# The Health Benefit Effect of the Universal Coverage Scheme in Thailand[*]

Touchanun Komonpaisarn

Faculty of Economics,

Chulalongkorn University

Touchanun.k@chula.ac.th

## Abstract

This study takes advantage of the "natural experiment" features of the 2002 health care reform in Thailand to estimate its impact on health outcomes among Thai people. The scheme intends to increase the accessibility to quality healthcare for Thai people who had no financial protection against high healthcare expenditures before the reform. The scheme were claimed to tremendously raise healthcare utilization rate at public hospitals nationwide. Higher accessibility to necessary healthcare services could potentially benefit the health status of these people or it could yield an opposite outcome if people choose to exploit the system. This paper employs data from the surveys conducted by the National Statistical Office of Thailand in 1996, 2006, and 2009 to analyze the scheme's possible benefits. The difference-in-differences and the propensity scores technique are combined to identify the effect of the reform on various health outcomes. The findings reveal that those who directly benefited from the scheme seem to have higher chance of getting sick, higher chance of getting day offs from illness, and higher chance of getting hospitalized than those who did not benefit from the reform.

*JEL Classification Codes*: I130, I120, I180, C130, C140, C190

*Keywords:* Health Insurance, Causality, Difference-in-Differences, Propensity Scores, Non-Parametric Bootstrapping

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## 1. Introduction

The Health Security System in Thailand was changed dramatically in 2002. The reform provided those who were neglected by the society the access to affordable healthcare. The Universal Health Coverage Scheme was introduced in that year and approximately 76% of the Thai population who lack the access to any kind of social health insurance are under this program (National Health Security Office 2014). Twelve years after the reform, this study tried to quantify the health benefits of having health insurance among those who were the target groups of the reform.

Relatively few studies had tried to establish the association between health insurance and health outcomes. Baker, Sudano, Albert, Borawski and Dor (2002) used the data from the Health and Retirement Study (HRS) and found that those without health insurance were more likely to experience a major decline in health. Moreover, they found that those who lost health insurance tended to suffer from new mobility difficulty as compared to those fully insured. Haas and Goldman (1994) found that acutely injured patients who did not have health insurance received fewer resources during their treatment and also had higher in-hospital mortality rates than those with private insurance. Ayanian, Kohler, Abe and Epstein (1993) found that those without health insurance and those under Medicaid program with breast cancer were generally diagnosed at more advanced stage of the disease than those with private health insurance. The stage-specific survival rate and the adjusted risk of death were also significantly higher among the uninsured women. Roetzheim, Pal, Gonzalez, Ferrante, Van Durme and Krischer (2000) found that different treatment procedures were observed among those with colorectal cancer under different insurance schemes. Uninsured patients or those under Medicaid/HMO[1] scheme had higher mortality rates than those under commercial fee-for-service scheme.

The failure to establish strong causality between health insurance and utilization or outcomes come from the fact that most work used cross sectional data in the analysis and this practice was known to generate biased estimates (Doyle, 2005; Freeman, Kadilaya, Bell and Martin, 2008). The concern involved the endogeneity of health insurance status and self-selection issue. Many unobserved factors that correlate with health insurance status and outcomes of interest

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[1] HMO stands for Health Maintenance Organization.

exist, for example, people who were young and healthy are more likely to be uninsured as they do not expect themselves to seek health care much, and this could bias the direction and magnitude of the link. Negative correlation between health insurance coverage and health outcomes could be observed for this healthy uninsured group. Positive correlation could be found if those who buy health insurance are those who are health conscious who tend to have better health outcomes. Only randomization of health insurance status could yield an unbiased estimation of interested causality.

In an attempt to correctly identify the effect of health insurance, the Rand Health Insurance Experiment (HIE) was conducted during the 1970s to early 1980s where a group of American households were randomly assigned different health insurance coverage. It was found that no significant impact of health insurance on health outcomes was found (Manning, Newhouse, Keeler, Leibowitz and Marquis, 1987).

The difference-in-differences (DID) technique used in this study has been widely employed in many quasi-experimental studies in an attempt to mimic the randomization process and correctly identify the appropriate comparison groups.[2] For example, Hamermesh and Trejo (2000) used the difference-in-differences estimator to estimate the labor outcomes of extending overtime law to cover male workers in California. Employing comparable groups of workers as control, they come up with the labor demand elasticity estimates. Gruber and Poterba (1994) applied the concept of difference-in-differences estimator to limited dependent variable model in their study and found that newly enacted law on tax treatment of health insurance expenses for self-employed workers resulted in more purchases of health insurance plan among this group of people.

