The Impact of Private Insurance Coverage on Veterans' Use of VA Care: Insurance and Selection Effects

Yujing Shen, Ann Hendricks, Fenghua Wang, John Gardner, and Lewis E. Kazis

Objective. To examine private insurance coverage and its impact on use of Veterans Health Administration (VA) care among VA enrollees without Medicare coverage.

Data Sources. The 1999 National Health Survey of Veteran Enrollees merged with VA administrative data, with other information drawn from American Hospital Association data and the Area Resource File.

Study Design. We modeled VA enrollees' decision of having private insurance coverage and its impact on use of VA care controlling for sociodemographic information, patients' health status, VA priority status and access to VA and non-VA alternatives. We estimated the true impact of insurance on the use of VA care by teasing out potential selection bias. Bias came from two sources: a security selection effect (sicker enrollees purchase private insurance for extra security and use more VA and non-VA care) and a preference selection effect (VA enrollees who prefer non-VA care may purchase private insurance and use less VA care).

Principal Findings. VA enrollees with private insurance coverage were less likely to use VA care. Security selection dominated preference selection and naïve models that did not control for selection effects consistently underestimated the insurance effect.

Conclusions. Our results indicate that prior research, which has not controlled for insurance selection effects, may have underestimated the potential impact of any private insurance policy change, which may in turn affect VA enrollees' private insurance coverage and consequently their use of VA care. From the decline in private insurance coverage from 1999 to 2002, we projected an increase of 29,400 patients and 158 million dollars for VA health care services.

Key Words. VA health care system, insurance effect, selection effect, access/demand/utilization of services, instrumental variables

One of the largest integrated health care delivery systems in the United States, the Veterans Health Administration (VA) provided care to 4.2 million veterans in fiscal year (FY) 2003. Treatment is virtually free for enrollees with

high priority status due to service-connected disability or low income. Others face copayments but the amount is considerably lower than for non-VA care. Many VA enrollees have private insurance or other public coverage such as Medicare. In 1999, 27.4 percent of VA enrollees had no public or private insurance (Shen et al. 2003). Earlier studies have found that alternative insurance coverage was related to VA enrollees' use of VA and non-VA services in addition to sociodemographic information, VA priority status and travel distance to VA (Kosloski, Austin, and Borgatta 1987; Fleming et al. 1992; Burgess and DeFiore 1994; Kashner et al. 1998; Romeis, Gillespie, and Coe 1998; Borowsky and Cowper 1999; Mooney et al. 2000). For example, Kashner et al. (1998) found that veterans with private insurance were less likely to use VA surgical care and more likely to have VA outpatient visits. They concluded that the latter may be due to adverse selection, i.e., sicker people (indicated by more VA outpatient visits) tended to purchase insurance. However, few studies have tried to account for a potential selection effect in insurance coverage for VA enrollees.

Selection effect (sometimes called "adverse selection") has been well studied in the general population (Wolfe and Goddeeris 1991; Davidson, Sofaer, and Gertler 1992; Gertler, Sturm, and Davidson 1994; Ettner 1997; Hurd and McGarry 1997). The positive correlation of private health insurance and the use of health care services may arise from both an insurance effect (i.e., low out-of-pocket cost encourages people to seek more health care) and a selection effect (people with perceived needs for more care tend to be insured).

As in the general population, VA enrollees with alternative insurance coverage may use less VA care because the effective cost of non-VA care has decreased. Unlike the general population, however, selection effects for VA enrollees arise from two aspects: (1) veterans who are sicker may tend to purchase private insurance for security and therefore may use both VA and non-VA care intensively (a security selection effect); and (2) veterans who prefer non-VA care may purchase private insurance and use less VA care (a preference selection effect). Neither aspect can be completely observed, but both affect decisions to purchase insurance and the amount of VA/non-VA

Address correspondence to Yujing Shen, Ph.D., VA New Jersey Healthcare System Center for Healthcare Knowledge Management, East Orange VA Medical Center, 385 Tremont Avenue, Mailstop 129, East Orange, NJ 07018-1095. Ann Hendricks, Ph.D., and John Gardner, Ph.D., are with the Health Care Financing & Economics (152H), VA Boston Healthcare System, Boston, MA. Fenghua Wang, Ph.D., is with the Research Center, Shanghai Stock Exchange, Shanghai, China. Lewis E. Kazis, Sc.D., is with the Center for Health Quality, Outcomes & Economic Research, CHQOER (152), Bedford, MA.

care demanded. Ignoring the selection effect by treating insurance as exogenous could either over- or underestimate the insurance effect for this special population, depending on which type of selection effect predominates for VA enrollees.

In this study, using survey data from VA, we examined non-Medicare VA enrollees' private insurance coverage and its relationship to the use of VA care. This study broadens our knowledge of the reliance of VA services for VA enrollees lacking Medicare coverage and is the first to address the complex issue of VA enrollees' use of VA care by incorporating a wider array of explanatory factors, including sociodemographic information, patients' health status measured by Veterans SF-36 (Kazis et al. 1999), self-reported chronic diseases, access to VA and non-VA alternatives including both travel distance and characteristics of VA/non-VA systems, and insurance coverage. To our knowledge, this is the first study to evaluate the impact of various measures of access to non-VA care on veterans' use of care.

