations of the empirical results. Of course, the availability of more direct measures of attitudes towards risk in survey data would also help in identifying the source of the empirical relationship between risk and insurance.

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Table 1 Sample proportions in SAHS categories by insurance category

	Self Assessed Health Status					
	Excellent	**Very Good**	**Good**	**Fair**	**Poor**	**All**
Number	3037	5627	5502	2600	928	17694
Percentage	17.2	31.8	31.1	14.7	5.2	100
Number insured	1646	2952	2515	966	249	8328
Number not insured	1391	2675	2987	1634	679	9366
Percentage by SAHS						
Insured	54.2	52.5	45.7	37.2	26.8	47.1
Not insured	45.8	47.5	54.3	62.9	73.2	52.9

Table 2 Variable means by insurance status

	Not insured		Insured	
Demographics	Mean	StDev	Mean	StDev
male	0.458	0.498	0.452	0.498
female	0.542	0.498	0.548	0.498
age in years	45.819	18.179	47.792	15.249
age>30 dummy	0.746	0.435	0.875	0.330
age minus 30 if >0	17.137	16.640	18.342	14.443
age>65 dummy	0.194	0.395	0.152	0.359
age minus 65 if >0	1.797	4.211	1.317	3.614
single*	0.347	0.476	0.245	0.430
married	0.466	0.499	0.671	0.470
married with kids	0.436	0.928	0.617	1.021
single with kids	0.229	0.674	0.070	0.362
born in Australia*	0.710	0.454	0.753	0.431
born NZ	0.027	0.163	0.017	0.131
born Oceania	0.007	0.083	0.004	0.062
born UK	0.088	0.283	0.085	0.279
born NW Europe	0.023	0.151	0.021	0.145
born SE Europe	0.061	0.240	0.043	0.203
born N Africa	0.003	0.057	0.003	0.056
born Middle East	0.011	0.102	0.004	0.067
born other Africa	0.008	0.090	0.010	0.099
born SE Asia	0.029	0.169	0.023	0.149
born other Asia	0.009	0.096	0.011	0.104
english at home*	0.856	0.351	0.892	0.310
non english	0.144	0.351	0.108	0.310
Geographic				
NSW*	0.223	0.416	0.217	0.412
VIC	0.208	0.406	0.206	0.404
QLD	0.187	0.390	0.162	0.369
SA	0.119	0.324	0.114	0.318
WA	0.115	0.319	0.133	0.340
TAS	0.067	0.251	0.062	0.242
NT	0.015	0.122	0.014	0.119
ACT	0.065	0.246	0.091	0.287
major urban*	0.611	0.488	0.683	0.465
other urban	0.270	0.444	0.197	0.398
rural	0.119	0.324	0.119	0.324
Income ('000's)				
Personal income				
if female	0.191	0.249	0.292	0.416
if male	0.236	0.360	0.402	0.618
squared if female	0.099	0.268	0.258	0.753
squared if male	0.185	0.520	0.544	1.397
Other income				
if female	0.132	0.272	0.279	0.493
if male	0.088	0.193	0.146	0.295
squared if female	0.092	0.366	0.321	0.996
squared if male	0.045	0.211	0.108	0.397
missing personal	0.049	0.216	0.097	0.296
missing other	0.178	0.382	0.184	0.388
person/bedroom	0.886	0.426	0.852	0.386
levy if male	0.015	0.122	0.113	0.317
levy if female	0.023	0.150	0.065	0.247
concession card	0.533	0.499	0.228	0.420
dva pension	0.024	0.154	0.009	0.096
dva widow pension	0.033	0.179	0.008	0.087