The healthcare reform in 2002 in Thailand directly affected those facing high risk of healthcare catastrophic spending. Those who used to be uninsured were provided with health insurance coverage with a co-payment of 30 Baht each time they obtained healthcare services.[3] This reform could be considered a change in health insurance coverage that was "exogenously determined". This constituted a perfect situation for a quasi-experimental study (Doyle, 2005; Freeman et al., 2008; Rosen and Gayer, 2010). Using a survey of health care utilization behavior among Thai people in 1996, 2006, and 2009, the difference-in-differences and the propensity scores technique were employed in the analysis, the findings showed that Thai people who were

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[2] See also Gruber (1994a, b), Finkelstein (2008), Dave and Kaestner (2009).
[3] Around $1 in 2014.

uninsured before the reform were more likely to report being sick one month before the survey date, more likely to report taking day offs from illness, and more likely to report getting hospitalized twelve months before the survey date. These are opposite to findings in the literature where health insurance coverage (or the lack thereof) were found to improve (deter) health outcomes (Haas and Goldman, 1994; Currie and Gruber, 1996; Tilford, Robbins, Shema and Farmer, 1999; Roetzheim et al., 2000; Levy and Meltzer, 2001; Baker et al., 2002; Doyle, 2005; Freeman et al., 2008).

This paper is divided into 6 sections. The first section gave a general idea about the health care system in Thailand, followed by a description of the data used in the analysis. The third section discussed the estimation strategy used to establish the causality between health insurance coverage and health outcomes among Thai people. Empirical results were reported and interpreted in the fourth section. Limitations of the study was later discussed. The last section presented the conclusion.

## 2. Overview of the Health Care System in Thailand

### Pre-Universal Coverage Period: Pre-2002

According to the Thailand Health Profile Report 2005-2007, Thailand had five major health insurance schemes that covered its population before 2002.

### 2.1 Welfare Card Program

The Welfare Card program was set up as a safety net program to help those who were unable to afford to pay their healthcare expenses. Those who met the wealth/income criterion or other related criterion[4] would be given a card that allowed them to access free healthcare at the assigned facilities.[5] Financing methods included Capitation and DRG-based payment system.[6] This program was the model that Universal Coverage Scheme followed in 2002. Thirty percent of Thai population were under this program in 2001.

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[4] For example, those who were older than 60 years old, under 15 years old, had disabilities, or had no regular stream of income (monks or religious leaders).
[5] See Wibulpolprasert (2008).
[6] DRG or Diagnosis Related Group represents a financing method that bases any payment to healthcare providers on cost categories of disease groups that an admission falls into.

## 2.2 Voluntary Health Card Program

The program, as the name suggests, was based on a voluntary basis. Any Thai household could buy the card that would allow not more than 5 members of that household to access free healthcare services at the assigned public health facilities. The other name of the program was "The 500 Baht card" as large part of the full card price were subsidized by the government. The program suffered a lot from the selection problem as most households buying the card were those expected to utilize high volume of healthcare (i.e., not in good health conditions). Around 23% of Thai population, especially those in the rural area, were under this program before the reform.

## 2.3 Civil Servants Medical Benefits Scheme (CSMBS)

Civil servants in Thai government or permanent employees in a state enterprise and their immediate relatives (spouses, children, parents) were qualified to receive free healthcare at any public hospitals in the Thai Kingdom. It was established to compensate the lower-than-the- market income. The beneficiaries of the program would get full reimbursement of any healthcare costs incurred at public hospitals from the Ministry of Finance for the outpatient services. In 2007, the responsible agencies began to pay the facilities directly where the patients had no need to pay anything when they exercised their rights at the assigned facilities. The same approach applied to the inpatient services regardless of where the services were received. The program suffered a lot from an ever-increasing expenditures since the reimbursement was done on a Fee-For-Services basis. An attempt to contain costs of the program was initiated in 2007 by employing the DRG system. The program covered 8.5% of Thai population before 2002.

## 2.4 Social Security Scheme (SSS)

Since 1990, employees of any enterprise have been mandated to participate in the Social Security Scheme.[7]  The employers are required to transfer 3% of its employees' earnings to the Social Security Office every month (1.5% from employees' salary and another 1.5% from the employer's earnings). The collection of 1.5% of the earnings also comes from the government. The total collected fund would be used to pay for healthcare costs of its beneficiaries on the basis that the workers have to utilize services at the assigned (public or private) facilities. The fund were also used for unemployment insurance payment, maternity leave payment, and pension payment

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[7] According to the Social Security Act 1990 and its later modifications.

for its beneficiaries. The scheme employs both capitation and Fee-For-Service to reimburse the contracted providers. Around 8% of Thai population were under SSS in 2001.

## 2.5 Private Health Insurance

Private Health Insurance were common among those with high income who did not have access to formal health insurance (CSMBS or SSS) such as business owners or large-enterprise entrepreneurs. It normally comes as a package combining life insurance, health insurance, or accident insurance. The reimbursement rates vary depending on the premium of the package. Only one percent of Thai people were under this type of insurance.

### Post-Reform Period: Post-2002

The Universal Coverage Scheme was piloted in Thailand in 2001. The scheme expanded to cover the whole country in 2002. The National Health Security Office (NHSO) was set to be operating agency for the entire scheme following the National Health Security Act of 2002. The scheme provided health insurance to those without formal coverage in the Thai society, i.e. those not eligible for CSMBS or SSS schemes. It consolidated schemes such that only three health insurance schemes were recognized in Thailand, namely, the Civil Servants Medical Benefits (CSMBS), the Social Security Scheme (SSS) and the Universal Coverage Scheme (UCS).

Those who used to be under the Welfare Card program would be assigned "an exempted gold card" which allowed them to access free healthcare at the assigned public facilities, they could access all the qualified services free of charge.[8]

Those without any health insurance coverage and those under the Voluntary Health Card Program would be issued a "non-exempted" gold card which required them to co-pay each time they visited the assigned facility (30 Baht).[9]

The scheme paid the contracted health facilities based on a capitation basis for the outpatient services and on a DRG system with some thresholds for the inpatient services. The

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[8] For example, maternity services, dental care, health check-ups, prevention and promotion services, and prescription drugs under the Essential Drug list.
[9] This co-payment was abolished in 2006 due to administrative issues.

NHSO was the agent responsible for using allocated tax revenue to pay every contracted health facilities in Thailand.

### 3. Data

**Health and Welfare Survey (HWS)**

The Health and Welfare Survey is a household survey that was conducted every 5 years before 2001 by the National Statistical Office of Thailand (NSO). In 2001, the survey was conducted every two years. The survey obtains information about healthcare utilization (both OP and IP), health insurance status, and various health-related behaviors. Demographic characteristics were matched from the household Socio-Economic Survey in the same year. The survey includes roughly 70,000 nationally representative individuals each round. This paper analyzed the data pre and post reform, i.e., the data from 1996, 2006 and 2009.

Table 1 suggested that among the 5 groups of people under different insurance schemes, those under Voluntary Health Card and those under Welfare Card were the most likely to be married. Those under the Social Security were the youngest, which is consistent as they were mostly young professionals who work in the formal private sector. Voluntary Health Card and Welfare Card programs seemed to benefit those in the rural area rather than those in the urban area since very low proportion of people under these two schemes reported residing in an urban area. Education level reported were the highest among the civil servants who were covered by the CSMBS health insurance, this is reasonable as they were mostly technocrats who worked in the government agencies. Those under Welfare Card program were most likely to report having days off from illness or being sick in the past month prior to the survey date. The least likely to report being sick were those under social security scheme, given that they were younger than other groups, this was expected. The uninsured hardly got hospitalized in during 1 year prior to interview date; their lack of financial coverage could be one incentive for not spending a night at a hospital when necessary. Similar findings were found in the propensity scores-weighted statistics reported in Table 2-3.

### 4. Estimation Strategy

**Difference-in-Differences**

The estimator for the effect of the scheme can be represented by the following equation:

$$DID = (Y_t^{postUC} - Y_t^{preUC}) - (Y_c^{postUC} - Y_c^{preUC})$$

where $Y_i$= measures of health outcome, $t$= treated group and $c$= control group.

The underlying assumption is that without the reform, any post-2002 changes in health outcomes of those in treated groups would be similar to those of the control groups. Any changes in excess of control groups' could be attributed to the reform.

This study used both the linear probability model and probit model to capture changes in different health outcomes. That is, $Y$ is the number of days off from illness a person reported during 1 month prior to interview date in an LPM regression and $Y$ is a binary indicator of whether a person had been hospitalized (has been sick or taken days off from illness) before the survey date. In order to identify the effect of the Universal Coverage Scheme in 2002 on health outcomes, we calculate a difference-in-differences estimator (Hamermesh and Trejo, 2000; Gruber, 1994; Gruber and Poterba, 1994; Dave and Kaestner, 2009; Finkelstein, 2007, 2008).