Above all, our analysis acknowledges the existence of selection effects by treating insurance coverage as endogenous. Using appropriate models and instrumental variables, we were able to separate an insurance effect from a selection effect. If future premium increases force enrollees to forgo private insurance, the coefficient for the insurance effect allows us to predict the impact on the demand for VA care. Hence it is important to correctly estimate the insurance effect.

METHODS

Data Sources

The study used the 1999 National Health Survey of Veteran Enrollees, the largest and most detailed survey of veterans using VA services ever conducted. A total of 1,400,000 enrollees were surveyed by mail using a stratified random sample design. The survey sample accounted for 41 percent of the VA enrollment file as of March 1999. Patients were sampled randomly in equal numbers between five survey modules. These modules share 31 core questions about enrollees' health status measured by the Veterans SF-36, prevalence of medical and mental conditions, and sociodemographic factors. The overall response rate was 63 percent, but was higher for older enrollees (over 70 percent for those age 60 or higher) and lower for those who were younger (below 50 percent for those under 40) (Department of Veterans Affairs 2000).

We used the Insurance module for this study ($N = 152,258$). The module asked enrollees whether they had Medicare, Medicaid, or private insurance. The survey data also provided enrollees' VA priority status and the zip codes of their residence. We restricted our study sample to those who had reported having no Medicare coverage (47 percent of the respondents, Shen et al. 2003).

We merged the survey data with the FY 1999 VA cost data from VA's Allocation Resource Center (ARC), which calculates the VA total budget expenditures as well as inpatient, outpatient, and pharmacy expenditure for each patient in each year for use by the Department leadership in the federal budget process. The ARC calculations are based on the national utilization and pharmacy databases merged with financial data. We used the Area Resource File for information on percentage of no insurance at the metropolitan statistical area (MSA) level. Using latitude/longitude data, the residence zip codes and zip codes of hospitals from American Hospital Association data, we identified the closest VA and non-VA hospitals and calculated the shortest distance in miles. We defined the non-VA hospital market as all the hospitals within an area with a radius equal to the distance to the closest non-VA hospital plus ten miles. In addition to travel distance, VA/non-VA hospitals' characteristics were used in the analyses to capture the accessibility of VA/non-VA care. We focused on VA enrollees residing only in the 48 contiguous states. After excluding survey respondents with any missing values of the independent variables, our final study sample size is 48,448.

Measures of Care

We used several measures of care to examine the impact of private insurance on the use of VA and non-VA care. First, we examined general VA care and VA inpatient care measured by their VA total cost and inpatient cost. The VA pharmacy benefit was free to qualified VA enrollees and the copay was only \$2 per prescription per month for others in 1999 (increasing to \$7 in 2001). Given the high premium of outpatient prescription coverage and its significant out-of-pocket cost in the private sector at that time, policymakers believed that many veterans used their VA benefits primarily for prescription medicines. We examined VA pharmacy cost to test the hypothesis.

Empirical Model

The empirical model of VA enrollees' choice of purchasing private insurance and use of care was derived from a consumers' choice model. First, VA

enrollees made an insurance purchase decision. Let D_i be binary discrete choice: $D_i = 1$ if enrollee i had private insurance, otherwise $D_i = 0$. VA enrollees purchased private insurance if its utility was greater than the utility of no insurance. Let Z_i be a set of independent variables that affected the utility level of having private insurance and normalize the utility without insurance as 0. Let U_i be the latent unobserved utility with: $U_i = \alpha_0 + Z_i\alpha_1 + \varepsilon_i$. α was the set of unknown parameters and ε_i was a random unobservable. Hence VA enrollee i purchased insurance iff

$$\alpha_0 + Z_i\alpha_1 + \varepsilon_i \geq 0 \quad (1)$$

Next, we modeled how having private insurance affected VA enrollees' use of care. Because almost 20 percent of VA enrollees had no VA care, 90 percent had no VA inpatient care, and 30 percent had no VA pharmacy cost, we used a two-part model. For example, total cost comprises the probability of having any care in VA (positive total cost) and the level of total cost conditional on positive cost. We assumed the utility of having VA care to be $\beta_0 + X_i\beta_1 + D_i\beta_2 + \delta_i$, and normalized the utility without VA care as 0. Then

$$TC_i > 0 \text{ iff } \beta_0 + X_i\beta_1 + D_i\beta_2 + \delta_i \geq 0 \quad (2)$$

where TC was the total cost, X was the set of independent variables that affect the utility function. The insurance effect was captured by β_2 .

The level of total cost was modeled as

$$IC_i | IC_i > 0 = \lambda_0 + X_i\lambda_1 + D_i\lambda_2 + v_i \quad (3)$$

The endogeneity of private insurance existed when $\rho(\varepsilon_i, \delta_i) \neq 0$ and $\rho(\varepsilon_i, v_i) \neq 0$, i.e., when the unobservable error term ε_i in the insurance purchase model was correlated with error terms δ_i and v_i in the total cost model. Ignoring this correlation would lead to biased estimation of the impact of D and X on IC .

