Job Market Paper

Severe Medical Conditions and Loss of Health Insurance Coverage: Evidence from the Health and Retirement Study

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Abstract

Illness increases individuals' demand for health insurance, but may also place them at risk of losing coverage. While public insurance and price restrictions in private markets aim to reduce this risk, little is known about whether severe medical conditions affect the likelihood of losing coverage. I explore this issue and find a lagged negative effect on policyholders of individual insurance plans. Policyholders who become high-risk do not lose coverage immediately, but policyholders who have been high-risk for two or more years are 5.1 percentage points (57%) more likely to become uninsured than their low-risk counterparts. I further show that state price restrictions result in an adverse selection effect leading low-risk policyholders to drop out of the market. These findings imply an ex-ante welfare loss and a coverage tradeoff between regimes with and without price restrictions.

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1. Introduction

The diagnosis of severe medical conditions has competing effects on health insurance coverage. On the one hand, it increases the demand for coverage because individuals diagnosed with severe medical conditions (high-risk individuals) not only face a substantially higher risk of future health problems, but also need the coverage to pay for regular checkups helping to manage their medical conditions.[1] On the other hand, this diagnosis may place individuals at risk of losing coverage due to declines in resources and due to risk discrimination in private health insurance markets. Individuals would want to avoid this risk because loss of coverage hinders their consumption smoothing and may exacerbate their medical conditions (e.g., Institute of Medicine, 2003; Levy and Meltzer, 2004). Public insurance and price restrictions in private markets aim to reduce this risk. However, little is known about whether severe medical conditions affect the likelihood of losing coverage and whether these price restrictions affect this likelihood.

To address these issues, this paper conducts two tests. First, I test whether high-risk individuals, specifically high-risk policyholders who purchase coverage from the individual (non-group) health insurance market, continue or lose coverage. In the individual market, risk discrimination is prevalent in most states because whether coverage is offered and at what premium rate depends on risk status. In the employment-based (group) market, however, federal laws prohibit individual risk discrimination.

Second, I test whether price restrictions in insurance markets result in an adverse selection effect leading low-risk policyholders to *drop out of the market*. I conduct this test by exploiting state variations in the degree of risk discrimination in the individual market. Some states implement price restrictions, while the other states do not. These restrictions limit the range of variation in premium rates due to risk status. Thus premium rates charged to high-risk policyholders are lowered, but rates charged to low-risk policyholders are increased. In a voluntary market, these restrictions may result in an adverse selection effect in which high-risk policyholders retain coverage, but low-risk policyholders drop out of the market.

I use individual data on 50-to-64-year-old Americans from the Health and Retirement Study (HRS). Conditional on current insurance status, I focus on changes in insurance coverage

[1] For example, the diabetic not only faces an increased risk of kidney disease and amputations, but also needs six kinds of examinations performed annually, if not sooner (Institute of Medicine, 2002).

at the extensive margin for two reasons. First, the HRS statistics indicate that approximately 98% of the policyholders have comprehensive plans.[2] These statistics imply that coverage changes at the extensive margin result in larger financial risk changes than changes at the intensive margin. Second, HRS provides limited, qualitative measures on intensive-margin changes. Additionally, the coverage analysis is augmented by an analysis of premium payment level because HRS is one of the few public data sets that contain information on premium payments.

I divide high-risk individuals into two groups: (1) individuals who "just become high-risk;" (2) individuals who "have been high-risk for two or more years." I compare changes in insurance coverage between each of these two groups and a low-risk reference group. This division is justified because the diagnosis of severe medical conditions resembles a permanent health shock, and the degree of risk discrimination may vary across the duration of experiencing medical conditions.

The findings indicate that severe medical conditions have a lagged effect on the probability of becoming uninsured. Policyholders who become high-risk do not lose coverage immediately. This finding may be explained by prohibition of selective increases in premium rates and by short duration of experiencing medical conditions. In contrast, policyholders who have been high-risk for two or more years are 5.1 percentage points (57%) more likely to become uninsured. Three factors can explain this likelihood, including risk discrimination, an imperfect safety net, and an income effect. Four factors, however, cannot, including the crowding out effect of Medicaid coverage or of uncompensated care, better health conditions, and fatalism. Findings from premium payment analysis also support this lagged effect.

The findings further indicate that state price restrictions result in an adverse selection effect. Price restrictions are associated with a 4.7 percentage points (45%) increase in low-risk policyholders' probability of becoming uninsured, and a 5.5 percentage points (24%) decline in high-risk policyholders' probability of becoming uninsured. The overall coverage rate declines by 2.6 percentage points (20%). Robustness checks indicate that this adverse selection effect is not driven by declines in income.

The findings indicate that insurance coverage responds to changes in risk status. This response implies an ex-ante welfare loss. I calibrate this loss and find that two-thirds of the

[2] Comprehensive plans provide coverage for routine doctor visits and for emergency and hospitalization. Catastrophic plans provide coverage for emergency and hospitalization only.

respondents are willing to pay 14% of their income to avoid coverage fluctuation. This welfare loss arises because before diagnosis, risk-averse individuals would want to insure against the risk of losing coverage if they become ill. However, this insurance is imperfect in spite of public insurance and price restrictions in private markets.

The findings further imply a welfare tradeoff in a voluntary health insurance market. On the one hand, if price restrictions are not implemented, high-risk policyholders may become uninsured, which result in a large welfare loss for each of them. Yet, the number of policyholders suffering such loss may be small since high-risk policyholders account for 20% of the sample. On the other hand, if price restrictions are implemented, low-risk policyholders may drop out, which result in a smaller welfare loss for each of them. Yet, the number of dropout may be large since low-risk policyholders are the majority.

Among policies that address this welfare tradeoff, price restrictions with compulsory purchase of catastrophic plans impose the greatest degree of regulation on the health insurance market. Such policies may reduce welfare since individuals cannot choose to be uninsured. However, they do eliminate the risk of losing coverage so welfare may be improved from an ex-ante point of view.

Although an attempt to implement universal health insurance coverage failed in 1994, coverage expansion remains a key policy issue. This paper examines why policyholders become uninsured. So, on the flip side, it analyzes how to help the uninsured obtain coverage. In addition to the risk discrimination discussed earlier, the findings imply that the success of coverage expansion hinges on whether the society has a consensus on substantial income redistribution. Income effects play a vital role in dropping insurance coverage; for policyholders who have been high-risk, low income is associated with an 11.8 percentage points (109%) higher probability of becoming uninsured.

Medical progress has made genetic testing possible, and it is expected that this testing will become part of the routine physical examination of the twenty-first century (Pyenson, 2003). My findings can be applied to genetic testing because government faces the same challenge when it decides whether the insurer can use genetic information for risk discrimination. Information from genetic testing may facilitate preventive treatments; however, if its use is unregulated, this information may deprive individuals of insurance possibilities much before they actually contract the genetic disease (e.g., Alzheimer's disease). If the insurer is prohibited from

using genetic information, but individuals have access to it, this prohibition may result in an adverse selection effect leading low-risk individuals to drop out of the market. The extreme case of this dropout is the collapse of insurance markets.

This paper contributes to three strands of literature. The first test of the paper shows an imperfect "smoothing" in insurance coverage so it complements studies on consumption smoothing (e.g., Cochrane, 1991; Townsend, 1994, 1995; Gertler and Gruber, 2002). Consumption smoothing indicates that when individuals are affected by idiosyncratic shocks, their resources decline, but consumption fluctuations can be prevented by formal and/or informal insurance mechanisms. Similarly, individuals may be affected by adverse "classification risk"; when individuals are diagnosed with severe medical conditions, they are classified as "high-risk" in the formal insurance market. Their resources decline, and they are risk-discriminated against in the insurance market. Still, coverage fluctuations can be prevented by restrictions on risk discrimination in the market, availability of an alternative type of insurance coverage, and/or sufficient resources. Perfect consumption smoothing indicates that consumption growth should be independent of risk status. Analogously, "smoothing" in insurance coverage would indicate that coverage continuation should be independent of or *increase with* risk status. It is debated whether utility of consumption is state-dependent, but the demand for insurance coverage increases with risk status.[3]

The second test of the paper contributes to empirical studies on adverse selection because it shows that price restrictions lead low-risk policyholders to drop out of the market. Adverse selection is a classic theory (Akerlof, 1970; Rothschild and Stiglitz, 1976), but studies find little empirical support in life and automobile insurance markets (Cawley and Philipson, 1999; Chiappori and Salanie, 2000). While studies find evidence in favor of adverse selection in health insurance markets, these findings are limited because they show that low-risk individuals switch to less comprehensive policies rather than dropping out of insurance markets (e.g., Cutler and Reber, 1998; Buchmueller and DiNardo, 2002; Finkelstein, 2004).[4]

Finally, this paper contributes to the existing empirical literature on health insurance

[3] See Gollier and Eeckhoudt (2000) for a review. Increase in risk refers to first order or second order stochastic dominated shifts, though it usually refers to a first order stochastic dominated shift in the context of health insurance coverage.

[4] Finkelstein (2004) shows that an introduction of minimum standards for the Medigap health insurance market is associated with a decline in the Medigap coverage rate. I interpret this decline as an intensive-margin change in coverage because the elderly are primarily covered by Medicare.

coverage. McClellan (1998) and Smith (2003) take a macro-level view of the U.S. health insurance markets and suggest that diagnosis of severe medical conditions does not lead to a loss in health insurance coverage. In contrast, this paper takes a micro-level view and finds a coverage loss in the individual market**.** This divergence in findings is not unexpected because each health insurance market targets different segments of the population and varies substantially in risk discrimination.

The rest of the paper is structured as follows. Section 2 gives an overview of the individual health insurance market. Section 3 describes the data. Section 4 outlines the empirical strategy. Section 5 reports findings in five sub-sections: changes in insurance coverage, state price restrictions, premium payment levels, calibration of the ex-ante welfare loss, and income effects. Finally, Section 6 concludes.

2. Operation of the Individual Health Insurance Market

I start this section by reviewing the major types of health insurance coverage in the U.S. Then I introduce the complex operation of the individual market by highlighting three elements relevant to continuation of coverage: risk discrimination, state price restrictions, and guaranteed renewability.

Figure 1 shows the major health insurance markets for Americans aged 50 and above. Medicare coverage is universally available to individuals aged 65 and above, and Medicaid coverage is available to some of the indigent. The rest of the sub-population obtains coverage from the private market, and the stability of their coverage may depend on their income levels. Thus these individuals can be divided into three insurance categories which roughly correspond with income levels as well. The first category includes individuals who obtain group coverage and retiree health insurance benefits. When they retire before the age of 65, these benefits offer them a smooth transition to Medicare coverage. The second category includes individuals who obtain group coverage when they work, but do not have retiree benefits. Since COBRA coverage is limited to eighteen months, these individuals may purchase insurance coverage from the individual market if they retire before the age of 65. The third category includes the self-employed and low-wage workers whose jobs do not provide insurance coverage. Individuals in this category rely on the individual health insurance market as their sole source of coverage.