Those previously uninsured or under the Voluntary Health Card program were assigned into the *non-exempted* gold card group (co-payment was required). These people constitute two different treatment groups. Those under the Welfare Card Program before 2002 were assigned into the *exempted* gold card group (services were free of charge), so they were not affected by the scheme at all and could be used as a control group. Since all the three groups were mostly in the informal sectors, they should be largely comparable and the underlying assumption should be met.

**Two Treatment Groups**

Those who were uninsured before the reform experienced a higher accessibility due to lower cost of care, while those who were under the Voluntary Health Card program had experienced an increase in marginal cost of health care, so the scheme could reduce their accessibility. The estimating equation that controls for an individual's characteristics and allows for a different effect of the scheme on health outcomes of each group is followed.[10]

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[10] To maximize sample size, this study included ALL insurance groups, i.e., both those under CSMBS (G4) and SSS (G5) were also included in the estimating equation.

$$Y_{it} = X_{it}\delta + \alpha_1 T1_{it} + \alpha_2 T2_{it} + \alpha_3 G3_{it} + \alpha_4 G4_{it} + a_5 G5_{it} + \beta_1 T1_{it} * postUC +$$

$$\beta_2 T2_{it} * postUC + \beta_3 G3_{it} * postUC + \beta_4 G4_{it} * postUC + \beta_5 G5\_it * post + \beta_6 postUC$$

$$+ \sum_p D\{\kappa_p\} + \sum_q R\{\phi_q\} + \eta_{it}$$

Where

$X_{it}$=Socio-economic variables, including gender, age, marital status, education, occupation, residence, degree of urbanness.

$T1_{it}$=indicator variable for treatment group who was uninsured (group 1)

$T2_{it}$=indicator variable for treatment group who was under the Voluntary Health Card program (group 2)

$G3_{it}$ =indicator variable for those under the Welfare Card program (group 3)

$G4_{it}$=indicator variable for those under the CSMBS program (group 4)

$G5_{it}$=indicator variable for those under the SSS program (group 5)

$\kappa_p$=disease fixed effect

$D$ = total number of diseases

$\phi_q$=region fixed effect

$R$ =total number of regions

$\alpha_j$ = time-invariant factor of those under insurance group $j$, $j = 1,\dots,5$

$\beta_j$= trend in health outcomes within insurance group $j$ over time, $j = 1,\dots,5$

$\eta_{it}$= unobserved disturbances.

The coefficients of interest are

$\beta_1 - \beta_3$=DID estimate of the reform on Group 1compared to control group (3)

$\beta_2 - \beta_3$=DID estimate of the reform on Group 2 compared to control group (3)

In 2006, the uninsured and those under Voluntary Health Card program were indistinguishable (both had to co-pay 30 Baht/each visit), so the propensity scores[11] (Rosenbaum and Rubin, 1983; Dehejia and Wahba, 2002) of a person being uninsured (T1) or under the Voluntary Health Card group (T2) *prior to* the reform were employed, i.e.

$$
\begin{aligned}
Y_{it} = {} & X_{it}\delta + \alpha_1 p_{it}^{G1} + \alpha_2(1 - p_{it}^{G1}) + \alpha_3 G3_{it} + \alpha_4 G4_{it} + \alpha_5 G5_{it} + \beta_1 p_{it}^{G1} * postU + \beta_2(1 \\
& - p_{it}^{G1}) * postUC + \beta_3 G3_{it} * postUC + \beta_4 G4_{it} * postUC + \beta_5 G5_{it} * postUC \\
& + \beta_6\, postUC + \sum_{\{p=1\}} D\{\kappa_p\} + \sum_{\{q=1\}} R\{\phi_q\} + \eta_{it}
\end{aligned}
$$

$p_{it}^{G1}$ =propensity score that a person was in group 1 (uninsured) *prior to* the reform

$1 - p_{it}^{G1}$ = propensity score that a person was in group 2 (Voluntary Health Card) *prior to* the reform

The abolishment of the co-payment system in late 2006 combined the uninsured, those under Welfare Card program, and those under Voluntary Health Card program into one single group (they no longer had to pay anything), so the propensity scores of a person being uninsured (T1) or under the Voluntary Health Card group (T2), and the propensity scores of a person being under Welfare Card program (G3) before the reform were employed. i.e.