Two binary choice models were interacted with each other when we assumed that $\rho(\varepsilon_i, \delta_i) \neq 0$. By assuming that $(\varepsilon_i, \delta_i) \sim$ bivariate normal distribution with $[0, 0, 1, \sigma, \rho]$, we used a maximum likelihood (ML) method to obtain consistent estimation of α , β , and ρ . Similarly, we assumed that $(\varepsilon_i, v_i) \sim$ bivariate normal distribution with $[0, 0, 1, \sigma', \rho']$. As the level of total cost was a continuous variable, we used a Heckman two-stage model (Heckman 1979) to deal with endogeneity.

Model Identification and Instrumental Variables

The key to this study is to identify valid instruments, variables that affect the VA enrollees' insurance status but do not directly affect their use of care. One

possible instrument was the percentage of people with no insurance in the MSA. An individual living in an area with a high insurance rate would be more likely to have insurance, but it seemed plausible that the aggregate insurance rate in the MSA was unlikely to affect a specific individual's need for health care. We empirically tested the validity of the instrumental variable.

In the utilization model, several factors were used to capture the non-VA care market and VA care available to VA patients. They included the travel distance to the closest VA hospitals and non-VA hospitals, whether the closest VA hospital was a general hospital or was affiliated with a medical school, and the number of major services provided in the closest VA hospital (Table 1 lists the 18 major services considered here). The non-VA care market was characterized by the number of non-VA hospitals, number of non-VA hospitals affiliated with medical schools, and number of general hospitals within the area with radius of 10 miles plus the distance to the identified closest non-VA hospitals. (The results were similar when we used a radius with +15 miles.)

Key Explanatory Variables

Enrollees' health status was posited to be a major factor in the decisions to purchase insurance coverage or use care. We used the Veterans SF-36 two component summary scales, a physical component summary (PCS) and a mental component summary (MCS), to measure health status. Higher summary scores indicate better health (Kazis et al. 1999). In addition, we also used the number of physical and mental chronic diseases to measure health status. These two indicators were based on self-reported information on 12 chronic physical diseases and three chronic mental disorders. The full list of explanatory variables is given in Table 1.

RESULTS

Table 2 presents the descriptive statistics of the relevant measures of VA/non-VA utilization by insurance status. In FY 1999, 80 percent of our study sample sought care in VA with an average budget expenditure of \$4,400 per patient. For enrollees without private insurance coverage, 88 percent had VA care (mean = \$5,300). About 66 percent of those with private insurance received VA care (average = \$2,300).

About 9.2 percent of the study sample had VA inpatient care with average cost of \$12,100, but enrollees without private insurance coverage had a higher rate of VA inpatient care than those with private insurance (12.9 versus

Table 1: Descriptive Statistics of Independent Variables (1999 National Health Survey of Veteran Enrollees—Insurance Module)

	<i>Total Sample, No Insurance,</i> <i>N= 48,448 N= 29,944</i>		<i>Private Insurance,</i> <i>N= 18,504</i>
Personal characteristics			
Female	7.1%	6.2%	8.5%
Nonwhite	29.2%	31.6%	25.4%
Age			
Under 45	21.8%	19.1%	26.3%
45–54	38.6	37.7	40.2
55–64	30.1	30.4	29.7
65 and older	9.5	12.9	3.9
Education status			
≤ 8 years, elementary	8.6%	11.3%	4.2%
9–11 years, some high school	7.1	9.5	3.1
12 years or GED high school graduate	31.3	33.7	27.4
College 1–3 years	37.3	34.5	41.9
College graduate or graduate school	15.7	11.0	23.4
Economic hardship: yes = 1	18.6%	23.9%	9.9%
Live alone: yes = 1	23.8%	29.4%	14.7%
Marriage status			
Currently married	54.3%	42.9%	72.8%
Formerly married	33.1	41.5	19.4
Never married	12.6	15.6	7.8
Employment status			
Employed	55.2%	41.7%	77.0%
Retired	16.8	19.1	13.1
Others	28.0	39.2	9.9
VA priority			
Priority 1: service connected disability 50% or more	12.9%	13.4%	11.9%
Priority 2: service connected disability 30–40%	10.6	8.0	14.9
Priority 3: Service connected disability 10–20%, plus former POWs	17.7	12.9	25.5
Priority 4: Aid and attendance, housebound, catastrophically disabled	1.2	1.9	0.2
Priority 5: income and net worth below established thresholds	43.7	55.9	24.1
Priority 6: World War-I, “Agent Orange,” “Gulf War syndrome,” compensable 0%	2.1	1.3	3.5
Priority 7: copayments for VHA services (category C)	11.8	6.7	20.0
Medicaid enrolled	2.7%	3.3%	1.6%
Health status indicators, mean (standard error)			
PCS: VSF-36 physical component scale	35.0 (11.90)	34.0 (11.63)	37.1 (12.13)
MCS: STD mental component scale	45.2 (13.74)	43.8 (13.91)	47.7 (13.04)