	Not insured		Insured	
Education	Mean	StDev	Mean	StDev
degree*	0.094	0.292	0.240	0.427
diploma	0.075	0.263	0.117	0.322
other qualification	0.249	0.432	0.241	0.428
only school	0.550	0.497	0.381	0.486
missing qualifications	0.032	0.176	0.020	0.141
Employment				
manager*	0.027	0.163	0.082	0.274
professional	0.072	0.259	0.198	0.398
assoc professional	0.052	0.222	0.102	0.302
trade	0.079	0.269	0.064	0.245
advanced clerk	0.020	0.141	0.038	0.190
intermed clerk	0.090	0.286	0.117	0.322
intermed production	0.055	0.228	0.035	0.185
elementary clerk	0.049	0.217	0.036	0.187
labourer	0.065	0.247	0.031	0.173
employee*	0.413	0.492	0.537	0.499
employer	0.011	0.106	0.048	0.214
self employed	0.083	0.276	0.114	0.318
full-time worker*	0.352	0.478	0.525	0.499
part-time	0.158	0.365	0.178	0.382
part-time and female	0.114	0.318	0.148	0.356
shift work	0.093	0.291	0.096	0.295
works over 48 hrs/wk	0.090	0.286	0.187	0.390
Labour Force				
employed*	0.510	0.500	0.703	0.457
not in labour force	0.441	0.497	0.282	0.450
fem & not in lf	0.288	0.453	0.196	0.397
unemployed	0.049	0.216	0.015	0.120
female & unemp	0.022	0.147	0.007	0.082
unempl for 13-51 wks	0.014	0.117	0.005	0.072
unempl for >51 wks	0.007	0.083	0.001	0.031
Risk Behaviours				
daily smoker	0.328	0.470	0.164	0.370
no. st. drinks per day	1.177	2.754	1.177	1.922
thin	0.088	0.283	0.066	0.249
normal*	0.370	0.483	0.388	0.487
overweight	0.287	0.453	0.328	0.470
obese	0.153	0.360	0.148	0.355
missing bmi dummy	0.103	0.303	0.070	0.255
low exercise*	0.362	0.481	0.409	0.492
high	0.054	0.226	0.063	0.243
moderate	0.233	0.423	0.265	0.441
sedentary	0.009	0.096	0.010	0.098
no exercise	0.342	0.474	0.254	0.435
Chronic Conditions				
number	2.785	1.750	2.848	1.665
asthma	0.115	0.320	0.102	0.303
cancer	0.099	0.299	0.105	0.306
heart	0.382	0.486	0.411	0.492
diabetes	0.085	0.279	0.065	0.246
46 conditions	see table A1			

* indicates omitted group in regressions.

Table 3 Private health insurance probits – various specifications
Coefficients on the SAHS categories (excellent is the omitted group)

SAHS	**Model I**		**Model II**		**Model III**		**Model IV**		**Model V**		**Model VI**		**Model VII**	
Category	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
very good	-0.0437	0.1221	-0.0569	0.0509	-0.0152	0.6231	0.0022	0.9437	0.0232	0.4641	-0.0003	0.9914	-0.0004	0.991
good	-0.2132	<.0001	-0.2288	<.0001	-0.1081	0.0006	-0.0712	0.0252	-0.0258	0.4284	-0.0707	0.0357	-0.0696	0.0381
fair	-0.4332	<.0001	-0.4654	<.0001	-0.2035	<.0001	-0.1568	<.0001	-0.0933	0.0189	-0.1644	<.0001	-0.1598	0.0002
poor	-0.7233	<.0001	-0.7549	<.0001	-0.3558	<.0001	-0.3149	<.0001	-0.2404	<.0001	-0.3261	<.0001	-0.3065	<.0001
Log Likelihood	-12036.42		-11253.44		-9785.54		-9585.18		-9459.29		-9440.69		-9397.79	
No. Pars.	5		25		50		74		84		89		130	
Pseudo-R^2	0.0162		0.0802		0.2001		0.2165		0.2268		0.2283		0.2318	
Added Vars	None		Demographic		Demographic Geographic Income		Demographic Geographic Income Education Labour Force Employment		Demographic Geographic Income Education Labour Force Employment Risk Behaviour		Demographic Geographic Income Education Labour Force Employment Risk Behaviour Conditions-Broad		Demographic Geographic Income Education Labour Force Employment Risk Behaviour Conditions-Details	

Notes: The dependent variable is dichotomous with a 1 indicating private hospital cover. Each set of coefficients corresponds to a separate probit regression. The number of observations for each probit is 17,694. No Parameters indicates the number of parameters estimated in the probit including an intercept. The coefficients on other variables are not shown.