$$
\begin{aligned}
Y_{it} = {} & X_{it}\delta + \alpha_1 p_{it}^{G1} + \alpha_2 p_{it}^{G2} + \alpha_3(1 - p_{it}^{G1} - p_{it}^{G2}) + \alpha_4 G4_{it} + \alpha_5 G5_{it} + \beta_1 p_{it}^{G1} * postU \\
& + \beta_2 p_{it}^{G2} * postUC + \beta_3(1 - p_{it}^{G1} - p_{it}^{G2}) * postUC + \beta_4 G4_{it} * postUC \\
& + \beta_5 G5_{it} * postUC + \beta_6\, postUC + \sum_{\{p=1\}} D\{\kappa_p\} + \sum_{\{q=1\}} R\{\phi_q\} + \eta_{it}
\end{aligned}
$$

$p_{it}^{G1}$=propensity score that a person was in group 1 (uninsured) *prior to* the reform

$p_{it}^{G2}$= propensity score that a person was in group 2 (Voluntary Health Card) *prior to* the reform

$1 - p_{it}^{G1} - p_{it}^{G2}$= propensity score that a person was in group 3 (Welfare Card) *prior to* the reform

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[11] Insurance group assignment equation was estimated using the data from 1996, this equation was then used to predict the scores (probabilities) that a person in 2006 was uninsured or under Voluntary Health Card program prior to the reform.

To take into account the possible over-precision problem resulting from propensity scores, this study reports the bootstrapped standard errors in all the tables.[12]

Moreover, this study restricted the sample to only those in the working age group (16-59 years old) since those younger than 15 years old and older than 60 years old were supposed to be only under the Welfare Card program but were found to be under different schemes, measurement errors could result if they were included in the estimation.

## 5. Results

**Treated who used to be Uninsured**

From Table 4, it can be seen that those who were uninsured before the reform were more likely to report taking days off from illness one month before the survey date, the DID estimator from a probit model is 0.304 and highly statistically significant at 1%.[13] They were also more likely to report being sick in the past one month with the DID estimators highly significant in both LPM and probit model. Moreover, they were more likely to report utilizing residential care sometimes during the past one year, compared to those unaffected by the reform (those under Welfare Card program). The DID estimators for hospitalization event were significant at 1 % in both linear regression and binary choice models. Among those reported having sick days off or being hospitalized, after controlling for types of sickness, no significant differences were found in the length of days off or length of stay at a hospital between those used to be uninsured and those under Welfare Card program.

Similarly, when the sample from 2009 and 1996 were compared, those who were predicted to be uninsured before the reform were more likely to report days off from illness or being hospitalized prior to the interview, all the DID estimators for these variables were statistically significant at 1%. However, one anomaly occurred when the DID estimator of being sick variable had an unexpected sign, i.e., it said that those uninsured were less likely to report being sick in the past one month, the estimates was significant at 5%, however, it was significant only in the linear

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[12] Basically, a random sample was drawn (with replacement) from data in 1996 survey and equation for insurance group assignment was estimated, while another random sample was drawn from data in 2006 and the predicted scores of being in either T1, T2, or T3 among those with non-exempted gold card in 2006 were calculated. This process was repeated 100 times to come up with the non-parametric bootstrapped standard errors of coefficients differences.

[13] The full regression results are not reported here but available upon request.

probability model, the significance dropped when binary choice model was employed. One possible explanation for this finding is that since the DID estimator was derived based on predicted scores of being in uninsured group or Welfare Card group using exactly the same predicting equation, the comparison of estimated coefficients could be weakened by the problem of multicollinearity.

**Treated who used to have the Voluntary Health Card**

From Table 4, among those who were under Voluntary Health Card, the DID estimators suggested that under probit model, they were more likely to report taking days off from illness. The DID estimators of sickness indicator or hospitalization indicator were all negative, however, they were not statistically significant. However, if this group were to be hospitalized, they would spend a significantly longer time in hospital (12 days more) than those under the Welfare Card program, this could be a sign of them having worse health than those who were unaffected by the reform.

The results were slightly improved when the sample in 1996 were compared with the sample from 2009, the DID estimators suggested that those under Voluntary Health Card were statistically more likely to report taking days off from illness in the past one month in both LPM and probit models, however, estimates for other variables were mostly insignificant.

6. **Study Limitations**

The author realized two important limitations present in this study. Firstly, the comparability of treated groups and control group was still imperfect as shown in different descriptive statistics of various characteristics among the uninsured and those under the Welfare Card program, a more thorough analysis using propensity scores matching technique where each observation would be matched with a set of observations with closest propensity scores (nearest-neighbor method, see Dehejia and Wahba, 2002) is being considered. Second, propensity scores of being in each insurance group were calculated from the same predicting equation and it could result in multicollinearity problem in the final estimating model (a possible cause of contradicting results in Table 5). This issue need to be studied more deeply and resolved.