continued

Table 1: *Continued*

	<i>Total Sample, N = 48,448</i>	<i>No Insurance, N = 29,944</i>	<i>Private Insurance, N = 18,504</i>
Total # of physical chronicle conditions (0–12)	3.3 (2.11)	3.3 (2.12)	3.1 (2.08)
Total # of mental conditions (0–3)	0.5 (0.77)	0.6 (0.81)	0.4 (0.67)
No insurance percentage at MSA (metropolitan statistical area) level*	19.7 (6.76)	20.1 (6.80)	19.0 (6.63)
Distance**			
Distance difference between the closest Non-VA hospital and the closest VA hospital, mean (standard error)	– 29.9 (36.61)	– 29.5 (36.06)	– 30.5 (37.48)
Travel distance to the closest VA hospital			
Less than 10 miles	29.0%	30.8%	26.2%
10–20 miles	16.5	15.3	18.5
20–30 miles	10.3	9.9	11.0
30–40 miles	8.0	7.8	8.4
40–50 miles	7.6	7.5	7.8
Over 50 miles	28.5	28.7	28.2
Hospital information			
Percent for whom:**			
The closest VA hospital is not general hospital	8.5	7.6	10.1
The closest VA hospital is not affiliated with medical school	11.7	11.7	11.8
Mean # of major services provided in the closest VA hospital†	9.2 (5.92)	9.2 (5.94)	9.2 (5.89)
Mean # of non-VA hospitals affiliated with medical school	3.6 (7.09)	3.8 (7.39)	3.3 (6.55)
Mean # of non-VA hospitals being general hospital	7.1 (9.16)	7.5 (9.65)	6.5 (8.25)
Mean # of non-VA hospitals	9.5 (12.0)	9.9 (12.57)	8.7 (10.89)

†We examined the following 18 major services categories: adult day care, HIV/AIDS services, alc/drug abuse, alc/drug outpatient, arthritis treatment, card cath lab, cardiac ICU, emergency dept., geriatric services, hospice, med/surg ICU, oncology services, psychiatric care, psychiatric outpatient, rehabilitation care, physical rehabilitation, skilled nursing, urgent care center.

Variables with * were used only in model of choosing insurance type, variables with ** were used only in the model of using health services. The rest were common variables.

3.2 percent) and cost \$3,600 more per patient. More than two-thirds of people used VA pharmacy with the average cost of \$730, which accounted for 19.9 percent of total VA cost. More enrollees without private insurance used VA pharmacy (80 percent) than those with private insurance (51 percent) and their

Table 2: Use of VA Care by VA Patient's Insurance Status

	<i>Total Sample, N = 48,448</i>	<i>No Insurance, N = 29,944</i>	<i>Private Insurance, N = 18,504</i>
Percentage with VA care	79.9%	88.1%	66.4%
Total VA cost (\$1,000)	4.4 (10.13)	5.3 (11.49)	2.3 (5.75)
Percentage with VA inpatient care	9.2%	12.9%	3.2%
VA inpatient cost (\$1,000)	12.1 (16.49)	12.6 (17.05)	9.0 (11.91)
Percentage with VA pharmacy cost > 0	69%	80%	51%
VA pharmacy cost (\$)	730 (135)	785 (138)	590 (129)
Ratio of pharmacy cost/ total cost	19.9% (0.22)	19.8% (0.21)	20.1% (0.24)

Note: VA cost was FY1999 cost using VA ARC annual data. Standard errors are presented in parentheses.

cost was higher (\$785 versus \$590). The ratio of VA pharmacy cost to total cost was similar for enrollees with and without private insurance.

Validity of the Instrumental Variable

IV estimates are consistent and reliable only if the instrumental variable (percentage of people without insurance at the MSA level) is (1) strongly correlated with the endogenous variable (VA enrollees' insurance status), instrumental variable estimations could be inconsistent if there is weak correlation (Bound, Jaeger, and Baker 1995; Staiger and Stock 1997); and (2) does not have a direct effect on use of VA care. To test the first condition, Staiger and Stock (1997) recommend that the first stage *F*-statistics, which test the hypothesis that instruments do not enter the first stage regression (in our case, VA enrollees' insurance status), should have a value of at least 10. Given that the *F*-statistics are developed for linear models, we ran the linear first-stage insurance model (Hadley and Waidmann 2006). The instrumental variable had an *F*-statistic equal to 242, which indicated that it was unlikely to have bias due to a weak instrument. To test the second assumption, we regressed total patient-level VA cost on the MSA-level noninsurance rate and other covariates. The results showed that the parameter estimate of the noninsurance rate was not statistically significant ($p = .418$). Similarly, noninsurance was not correlated with VA patient-level inpatient cost ($p = .173$) or pharmacy cost ($p = .382$). The tests increased our confidence in the validity of our instrumental variable.