In the group market, continuation of coverage may not depend on risk status because

federal laws prohibit individual risk discrimination. If firms provide group health insurance coverage, employees are entitled to coverage, regardless of risk status. The amount of employee contribution is also required to be independent of risk status.[5] In the individual market, however, continuation of coverage may depend on risk status because most states allow insurance companies to conduct risk discrimination by medical underwriting. When applying for coverage, individuals have to answer a series of medical questions. Companies review these answers and decide whether they will offer each applicant coverage.

The effects of risk discrimination on coverage acquisition differ across two types of high-risk policyholders: (1) policyholders who are high-risk when applying for coverage; (2) policyholders who become high-risk after their policies are issued. Risk discrimination limits only the first type in obtaining coverage from the individual market. This limitation arises because, contrary to economic theory, it is controversial to offer high-risk applicants actuarially fair premium rates. Therefore, most insurers do not offer high-risk applicants coverage though the following three kinds of insurers are exceptions to this common practice: (1) insurance companies or membership organizations, such as the American Association of Retired Persons, whose practices of medical underwriting are less restrictive; (2) insurers whose policies are subsidized through state-level programs, such as risk pools; (3) insurers selling policies in states where open enrollment or guaranteed issue is implemented. Economic theory suggests that the practice of medical underwriting creates a public-information environment where insurers facing competitive markets offer full insurance coverage with actuarially fair premium rates to both high-risk and low-risk applicants.

When coverage is obtained, the first type of high-risk policyholder usually pays a surcharged premium rate. This surcharge depends on whether the state implements price restrictions (see the appended table). Overall, this surcharge ranges from 0 to 50% of the standard risk rate in states that implement price restrictions. In 1996, 36 states implemented price restrictions. This number increased to 37 in 2000. States implement price restrictions if they impose rating restrictions and/or establish risk pools. Rating restrictions lower the premium rate charged to high-risk policyholders, but raise the rate charged to low-risk policyholders. The most

[5] It is possible that employers, especially small-firm employers, stop offering insurance coverage or switch from offering comprehensive insurance policies to offering policies that have lower quantities of coverage when the group has a substantially increased risk due to some employees' diagnoses of severe medical conditions (e.g., HIV). However, any changes in offering group coverage should apply to all members of the group, not just to employees diagnosed with severe medical conditions.

stringent type of rating restriction is community rating because it requires insurance companies to charge the same rate for all policyholders.[6] Risk pools offer insurance coverage to high-risk individuals at a subsidized rate.[7]

In states that do not implement price restrictions, an implicit cap on the surcharge may be imposed due to the controversy about offering high-risk applicants actuarially fair rates. From the report of the Kaiser Family Foundation (Pollitz, Sorian, and Thomas, 2001), I deduce that this implicit cap amounts to 100% of the standard risk rate.

Figure 2, which shows premium patterns in the individual market, implies that the effects of risk discrimination on coverage renewal may also vary across these two types of high-risk policyholders. The first type may be more likely to drop coverage than their low-risk counterparts because revised premium rates may exceed only their reservation price for coverage. This excess may arise because the first type usually pay a surcharged rate when policies are issued, and upon coverage renewal, the increase in premium rates averages 20% every policy year (American Academy of Actuaries, 2004). Therefore, Figure 2 shows a widening gap in premium rates between the first type and their low-risk counterparts. Their gap in reservation prices, however, can be reasonably assumed to be constant because their risk status remains the same throughout these periods.

When policyholders become high-risk, they begin to have large medical claims. However, Figure 2 implies that these policyholders may not lose coverage in the short run due to the absence of large, sudden increases in premium rates. This absence arises because individual health insurance contracts offer "guaranteed renewability" that allows policyholders to renew their contracts and that prohibits companies from revising premium rates based on an individual's claims experience.[8] Insurance companies, however, can revise rates based on the experience of a *class* of policies, policies offering the same or similar coverage. Companies revise premium rates every six months or every year.

In the long run, however, policyholders who become high-risk may lose coverage because as time goes by, they pay a higher premium rate due to adverse selection in the original class of policies. These policyholders are usually locked in to their original policies since they

[6] The other type of rating restriction is a health status rating band that allows premium rates to vary from +/-10 % to +/-25% of the base rate.
[7] Communicating for Agriculture and the Self-Employed (2003) reviews funding mechanisms of risk pools.
[8] Patel and Pauly (2002) indicates that this offer has been a common practice for decades.

cannot pass underwriting to obtain new policies. Yet, their low-risk counterparts can migrate to new policies. This situation will be exacerbated if insurance companies adopt "closed block durational rating" which implies rate revision is based on the duration of policy retention (General Accounting Office, 1996). This durational rating indicates that insurers offer a class of policies at an artificially low rate. Then these insurers raise premium rates, close this class of policies by no longer accepting new applicants, and introduce a new class of policies to the market. Closed block durational rating is legal in states that do not implement price restrictions.

3. Data Description

The Health and Retirement Study is a nationally representative data set; it surveyed individuals aged 50-61 in 1992 and has followed up with them every two years.[9] Since Americans aged 65 and above have access to Medicare coverage, my analysis is restricted to the "near elderly," aged between 50 and 64. The individual health insurance market plays a crucial role in offering coverage to the near elderly because they are in transition from the workforce to retirement, and the percentage of group plans covering retirees declined steadily from 78% in 1992 to 64% in 2000. During 1994, the individual market served as the only source of coverage for approximately 10.5 million Americans under the age of 65. This amounted to 4.5% of the non-elderly population, but for retirees aged 64 or younger, this percentage reached 9.8% (General Accounting Office, 1996).

HRS enables me to identify respondents who rely on the individual market as their sole source of coverage because it solicits information on four types of health insurance plans: (1) public plans (Medicare or Medicaid), (2) own group plans, (3) spouse's group plans, and (4) plans directly purchased from an insurance company.

While age or self-reported health conditions are commonly used to indicate risk status, this paper uses doctor diagnosed severe medical conditions because insurance companies classify applicants diagnosed with these conditions as "medically uninsurable" and usually reject them. To remedy the adverse coverage effect caused by this rejection, a number of states implemented reform programs in the individual market in the 1990s.

Among various severe medical conditions, HRS enables me to define high-risk

[9] See Juster and Suzman (1995) and Juster and Smith (1997) for further discussion of the data set. This paper uses RAND HRS data file and RAND-enhanced flat files because they facilitate data management.

respondents as those diagnosed with any of the four conditions: (1) diabetes; (2) heart disease; (3) stroke; (4) cancer (any kind except skin cancer). Low-risk respondents are not diagnosed with any of these four conditions. While these conditions vary from chronic to acute, individuals diagnosed with these conditions all share a common feature of being rejected by most insurance companies (General Accounting Office, 1996; Blue Cross Blue Shield of Illinois, 2005). It is a delicate task to decide which conditions should be classified as "medically uninsurable" because both heterogeneity in medical underwriting and sample size should be taken into account. This heterogeneity arises because less severe health problems, such as back pain, may lead to rejections in some companies only. Therefore, if a broad range of health problems are included in the risk indicator, the analysis may find no effects of severe medical conditions on continued coverage simply because some of the classified health problems do not accurately indicate risk status. While it would augment my examination by analyzing the coverage effect of each medical condition, this analysis is not feasible due to limited sample sizes. HRS survey questions on doctor diagnosed health problems resemble the medical questions used in underwriting because HRS questions are worded as "In the past two years has a doctor told you that you have (diabetes)? " HRS statistics indicate that 31% of the near elderly are high-risk. This percentage is 22% for the near elderly covered by individual policies.[10]

Table 1 shows a two-period transition matrix of insurance status. For respondents covered by group plans, this table indicates that the chance of becoming uninsured responds little to risk status (approximately 3% for each risk status). For respondents covered by individual plans, however, this chance increases with risk status (13% versus 9%). This increase does not match the theory of the demand for insurance coverage; it may be caused by an imperfect safety net. The support from public plans is outweighed by the adverse coverage effect of risk discrimination in the individual market. Being high-risk is associated with a 6 percentage points higher chance of becoming covered by public plans (10% versus 4%), but with a 9 percentage points lower chance of retaining individual plans (48% versus 57%).

Table 2, which shows the transition matrix conditional on price restrictions, indicates that coverage security is eroded away by a larger degree of risk discrimination in the individual market. In states that do not implement price restrictions, the chance of becoming uninsured

[10] Broken down by medical conditions, 40% of these high-risk policyholders are diagnosed with diabetes. This percentage is 33% for cancer, 42% for heart disease, and 10% for stroke. The sum of these four percentages exceeds 100% since a policyholder may be diagnosed with multiple conditions.

significantly increases with risk status by a wide margin (20% versus 11%). Yet, this margin is small and insignificant (10% versus 8%) in states that implement price restrictions.

It appears that the coverage effect of price restrictions on low-risk policyholders are opposite to what is expected because their implementation is associated with a lower chance of becoming uninsured (8% versus 11%) and a higher chance of retaining individual plans (58% versus 57%). However, a multivariate analysis is needed because these two types of states differ in other dimensions, such as geographical location and the rate of uninsured individuals. Broken down by census region, states that do not implement price restrictions are primarily located in the South, and the South also has the highest rate of uninsured individuals (20%).[11]

4. Empirical Strategy

This section discusses the strategy that identifies the causal effects of severe medical conditions on changes in health insurance coverage. Causality is difficult to establish because it is socially unacceptable to run randomized or natural experiments that generate truly exogenous variation in severe medical conditions. The best feasible strategy is to conduct an observational study that uses a less heterogeneous sample and that carefully controls for observed and unobserved heterogeneity. Therefore, I mitigate sample heterogeneity by using a narrow age group (aged 50-64) stratified by current insurance status. This stratification accounts for individual fixed effects since current insurance status is a variation of lagged dependent variable.

I divide high-risk policyholders into two groups: (1) policyholders who "just become high-risk;" (2) policyholders who "have been high-risk for two or more years." I focus not only on the first group, but also on the second due to two reasons. First, these two groups face different premium rates because approximately 60% of the policyholders in the second group apply for individual policies when they are at the status of high-risk. Second, while the first group may have a higher demand for coverage than the second, both groups' demand is substantially higher than the low-risk group. Unlike leg injuries from a motor vehicle accident, the diagnosis of the four severe medical conditions resembles a permanent health shock as individuals hardly ever make a full recovery from these conditions.

4.1 Changes in insurance coverage

[11] This rate refers to the percentage of civilian noninstitutionalized population who lacked health insurance coverage in 1996. The rates for the other three regions are 14% for the Midwest, 14% for the Northeast, and 19% for the West.

My analysis centers on a reduced form equation that describes the decision to continue coverage for respondents covered by individual plans in period (t-1).

(1) $UNINS_{it} = f(HRISK_{it}, PC_{it}, HRISK_{it}*PC_{it}, ELIG_{it}, RESOURCE_{it}, INS_{it-2}, X_{it}, REG_i)$

Due to policy interests, the binary dependent variable UNINS indicates whether the respondent is uninsured (not covered by any type of coverage) in period (t). UNINS uses information collected during the survey years of 1996-2000 because health insurance status is consistently measured only during this period. This consistency is discussed in the appendix.

HRISK refers to two binary variables indicating risk status. One variable JBHRISK indicates whether the respondent just become high-risk [low-risk in period (t-1), but high-risk in period (t)]. The other variable B2HRISK indicates whether the respondent has been high-risk for two or more years (high-risk in both periods). The reference group is the low- risk in both periods. PC is a binary variable indicating whether states implement price restrictions. I exploit cross-sectional variations in price restrictions, not within variations, because the latter was generated in only one state during the period of 1996-2000. HRISK*PC indicates the interaction between risk status and price restrictions.

A binary response model, not a multinomial response model or a duration model, is employed. The use of a binary model is justified because policyholders can choose to keep their coverage or become uninsured. A multinomial model may appear suitable since there are five types of insurance coverage. However, its use hinges on the assumption that all types of coverage are feasible choices. This is hardly justified because public plans are not available to low-risk respondents unless they are indigent. Own group coverage may not be available to the self-employed because it may take these near elderly more than two years to accumulate human capital required for switching to a job offering insurance coverage. A duration model is not used due to inadequate variations in the duration of policy retention.

I test whether insurance coverage responds to changes in risk status. Non-response can be inferred by zero or negative coefficients on HRISK because the demand for coverage increases with risk status. I also test whether price restrictions result in an adverse selection effect in which low-risk policyholders drop out of the market, but high-risk policyholders retain coverage. This effect can be implied by positive coefficients on PC and negative coefficients on

(PC+HRISK*PC).[12]

ELIG refers to eligibility for alternative types of coverage, RESOURCE refers to economic resources that respondents possess, INS refers to past insurance status, X refers to socio-economic variables, and REG refers to census region fixed effects. These covariates are discussed in the appendix.

4.2 Premium payment levels

To augment the coverage analysis, I employ a reduced form equation to examine whether premium payment levels respond to changes in risk status.

$$(2) \qquad Y_{it} = \beta_0 + \beta_1 HRISK_{it} + \beta_2 PC_{it} + \beta_3 HRISK_{it}*PC_{it} + \beta_4 QCOV_{it} + \beta_5 Z_{it} + \beta_6 REG_i + \varepsilon_{it}$$

The variable Y refers to annual premium payment measured by 2002 dollars. The variables of HRISK and PC follow the same definitions from Section 4.1. QCOV refers to quantity of coverage, Z refers to economic resources, past insurance status, and socio-economic variables, REG refers to census region fixed effects. These covariates are discussed in the appendix.

While this examination can be enhanced by analyzing changes in premium payment, this analysis is not feasible due to limited premium information. This limitation arises because the premium payment survey questions are ambiguous for married respondents, and this ambiguity may lead to substantial measurement error in premium information. As a result, married respondents are excluded from premium analysis even though this exclusion greatly reduces premium information by approximately 75%. This ambiguity and three additional sources of measurement error leading to observation exclusions are discussed in the appendix.

5. Findings

I report findings in five sub-sections: changes in insurance coverage, state price restrictions, premium payment levels, welfare analyses, and income effects.

5.1 Changes in insurance coverage

As discussed in Section 4.1, a binary response model is used in estimation. Results from

[12] This effect can also be implied by negative coefficients on (HRISK*PC); price restrictions reduce high-risk policyholders' probability of becoming uninsured relative to their low-risk counterparts.

linear probability models are presented for ease of exposition. Similar results are found from probit models. Additionally, results from a single regression that pools respondents across risk status are presented. Similar results are found from three separate regressions conditional on risk status. Since the sample may have multiple observations on the individual, standard errors are corrected for individual-level clustering.[13] Similar results are found when state-level clustering is corrected.[14]

Table 3 indicates that coverage security does not hold for policyholders who have been high-risk for two or more years. Being high-risk is associated with a 4.5 percentage points higher probability of becoming uninsured when the effects of socio-economic variables are controlled in column (1). This estimate increases to 5.1 percentage points when the effects of eligibility for alternative types of coverage are netted out in column (3). Since the baseline probability is 8.9 percentage points, this indicates that policyholders who have been high-risk are 57% (5.1/8.9) more likely to become uninsured. This likelihood may be explained by risk discrimination in the individual market. Additionally, this likelihood may be explained by imperfect safety net due to the slight decline in the estimates of "being high-risk" from column (3) to (1). This decline implies that while alternative types of coverage mitigate the adverse coverage effect of risk discrimination, this improvement is slight. This slight improvement is not surprising because policyholders of individual plans are the ones who are not eligible for alternative types of coverage in the first place. Column (2) adds the eligibility for public plans as the covariate, and column (3) adds the eligibility for own and spouse's group coverage.

Yet, the findings indicate that policyholders who become high-risk do not lose coverage immediately. Column (1) shows that becoming high-risk is associated with a 0.02 percentage point insignificantly higher probability of becoming uninsured. This insignificance holds in columns (2) and (3), and further discussion is reserved for Section 5.3.

In columns (1)-(3), household income is used to proxy for economic resources that respondents possess. A parallel analysis that uses household wealth as the proxy is shown in columns (4)-(6). The results from the latter three columns match the findings in columns (1)-(3). This match may be caused by the high correlation between income and wealth as the statistics

[13] The econometric model presented in equation (1) assumes that the error term is not correlated with insurance status in period (t-1) or (t-2). Yet, the error term can be correlated with insurance status in period (t-3) or earlier. This suggests that the error term can be correlated within an individual. Wooldridge (2003) indicates that this correlation is not likely to cause inconsistency of the OLS estimator.

[14] Unreported results are available upon request.

indicate a 0.57 correlation coefficient. The rest of this paper uses household income to measure economic resources because it may mitigate the endogeneity problem. The value of household income precedes reported insurance status by at least three months because household income refers to annual income earned during the last calendar year of period (t), and approximately 90% of the respondents are interviewed during April and December. On the contrary, the value of household wealth may be endogenous to the decision to continue coverage because HRS survey questions indicate that both wealth and insurance status refer to the point information when respondents are interviewed in period (t).

The results indicate that the estimates of the covariates are consistent with what is expected. The findings from columns (1)-(3) suggest that income level is negatively correlated with the predicted probability of becoming uninsured. A 1% increase in household income is associated with a 2.2 percentage points lower probability of becoming uninsured. The findings from column (2) suggest that being eligible for public plans is negatively correlated with the probability of becoming uninsured; receiving DI/SSI benefits is associated with a 11.3 percentage points lower probability of becoming uninsured. The findings from column (3) suggest that being eligible for group coverage is associated with a reduction in the probability of becoming uninsured, but this reduction is not significantly different from zero. This insignificance indicates that conditional on not being eligible for group coverage, the likelihood is small for the near elderly to become covered by group plans even though they or their spouses work full time.

5.2 State price restrictions

Table 4 indicates that coverage insecurity is exacerbated in states that do not implement price restrictions. Being high-risk is associated with a 12.3 percentage points (118%) higher probability of becoming uninsured. Moreover, the findings imply that price restrictions result in an adverse selection effect leading low-risk policyholders to drop out of the market. This dropout amounts to 4.7 percentage points or 45% (4.7/10.4). The findings also show that price restrictions reduce high-risk policyholders' probability of becoming uninsured and lower the overall rate of insurance coverage. In states that do not implement price restrictions, the average probability of becoming uninsured amounts to 12.9 percentage points. This probability reaches 15.5 percentage points in the other type of state. HRS statistics indicate that for the near elderly

covered by individual plans, 20% are high-risk, and 80% are low-risk.[15] I assume that these percentages do not depend on state price restriction and use them as weights to calculate the average probability.

Table 4.1 indicates this adverse selection effect is not driven by declines in income. No matter whether respondents experience declines in income, price restrictions are associated with a 4 percentage points increase in low-risk policyholders' probability of becoming uninsured. Respondents experience declines in income if their household income in period (t) is less than 95% of their income in period (t-1).

Overall, the findings provide evidence in favor of adverse selection. Price restrictions achieve their intended effect of helping high-risk policyholders retain coverage, but lead low-risk policyholders to drop out of the market. Since low-risk policyholders are the majority, the overall coverage rate declines. For two reasons, the decline found in this paper should be considered as the lower bound effect of price restrictions in the individual health insurance market. First, this paper studies the near elderly's decision to continue coverage, and the demand for insurance coverage increases with age. Therefore, the decline in non-elderly coverage rate is expected to be larger if low-risk, young policyholders have a more elastic demand for coverage. Second, this paper investigates the average effect of price restrictions. The decline in coverage rate is expected to be larger in states that implement community rating.

5.3 Premium payment levels

Table 5 reports the OLS findings that concern risk status and premium payment. The nationwide analysis, which is shown in columns (1)-(3), indicates that becoming high-risk is actually associated with a 3% (-68/2414) insignificant reduction in premium payment when quantity of insurance coverage and geographical variations are accounted for. This insignificance, which matches the findings from Table 3, may be explained by two factors: (1) "guaranteed renewability" that prohibits selective increases in premium rates; (2) short duration (less than two years) of experiencing severe medical conditions.

The findings from column (3) suggest that being high-risk is associated with a 22% (520/2414) significantly higher premium payment. To examine whether this higher premium payment is influenced by state price restrictions, a parallel analysis conditional on price

[15] The percentages are actually 17% for policyholders who have been high-risk, 5% for policyholders who become high-risk, and 78% for low-risk policyholders. To facilitate the calculation, I omit policyholders who become high-risk and round off the percentages.

restrictions is shown in columns (4)-(6). Due to limited premium information, some of the estimates are not different from zero at the conventional level of significance. Yet, the findings provide evidence in favor of adverse selection. Price restrictions reduce high-risk policyholders' premium payment relative to their low-risk counterparts, increase low-risk policyholders' payments, and reduce high-risk policyholders' payments. The findings from column (6) indicate that being high-risk is associated with a 13% [292/(2281+24)] higher premium payment in states implementing price restrictions. This percentage is 42% (962/2281) in states that do not implement price restrictions. This 42% serves as the lower bound of the gap in premium payment in this type of state since the OLS estimate is downward biased due to sample selection shown in Table 4. By the same token, 1% (24/2281) serves as the lower bound of low-risk policyholders' gap in premium payment due to state implementation of price restrictions.[16]

This paper uses three policy characteristics to measure quantity of insurance coverage though the information on deductible is not available. This unavailability may lead to an omitted-variable bias, and it is difficult to "sign" the bias due to the complexity of the underlying relationship. Yet, in the scenario of two explanatory variables, an upward bias arises due to a negative correlation between risk status and the amount of deductible. On the contrary, a downward bias arises when being high-risk is associated with selecting a high-deductible plan. This selection is facilitated by the possibility of within-company policy switches. While high-risk policyholders cannot pass new medical underwriting, some insurance companies allow them to switch to plans offering a higher amount of deductible. This switch will be made when the gain from a lowered premium payment outweighs the loss from an increase in risk exposure.