Table 4 Private health insurance probits
Marginal effects of the SAHS categories – Models I and VII

	Model I		Model VII	
	Estimate	StErr	Estimate	StErr
Average Predicted Probability - Observed SAHS (observed probability is 0.471)	0.4707	0.0037	0.4705	0.0036
Average Predicted Probability - Counterfactual SAHS				
excellent	0.5420	0.0092	0.4889	0.0085
very good	0.5246	0.0073	0.4888	0.0059
good	0.4571	0.0066	0.4677	0.0060
fair	0.3715	0.0100	0.4404	0.0091
poor	0.2683	0.0143	0.3967	0.0158
Marginal Effects - Comparison Group is Excellent				
very good	-0.0174	0.0125	-0.0001	0.0095
good	-0.0849	0.0107	-0.0212	0.0105
fair	-0.1704	0.0130	-0.0485	0.0127
poor	-0.2737	0.0185	-0.0922	0.0192

Notes: The average predicted probability is computed with all explanatory variables (including SAHS) at their observed values. A predicted probability of coverage is computed at each data point using the model estimates and averaged over the sample. The predicted probabilities with counterfactual SAHS are computed by placing each observation in the SAHS category under consideration while keeping all other variables at their observed values. A predicted probability of coverage is computed for each data point and these are averaged over the sample. The marginal effect is simply the difference in the predicted probability with all sample points placed in the category under consideration and the predicted probability with all individuals declaring excellent for SAHS. Standard errors are bootstrapped with 250 draws.

Table 5 Correlations between SAHS and insurance indices

Variable Groups	**Impact on SAHS**	**Impact on insurance**	**Correlation Coefficient**	**p-value**
All variables	mixed	mixed	0.3662	<.0001
Demographics	mixed	mixed	0.3454	<.0001
Geography	mixed	mixed	-0.5230	<.0001
Income	positive	positive	0.9100	<.0001
Education	positive	positive	0.7829	<.0001
Employment	positive	positive	0.5106	<.0001
Risk behaviours	negative	negative	0.6604	<.0001
Conditions	negative	positive	-0.2442	<.0001

Notes: The correlation is calculated using the components of the linear indices in the ordered probit regression for self-assessed health and the binary probit for insurance. See the text for details.

Table 6 Marginal Effects - Percentage Point Change from Excellent Group

SAHS	Model VII	With Kessler score	Excludes obs. with missing income	Families (incl. sole parents)	Singles	Females	Males	Insured 5+ years	Insured <5 years
very good	0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01
good	0.02**	0.02*	0.01	0.02	0.02	0.02	0.02	0.01	0.02**
fair	0.05***	0.04***	0.04***	0.04***	0.05**	0.06***	0.03*	0.04***	0.03*
poor	0.09***	0.08***	0.08***	0.11***	0.07***	0.11***	0.07***	0.07***	0.05***
No. pars.	130	131	128	130	127	122	122	130	130
No. obs.	17,694	17,694	14,497	11,003	6,691	9,640	8,054	17,694	11,829
Log Likelihood	-9397.79	-9396.43	-7648.69	-5736.38	-3510.82	-5066.76	-4267.49	-9138.39	-5054.50

Notes: * indicates that the underlying coefficient is significant at 10%, ** at 5% and *** at 1%. The other controls are as described for Model VII except for obvious exclusions/inclusions related to the change in specification. The long-term insurance probit is estimated on the whole sample treating the insured less than 5 years as not insured. The short-term insurance probit is estimated on the reduced sample that excludes those who were insured 5 years ago or more.