Literature has demonstrated that some MSAs may have more aggressive practice patterns than other MSAs. The aggressive MSAs may have higher premiums for private coverage and lower coverage rates (Wennberg, Fisher,

and Skinner 2002). If the aggressive practice patterns spill over into VA practice, areas with high rates of un-insurance will exhibit greater spending in the VA sector even if there is no causal link at the individual level, which has been demonstrated above. The possible spillover effect from the private sector to the VA sector may affect the strength of the instrumental variable.

Unlike the Medicare fee-for-service program, VA medical center budgets provide a financial disincentive for chiefs of medical services to allow more aggressive practice, however. While Medicare providers are paid more if they provide more services, VA medical centers are not. Indeed, internal (unpublished) VA studies suggest that VA does not mirror private sector practice patterns in this way. Nevertheless, we explored this possible confounder (spillover effect) by testing for correlation of the area un-insurance rate with both per capita Medicare expenditures (aggregated to the MSA level from county-level Part A and B reimbursement figures published on the CMS website) and per capita VA expenditures calculated across all VA patients for each medical center. The former were significantly and positively correlated as suggested by the published literature ($t = 4.69$, R^2 0.07). VA per capita expenditures had a negative but statistically insignificant relationship with the no insurance rate, however ($t = 1.41$, R^2 0.02). Consequently, we do not believe that geographic areas with high rates of un-insurance exhibit greater spending in the VA sector, which further supports the validity of the instrumental variable.

Who Purchased Private Insurance

Table 3 presents the estimation of the insurance model, based on the joint estimation of insurance coverage and use of VA care or not. (The results from the simple probit model of insurance coverage without considering its correlation with use of care and others joint estimation were similar and are not presented here.)

Sociodemographic factors were highly associated with insurance coverage. For example, VA enrollees more likely to have private insurance were female, white, highly educated, married, and employed. The likelihood of having private insurance was also associated with VA priority status. Enrollees with extensive disabilities (priority 4) were least likely to have insurance. Those without a service connected disability and whose incomes were above established thresholds (priority 7) were most likely to have insurance.

The correlation between observable health status and private insurance was very weak. The numbers of chronic and mental conditions were not significantly correlated with the likelihood of having insurance coverage. Even

Table 3: Results on Insurance Model (Probability of Having Private Insurance)

<i>Independent Variables</i>	<i>Coefficient</i>	<i>Standard Error</i>
Female	0.24***	0.025
Nonwhite	− 0.06***	0.015
Age	(Under 45: reference group)	
45–54	− 0.35***	0.041
55–64	− 0.56***	0.042
65 and older	− 0.33***	0.059
Education	(College 1–3 years: reference group)	
≤ 8 years, elementary	− 0.39***	0.041
9–11 years, some high school	− 0.37***	0.031
High school graduate	− 0.07***	0.016
At least college graduate	0.20***	0.019
Medicaid enrolled	0.26***	0.045
Economic hardship: yes = 1	− 0.28***	0.019
Live alone	0.04*	0.020
Marriage status	(Currently married: reference group)	
Formerly married	− 0.62***	0.018
Never married	− 0.66***	0.024
Employment status	(Employed: reference group)	
Retired	− 0.35***	0.020
Other	− 0.87***	0.023
VA priority status	(Priority_5: reference group)	
Priority_1	0.44***	0.022
Priority_2	0.67***	0.022
Priority_3	0.68***	0.018
Priority_4	− 0.17***	0.088
Priority_6	0.58***	0.043
Priority_7	0.83***	0.021
PCS	0.01***	0.000
MCS	0.00***	0.000
# of physical chronic conditions	0.01	0.005
# of mental conditions	0.01	0.011
No insurance rate at MSA level	− 0.06***	0.000

*Significance ≤ .05.

***Significance ≤ .001.

though both veteran SF-36 physical and mental component scales (PCS and MCS) had a positive and significant impact on the likelihood of having insurance coverage, their magnitudes were negligible.

The parameter estimate of the instrumental variable (noninsurance rate at the MSA level) was -0.006 ($p \leq .001$). The sign is consistent with the hypothesis that people who live in areas with a high noninsurance rate were less likely to have private insurance.

Endogeneity and Impact of Private Insurance

To provide a baseline estimation and comparison, we ran naïve models that did not account for the unobservable correlation between insurance and use of care. These naïve models included (1) probit models dealing with dependent variables such as the likelihood of having VA cost, inpatient cost, and pharmacy cost; and (2) least square regressions with dependent variables such as the level of VA cost, inpatient cost, pharmacy cost, and the ratio of pharmacy cost to total cost. Table 4 summarizes and compares the impact of private insurance coverage on the use of care with/without controlling for insurance endogeneity. Overall, having insurance significantly decreased the likelihood of using VA care overall, inpatient care and pharmacy care in particular. However, its effects on the level of VA total cost, inpatient cost, and pharmacy cost were not significant. Models with no control for endogeneity always underestimated the insurance effect on the use of VA care.

