Research article

Effect of supplementary private health insurance on inpatient utilisation: Evidence from Malaysia

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ABSTRACT

Supplementary private health insurance (PHI) provides better access to healthcare, improves health outcomes, potentially lowers the costs for health systems and supports the social security system. Improperly regulated PHI, however, may aggravate inequity of access towards preferential care and encourage moral hazard among PHI purchasers, altering the health-seeking behaviour, which is often observed through the pattern of health care utilisation. We investigated the effect of PHI ownership on private inpatient care utilisation, its frequency of admission and length of stay by conducting secondary data analysis of the Malaysian National Health Morbidity Survey (NHMS) 2015 data, a nationally representative community health survey. Malaysian adults 18 years of age and above who utilised inpatient healthcare facilities were included. In this cross-sectional study, we addressed the endogeneity effect of health insurance by employing instrumental variable estimation and a two-stage residual inclusion analysis. We found a significant increase in private inpatient utilisation among those who owned PHI compared to those who did not ($\beta = 4.39$, $p < 0.001$). There was no significant difference in the frequency of admission and length of stay. The increase in private inpatient utilisation among PHI owners may reflect the demand for timely care and hospitality provided by the private sector, potentially exacerbating the moral hazard behaviour among PHI owners. Further exploration of this issue could impact future healthcare systems financing designs and PHI regulation.

1. Introduction

Private health insurance (PHI) has evolved as an essential component of healthcare systems, improving social security by covering medical expenses incurred upon utilising private healthcare facilities while shifting the burden away from the public health sector [1]. In the dichotomous healthcare systems of Malaysia, where the federal government heavily subsidises the public health sector through general revenue and taxation while the private healthcare sector operates on an out-of-pocket basis, PHI plays a supplementary role [1–3]. It provides alternative access to private health care offering preferential choices of providers and care options, as well as shorter waiting times [1], thus reducing the fiscal burden and improving the operational efficiency of the public sector [3]. Essentially, PHI is

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introduced to provide better access to healthcare, improve health outcomes, and lower costs for both population and the health systems [1,4,5].

However, without proper regulation, the supplementary role provided by PHI may cause undesirable effects. As it allows access to preferential care, it may exacerbate social inequity by widening the gap in healthcare utilisation among different socioeconomic groups [6,7]. Similar to other countries, owners of PHI policy in Malaysia tend to be the more affluent group [2]. Greater access to a preferred care pathway may translate into higher health service consumption among PHI policy owners. This inequity may cause division in population health outcomes, widening the gap in health status between the two ends of the socioeconomic spectrum [8].

Increased health utilisation can also be driven by moral hazard, a phenomenon associated with PHI acquisition. According to basic economic theory, health insurance coverage may reduce prevention activities by lowering the cost of medical care and disease treatment [9]. