Conference Paper

Length of Hospital Stay in Different Health Insurance Payment Systems

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Abstract

Before the merging of health insurance schemes in 2014, Indonesia has two type of government health insurance programs based on its payment system. Jamkesmas applied diagnosis-related groups-based (DRG) payment system, while Askes and Jamsostek are much alike to fee-for-service (FFS) model. The different payment systems likely affect hospital behavior in delivering health services. One direct measure to address this issue is hospital length of stay (LOS). This paper focuses to examine the effect of Indonesia's health insurance payment systems on hospital LOS using the Indonesia National Socio-Economic Survey (Susenas) 2012 dataset. Count data model is used to address endogeneity issue of health insurance. Our findings suggest that FFS insurance have strong effect to increase LOS, on the contrary, DRG insurance give strong effect to reduce LOS. This finding supports the idea that FFS encourages hospitals to apply more services, while DRG encourages hospitals to keep their costs low to avoid making loss.

Keywords: health insurance; length of stay; inpatient care; hospitalization; econometric.

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1. INTRODUCTION

Indonesia is in the midst of major health system reforms aimed at attaining universal health coverage (UHC) by the merging of social health insurance programs with the aim of providing UHC to the entire population in which was gradually implemented since 2014. Prior to the merging, Indonesia had several social health insurance schemes, each covering a different target population and a different benefit package. These social health insurance programs included Askes, Jamsostek, and Jamkesmas. As can be seen among three health insurance schemes before the merging, there were two models of hospital payment system that were applied. Askes and Jamsostek are much alike to fee-for-service (FFS) model, while Jamkesmas applied diagnosis-related groups-based (DRG) payment system.

Theoretically, health insurance may affect utilization of health services. One direct measure to health care utilization is length of stay (LOS) in hospital. Study found that LOS has increased under the FFS model. FFS model encourages health providers to apply more procedures that may lead to the increase in patients' hospitalization days [4]. Contrary to that, the decline in LOS among Japanese hospitals is considered to be due to cost-containment policies based on DRG-like payment system [7]. Given these competing hypotheses, the different payment systems are likely to affect hospital behavior in raising or lowering the intensity of care provided by LOS.

This paper is aimed to find out the influence of different health insurance payment systems on hospital LOS. We use inpatient LOS data in public hospital since the rule of public hospital plays main role in providing services to social health insurance patients.

2. METHODS

2.1. Data

The study was based on data from the Indonesia National Socio-Economic Survey (Susenas) 2012 dataset. Susenas is a socioeconomic surveys conducted by Central Bureau of Statistics (BPS). It is designed in order to collect social population data with representative sample of 300,000 households.

Observations of long inpatient stay were not included in this study because it may reflect long-term care on special hospitals like psychiatric hospital. Long-term care on special hospitals was associated with an increased LOS due to the nature of disease. Pattern even persisted after adjustment for DRG [1]. Since average length of stay in non long-term care facilities is generally less than 30 days [8], the study do not include observations of inpatient who stayed more than 30 days.

2.2. Methods

In this analysis we used two-part models. In two-part model, the process was separated between the decision to use services and the estimation among individuals having the services [3]. This comprised a probit model for the probability of an individual having inpatient admissions to public hospitals, and poisson regression was applied only to the subsample with nonzero inpatient LOS, to estimate correlates of the positive level of inpatient care.