7. **Conclusion**

This study made use of the natural experiment features of the 2002 health care reform in Thailand to estimate its impact on health outcomes among Thai people. It used the difference-in-differences and the propensity scores technique to capture the pure effect of the reform on the health outcomes of those who were directly affected by the reform. Those who were not affected by the reform were used as a control group in this quasi-experimental study. It was found that the uninsured Thai experienced worsened health outcomes compared to those who did not benefit from this reform.

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Table 1: Descriptive Statistics (1996)

|  | G1 | | G2 | | G3 | | G4 | | G5 | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Male | 0.468 | (0.499) | 0.457 | (0.498) | 0.461 | (0.499) | 0.448 | (0.497) | 0.511 | (0.500) |
| Married | 0.656 | (0.475) | 0.735 | (0.442) | 0.746 | (0.435) | 0.732 | (0.443) | 0.576 | (0.494) |
| Age | 34.102 | (11.757) | 36.041 | (12.174) | 37.173 | (12.132) | 37.580 | (11.333) | 30.182 | (8.705) |
| $Age^2$ | 1,301.15 | (851.40) | 1,447.11 | (901.83) | 1,528.98 | (911.66) | 1,540.71 | (856.00) | 986.72 | (598.85) |
| Urban | 0.303 | (0.459) | 0.087 | (0.281) | 0.095 | (0.293) | 0.489 | (0.500) | 0.522 | (0.500) |
| Primary school | 0.203 | (0.403) | 0.196 | (0.397) | 0.176 | (0.381) | 0.056 | (0.231) | 0.195 | (0.396) |
| Lower secondary school | 0.144 | (0.351) | 0.119 | (0.324) | 0.082 | (0.274) | 0.174 | (0.379) | 0.197 | (0.398) |
| High school | 0.085 | (0.279) | 0.046 | (0.210) | 0.026 | (0.160) | 0.159 | (0.366) | 0.184 | (0.388) |
| Diploma | 0.020 | (0.141) | 0.010 | (0.101) | 0.004 | (0.066) | 0.091 | (0.288) | 0.085 | (0.278) |
| Bachelor | 0.021 | (0.145) | 0.006 | (0.074) | 0.001 | (0.034) | 0.270 | (0.444) | 0.116 | (0.320) |
| Master | 0.001 | (0.032) | 0.000 | (0.013) | 0.000 | (0.000) | 0.014 | (0.117) | 0.005 | (0.071) |
| Ph.D. | 0.000 | (0.006) | 0.000 | (0.000) | 0.000 | (0.000) | 0.001 | (0.036) | 0.000 | (0.000) |
| Day off (=1) | 0.043 | (0.202) | 0.059 | (0.236) | 0.077 | (0.266) | 0.025 | (0.156) | 0.034 | (0.181) |
| Sick past 1 month (=1) | 0.114 | (0.318) | 0.175 | (0.380) | 0.203 | (0.402) | 0.107 | (0.309) | 0.089 | (0.285) |
| Hospitalized past 12 months (=1) | 0.047 | (0.212) | 0.092 | (0.289) | 0.087 | (0.281) | 0.065 | (0.247) | 0.049 | (0.217) |
| Number of days off | 0.267 | (2.626) | 0.364 | (2.850) | 0.537 | (3.704) | 0.131 | (1.629) | 0.180 | (2.379) |
| Length of Stay | 0.381 | (6.002) | 0.785 | (9.682) | 1.152 | (16.646) | 0.452 | (2.800) | 0.362 | (3.989) |

*Source:* Health Welfare Survey 1996. G1= Uninsured group, G2=Voluntary Health Card group, G3= Welfare Card group, G4=Civil Servant Medical Benefit group, G5= Social Security group. Standard deviation in parentheses.

Table 2: Descriptive Statistics (2006)