5.4 Calibration of ex-ante welfare loss

Table 3 shows that high-risk policyholders are more likely to become uninsured than their low-risk counterparts. This likelihood implies imperfect "smoothing" in insurance coverage; individuals are at risk of losing coverage when they are diagnosed with severe medical conditions. The risk of losing coverage reduces welfare because ex-ante, individuals would want to avoid coverage fluctuation, but cannot. Tables 4 and 5 imply that this coverage fluctuation can be explained by variation in premium rates due to risk status. Therefore, by following Chiappori

[16] In theory, the specification error due to sample selection can be readily corrected by econometric techniques, such as the Heckit method. In practice, however, this method is not feasible because the censored sample (respondents who are not covered by individual policies) accounts for approximately 90% of the near elderly. It is problematic to extrapolate premium values of 90% of the near elderly from the other 10%.

(2003)**,** I employ this premium variation to calibrate the ex-ante welfare loss measured by risk premium, the amount of money that individuals are willing to pay to avoid premium uncertainty[17]. Risk premium (rp) is defined by

(3) $u(I-P-rp)= q\, u(I-P_{HR})+(1-q)\, u(I-P_{LR})$

u is an expected utility function, I refers to household income, P refers to average premium rate, P_{HR} refers to premium rate charged to high-risk policyholders, P_{LR} refers to premium rate charged to low-risk policyholders, q refers to the probability of being diagnosed with severe medical conditions (classified as "high-risk"). Before diagnosis, individuals would be charged average premium rate. This diagnosis exposes individuals to a "classification risk" because if they are tested positive (negative), they will be charged a high-risk (low-risk) premium rate. Individuals would be willing to pay a certain amount of money (risk premium) to avoid this premium uncertainty.

Table 6, which shows the distribution of risk premium, indicates that two-thirds of the respondents fall into the "most risk averse" category and are willing to pay 14% of their income to avoid "classification risk." The rest of the respondents are less risk averse so their risk premium is smaller. Respondents are divided into four categories according to their risk aversion. This division is based on their responses to a set of HRS questions on willingness to accept hypothetical gambles over lifetime income. I employ the conventional use of the constant relative risk aversion (CRRA) utility function, and the coefficient of relative risk aversion is derived from Barsky et al (1997) that estimates the average coefficient of relative risk aversion for each of these four categories.

Table 6 calibrates risk premium by using the average probability of being diagnosed with severe medical conditions.[18] Table 6.1 shows the distribution of risk premium based on probability values deviating from the average. The findings indicate that when the average probability is used as the benchmark, risk premium responds moderately to variations in the probability. For a 5 percentage points change in the probability, the resulting change in risk premium ranges from 1% to 2% of the income. This magnitude roughly holds across categories

[17] This calibration concerns welfare loss only in the period immediately after diagnosis. It does not take into account long-term welfare loss.

[18] This average probability is 0.2 based on the percentage of high-risk policyholders.

of risk aversion. This probability may differ from the average for competing reasons. On the one hand, it may fall below the average since "classification risk" may have a deterrence effect leading only healthier individuals to take the medical exam. On the other hand, this probability may fall above the average since sicker individuals are more likely to take the medical exam when the loss due to "classification risk" is outweighed by the benefit due to early treatments.

To facilitate the calibration, I make the following assumptions. First, individuals are not covered by individual plans at the time of diagnosis, but wish to purchase individual plans.[19] Second, welfare loss caused by paying a high-risk actuarially fair rate is equivalent to the loss caused by coverage rejection. This calibration assumes that insurance companies do not reject applications from high-risk individuals, but charge them actuarially fair premium rates. In practice, however, insurance companies do not offer actuarially fair rates to high-risk individuals, but mostly reject their applications. Thirdly, when individuals are classified as "high-risk", they prefer purchasing coverage at the actuarially fair rate to dropping out of the market. Finally, individual insurance plans reimburse all medical expenses so "classification risk" affects premium rates only.

I employ the following parameter values to facilitate the calibration. First, the actuarially fair premium rate of single, low-risk policyholders is $2,414 per year. This value is taken from the estimate in Column (3) of Table 5. Second, the actuarially fair premium rate of single, high-risk policyholders is $9,656 per year. This value is based on HRS statistics on total medical expenses indicating that the expenses incurred by high-risk policyholders are four times higher than their low-risk counterparts. Third, the average premium rate is $3,862 per year. This value is the weighed average rate. Finally, household income is $27,300 per year. This value is taken from the median income of single policyholders.

5.5 Income effects

Table 3 implies imperfect "smoothing" in insurance coverage, and Table 4 indicates that this imperfection can be explained by risk discrimination in the individual market. In this sub-section, I analyze whether this imperfection can be explained by additional factors, including an income effect, better health conditions, fatalism, and the crowding out effect of Medicaid coverage or of uncompensated care. I find that an income effect also explains this imperfection,

[19] If they are covered by individual plans, the welfare loss may be smaller because of prohibition of individual experience rating.

but the rest of the factors do not.

Table 7 examines the income effect by dividing policyholders into two income groups. The findings indicate that coverage insecurity is exacerbated for low-income policyholders; being high-risk is associated with a 9.8 percentage points (83%) significantly higher probability of becoming uninsured. For high-income policyholders, however, being high-risk is associated with a small and insignificantly higher probability. I use the median value of household income to determine which of the two possible group policyholders fall into: the above or median group. This median value is conditional on survey year and on marital status (single or married). Policyholders are covered by individual plans in period (t-1) and decide to continue or lose coverage in period (t). Household income refers to the income earned during the last calendar year of period (t).

The transition matrix shown in Table 7.1 indicates that declines in income can explain why low-income, high-risk policyholders are more likely to become uninsured than their low-risk counterparts. These high-risk policyholders experience a larger decline in income, regardless of marital status. Single, low-income, high-risk policyholders experience a 38% decline in income, yet their low-risk counterparts experience a 14% decline. These two percentages are 22% and 14%, respectively, for their married counterparts.

While this paper does not formally test the causality between income and health, the transition matrix suggests that poorer health may lead to this larger income decline through a greater increase in retirement.[20] For low-income policyholders, being high-risk is associated with a significantly higher proportion of poor health (0.41 versus 0.17) in period (t-1), but with the same proportion of retirees (0.22).[21] The proportion of high-risk retirees significantly increases to 0.36 in period (t), while the low-risk's proportion slightly increases to 0.25. This greater increase in retirement may lead to a larger decline in income.

For high-income policyholders, however, being high-risk is associated with a small and insignificant increase in retirement. Their incomes actually increase, regardless of marital and risk status. This may explain their small and insignificant risk differential in the probability of becoming uninsured.

The findings from Table 8 confirm that both risk discrimination and income effects

[20] See Adams et al. (2003) for investigations of the causality between health and socioeconomic status.
[21] These two associations hold in period (t-2) as well.

contribute to imperfect "smoothing" in insurance coverage. State price restrictions reduce the risk differential in the probability of becoming uninsured in both income groups. Specifically, for low-income policyholders, being high-risk is associated with a 19.9 percentage points higher probability of becoming uninsured in states that do not implement price restrictions. This number, however, is 5.3 in the other type of state. Low income increases the risk differential in the probability of becoming uninsured in both types of states. This increase amounts to 14.3 percentage points in states that do not implement price restrictions and to 6.6 percentage points in the other type of state.

The findings indicate that low-income, high-risk policyholders are more likely to become uninsured than their low-risk counterparts. One may hypothesize that this likelihood is caused by low-income, high-risk policyholders' improvement in health conditions. Yet, this hypothesis is rejected by self-reported health status shown in Table 9. For low-income, high-risk policyholders, becoming uninsured is not only associated with initially poorer health, but also with a wider gap in health status. For those who become uninsured in period (t), 54% of them report poor health in period (t-1). This percentage is 38% for those who remain insured. The gap in reporting poor health is 16 percentage points, but reaches 19 percentage points in period (t). For low-income, low-risk policyholders, however, becoming uninsured is associated with initially poorer health, but with an improvement in health status. For those who become uninsured in period (t), 27% of them report poor health in period (t-1). This percentage is 15% for those who remain insured. This gap is 12 percentage points, but narrows to 4 percentage points in period (t) since only 20% of those who become uninsured report poor health. The pattern of initially poorer health and an improvement in health status can also be found in high-income policyholders, regardless of risk status. The demand for health insurance coverage is derived from the demand for good health so one may hypothesize that an improvement in health conditions leads to dropout of insurance coverage.[22]

For low-income, high-risk policyholders, becoming uninsured is associated with initially poorer health. One may conjecture that this poorer health result in fatalism that leads to coverage dropout. Fatalism indicates that sick policyholders consider it too costly to invest in "good

[22] It would be helpful to examine the relationship between medical care utilization and becoming uninsured. Yet, it is difficult to interpret this relationship because health insurance status refers to the point information when respondents are interviewed in period (t), but medical care utilization refers to the care received during the past two years of period (t).

health;" they view retaining health insurance coverage as inferior to consuming other goods. However, this association is unlikely to be explained by fatalism for three reasons. First, fatalism may arise due to personal preference, but my analysis takes into account individual fixed effects. Second, fatalism may arise due to changes in preference. Yet, it is difficult to find a credible source for this change because these policyholders do not report abrupt declines in health conditions. Third, in spite of the costly investment in good health, policyholders would want to retain coverage so that they can keep consuming their health conditions at a certain level. Good health is not only an investment, but also a consumption good (Grossman, 1972).

I investigate the crowding out effect of Medicaid coverage by excluding from analysis policyholders whose household incomes fall in the lowest 10%. The findings are shown in column (1) of Table 10, and the results related to being high-risk are very similar to their full-sample counterparts in column (2). This suggests that Medicaid cannot explain why low income increases the risk differential in the probability of becoming uninsured. A 10% cutoff value is chosen because the incomes of the remaining policyholders fall above the income standards used in most states to determine eligibility for Medicaid coverage.[23] The risk differential increase in the probability of becoming uninsured may represent the crowding out effect of Medicaid coverage because it pays for medical expenses incurred during the three months prior to the date of application if the indigent are eligible at that time. This payment may lead applicants to drop individual plans and become temporarily uninsured due to pending approval. This temporary lack of insurance coverage is more likely to arise among indigent, high-risk policyholders than their low-risk counterparts because the former can apply for Medicaid coverage from all three key eligibility groups, but the latter can apply from the categorically needy group only. While the Medicaid program varies across states, it attempts to cover three key eligibility groups: (1) the categorically needy; (2) the medically needy; (3) special groups (Centers for Medicare & Medicaid Services, 2003).

For low-income policyholders, being high-risk is associated with a significantly higher probability of becoming uninsured. One may hypothesize that this association is caused by the crowding out effect of uncompensated care because mission and statutes require hospitals and clinics to offer certain types of medical care even in the absence of payment. However, this

[23] The 10% cutoff value is conditional on survey year and on marital status. The lowest income of the remaining policyholders is approximately $6,000 for single individuals and $13,300 for married individuals. The findings do not change materially when a 15% cutoff value is used.

hypothesis contradicts (1) the results from a fixed-effect approach, (2) research reports from the Urban Institute, and (3) conventional wisdom. Access to uncompensated care is typically measured by the distance to free clinics and hospitals. This distance is assumed to be a fixed effect. If so, then the findings take into account the crowding out effect of uncompensated care because my analysis controls for individual and regional fixed effects. Research reports from the Urban Institute (Holahan and Spillman, 2002; Spillman, Zuckerman, Garrett, 2003) imply little crowding out effect because uncompensated care does not affect the substantial gap in medical care utilization between the low-income uninsured and their insured counterparts. Conventional wisdom suggests that if this crowding out effect did exist, being *low-risk* would be associated with a higher probability of becoming uninsured. Due to a lower demand for coverage, low-risk policyholders may be more likely to substitute formal insurance coverage for the limited free coverage.