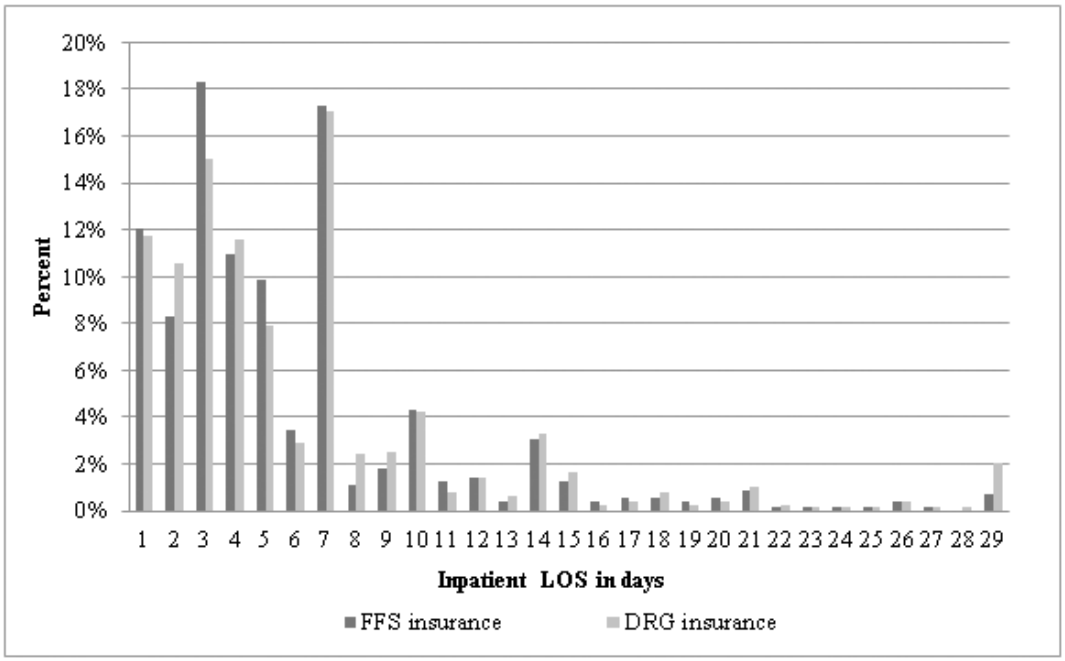

Figure 1: Inpatient LOS by insurance status conditional on having inpatient care.

Study showed that examining demand of insurance has risks of bias. One of the way to address this issue is by taking endogeneity of insurance into account [5]. Endogeneity of insurance is often caused by the presence of unobservable factors which influence the selection of the scheme member. This situation causes unobserved heterogeneity which influences the estimation of insurance demand. To address this problem, instrumental variables method was applied [9]. Insurance variables, FFS and DRG, was used as dummy variables in the demand equation. FFS represents Askes and Jamsostek, while DRG represents Jamkesmas. Variables selected as instrumental variables for health insurance is self-employment (for FFS insurance) and number of child (for DRG insurance).

3. RESULTS AND DISCUSSION

3.1. Descriptive Results

Distribution of sample in inpatient LOS showed that approximately 99 percents of respondents had zero public hospital inpatient LOS. Conditional on having inpatient admissions, 80 percents of FFS insured patients and 77 percent of DRG insured patients had LOS less than or equal to 7 days (see Figure 1). Summary statistics for the variables used in the study were presented in Table 1.

3.2. Econometric Results

3.2.1. Instrument of Insurance Variable

The hospital LOS was modeled as two-stage decision. To address selection issue of insurance, we took endogeneity into account by using probit model to estimate the probability of inpatient care and poisson regression to estimate inpatient LOS. We applied two-step IV-type procedure. First, we predicted insurance variable using ordinary least squares method involving the instrument variables. Then we used the predicted values in the next step to replace the insurance variable original value [6].

The results of the first step regressions were presented in Table 2. The F-statistics of FFS and DRG insurance variables were larger than 1,333 and 1,606, thus well above the threshold of 10. We used Wu-Hausman test for endogeneity by regressing the endogeneous variable on instrument and by saving the residuals. Then this residual was included as an extra term in the original model. The p-value was 0.00 for FFS insurance and 0.04 for DRG insurance, so instrumented variable was endogenous.