Appendix Table A1 Insurance probits – Various specifications, Details

	Model I		Model II		Model III		Model IV		Model V		Model VI		Model VII	
Variable	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**
Intercept	0.1054	<.0001	-0.9214	<.0001	-0.251	0.180	0.5361	0.0094	0.5824	0.0055	0.5661	0.0071	0.5402	0.0104
verygood	-0.0437	0.1221	-0.0569	0.0509	-0.015	0.623	0.0022	0.9437	0.0232	0.4641	-0.0003	0.9914	-0.0004	0.9910
good	-0.2132	<.0001	-0.2288	<.0001	-0.108	0.001	-0.0712	0.0252	-0.0258	0.4284	-0.0707	0.0357	-0.0696	0.0381
fair	-0.4332	<.0001	-0.4654	<.0001	-0.204	<.0001	-0.1568	<.0001	-0.0933	0.0189	-0.1644	<.0001	-0.1598	0.0002
poor	-0.7233	<.0001	-0.7549	<.0001	-0.356	<.0001	-0.3149	<.0001	-0.2404	<.0001	-0.3261	<.0001	-0.3065	<.0001
female			0.0734	0.0002	0.059	0.249	-0.1291	0.1491	-0.1543	0.0878	-0.1694	0.0612	-0.1707	0.0604
AGE			0.0181	0.0053	-0.022	0.002	-0.0324	<.0001	-0.0306	<.0001	-0.0323	<.0001	-0.0321	<.0001
agegt30			0.4482	<.0001	0.336	<.0001	0.3802	<.0001	0.4087	<.0001	0.4164	<.0001	0.4248	<.0001
ageless30			-0.0133	0.0457	0.047	<.0001	0.0574	<.0001	0.0532	<.0001	0.0527	<.0001	0.0505	<.0001
agegt65			-0.2716	<.0001	0.097	0.112	0.1002	0.1035	0.0718	0.2464	0.0840	0.1759	0.0849	0.1754
ageless65			-0.0116	0.0240	-0.027	<.0001	-0.0263	<.0001	-0.0238	<.0001	-0.0225	<.0001	-0.0197	0.0007
married			0.3862	<.0001	0.274	<.0001	0.2787	<.0001	0.2535	<.0001	0.2534	<.0001	0.2582	<.0001
mwithkids			-0.0453	0.0003	0.074	<.0001	0.0624	0.0002	0.0597	0.0005	0.0636	0.0002	0.0644	0.0002
swithkids			-0.2794	<.0001	-0.028	0.273	-0.0273	0.2990	-0.0240	0.3661	-0.0215	0.4187	-0.0182	0.4941
bornnz			-0.4076	<.0001	-0.464	<.0001	-0.4363	<.0001	-0.4403	<.0001	-0.4389	<.0001	-0.4451	<.0001
bornoceania			-0.4281	0.0019	-0.452	0.002	-0.3812	0.0103	-0.3760	0.0118	-0.3620	0.0152	-0.3603	0.0158
bornuk			-0.1832	<.0001	-0.265	<.0001	-0.2803	<.0001	-0.2778	<.0001	-0.2737	<.0001	-0.2721	<.0001
bornnweurope			-0.1985	0.0033	-0.237	0.001	-0.2585	0.0003	-0.2362	0.0011	-0.2338	0.0013	-0.2351	0.0012
bornseeurope			-0.2591	<.0001	-0.290	<.0001	-0.2434	<.0001	-0.2416	<.0001	-0.2316	<.0001	-0.2321	<.0001
bornnafrica			0.0146	0.9335	0.102	0.588	0.0555	0.7709	0.0501	0.7943	0.0591	0.7591	0.0507	0.7940
bornmiddleeas			-0.5266	<.0001	-0.399	0.002	-0.3728	0.0045	-0.3465	0.0085	-0.3296	0.0123	-0.3363	0.0109
bornoafrica			0.0281	0.7876	-0.149	0.194	-0.2417	0.0383	-0.2926	0.0121	-0.2828	0.0156	-0.2841	0.0157
bornseasia			-0.1926	0.0037	-0.195	0.006	-0.2023	0.0046	-0.2283	0.0015	-0.2213	0.0021	-0.2345	0.0011
bornoasia			-0.0352	0.7207	-0.071	0.496	-0.1343	0.2035	-0.1341	0.2036	-0.1150	0.2764	-0.1012	0.3400
nonenglish			-0.0926	0.0165	-0.048	0.248	-0.0670	0.1089	-0.0819	0.0522	-0.0664	0.1167	-0.0654	0.1230
VIC					0.032	0.321	0.0320	0.3226	0.0210	0.5187	0.0200	0.5405	0.0258	0.4307
QLD					0.003	0.933	0.0076	0.8249	-0.0029	0.9339	-0.0077	0.8240	-0.0059	0.8635
SA					0.101	0.008	0.1240	0.0012	0.1238	0.0014	0.1220	0.0016	0.1220	0.0017
WA					0.169	<.0001	0.1771	<.0001	0.1664	<.0001	0.1638	<.0001	0.1664	<.0001
TAS					0.200	<.0001	0.2146	<.0001	0.2103	<.0001	0.2053	<.0001	0.2054	<.0001
NT					0.037	0.683	0.0350	0.6990	0.0473	0.6051	0.0503	0.5828	0.0481	0.6008
ACT					-0.025	0.570	-0.0799	0.0767	-0.0827	0.0689	-0.0931	0.0412	-0.0868	0.0578