Finally, the relatively high re-interview rate suggests that attrition plays a small role in the findings. Thus the specification error due to attrition is not corrected. During 1996-2000, the re-interview rate averages 93.3%, and the mortality rate averages 2.4%. Re-interview rate refers to the response rate for those who were interviewed at the previous wave. Mortality rate refers to the ratio between the number of deaths since the previous wave and the number of respondents at the previous wave.

6. Conclusions

High-risk individuals have a higher demand for health insurance coverage, but they may be at risk of losing coverage due to risk discrimination in private health insurance markets and due to declines in resources. This paper examines whether high-risk individuals, specifically high-risk policyholders who purchase coverage from the individual market, continue or lose coverage. The findings suggest that policyholders who have been high-risk for two or more years are more likely to become uninsured than their low-risk counterparts. This likelihood implies imperfect “smoothing” in coverage so it indicates an ex-ante welfare loss. I calibrate this loss and find that two-thirds of the policyholders are willing to pay 14% of their income to avoid coverage fluctuation.

States have implemented price restrictions to narrow the range of premium rate variation due to risk status. Yet, these restrictions are prone to market failures in the individual health

insurance market. This paper confirms the premise of market failure because the findings show that price restrictions have helped high-risk policyholders retain coverage, but result in a negative externality leading low-risk policyholders to drop out of the market. This dropout provides evidence of adverse selection and implies a welfare tradeoff between regimes with and without price restrictions. Future research will employ the joint distribution of risk status and risk aversion to figure out which regime is associated with a larger overall welfare loss.

References

Adams, Peter et al., "Healthy, wealthy, and wise? Tests for Direct Causal Paths between Health and Socioeconomic Status," *Journal of Econometrics* 112 (2003), 3-56.

Akerlof, George A., "The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanism," *Quarterly Journal of Economics* 84:3 (1970), 488-500.

American Academy of Actuaries, *Report to the NAIC's A&H Working Group of the Life and Health Actuarial Task Force*, Washington, D.C. (2004).

Barsky, Robert B., F. Thomas Juster, Miles S. Kimball, Matthew D. Shapiro, "Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study," *Quarterly Journal of Economics* 112:2 (1997), 537-579.

Blue Cross Blue Shield of Illinois, *Blue Choice Select: Individual and Family Health Insurance Application Brochure*, Chicago, IL (2005).

Buchmueller Thomas C., Robert G. Valletta, "The Effect of Health Insurance on Married Female Labor Supply," *Journal of Human Resources* 34:1 (1999), 42-70.

Buchmueller, Thomas, John DiNardo, "Did Community Rating Induce an Adverse Selection Death Spiral? Evidence from New York, Pennsylvania, and Connecticut," *American Economic Review* 92:1 (2002), 280-294.

Cawley, John, Tomas Philipson, "An Empirical Examination of Information Barriers to Trade in Insurance," *American Economic Review* 89:4 (1999), 827-846.

Centers for Medicare & Medicaid Services, *Medicaid At-a-Glance 2003: a Medicaid Information Source*, Baltimore, MD (2003).

Chiappori, Pierre-Andre, "The Welfare Effects of Predictive Medicine," Working Paper, University of Chicago (2003).

Chiappori, Pierre-Andre, Bernard Salanie, "Testing for Asymmetric Information in Insurance Markets," *Journal of Political Economy* 108:1 (2000), 56-78.

Cochrane, John H., "A Simple Test of Consumption Insurance," *Journal of Political Economy* 99:5 (1991), 957-976.

Communicating for Agriculture and the Self-Employed, *Comprehensive Health Insurance for High-Risk Indivdiuals*, 17th ed. Fergus Falls, MN (2003).

Cutler, David M., Sarah J. Reber, "Paying for Health Insurance: The Trade-off between Competition and Adverse Selection," *Quarterly Journal of Economics* 113:2 (1998), 433-

466.

Finkelstein, Amy, "Minimum Standards, Insurance Regulation and Adverse Selection: Evidence from the Medigap Market," *Journal of Public Economics* 88:12 (2004), 2515-2547.

General Accounting Office, *Private Health Insurance: Millions Relying on Individual Market Face Cost and Coverage Tradeoffs*, GAO/HEHS-97-9, Washington, D.C. (1996).

Gertler, Paul, Jonathan Gruber, "Insuring Consumption Against Illness," *American Economic Review* 92:1 (2002), 51-70.

Christian, Gollier, Louis Eeckhoudt, "The Effects of Changes in Risk and on Risk Taking: A Survey" (pp.117-130), in Georges Dionne (Eds.), *Handbook of Insurance,* Boston: Kluwer Academic Publishers (2000).

Grossman, Michael, "On the Concept of Health Capital and the Demand for Health," *Journal of Political Economy* 80:2 (1972), 223-255.

Gruber, Jonathan, Jeffrey Kubik, "Health Insurance Coverage and the Disability Insurance Application Decision," *NBER Working Paper* No. 9148 (2002).

Holahan, John, Brenda Spillman, "Health Care Access for Uninsured Adults: a Strong Safety Net is not the Same as Insurance," Research Report, Urban Institute (2002).

Institute of Medicine, *Care without Coverage: Too Little, Too Late*, National Academies Press, Washington, D.C. (2002).

_____., *Hidden Costs, Value Lost: Uninsurance in America*, National Academies Press, Washington, D.C. (2003).

Juster, F. Thomas, James P. Smith, "Improving the Quality of Economic Data: Lessons from the HRS and AHEAD," *Journal of the American Statistical Association* 92:440 (1997), 1268-1278.

Juster, F. Thomas, Richard Suzman, "An Overview of the Health and Retirement Study," *Journal of Human Resources* 30: Special Issue on the Health and Retirement Study: Data Quality and Early Results (1995), S7-S56.

Levy, Helen, David Meltzer, "What do We Really Know about Whether Health Insurance Affects Health?" (pp. 179-204), in Catherine McLaughlin (Eds.), *Health Policy and the Uninsured*, Washington D.C.: Urban Institute Press (2004).

McClellan, Mark, "Health Events, Health Insurance, and Labor Supply: Evidence from the Health and Retirement Study" (pp.301-352), in David A. Wise (Eds.), *Frontiers in the*

Economics of Aging, Chicago: University of Chicago Press (1998).

National Association of Health Underwriters, *State-Level Health Insurance Reforms as of August 1, 2001*, 10 September 2004 <http://www.nahu.org>

Patel, Vip, Mark V. Pauly, "Guaranteed Renewability and the Problem of Risk Variation in Individual Health Insurance Markets," *Health Affairs-Web Exclusive* (28 August 2002), 280-289.

Pollitz, Sorian, and Thomas, "How Accessible is Individual Health Insurance for Consumers in Less Than Perfect Health," Research Report, Kaiser Family Foundation (2001).

Pyenson, Bruce S., "Genetic Testing, Medical Progress and the Health Insurance Industry," *Health Section News at the Society of Actuaries* 45 (2003), 1-7.

RAND Corporation, *Rand HRS Data Documentation*, Version D (2004)

Rothschild, Michael, Joseph E. Stiglitz, "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information," *Quarterly Journal of Economics* 90:4 (1976), 630-649.

Smith, James P., "Consequences and Predictors of New Health Events," *NBER Working Paper* No.10063 (2003).

Spillman, Brenda C., Stephen Zuckerman, Bowen Garrett, "Does the Health Care Safety Net Narrow the Access Gap?" Research Report, Urban Institute (2003).

Townsend, Robert M., "Risk and Insurance in Village India," *Econometrica* 62:3 (1994), 539-591.

_____., "Consumption Insurance: An Evaluation of Risk-Bearing systems in Low-Income Economies," *Journal of Economic Perspectives* 9:3 (1995), 83-102.

Wooldridge, Jeffrey M, *Introductory Econometrics*, 2nd ed. Mason, OH: South-Western (2003).

Appendix

I divide this appendix into three sub-sections: definitions of covariates, issues of measurement error, and a table describing state implementation of price restrictions in the individual health insurance market.

A.1 Definitions of covariates

In Section 4.1, the inclusion of ELIG (eligibility for alternative types of coverage) in equation (1) addresses the issue of policy correlation; states implementing price restrictions in the individual market may impose regulatory policies in other health insurance markets. These policies may reduce the number of uninsured individuals by facilitating the eligibility for an alternative type of insurance coverage. Thus while a person's eligibility may be endogenous to the decision to continue coverage, this omitted-variable specification error is corrected by including ELIG. Examples of policy correlation include state implementation of reform programs in the small group market, imposition of less restrictive requirements for enrolling in the Supplemental Security Income (SSI) program, and more generous award decisions on the disability insurance (DI) program. Recipients of SSI benefits are immediately eligible for Medicaid coverage, and recipients of DI benefits are eligible for Medicare coverage if they have been with a disability for two years (Gruber and Kubik, 2002).

As a result, ELIG includes three proxy variables (FTIME, SFTIME, and DISSI). FTIME refers to the binary variable indicating whether the respondent works full time; it is an eligibility proxy for own group coverage because the offer of group coverage is usually limited to full-time workers (Buchmueller and Valletta, 1999). SFTIME refers to the binary variable indicating whether the spouse works full time; it is an eligibility proxy for spouse's group coverage. DISSI refers to the binary variable indicating whether the respondent receives DI or SSI benefits; it is an eligibility proxy for public plans.[24]

In equation (1), RESOURCE refers to economic resources that respondents possess; it is proxied by household income earned during the last calendar year of period (t)[25] or by household wealth during period (t).

While it remains difficult to predict the onset of severe medical conditions, this onset is

[24] HRS statistics suggest that DISSI is a good proxy because only 3% of the respondents *not* receiving DI or SSI benefits are covered by public plans. In contrast, 71% of the respondents receiving DI or SSI benefits are covered by public plans.

[25] For example, if period (t) refers to the survey year of 1996, income refers to household income earned during the calendar year of 1995.

related to the intensity of medical care use and to socio-economic status. This intensity and status further affect whether individuals have undiagnosed medical conditions. This discrepancy may not be a major issue because both insurance companies and my paper classify these individuals as "low-risk." Still, these two endogeneity problems are addressed by the inclusion of INS and X in equation (1). INS refers to five binary variables that divide insurance coverage in period (t-2) into six categories: (1) individual plans, (2) public plans, (3) own group plans, (4) spouse's group plans, (5) uninsurance, and (6) unknown insurance status. The sixth category is not related to risk status because HRS added a new cohort in 1998, and past insurance status of this cohort is not known. Additionally, X refers to socio-economic variables that include age, gender, marital status, race, and education. Age is a continuous variable. Gender and marital status are binary variables. Race includes two binary variables (three categories: Caucasian, African American, and other). Education includes four binary variables (five categories: high school dropout, GED, high school graduate, some college, and college and above). While gender, race, and education are time-invariant, they serve as a proxy for unobserved trends that may vary across individuals and may affect the diagnosis of severe medical conditions.