For example, in the estimation of the likelihood of having VA care in FY 1999, the magnitude of the insurance effect estimated in the IV model was -1.03 ($p \leq .001$) compared with -0.60 ($p \leq .001$) in the naïve model. The correlation of two error terms in the functions for insurance coverage and having VA care in FY 1999 was positive and significant ($0.26, p \leq .001$). This suggests that the security selection effect dominates the preference selection effect. Sicker VA enrollees appear to purchase insurance coverage because of their perceived need for care whether in the VA or not. Because of the positive selection effect, a naïve probit model that treats insurance as exogenous would result in an underestimation of the insurance effect on the use of VA care. For those who sought care in VA in FY 1999, private insurance reduced their VA cost, but the impact was not statistically significant.

The results for inpatient care were similar, i.e., private insurance significantly decreased the likelihood of VA hospitalization ($-0.96, p \leq .001$). Once VA enrollees got in VA hospitals, however, the effect of insurance status on VA inpatient cost was not statistically significant. The naïve model, which did not take into account insurance endogeneity, underestimated the insurance effect on the use of VA inpatient care.

Private insurance significantly decreased the likelihood of using VA pharmacy ($-1.02, p \leq .001$) and the level of pharmacy cost ($-0.24, p \leq .05$). However, there was no impact of insurance on the ratio of pharmacy cost to total cost. Given that medications are a crucial part of care, the probability of having positive pharmacy cost and the level of total pharmacy cost can be treated as another indicator of intensive use of VA care. With the ratio of

Table 4: Comparisons of Insurance Effect for IV Models versus Naïve Models

Dependent Variables	IV Models				Naïve Models			
	Coefficient of Private Insurance [†]	Predicted Value [†]	Predicted Value 2 [§]	Difference [¶]	Coefficient of Private Insurance	Predicted Value [†]	Predicted Value 2 [§]	Difference [¶]
Probability of any VA cost	- 1.03***	83.4%	84.4%	1%	- 0.60***	83.7%	84.3%	0.5%
Level of total VA cost	- 1.42	\$3,906	\$3,959	\$53	- 1.25	\$3,906	\$3,956	\$50
Probability of any VA inpatient cost	- 0.96***	7.1%	7.6%	0.5%	- 0.41***	6.6%	6.7%	0.1%
Level of VA inpatient cost	- 3.47	\$9,769	\$9,872	\$103	- 2.19	\$9,673	\$9,761	\$88
Probability of any VA pharmacy cost	- 1.03***	72.1%	73.5%	1.4%	- 0.61***	72.4%	73.2%	0.8%
Level of VA pharmacy cost	- 0.24*	\$638	\$648	\$10	- 0.05*	\$649	\$651	\$4
Pharmacy cost/total cost	- 0.002	19.5%	19.5%	0	- 0.007	19.5%	19.5%	0

*Significance $\leq .05$.

***Significance $\leq .001$.

[†]From Table 5 first row.

[‡]The predicted value at the population average with insurance rate of 38%.

[§]The predicted value at the population average with insurance rate of 34%.

[¶]The difference between predicted value 2 and predicted value 1 is the impact of dropping 4% insurance rate.

pharmacy cost to total cost as a proxy of whether VA enrollees came to VA mainly for pharmacy, there is no evidence to suggest that veterans with private insurance would use VA primarily for prescription.

To illustrate the impact of private insurance coverage on VA cost, we quantified the cost to VA of a 4 percentage point decline in private coverage among VA enrollees without Medicare coverage. Basically we calculated the predicted probabilities of having VA care, VA inpatient care, VA pharmacy use, and the predicted level of the cost items at the population average. Then we generated the predicted values by allowing the average insurance rate of 38 percent to dip to 34 percent. We estimated that a 4 percentage point decline in private coverage would result in 84.4 percent of VA enrollees without Medicare turning to VA for some care, an increase of 1 percentage point; 7.6 percent of VA enrollees would have used VA inpatient care, an increase of 0.5 percentage points; and 73.5 percent of VA enrollees would have used VA pharmacy, an increase of 1.4 percentage points (Table 4).

Regarding the difference between the IV models and naïve models, the IV method of modeling predicted probability of having some VA care doubled the impact of a 4 percentage point decline in private coverage (1 versus 0.5 percent). This difference (between the IV and naïve models) could have an important impact on forecasts or simulations of aggregate levels of VA services under various scenarios for veterans' insurance coverage. The impact of the IV approach is not as great for other measures of VA utilization, however. For example, the difference in total VA cost following a change in private coverage is only \$3 between the IV and naïve models.

Finally, Table 5 presents the full IV regression results for all VA cost items. The results show that other factors are associated with VA enrollees' use of VA. Some results are consistent with previous findings. For example, travel distance to VA was associated with VA use. VA enrollees living farther from VA hospitals were less likely to use VA care (Burgess and DeFiore 1994; Mooney et al. 2000).