Appendix Table A1 Insurance probits – Various specifications, details continued

	Model III		Model IV		Model V		Model VI		Model VII	
Variable	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**
otherurban	-0.234	<.0001	-0.2056	<.0001	-0.1991	<.0001	-0.1972	<.0001	-0.1975	<.0001
rural	-0.146	<.0001	-0.1555	<.0001	-0.1500	<.0001	-0.1465	<.0001	-0.1487	<.0001
incfemk	1.037	<.0001	0.9304	<.0001	0.9593	<.0001	0.9547	<.0001	0.9469	<.0001
incmalk	0.642	<.0001	0.5378	<.0001	0.5167	<.0001	0.5165	<.0001	0.5083	<.0001
incfemksqu	-0.098	0.090	-0.0795	0.1966	-0.0912	0.1401	-0.0921	0.1345	-0.0908	0.1409
incmalksqu	0.005	0.883	-0.0048	0.9059	0.0018	0.9640	0.0015	0.9715	0.0037	0.9287
incothf	0.377	<.0001	0.3673	<.0001	0.3502	<.0001	0.3567	<.0001	0.3543	<.0001
incothm	0.439	<.0001	0.3483	0.0008	0.3495	0.0008	0.3413	0.0011	0.3366	0.0013
incothfsqu	0.111	0.014	0.1096	0.0171	0.1117	0.0152	0.1070	0.0199	0.1078	0.0186
incothmsqu	0.005	0.946	0.0333	0.6446	0.0311	0.6695	0.0330	0.6509	0.0338	0.6410
misspinc	0.283	<.0001	0.2508	<.0001	0.2441	<.0001	0.2523	<.0001	0.2487	<.0001
missothinc	0.007	0.850	0.0189	0.6099	0.0401	0.2827	0.0356	0.3403	0.0376	0.3154
persperbed	-0.275	<.0001	-0.2621	<.0001	-0.2573	<.0001	-0.2537	<.0001	-0.2555	<.0001
mwithlevy	-0.041	0.578	-0.1058	0.1543	-0.1061	0.1554	-0.1015	0.1743	-0.1070	0.1526
swithlevy	0.186	0.003	0.0989	0.1252	0.1060	0.1023	0.1137	0.0801	0.1130	0.0826
concard	-0.694	<.0001	-0.6741	<.0001	-0.6620	<.0001	-0.6710	<.0001	-0.6692	<.0001
dvapen	-0.402	<.0001	-0.3918	<.0001	-0.3979	<.0001	-0.4076	<.0001	-0.4107	<.0001
dvawid	-0.662	<.0001	-0.6611	<.0001	-0.6891	<.0001	-0.6984	<.0001	-0.7128	<.0001
diploma			-0.1228	0.0066	-0.0988	0.0299	-0.0967	0.0339	-0.0928	0.0423
otherqual			-0.2340	<.0001	-0.1969	<.0001	-0.1972	<.0001	-0.1887	<.0001
onlyschool			-0.3418	<.0001	-0.2889	<.0001	-0.2827	<.0001	-0.2762	<.0001
missqual			-0.3601	<.0001	-0.3105	<.0001	-0.3172	<.0001	-0.3151	<.0001
professional			-0.1099	0.0698	-0.1118	0.0668	-0.1105	0.0704	-0.1048	0.0872
assprof			-0.0701	0.2666	-0.0590	0.3528	-0.0520	0.4135	-0.0567	0.3730
trade			-0.3537	<.0001	-0.3154	<.0001	-0.3062	<.0001	-0.3041	<.0001
advclerk			-0.1220	0.1383	-0.1160	0.1614	-0.1123	0.1758	-0.1154	0.1650
intclerk			-0.0975	0.1228	-0.0770	0.2259	-0.0690	0.2788	-0.0668	0.2954
intprod			-0.5452	<.0001	-0.4884	<.0001	-0.4772	<.0001	-0.4738	<.0001
elclerk			-0.2612	0.0004	-0.2361	0.0016	-0.2305	0.0021	-0.2347	0.0018
labourer			-0.5109	<.0001	-0.4527	<.0001	-0.4424	<.0001	-0.4345	<.0001