In equation (2), QCOV is included to control for the confounding factor that high-risk individuals may purchase more comprehensive policies. Specifically, QCOV measures quantity of insurance coverage by six binary variables derived from the information on three policy characteristics. HRS survey questions to these characteristics are worded as (1) whether policies are HMO plans, (2) whether prescription drugs are covered, and (3) whether policies have limits on preexisting conditions. HMO plans are considered to be a smaller quantity of coverage as these plans ration inpatient care and provide limited choices of physicians. Answers to each question are divided into three categories: (1) yes, (2) no, and (3) not available. The third category is not related to risk status because HRS did not collect information on policy characteristics until 1996, but has collected information on premium payments since 1992.

Premium rates may vary across geographical areas; so do lifestyles. Since lifestyles may affect the prevalence of severe medical conditions, this endogeneity problem is mitigated by the inclusion of REG (census region fixed effects). Additionally, Z refers to a vector of variables including economic resources, insurance status in the last period, and socio-economic characteristics.[26] These variables follow the same definitions from equation (1).

[26] While *offered* premium rate does not depend on economic resources, race, and education, these three variables are

A.2 Issues of measurement error

As mentioned in Section 4.1, the dependent variable (UNINS) uses information collected during the survey years of 1996-2000. This time frame is chosen because health insurance status is consistently measured during this period, but not across all waves. This inconsistency may overestimate the number of uninsured respondents during the survey years of 1992, 1994, and 2002. While this potential measurement error is unlikely to be correlated with risk status, it may cause inefficiency for OLS estimators when health insurance status is used as the dependent variable. HRS asks respondents if they have any of the four types of insurance coverage listed in Section 3, and respondents who reported "not having any" are considered uninsured. During the survey years of 1996, 1998, and 2000, uninsured respondents are asked two additional questions that double check their status.[27] After being asked these questions, 8.5% of the uninsured respondents change their status because they are actually covered by insurance plans.

During the survey years of 1992-2000, the premium payment survey questions are worded as "How much do you pay for this health insurance?"[28] These questions are ambiguous for married respondents whose individual policies cover their spouses because their policies can be paid by either or both marriage partners. This ambiguity may create substantial measurement error in premium payment of married respondents because the majority of their policies cover spouses. During the survey years of 1996-2000, policyholders are asked if their plans cover someone else. These surveys suggest that 58% of married policyholders' insurance plans cover someone else, predominantly their spouses. This percentage is only 5% for single policyholders.

Measurement error may also arise in the following three types of observations so they are excluded from premium analysis. First, for respondents covered by individual plans for three consecutive periods or more, I mark their observations if premium payment values substantially vary from the values in the preceding and in the following period. Two observations are excluded because their variations exceed $5,000.[29] This exclusion is justified because a substantial increase in premium rate is hardly approved by state departments of insurance. Second, for each

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included because I examine the relationship between premium payment level and risk status.

[27] The first question is worded as "According to my information, you are not currently covered by any government or private health insurance plans that provide for medical care. Is that correct?" Answering "no" leads to a second question worded as "Under which of the following plans are you covered?".

[28] This question becomes clearer in 2002 as it is worded as "How much do you (or your [husband/wife/partner]) pay every month in premiums for this plan?"

[29] The cutoff value $5,000 is somewhat arbitrarily chosen. However, the findings are robust to other cutoff value, such as $4,000.

wave, I exclude observations whose premium payment values fall in the lowest 10%.[30] The per-wave cutoff value ranges from $221 to $385, and the per-wave number of excluded observations ranges from 9 to 18. This exclusion is justified because General Accounting Office (1996) suggests that it is very unlikely that the premium rate of near-elderly policyholders falls below $500. Third, I exclude two observations whose premium payment values exceed $20,000 per year[31]. This exclusion is justified because such a high premium rate is hardly approved by state departments of insurance.

[30] The cutoff value 10% is somewhat arbitrarily chosen. However, the findings are robust to other cutoff value, such as 5% or 15%.
[31] The cutoff value $20,000 is somewhat arbitrarily chosen. However, the findings are robust to other cutoff value, such as $15,000.

A.3 State Implementation of Price Restrictions in the Individual Health Insurance Market

State[32]	Price restrictions[33]			No price restrictions[34]
	Rating restrictions	Risk pools	Effective year	
Alabama				X
Alaska		X	1992	
Arkansas		X	1996	
Arizona				X
California		X	1991	
Colorado		X	1991	
Connecticut		X	1976	
District of Columbia				X
Delaware				X
Florida				X
Georgia				X
Hawaii				X
Iowa	X		1996	
Idaho	X		1995	
Illinois		X	1989	
Indiana	X		1998	
Kansas		X	1992	
Kentucky	X		1996	
Louisiana	X		1994	
Maine	X		1993	
Maryland				X
Massachusetts	X		1996	
Michigan				X
Minnesota	X		1993	
Mississippi		X	1992	
Missouri		X	1992	
Montana		X	1987	

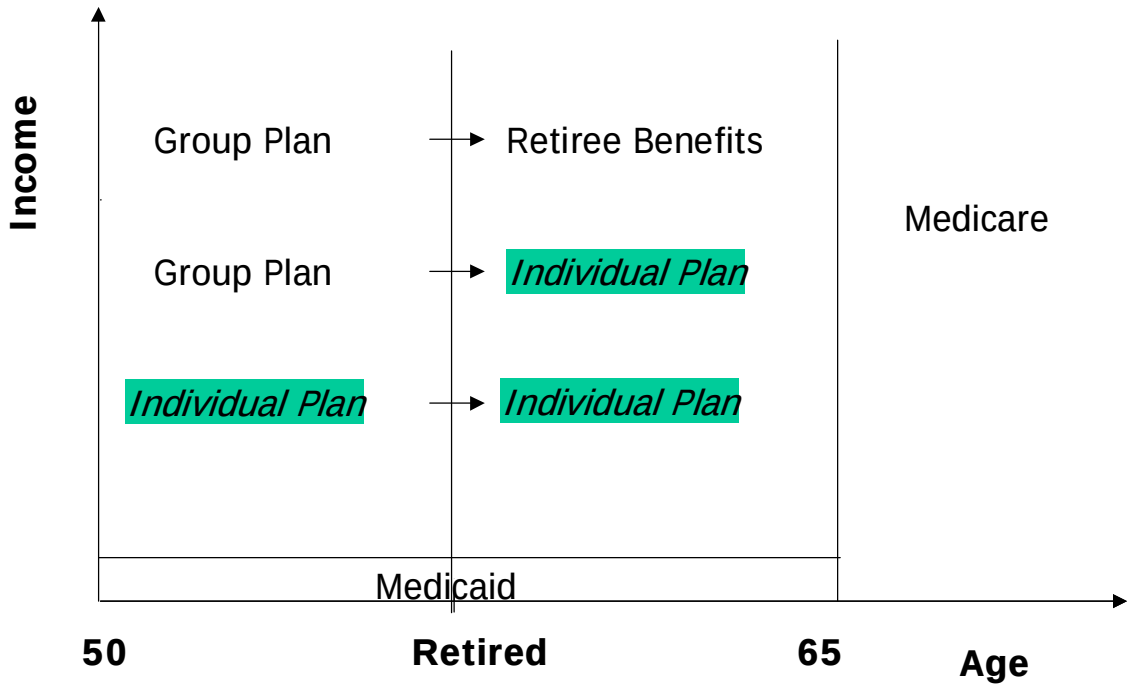
[32] Data sources: General Accounting Office (1996); National Association of Health Underwriters (2001); Communicating for Agriculture and the Self-Employed (2003).

[33] Price restrictions include two distinct categories: (1) rating restrictions (community rating or health status rating bands) and (2) risk pools. If states implement both health status rating bands and risk pools, they are put in the category of "rating restrictions". Thus Indiana is in the category of "rating restrictions" beginning in 1998, but in the category of "risk pools" before 1998 because it has implemented risk pools since 1982, but did not impose rating restrictions until 1998. This categorical switch also arises in Iowa (1987), Louisiana (1982), Minnesota (1976), New Mexico (1988), North Dakota (1982), Oregon (1990), South Carolina (1990), Utah (1991), and Washington (1988). In parentheses is the effective year of risk pools. The effective year of rating restrictions is reported in the table.

[34] I explain below why states are excluded from the category of price restrictions even though some of these states have mechanisms helping high-risk individuals obtain coverage. Alabama is excluded because its risk pools are not open to all high-risk individuals, but only to those who are eligible for portability under the HIPAA. Florida is excluded because new enrollment in its risk pools has been banned since 1991. Maryland is excluded because it did not establish risk pools until 2003. Nevada and South Dakota are excluded because of unknown indexed rate; the findings are robust when these two states are excluded from analysis. Open enrollment plans are available in the District of Columbia, Michigan, North Carolina, Rhode Island, and Virginia, but these plans do not have explicit restrictions on premium rates. Thus these five states are excluded.

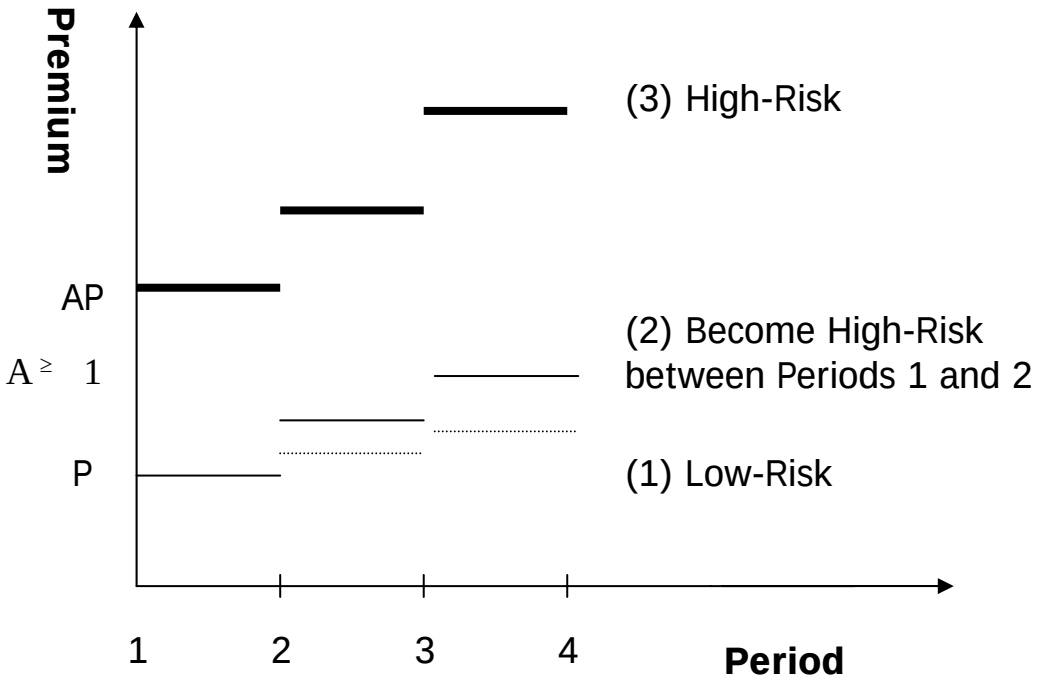
State	Price restrictions			No price restrictions
	Rating restrictions	Risk pools	Effective year	
Nebraska		X	1986	
Nevada				X
New Hampshire	X		1995	
New Jersey	X		1993	
New Mexico	X		1995	
New York	X		1993	
North Carolina				X
North Dakota	X		1995	
Ohio	X		1993	
Oklahoma		X	1996	
Oregon	X		1996	
Pennsylvania	X		1992	
Rhode Island				X
South Carolina	X		1992	
South Dakota				X
Tennessee		X	1987	
Texas		X	1998	
Utah	X		1996	
Virginia				X
Vermont	X		1993	
Washington	X		1995	
Wisconsin		X	1991	
West Virginia	X		1995	
Wyoming		X	1991	

Figure 1: Health Insurance Markets in the U.S.