| | G1* | | G2* | | G3 | | G4 | | G5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Male | 0.472 | (0.499) | 0.466 | (0.499) | 0.455 | (0.498) | 0.456 | (0.498) | 0.495 | (0.500) |
| Married | 0.660 | (0.474) | 0.742 | (0.438) | 0.693 | (0.461) | 0.751 | (0.433) | 0.622 | (0.485) |
| Age | 36.933 | (12.182) | 38.362 | (11.887) | 39.654 | (12.120) | 42.116 | (11.391) | 33.270 | (8.976) |
| Age$^2$ | 1,512.42 | (900.03) | 1,612.95 | (893.04) | 1,719.34 | (916.21) | 1,903.51 | (884.19) | 1187.44 | (652.19) |
| Urban | 0.625 | (0.484) | 0.270 | (0.444) | 0.456 | (0.498) | 0.812 | (0.391) | 0.711 | (0.453) |
| Primary school | 0.573 | (0.495) | 0.682 | (0.466) | 0.689 | (0.463) | 0.185 | (0.388) | 0.263 | (0.440) |
| Lower secondary school | 0.159 | (0.366) | 0.158 | (0.364) | 0.140 | (0.348) | 0.106 | (0.307) | 0.187 | (0.390) |
| High school | 0.171 | (0.377) | 0.114 | (0.318) | 0.127 | (0.333) | 0.185 | (0.388) | 0.218 | (0.413) |
| Diploma | 0.036 | (0.185) | 0.022 | (0.146) | 0.021 | (0.142) | 0.067 | (0.249) | 0.107 | (0.309) |
| Bachelor | 0.042 | (0.201) | 0.013 | (0.114) | 0.017 | (0.128) | 0.367 | (0.482) | 0.200 | (0.400) |
| Master | 0.002 | (0.039) | 0.000 | (0.015) | 0.000 | (0.021) | 0.049 | (0.215) | 0.014 | (0.117) |
| Ph.D. | 0.000 | (0.000) | 0.000 | (0.000) | 0.000 | (0.000) | 0.002 | (0.040) | 0.000 | (0.012) |
| Day off (=1) | 0.202 | (0.401) | 0.216 | (0.412) | 0.195 | (0.397) | 0.139 | (0.346) | 0.259 | (0.438) |
| Sick past 1 month (=1) | 0.145 | (0.352) | 0.155 | (0.362) | 0.180 | (0.384) | 0.163 | (0.369) | 0.117 | (0.322) |
| Hospitalized past 12 months (=1) | 0.059 | (0.235) | 0.064 | (0.244) | 0.070 | (0.255) | 0.062 | (0.241) | 0.063 | (0.243) |
| Number of days off | 1.326 | (6.378) | 1.386 | (6.311) | 1.409 | (7.744) | 0.809 | (5.286) | 1.556 | (8.691) |
| Length of Stay | 5.236 | (7.768) | 5.317 | (7.620) | 6.558 | (10.577) | 6.887 | (10.292) | 6.175 | (10.622) |

*Source:* Health Welfare Survey 2006. G1= Uninsured group, G2=Voluntary Health Card group, G3= Welfare Card group, G4=Civil Servant Medical

Benefit group, G5= Social Security group. Standard deviation in parentheses.* weighted average using propensity scores as weights.

Table 3: Descriptive Statistics of data in 2009

| | G1* | | G2* | | G3* | | G4 | | G5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Male | 0.468 | (0.499) | 0.463 | (0.499) | 0.449 | (0.497) | 0.434 | (0.496) | 0.494 | (0.500) |
| Married | 0.642 | (0.479) | 0.719 | (0.450) | 0.759 | (0.427) | 0.753 | (0.431) | 0.640 | (0.480) |
| Age | 37.544 | (12.507) | 38.594 | (12.175) | 44.301 | (11.679) | 43.331 | (11.518) | 34.808 | (9.407) |
| Age$^2$ | 1,565.96 | (930.36) | 1,637.74 | (913.72) | 2,098.99 | (929.79) | 2,010.20 | (907.66) | 1,300.11 | (703.14) |
| Urban | 0.611 | (0.488) | 0.263 | (0.441) | 0.281 | (0.450) | 0.797 | (0.402) | 0.697 | (0.459) |
| Primary school | 0.222 | (0.415) | 0.258 | (0.437) | 0.205 | (0.404) | 0.043 | (0.202) | 0.157 | (0.364) |
| Lower secondary school | 0.202 | (0.402) | 0.206 | (0.404) | 0.115 | (0.319) | 0.124 | (0.329) | 0.176 | (0.381) |
| High school | 0.159 | (0.365) | 0.110 | (0.314) | 0.061 | (0.239) | 0.148 | (0.355) | 0.225 | (0.417) |
| Diploma | 0.039 | (0.192) | 0.024 | (0.153) | 0.010 | (0.099) | 0.065 | (0.247) | 0.096 | (0.294) |
| Bachelor | 0.056 | (0.230) | 0.018 | (0.133) | 0.005 | (0.069) | 0.419 | (0.493) | 0.213 | (0.410) |
| Master | 0.003 | (0.051) | 0.001 | (0.022) | 0.000 | (0.000) | 0.072 | (0.259) | 0.022 | (0.146) |
| Ph.D. | 0.000 | (0.000) | 0.000 | (0.000) | 0.000 | (0.000) | 0.003 | (0.052) | 0.000 | (0.012) |
| Day off (=1) | 0.211 | (0.408) | 0.213 | (0.410) | 0.206 | (0.405) | 0.153 | (0.360) | 0.245 | (0.430) |
| Sick past 1 month (=1) | 0.166 | (0.372) | 0.182 | (0.386) | 0.217 | (0.412) | 0.153 | (0.360) | 0.134 | (0.340) |
| Hospitalized past 12 months (=1) | 0.050 | (0.217) | 0.052 | (0.222) | 0.052 | (0.223) | 0.047 | (0.211) | 0.049 | (0.216) |
| Number of days off | 0.886 | (4.018) | 0.930 | (4.246) | 0.926 | (4.437) | 0.596 | (3.598) | 0.662 | (2.579) |
| Length of Stay | 5.342 | (8.520) | 5.344 | (8.690) | 5.726 | (9.642) | 4.496 | (4.846) | 4.682 | (4.868) |