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Appendix Table A1 Insurance probits – Various specifications, details continued

	Model IV		Model V		Model VI		Model VII	
Variable	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**	**Coeff**	**p-value**
employPT	-0.0671	0.2941	-0.0944	0.1420	-0.0935	0.1466	-0.1001	0.1205
notinLF	-0.2977	<.0001	-0.2856	0.0002	-0.2850	0.0002	-0.2716	0.0004
unemp	-0.1927	0.1211	-0.1668	0.1851	-0.1613	0.2005	-0.1587	0.2089
femployPT	0.2514	0.0010	0.2655	0.0006	0.2644	0.0006	0.2669	0.0005
fnotinLF	0.2011	0.0033	0.2058	0.0028	0.2128	0.0021	0.1926	0.0057
funemp	0.0238	0.8689	0.0276	0.8497	0.0248	0.8652	0.0269	0.8544
unemp13t51	0.2099	0.1371	0.2162	0.1316	0.2175	0.1294	0.2143	0.1363
unempgt51	-0.2330	0.2839	-0.2261	0.3041	-0.2096	0.3403	-0.2035	0.3563
employer	0.3050	<.0001	0.3183	<.0001	0.3265	<.0001	0.3251	<.0001
selfemp	-0.0212	0.6028	-0.0165	0.6873	-0.0142	0.7280	-0.0146	0.7223
shift	-0.0708	0.0586	-0.0627	0.0965	-0.0632	0.0943	-0.0560	0.1390
over48h	0.0907	0.0158	0.1097	0.0037	0.1109	0.0034	0.1145	0.0025
smoke			-0.3620	<.0001	-0.3580	<.0001	-0.3470	<.0001
drinks			-0.0063	0.2265	-0.0065	0.2134	-0.0049	0.3569
thin			-0.0161	0.7069	-0.0122	0.7757	-0.0135	0.7534
fat1			-0.0037	0.8867	-0.0069	0.7913	-0.0089	0.7350
veryfat			-0.0004	0.9902	-0.0065	0.8448	-0.0190	0.5727
missbmi			-0.1438	0.0004	-0.1371	0.0008	-0.1366	0.0009
exhigh			0.0197	0.6847	0.0173	0.7212	0.0204	0.6759
exmod			-0.0049	0.8602	-0.0039	0.8877	-0.0021	0.9401
exsed			-0.0325	0.7650	-0.0448	0.6808	-0.0462	0.6720
exno			-0.1188	<.0001	-0.1161	<.0001	-0.1131	<.0001
numltc					0.0466	<.0001		
asthma					-0.0050	0.8905		
cancer					0.0301	0.4050		
heart					-0.0040	0.8755		
diabetes					-0.0523	0.2062		