3.2.2. The Probability of Inpatient Care

The first part of two-parts model was a probit model to analyze inpatient care probability (Table 2). FFS insurance was statistically significant and its beneficiaries were more likely to have inpatient care. This might happen because of the financial protection given by FFS insurance from out-of-pocket payment risks. FFS insurance gave a more flexible choice for both patient and hospital because of per diem payment mechanism in which using daily allowance for expenses to cover inpatient costs. This benefit had positive effect on individual decision to seek for health care. In contrary, DRG insurance was not statistically significant. Poor procedures in administration that caused delay in reimbursement, encourage hospital to turn away from DRG insurance patients.

The largest effects on the probability to have inpatient care on both insurance categories were individuals having age greater than or equal to 60 years old. This was an expected result because elder people have higher risk of getting ill. Contrarily, teenager group consisting of 10 to 14 years old was the less likely to have inpatient care, this could be happened because teenager tend to be healthier and have lower probability to get ill than another group of age. This finding corresponds to health status which is also significant for both categories, since health status is a major factor on deciding whether individual needs to have inpatient care or not. Another significant

Table 1: Summary statistics of the variables used in the study.

Variable	Definition	Mean	Std. Dev.	Min	Max
FFS insurance	1 if had "Askes" or "Jamsostek" insurance; 0 otherwise	0.13	0.34	0	1
CBG insurance	1 if had Jamkesmas insurance; 0 otherwise	0.23	0.42	0	1
Health status	1 if had fever/ cough/ cold/ asthma/ diarrhea/ frequent headache/ toothache in last month; 0 otherwise	0.23	0.42	0	1
Income	Log(per capita consumption expenditure)	13.07	0.66	11.11	18.13
HoH no-schooling^R	Had no education				
Elementary	Had some primary education	0.44	0.49	0	1
Junior	Had some junior education	0.17	0.37	0	1
Senior and higher	Had some senior and or higher education	0.31	0.46	0	1
Age <=9^R	9 years of age or less				
10-14	10-14 years of age	0.10	0.30	0	1
15-24	15-24 years of age	0.15	0.36	0	1
25-59	25-59 years of age	0.45	0.49	0	1
>=60	60 years of age or more	0.08	0.27	0	1
Married	1 if married; 0 otherwise	0.47	0.49	0	1
Urban	1 if urban; 0 otherwise	0.42	0.49	0	1
Household size	Number of household members	4.71	1.90	0	1
Female	1 if female; 0 otherwise	0.49	0.49	1	22
Electricity	1 if had electricity; 0 otherwise	0.90	0.29	0	1

^{R} is the reference group.

covariates were household size and female. Respondents from large family had higher probability to visit health facilities. Plausible reason for this finding is that in a large household there is less attention to members of household in terms of their nutritional needs and this makes them prone to illness, increasing probability of using medical care. Females were more likely to have inpatient care compared to male. This was consistent with the idea that females are more sensitive about health status [10].

3.2.3. The Inpatient LOS

Inpatient LOS on public hospital was analysed conditionally on having inpatient care using poisson regression model (Table 2). Insurance had a significant positive relationship with inpatient LOS. Note that each of insurances had a fundamentally different effect on LOS. FFS insurance increased LOS by a factor of 2.01 while DRG insurance

Table 2: Two-part model regression results for inpatient LOS in public hospital.