CONCLUSIONS

In this study, using VA data for VA enrollees without Medicare coverage, we modeled VA enrollees' decision to purchase insurance coverage and its impact on use of VA/non-VA care. By treating insurance as endogenous, we estimated the true insurance effect by teasing out a potential selection effect from the impact of insurance on the use of VA and non-VA care. We argue that the existence of selection bias in the estimation of an insurance effect can

Table 5: The Full IV Regression Results on VA Total Cost, Inpatient Cost, and Pharmacy Cost (FY 1999)

Independent Variables	Prob (Total Cost > 0)			Level of Total Cost			Prob (Inpatient Cost > 0)			Level of Inpatient Cost			Prob (Pharmacy Cost > 0)			Level of Pharmacy Cost			Pharmacy Cost/Total Cost		
	Coefficient	Standard Error	Standard	Coefficient	Standard Error	Standard	Coefficient	Standard Error	Standard	Coefficient	Standard Error	Standard	Coefficient	Standard Error	Standard	Coefficient	Standard Error	Standard	Coefficient	Standard Error	Standard
Private insurance	-1.03***	0.710	-1.42	0.745	-0.96***	0.101	-3.47	4.158	-1.03***	0.072	-0.24*	0.110	-0.002	0.016							
Female	0.21***	0.028	-0.11	0.199	-0.02	0.037	-1.84	1.104	0.25***	0.025	0.04	0.029	0.00	0.004							
Nonwhite	-0.01	0.016	-0.25*	0.114	-0.05*	0.019	-0.22	0.556	0.00	0.015	-0.10***	0.017	-0.02***	0.002							
Age																					
45-54	0.21***	0.048	0.44	0.271	0.02	0.044	-0.22	1.151	0.25***	0.043	-0.02	0.038	0.01*	0.006							
55-64	0.31***	0.055	1.50***	0.260	0.06	0.041	-0.85	0.979	0.28***	0.045	-0.06	0.036	-0.01*	0.006							
65 and older	0.04	0.072	1.84***	0.387	0.15**	0.057	-2.79*	1.391	0.02	0.062	-0.23***	0.055	-0.05***	0.008							
Education																					
≤ 8 years, elementary	0.05	0.045	-1.10***	0.248	-0.05	0.039	-1.72	0.989	0.05	0.039	-0.10**	0.035	0.01*	0.005							
9-11 years, some high school	-0.02	0.032	-0.42*	0.207	-0.02	0.033	-0.17	0.857	0.03	0.029	-0.07*	0.029	0.01***	0.005							
High school graduate	0.02	0.017	-0.15	0.119	0.01	0.020	-0.17	0.585	0.05***	0.016	-0.04*	0.017	0.00	0.003							
At least college graduate	0.03	0.021	0.01	0.162	0.03	0.029	-0.05	0.944	-0.01	0.019	0.07**	0.024	0.00	0.004							
Medicaid	-0.28***	0.044	0.26	0.313	-0.07	0.048	0.55	1.335	-0.31***	0.040	0.11*	0.046	0.02**	0.007							
Economic hardship	-0.18***	0.021	-0.73***	0.144	-0.08***	0.023	-2.27***	0.608	-0.19***	0.019	-0.11***	0.021	-0.02***	0.003							
Live alone	0.05*	0.021	-0.41**	0.140	-0.03	0.023	-0.51	0.641	0.07	0.019	0.02	0.020	0.01*	0.003							
Marriage status																					
Formerly married	-0.63**	0.024	0.57**	0.185	0.01	0.030	0.90	0.763	-0.03*	0.023	-0.07**	0.026	-0.01**	0.004							
Never married	-0.11***	0.029	0.86***	0.222	-0.02	0.036	1.58	1.019	-0.16***	0.027	0.03	0.032	-0.01**	0.005							