Note: Policyholders of individual plans earn lower income than individuals covered by group plans, but their income is not low enough to make them eligible for Medicaid coverage yet. This income comparison is justified by median income values conditional on individuals' insurance and marital status. The median annual income of single individuals covered by group plan amounts to $36,000 (in 2002 dollars), while the median annual household income of their married counterparts amounts to $66,200. For policyholders covered by individual plans, these two median income values are $27,300 and $52,100, respectively. For individuals covered by Medicaid, these two median income values are $8,300 and $21,800, respectively.

Figure 2: Premium Patterns in the Individual Market



Note: As discussed in Section 2, this figure summarizes premium patterns of the three types of policyholders. First, the premium pattern of policyholders who are low-risk throughout the periods is captured by a solid line between periods 1 and 2 and by a dashed line between periods 2 and 4. This dashed line highlights the capability of switching to new policies. Second, the premium pattern of policyholders who become high-risk in period 2 is captured by a solid line that highlights a smoothly increasing rate. Third, the premium pattern of policyholders who are high-risk when applying for coverage is captured by a bold solid line that highlights a surcharge in period 1.

Table 1: Transition Matrix of Insurance Status

Insurance Status in Period (t-1)	Percentage of Each Insurance Status in Period (t)						
	Uninsured	Breakdown of the Insured, Covered by				Total	No. of Observations
		(1) Individua Plan	(2) Own Group Plan	(3) Spouse's Group Plan	(4) Public Plan		
	1. High-Risk in Period (t)						
(1) Individual Plan	13	48	21	8	10	100	376
(2) Own Group Plan	3	4	81	7	5	100	3,352
(3) Spouse's Group Plan	3	4	24	63	6	100	1,181
(4) Public Plan	3	1	2	1	93	100	1,307
(5) Uninsured	53	7	12	4	24	100	714
	2. Low-Risk in Period (t)						
(1) Individual Plan	9	57	23	7	4	100	1,271
(2) Own Group Plan	3	5	83	8	1	100	8,599
(3) Spouse's Group Plan	4	5	27	62	2	100	3,052
(4) Public Plan	7	3	5	2	83	100	971
(5) Uninsured	63	8	15	5	9	100	1,790

1. Period (t) refers to survey years of 1996, 1998, and 2000 because health insurance status is consistently measured only during this period. Numbers in the first six columns are percentages. The last column shows the number of observations conditional on individuals' insurance status in period (t-1). See Section 3 for the definition of public plans and of risk classification.

2. This table includes respondents interviewed in two consecutive periods. During 1996-2000, the re-interview rate averages 93.3%, and the mortality rate averages 2.4%. Re-interview rate refers to the response rate for those who were interviewed at the previous wave. Mortality rate refers to the ratio between the number of deaths since the previous wave and the number of respondents at the previous wave.

3. The average age of high-risk respondents in period (t) is 59. This age is 58 for low-risk respondents.

Table 2: Insurance Status Transition and Price Restrictions in the Individual Health Insurance Market

Insurance Status in Period (t-1)	Percentage of Each Insurance Status in Period (t)						No. of Observations
	Uninsured	Breakdown of the Insured, Covered by				Total	
		(1) Individua Plan	(2) Own Group Plan	(3) Spouse's Group Plan	(4) Public Plan		
	Panel A: States that do not Implement Price Restrictions						
	A-1. High-Risk in Period (t)						
Individual Plan	20	37	23	10	10	100	105
	A-2. Low-Risk in Period (t)						
Individual Plan	11	57	20	7	5	100	401
	Panel B: States that Implement Price Restrictions						
	B-1. High-Risk in Period (t)						
Individual Plan	10	54	19	7	10	100	265
	B-2. Low-Risk in Period (t)						
Individual Plan	8	58	24	7	3	100	852

1. Period (t) refers to survey years of 1996, 1998, and 2000. See Section 2 for the definition of price restrictions.
2. See Table 1 for the rest of the footnotes.

Table 3: Effects of Severe Medical Conditions on the Probability of Becoming Uninsured in Period (t) Given that Respondents are Covered by Individual Plans in Period (t-1)

Independent Variables	Dependent Variable: Whether Uninsured in Period (t)					
	(1)	(2)	(3)	(4)	(5)	(6)
Been High-Risk	0.045	0.050	0.051	0.041	0.044	0.045
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Become High-Risk	0.0002	0.004	-0.003	0.003	0.007	-0.0003
	(0.030)	(0.030)	(0.028)	(0.031)	(0.031)	(0.029)
Receiving DI/SSI Benefits		-0.113	-0.110		-0.082	-0.084
		(0.031)	(0.031)		(0.037)	(0.038)
Working Full Time			-0.005			-0.023
			(0.016)			(0.016)
Spouse Working Full Time			-0.022			-0.028
			(0.016)			(0.016)
ln (Household Income)	-0.022	-0.022	-0.022			
	(0.007)	(0.007)	(0.008)			
ln (Household Wealth)				-0.017	-0.018	-0.020
				(0.005)	(0.005)	(0.005)
Baseline Probability	0.088	0.088	0.089	0.082	0.082	0.082
Socio-Economic Variables Included?	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.12	0.12	0.12	0.11	0.12	0.12
Number of Observations	1628	1628	1591	1580	1580	1543

1. Period (t) refers to 1996, 1998, and 2000. See Section 4.1 for the definition of risk classification.

2. Columns (1)-(3) use household income as the measure of economic resources that respondents possess. A parallel analysis that uses household wealth as the measure is shown in Columns (4)-(6).

3. Baseline probability refers to the probability that low-risk respondents become uninsured in period (t).

4. Estimation is performed by using linear probability models. Numbers in parentheses are standard errors corrected for individual-level clustering. Census region fixed effects and year fixed effects are controlled in all columns.

5. Socio-economic variables include insurance status in period (t-2), age, gender, marital status, race, and education. Eligibility for public plan is proxied by whether the respondent receives DI/SSI benefits. Eligibility for own and spouse's group coverage is proxied by two binary variables: (1) whether the respondent works full time; (2) whether the spouse works full time. See Section 4.1 for further discussions.

6. I conduct a sensitivity analysis by adding own and spouse's firm sizes as the proxy for eligibility for group coverage. The findings are robust, and the estimates of firm sizes are insignificant.

7. I conduct a sensitivity analysis by adding body mass index, hypertension, and smoking to mitigate the endogeneity problem. The findings are robust, and the estimates of these three variables are insignificant.

Table 4: Effects of Price Restrictions on the Probability of Becoming Uninsured in Period (t)

Risk Status of Policyholders	Probability of Becoming Uninsured	
	(1) States without Price Restrictions	(2) States with Price Restrictions
Low-Risk	0	0.047
		(0.022)
Being High-Risk	0.123	0.067
	(0.044)	(0.029)
Average	0.129	0.155

1. Period (t) refers to 1996, 1998, and 2000. See Section 2 for the definition of price restrictions.
2. Estimation is performed by using linear probability models. Numbers in parentheses are standard errors corrected for individual-level clustering. See Column (3) of Table 10 for full regression results.
3. Respondents are covered by individual plans in period (t-1). Baseline probability refers to the probability that low-risk respondents become uninsured in states without price restrictions. This probability is 0.104.
4. HRS statistics indicate that 20% of the respondents are high-risk, and 80% are low-risk. I assume that these percentages do not depend on state price restriction and use them as weights to calculate average probability. Therefore, 0.129=0.104+0.123*0.2; 0.155=0.104+0.047*0.8+0.067*0.2.
5. To examine whether the adverse selection effect is driven by declines in income, I divide respondents into two groups based on whether they experience declines in income [household income in period (t) is less than 95% of the income in period (t-1)]. The results are shown below.

Table 4.1: Effects of Price Restrictions Conditional on Declines in Income

Risk Status of Policyholders	Probability of Becoming Uninsured	
	States without Price Restrictions	States with Price Restrictions
Panel A: Respondents who do not Experience Declines in Income		
Low-Risk	0	0.044
		(0.028)
Being High-Risk	0.057	0.030
	(0.055)	(0.032)
Average	0.105	0.135
Panel B: Respondents who Experience Declines in Income		
Low-Risk	0	0.046
		(0.036)
Being High-Risk	0.167	0.109
	(0.070)	(0.050)
Average	0.152	0.178

6. Baseline probability is 0.094 in Panel A and 0.119 in Panel B.
7. The number of observation is 1571 in Table 4, 885 in Panel A of Table 4.1, and 686 in Panel B.

Table 5: Effects of Severe Medical Conditions on Premium Payment Levels

Independent Variables	Dependent Variable: Annual Premium Payment (in 2002 dollars)					
	(1)	(2)	(3)	(4)	(5)	(6)
Become High-Risk	25	-13	-68	26	-31	-78
	(243)	(236)	(239)	(242)	(236)	(238)
Been High-Risk	570	546	520	1034	1013	962
	(247)	(246)	(247)	(522)	(516)	(523)
Price Restrictions				-39	47	24
				(131)	(161)	(161)
Been High-Risk * Price Restrictions				-700	-708	-670
				(563)	(563)	(569)
Been High-Risk & in States with Price Restrictions				334	305	292
				(243)	(245)	(245)
(1) Predicted Value of Low-Risk	2410	2414	2414			
(2) Predicted Value of Low-Risk in States without Price Restrictions				2278	2280	2281
Socio-Economic Variables Included?	Yes	Yes	Yes	Yes	Yes	Yes
Census Region FE Included?	No	Yes	Yes	No	Yes	Yes
Plan Characteristics Included?	No	No	Yes	No	No	Yes
R-squared	0.20	0.21	0.23	0.21	0.22	0.23
Number of Observations	718	717	717	710	710	710

1. Estimation is performed by using OLS. See Section 2 for the definition of price restrictions and Section 4.1 for the definition of risk classification. Due to limited observations, the variable of "Become High-Risk" is not interacted with state price restrictions. Numbers in parentheses are standard errors corrected for individual-level clustering.
2. As discussed in Section 4.2, this table uses premium payment data of single policyholders during 1992-2002.
3. Year fixed effects are controlled in all columns. See Section 4.2 for the definitions of socio-economic variables, plan characteristics, and census region fixed effects.
4. I conduct a sensitivity analysis by adding two sets of geographical variables as the controls: (1) two urban-rural binary variables (three categories: urban, suburban, and ex-urban); (2) interactions between census region fixed effects and these two urban-rural variables. The findings are robust, and the estimates of these additional controls are insignificant.