	First stage regression, OLS; dependent variable : health insurance		Probit explaining whether individuals had inpatient care		Poisson regression explaining inpatient LOS	
	FFS	DRG	FFS	DRG	FFS	DRG
Instrument variable	-0.0758*** (0.0020)	0.0066*** (0.0009)				
Health insurance			1.0911** (0.3394)	-1.8557 (1.3618)	2.0168 *** (0.3750)	-8.9777*** (1.4334)
Health status	-0.0042** (0.0013)	0.0435*** (0.0018)	0.2341*** (0.0159)	0.3093*** (0.0611)	-0.0584*** (0.0173)	0.3236*** (0.0654)
Income	0.1056*** (0.0010)	-0.1154*** (0.0014)	0.0812* (0.0379)	-0.0201 (0.1596)	-0.1949*** (0.0418)	-1.0301*** (0.1680)
HoH no-schooling^R						
Elementary	-0.0018 (0.0024)	-0.0155*** (0.0033)	0.0245 (0.0345)	-0.0062 (0.0399)	0.0955* (0.0370)	-0.0483 (0.0430)
Junior	0.0199*** (0.0027)	-0.0384*** (0.0037)	0.0048 (0.0384)	-0.0423 (0.0627)	0.0694 (0.0409)	-0.2200*** (0.0660)
Senior and higher	0.2030*** (0.0027)	-0.1032*** (0.0036)	-0.2560** (0.0790)	-0.2191 (0.1417)	-0.3875*** (0.0865)	-0.8800*** (0.1500)
Age <=9^R						
10-14	0.0148*** (0.0022)	0.0214*** (0.0029)	-0.3216*** (0.0415)	-0.2661*** (0.0502)	-0.0116 (0.0552)	0.2114*** (0.0631)
15-24	-0.0005 (0.0020)	0.0289*** (0.0029)	-0.0447 (0.0286)	-0.0081 (0.0406)	0.0929** (0.0357)	0.2889*** (0.0483)
25-59	0.0023 (0.0022)	0.0465*** (0.0031)	0.0324 (0.0304)	0.0991 (0.0631)	0.2553*** (0.0325)	0.6133*** (0.0682)
>=60	0.0296*** (0.0027)	0.0592*** (0.0038)	0.3340*** (0.0324)	0.4522*** (0.0759)	0.3557*** (0.0339)	0.8756*** (0.0827)
Married	0.0416*** (0.0018)	-0.0406*** (0.0024)	0.1124*** (0.0276)	0.0848 (0.0581)	-0.1437*** (0.0271)	-0.4167*** (0.0612)
Urban	0.0469*** (0.0013)	-0.0412*** (0.0017)	0.0261 (0.0231)	-0.0005 (0.0600)	-0.0843*** (0.0241)	-0.3631*** (0.0617)
Household size	0.0052*** (0.0003)	0.0022*** (0.0005)	0.0161*** (0.0046)	0.0310*** (0.0074)	-0.0051 (0.0046)	0.0461*** (0.0076)
Female	-0.0033** (0.0011)	0.0020 (0.0015)	0.0412** (0.0149)	0.0466*** (0.0150)	-0.0627*** (0.0160)	-0.0344* (0.0167)
Electricity	0.0068** (0.0020)	-0.0680*** (0.0028)	0.1654*** (0.0353)	0.0430 (0.1021)	0.2872*** (0.0469)	-0.3165** (0.1100)
Constant	-1.3790*** (0.0139)	1.8329*** (0.0189)	-3.9405*** 0.4981	-2.0104 2.5335	3.8250 (0.5503)***	17.6666*** 2.6629
F statistic instrument	1,333.10	1,606.82				
Model Chi-Squared					377.00	386.34
Pseudo-R2					0.0201	0.0206

Note: * p<0.05; ** p<0.01; *** p<0.001; ^{R} is the reference group.

decreased by a factor of 8.97. This finding supported the hypothesis that FFS payment

system tended to encourage hospital to prolong LOS, while DRG tended to encourage hospital to reduce it. In FFS, the sum of the fees was reflecting the actual costs of patient. This mechanism encouraged hospital to apply more services per patient. However, this might lead to the risk of unnecessary or over supply of services. Contrarily, payment rate was predetermined and fixed in DRG insurance. To optimize profit and avoid loss, hospitals keep their actual costs low, which one of the way was by reducing length of stay [2].