*Source:* Health Welfare Survey 2009. G1= Uninsured group, G2=Voluntary Health Card group, G3= Welfare Card group, G4=Civil Servant Medical

Benefit group, G5= Social Security group. Standard deviation in parentheses.* weighted average using propensity scores as weights.

Table 4: Difference-in Differences Estimates using 1996 and 2006 data

| | Pr(Days off):LPM | Pr(Days off):Probit | Pr(Illness): LPM | Pr(Illness): Probit | Pr(Hospitalized ):LPM | Pr(Hospitalized) :Probit | Number of day off | Length of Stay |
|---|---|---|---|---|---|---|---|---|
| DID of uninsured | 0.02 | 0.304*** | 0.054*** | 0.242*** | 0.030*** | 0.241*** | -0.365 | 1.738 |
| | (0.019) | (0.079) | (0.010) | (0.040) | (0.007) | (0.052) | (1.724) | (3.535) |
| | {0.017} | {0.075} | {0.009} | {0.037} | {0.006} | {0.048} | {1.883} | {3.051} |
| DID of voluntary health card | 0.142** | 0.022 | -0.01 | -0.127 | -0.024 | -0.197 | 3.222 | 12.615** |
| | (0.067) | (0.262) | (0.029) | (0.126) | (0.020) | (0.160) | (5.501) | (5.726) |
| | {0.068} | {0.272} | {0.026} | {0.115} | {0.020} | {0.165} | {6.070} | {5.175} |
| Number of Observations | 53,114 | 53,104 | 88,894 | 88,894 | 88,894 | 88,894 | 3,146 | 4,801 |

*Source:* Health Welfare Survey 1996 and 2006. Robust Standard errors in parentheses. Bootstrapped standard errors in braces, the size of bootstrapped sample was 100. ***, **, * significant at 1%, 5%, and 10%, respectively.

Table 5: Difference-in Differences Estimates using 1996 and 2009 data

| | Pr(Days off):LPM | Pr(Days off):Probit | Pr(Illness): LPM | Pr(Illness): Probit | Pr(Hospitalized ):LPM | Pr(Hospitalized) :Probit | Number of day off | Length of Stay |
|---|---|---|---|---|---|---|---|---|
| DID of uninsured | 0.454*** | 3.028*** | -0.116** | 0.15 | 0.079** | 0.658** | 0.317 | 7.239 |
| | (0.079) | (0.328) | (0.051) | (0.184) | (0.031) | (0.27) | (5.212) | (6.196) |
| | {0.085} | {0.378} | {0.056} | {0.211} | {0.030} | {0.264} | {4.921} | {5.915} |
| DID of Voluntary Health Card | 0.743*** | 4.155*** | -0.216** | -0.062 | 0.033 | 0.27 | 6.084 | 18.024 |
| | (0.161) | (0.653) | (0.093) | (0.362) | (0.060) | (0.518) | (10.205) | (13.677) |
| | {0.171} | {0.730} | {0.114} | {0.453} | {0.059} | {0.509} | {9.648} | {12.710} |
| Number of Observations | 56,155 | 56,145 | 89,902 | 89,902 | 89,898 | 89,898 | 3,939 | 4,917 |

*Source:* Health Welfare Survey 1996 and 2009. Robust Standard errors in parentheses. Bootstrapped standard errors in braces, the size of bootstrapped sample was 100. ***, **, * significant at 1%, 5%, and 10%, respectively.