Table 6: Use Risk Premium to Calibrate the Welfare Loss due to Imperfect "Smoothing" in Insurance Coverage

Category		(1) Most Risk Averse	(2) 2nd Risk Averse	(3) 3rd Risk Averse	(4) Least Risk Averse
% of Respondents		65	11	11	13
Average Coefficient of Relative Risk Aversion		15.7	7.2	5.7	3.8
Risk Premium	(in dollars)	$3,786	$1,953	$1,496	$925
(q=0.2)	(% of Income)	14	7	5	3

1. Respondents are divided into four categories according to their risk aversion. This division is based on their responses to a set of HRS questions on willingness to accept hypothetical gambles over lifetime income.
2. The average coefficient of relative risk aversion is derived from Barsky et al (1997) since they estimate the average coefficient for each of these four categories.
3. Risk premium refers to the amount of money that individuals are willing to pay to avoid imperfect "smoothing" in coverage. Column (1) indicates that 65% of the individuals fall into the "most risk averse" category. They are willing to pay 14% of their income to avoid this imperfection.
4. q refers to the probability of being diagnosed with severe medical conditions. This table uses the average probability derived from the percentage of high-risk policyholders. The table below shows the distribution of risk premium based on probability values deviating from the average. The findings indicate when the average probability is used as the benchmark, risk premium responds moderately to variations in the probability. For a 5 percentage points change in the probability, the resulting change in risk premium ranges from 1% to 2% of the income. This magnitude roughly holds across categories of risk aversion. See Section 5.4 for further discussion.

Table 6.1: Calibration of Risk Premium Based on Different Probability Values

Category		(1)	(2)	(3)	(4)
% of Respondents		65	11	11	13
Average Coefficient of Relative Risk Aversion		15.7	7.2	5.7	3.8
Risk Premium	(in dollars)	$4,074	$2,430	$1,984	$1,397
(q=0.25)	(% of Income)	15	9	7	5
Risk Premium	(in dollars)	$3,412	$1,384	$936	$412
(q=0.15)	(% of Income)	12	5	3	2

Table 7: Effects of Income on the Probability of Becoming Uninsured in Period (t)

Risk Status of Policyholders	Probability of Becoming Uninsured	
	(1) Low-Income Group	(2) High-Income Group
Low-Risk	0	-0.028
		(0.022)
Being High-Risk	0.098	-0.020
	(0.035)	(0.027)

1. Period (t) refers to 1996, 1998, and 2000. Numbers in parentheses are standard errors corrected for individual-level clustering. See Section 5.4 for the definition of income groups and Column (2) of Table 10 for full regression results.

Table 7.1: Transition of Income, Retirement, and Health Status

Variable	Period (t-1)	Period (t)	Difference			Sample
			Mean	Std Error	% Change	Size
Panel A: Low-Income Group						
Median Household Annual Income (in $1,000 unit)						
Single, High-Risk	14.80	9.13	-5.68		-38	57
Single, Low-Risk	15.34	13.16	-2.18		-14	166
Married, High-Risk	32.23	25.26	-6.97		-22	135
Married, Low-Risk	31.56	27.10	-4.46		-14	467
Proportion of Poor Health						
High-Risk	0.41	0.44	0.03	0.05		192
Low-Risk	0.17	0.16	-0.01	0.02		633
Proportion of Retirees						
High-Risk	0.22	0.36	0.14	0.05		192
Low-Risk	0.22	0.25	0.03	0.02		633
Panel B: High-Income Group						
Median Household Annual Income (in $1,000 unit)						
Single, High-Risk	32.33	41.79	9.45		29	47
Single, Low-Risk	42.49	46.47	3.98		9	177
Married, High-Risk	79.00	91.34	12.34		16	137
Married, Low-Risk	76.03	95.80	19.77		26	465
Proportion of Poor Health						
High-Risk	0.21	0.29	0.08	0.04		184
Low-Risk	0.06	0.06	0.00	0.01		642
Proportion of Retirees						
High-Risk	0.15	0.20	0.05	0.04		184
Low-Risk	0.13	0.15	0.02	0.02		642

1. See the definition of poor health in Table 9.
2. Retirees refer to respondents who report retirement, not working, and not looking for full-time or part-time jobs.
3. This table reports the difference between periods. When comparisons are made between risks status, being high-risk is associated with poorer health at the 5 % level of significance, regardless of income group and period. Yet, being high-risk is associated with a significantly higher proportion of retirees only in the low-income group in period (t).

Table 8: Effects of Price Restrictions and Income on the Probability of Becoming Uninsured in Period (t)

Independent Variables	Dependent Variable: Whether Uninsured in Period (t)	
	(1) States without Price Restrictions	(2) State with Price Restrictions
Been High-Risk	0.199	0.053
(BeenHR)	(0.073)	(0.039)
Become High-Risk	-0.003	-0.016
	(0.051)	(0.032)
High Income Dummy (HID)	-0.033	-0.031
	(0.041)	(0.025)
BeenHR * HID	-0.143	-0.066
	(0.086)	(0.045)
HID+BeenHR*HID	-0.176	-0.096
	(0.090)	(0.043)
Baseline probability	0.142	0.121
Census Region FE?	Yes	Yes
R-squared	0.17	0.14
Sample Size	494	1077

1. Period (t) refers to 1996, 1998, and 2000. See Section 4.1 for the definition of risk classification and price restrictions. High-income dummy indicates whether annual income in period (t) is above the median value. Due to limited observations, the variable of "become high-risk" is not interacted with high-income dummy.
2. Column (1) includes respondents living in states that do not implement price restrictions, and Column (2) includes respondents living in the other type of state.
3. Baseline probability refers to the probability that low-income, low-risk respondents become uninsured in period (t).
4. Estimation is performed by using linear probability models. Numbers in parentheses are standard errors corrected for individual-level clustering. Socio-economic variables, eligibility for alternative types of insurance coverage, and year fixed effects are controlled included in all columns. See Section 4.1 for further discussion.

Table 9: Insurance and Health Status Transition of Respondents Covered by Individual Plans in Period (t-1)

Variable	Insurance Status in Period (t)			
	Uninsured	Insured	Difference	
			Mean	Standard Error
Panel A: Low-Income Group				
(A-1) High-Risk in Period (t)				
Proportion of Poor Health				
in (t-1)	0.54	0.38	-0.16	0.09
in (t)	0.59	0.40	-0.19	0.09
Sample Size	41	151		
(A-2) Low-Risk in Period (t)				
Proportion of Poor Health				
in (t-1)	0.27	0.15	-0.12	0.05
in (t)	0.20	0.16	-0.04	0.05
Sample Size	81	548		
Panel B: High-Income Group				
(B-1) High-Risk in Period (t)				
Proportion of Poor Health				
in (t-1)	0.75	0.18	-0.57	0.17
in (t)	0.50	0.27	-0.23	0.19
Sample Size	8	175		
(B-2) Low-Risk in Period (t)				
Proportion of Poor Health				
in (t-1)	0.18	0.06	-0.12	0.07
in (t)	0.12	0.06	-0.06	0.06
Sample Size	33	608		

1. Period (t) refers to 1996, 1998, and 2000. Median income value in period (t) is used to divide policyholders into the high- or low-income group.

2. The category of "high-risk" includes policyholders who have been high-risk and who become high-risk in period (t) as the latter has limited observations.

3. Poor health is a binary variable constructed from the survey question on self-reported health status. Five levels are used to report health status: excellent, very good, good, fair, or poor. This paper puts respondents in the category of "poor health" if they report the latter two levels. Respondents who report the first three levels are put in the other category.

Table 10: Effects of Medicaid Coverage on the Probability of Becoming Uninsured and Full Regression Results for Tables 4 and 7.

Independent Variables	Dependent Variable: Whether Uninsured in Period (t)		Independent Variables	Dep. Var.: Whether Uninsured in (t)
	(1) Medicaid Coverage	(2) Full Regression Results for Table 7		(3) Full Regression Results for Table 4
Been High-Risk	0.099	0.098	Price Restrictions	0.047
(BeenHR)	(0.038)	(0.035)	(PR)	(0.022)
Become High-Risk	0.013	0.043	Been High-Risk	0.123
(BecomeHR)	(0.054)	(0.056)	(BeenHR)	(0.044)
High Income Dummy	-0.011	-0.028	BeenHR*PR	-0.102
(HID)	(0.026)	(0.022)		(0.049)
BeenHR * HID	-0.092	-0.090	Become High-Risk	0.034
	(0.043)	(0.040)	(BecomeHR)	(0.059)
BecomeHR*HID	-0.059	-0.086	BecomeHR*PC	-0.056
	(0.056)	(0.058)		(0.067)
HID+BeenHR*HID	-0.103	-0.118	PR+BeenHR*PC	-0.055
	(0.044)	(0.041)		(0.046)
HID+BecomeHR*HID	-0.070	-0.114	PR+BecomeHR*PC	-0.009
	(0.058)	(0.059)		(0.066)
Baseline probability	0.120	0.128	Baseline probability	0.104
Census Region FE?	Yes	Yes	Census Region FE?	Yes
R-squared	0.12	0.13	R-squared	0.13
Sample Size	1446	1591	Sample Size	1571

1. Period (t) refers to 1996, 1998, and 2000. High-income dummy indicates whether annual incomes in period (t) are above the median value. The median value is approximately $23,000 for single and $51,000 for married respondents.
2. Column (1) examines the crowding out effect of Medicaid coverage by excluding respondents whose incomes in period (t) fall in the lowest 10%. Columns (2) and (3) provide full regression results for Tables 7 and 4.
3. In Columns (1) and (2), baseline probability refers to the probability that low-income, low-risk respondents become uninsured in period (t). In Column (3), baseline probability refers to the probability that low-risk respondents become uninsured in states that do not implement price restrictions.
4. Estimation is performed by using linear probability models. Numbers in parentheses are standard errors corrected for individual-level clustering. Socio-economic variables, eligibility for alternative types of insurance coverage, and year fixed effects are controlled included in all columns. See Section 4.1 for further discussion.
5. I conduct a sensitivity analysis by dividing price-restricted states into two distinct groups (rating restrictions or risk pools). The findings are similar indicating both policies result in an adverse selection effect in which high-risk policyholders retain coverage, but low-risk policyholders drop out of the market.