Health status was significant for both insurances but with different sign, it was negative to FFS and positive for DRG. Plausible explanation for this was that the socio-economic status of FFS insured was better than DRG insured, so that they tended to have better health. Income had negative significant effect on both insurance, it was probably because individuals with higher income tended to have better socio-economic status that might lead to better health. Education showed positive influence on LOS, this might happened because people with education had more knowledge about health and tended to seek for health services when they feel the needs for it [11]. Age played positive role in all categories except 10-14 years group in FFS and the coefficient was higher as individuals get older, this indicated that older people have higher risk to get ill. Marital status and urban/rural region were having negative effect on LOS. Plausible explanation for these that married individual tends to have less attention for his/her health condition because of the needs to take care of the family, and this makes them prone to illness. Individuals living in urban region were having negative effect on LOS, this indicated that people in urban region were more exposed to information, therefore they became more aware of over supplying of services in health care. Contrary to its positive sign on first stage regression, females reduced LOS conditionally on having inpatient care. Plausible explanation for this finding is even though females were more sensitive about health, they are less endowed with resources to health services [10]. Finally, electricity availability increased LOS by 0.28 for FFS and reduced by about 0.3 for DRG.

4. CONCLUSIONS

In this paper we analyzed the relationship between health insurance payment system and inpatient LOS using two-part models. Two-part models statistically distinguish between the probability of inpatient care and inpatient LOS. This paper supported the existing studies in some aspects. First, the analysis included two Indonesia's-before-merging insurance payment systems: FFS and DRG. Second, this paper used instrument

variable approach to account for insurance endogeneity. Finally, the analysis used national scale datasets from Susenas 2012. Overall, our results showed that conditionally on having inpatient care, FFS insurance had strong effect to increase LOS, on the contrary, DRG insurance strongly affected on reduced LOS. This finding supported the idea that FFS encouraged hospital to apply more services, while DRG encouraged hospitals keep their average costs low to avoid making loss. To achieve more comprehensive understanding and successful health reform in national health insurance, the reasons behind observed differences need to be further explored.

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References

[1] Bourgeois, J.A., Kremen, W.S., Servis, M.E., Wegelin, J.A. and Hales, R.E. 2005. "The Impact of Psychiatric Diagnosis on Length of Stay in a University Medical Center in The Managed Care Era." *Psychosomatics*, 46(5), pp.431-439.

[2] Busse, R., Geissler, A., Quentin, W. and Wiley, M. 2011. "Diagnosis-Related Groups in Europe. Moving Towards Transparency, Efficiency and Quality in Hospitals."

[3] Cameron, A.C. and Trivedi, P.K. 2005. *Microeconometrics: Methods and Applications*. Cambridge university Press.

[4] Échevin, D. and Fortin, B. 2014. "Physician Payment Mechanisms, Hospital Length of Stay and Risk of Readmission: Evidence from a Natural Experiment." *Journal of Health Economics*, 36, pp.112-124.

[5] Hidayat, B. and Pokhrel, S. 2009. "The Selection of an Appropriate Count Data Model for Modelling Health Insurance and Health Care Demand: Case of Indonesia." *International Journal of Environmental Research and Public Health*, 7(1), pp.9-27.

[6] Jürges, H. 2007. "Health Insurance Status and Physician-Induced Demand for Medical Aervices in Germany: New Evidence from Combined District and Individual Level Data." *SOEP Paper*, (8).

[7] Kato, N., Kondo, M., Okubo, I. and Hasegawa, T. 2014. "Length of hospital stay in Japan 1971–2008: Hospital ownership and cost-containment policies." *Health policy*, 115(2), pp.180-188.

[8] McKee, M. 2004. *Reducing Hospital Beds: What Are The Lessons To Be Learned? European Observatory on Health Systems and Policies*.

[9] Meer, J., Rosen, H.S. 2004. "Insurance and The Utilization of Medical Services." *Social Science & Medicine*, 58(9), pp.1623-1632.

[10] Muriithi, M.K. 2013. "The Determinants of Health-Seeking Behavior in a Nairobi Slum, Kenya." *European Scientific Journal*, 9(8).

[11] Sepehri, A., Simpson, W. and Sarma, S. 2006. "The Influence of Health Insurance on Hospital Admission and Length of Stay - The Case of Vietnam." *Social Science & Medicine*, 63(7), pp.1757-1770.