Appendix Table A1 Insurance probits – Various specifications, details continued

Variable	Model VII	
	Coeff	p-value
Other Infectious Diseases	0.1135	0.2680
Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0875	0.5602
Other Neoplasms	0.0650	0.4188
Diabetes with No or Unspecified Complications	-0.1020	0.0978
Type I Diabetes Mellitus	0.1192	0.3861
Other Endocrine/Metabolic/Nutritional Disorders	0.0100	0.8062
Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	0.1103	0.0587
Other Gastrointestinal Disorders	0.0240	0.5588
Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	-0.0856	0.1458
Disorders of the Vertebrae and Spinal Discs	-0.0218	0.8721
Osteoporosis and Other Bone/Cartilage Disorders	0.1295	0.0311
Other Musculoskeletal and Connective Tissue Disorders	0.0427	0.0650
Disorders of Immunity	0.1160	0.5588
Iron Deficiency and Other/Unspecified Anemias and Blood Disease	0.0153	0.8451
Drug/Alcohol Abuse, Without Dependence	-0.2808	0.0260
Personality Disorders	-0.0245	0.6385
Depression	-0.2018	0.1410
Anxiety Disorders	0.0535	0.3028
Other Psychiatric Disorders	0.0568	0.3619
Other Developmental Disability	-0.0285	0.9328
Seizure Disorders and Convulsions	0.0954	0.4691
Mononeuropathy, Other Neurological Conditions/Injuries	-0.0202	0.6221
Unstable Angina and Other Acute Ischemic Heart Disease	0.1567	0.1554
Angina Pectoris/Old Myocardial Infarction	-0.3926	<.0001
Hypertensive Heart Disease	0.1023	0.0028
Other and Unspecified Heart Disease	0.2389	0.4404
Cerebrovascular Disease, Unspecified	-0.0361	0.5738
Vascular Disease	0.0393	0.6597
Other Circulatory Disease	0.0382	0.4691
Chronic Obstructive Pulmonary Disease	-0.1379	0.2430
Asthma	0.0375	0.2970
Other Lung Disorders	-0.1044	0.0867

Appendix Table A1 Insurance probits – Various specifications, details continued

Variable	Model VII Coeff	p-value
Glaucoma	-0.0146	0.8728
Cataract	0.0853	0.1893
Other Eye Disorders	0.1309	<.0001
Significant Ear, Nose, and Throat Disorders	0.4260	0.0295
Hearing Loss	0.0318	0.3231
Other Ear, Nose, Throat, and Mouth Disorders	0.0414	0.0857
Urinary Obstruction and Retention	0.0527	0.4253
Incontinence	0.2248	0.0107
Other Urinary Tract Disorders	-0.0244	0.7744
Male Genital Disorders	0.0338	0.8689
Other Dermatological Disorders	0.0800	0.1626
Other Injuries	0.0354	0.4516
Major Symptoms, Abnormalities	0.2095	0.1850
Minor Symptoms, Signs, Findings	0.0569	0.0912

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII
Observations	17694	17694	17694	17694	17694	17694	17694
Log Lkhd	-12036.4	-11253.4	-9785.5	-9585.2	-9459.3	-9440.7	-9397.4
No pars.	5	25	50	74	84	89	130
Pseudo-R^2	0.0162	0.0802	0.2001	0.2165	0.2268	0.2283	0.2318