continued

Table 5: Continued

Independent Variables	Prob (Total Cost > 0)		Level of Total Cost		Prob (Inpatient Cost > 0)		Level of Inpatient Cost		Prob (Pharmacy Cost > 0)		Level of Pharmacy Cost		Pharmacy Cost/Total Cost	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Employment status														
Retired	0.10***	0.026	1.35***	0.179	0.09**	0.031	4.17***	0.921	0.07***	0.023	0.16***	0.026	0.00	0.004
Others	-0.04	0.026	1.80***	.219	0.08*	0.038	2.75***	0.984	-0.05	0.025	0.15***	0.032	-0.00	0.005
VA priority														
Priority_1	0.38***	0.029	1.01***	0.188	0.02	0.030	2.00***	0.770	0.28***	0.025	0.28***	0.027	0.01**	0.004
Priority_2	0.16***	0.029	-0.61**	0.238	-0.01	0.039	-1.33	1.110	0.10***	0.028	0.00	0.034	0.00	0.005
Priority_3	0.06*	0.026	-0.50*	0.220	-0.08*	0.037	-0.58	0.933	-0.02	0.025	-0.06	0.032	-0.02***	0.005
Priority_4	0.53	0.109	8.93***	0.412	0.48***	0.055	5.59***	1.171	0.29***	0.079	0.43***	0.058	-0.02*	0.009
Priority_6	-0.16***	0.049	-0.77	0.428	-0.09	0.079	-0.41	2.581	-0.21***	0.048	0.02	0.065	0.00	0.009
Priority_7	-0.27***	0.031	-0.48	0.262	-0.11*	0.049	0.37	1.400	-0.31***	0.031	0.00	0.038	0.01	0.006
PCS	-0.01***	0.001	-0.07***	0.005	-0.01***	0.001	-0.13***	0.026	-0.01***	0.001	-0.01***	0.001	-0.00	0.000
MCS	-0.00	0.001	-0.03***	0.005	-0.01***	0.001	0.00	0.022	-0.00***	0.001	-0.00***	0.001	-0.00**	0.000
# of physical conditions	0.11***	0.005	0.36***	0.031	0.06***	0.005	0.18	0.132	0.15***	0.005	0.06***	0.005	0.01***	0.001
# of mental conditions	0.09***	0.011	0.58***	0.075	0.05***	0.012	-0.24	0.332	0.09***	0.011	0.13***	0.011	0.10***	0.002
Difference in travel distance	-0.00	0.000	0.00	0.002	0.00**	0.000	-0.02	0.015	-0.00	0.000	0.00	0.000	-0.00*	0.000
Travel distance to VA														
10-19 miles	-0.18***	0.022	-0.53***	0.159	-0.02	0.026	-0.48	0.756	-0.13***	0.020	-0.05*	0.024	0.01*	0.003
20-29 miles	-0.22***	0.027	-0.68***	0.195	-0.12***	0.033	0.87	0.965	-0.17***	0.025	-0.030	0.029	0.01*	0.004
30-39 miles	-0.27***	0.030	-0.72***	0.219	-0.12**	0.037	1.30	1.072	-0.20***	0.028	-0.09**	0.032	0.01**	0.005
40-50 miles	-0.24***	0.033	-1.22***	0.231	-0.18***	0.041	-0.46	1.191	-0.16***	0.030	-0.09**	0.034	0.02***	0.005
Over 50 miles	-0.22***	0.033	-1.44***	0.236	-0.16***	0.042	-2.01	1.268	-0.14***	0.031	-0.09*	0.034	0.03***	0.005

VA was not general hospital	0.02	0.025	0.39*	0.186	-0.04	0.033	1.15	0.975	-0.07**	0.023	0.02	0.028	-0.01	0.004
VA was not affiliated with medical school # of services provided in VA	0.08***	0.023	-0.36*	0.159	-0.02	0.028	-2.08**	0.797	0.07***	0.021	-0.01	0.023	0.01*	0.003
# of non-VA hospitals affiliated with medical school	0.00	0.001	0.03**	0.009	0.00*	0.001	0.02	0.042	-0.00	0.001	0.00	0.001	-0.00***	0.000
# of non-VA hospitals being general hospitals # of non-VA hospitals	-0.01	0.004	0.12***	0.030	0.00	0.005	0.12	0.137	-0.00	0.004	0.01*	0.004	-0.00**	0.001
	0.00	0.004	-0.04	0.025	-0.00	0.004	0.03	0.113	0.00	0.003	-0.00	0.004	0.00*	0.001

*Significance $\leq .05$.

**Significance $\leq .01$.

***Significance $\leq .001$.

be from two sources: security or preference. VA enrollees with private insurance coverage were less likely to use VA care. Both the models that dealt with selection effect and the naïve models without controlling for selection effect led to these conclusions. The naïve models consistently underestimated the impact of insurance. The results imply that security selection dominates the preference selection effect.

The latest data showed that private health insurance coverage among people under 65 years of age has dropped from 73 percent in 1999 to 69 percent in 2003 (U.S. Department of Health and Human Services 2005). The continuous drop in the private insurance coverage may result in more pressure in the VA system. We estimated that a 4 percentage point decline in the private coverage among VA enrollees without Medicare coverage may lead to 1 percent more enrollees using VA care. With 2.94 million VA enrollees without Medicare coverage in 2002 (from our analysis of data published by Department of Veterans Affairs 2002), VA would have treated 29,400 new patients due to this decline in private coverage. Given that VA spent \$5,386 per patient in 2002, the shift would translate into \$158 million in additional VA cost in 2002.

Our empirical results indicated that security effect predominates, i.e., veterans who are sicker may tend to purchase private insurance for security and therefore may use VA care intensively. However, the correlation between measurable health status and the propensity to purchase private insurance is weak. Other studies have found similar results (Wolfe and Goddeeris 1991; Gertler, Sturm, and Davidson 1994; Ettner 1997; Hurd and McGarry 1997). The quality of measurable health status directly affects the detection of observable selection (Mello et al. 2003).

All of our analyses are based on the sample of the 1999 Large Health Survey of VA enrollees, which allows us to study only the self-selected population, i.e., veterans who have made the effort to show up at a VA facility and enroll to be eligible for VA care. The enrollment process is, by itself, a selection process that we do not address. The vast majority of veterans (about 16 million) who have not enrolled for VA care are not represented in this study. In addition, our analysis may have limited generalizability for younger VA enrollees, who were less likely to respond to the survey invitation.

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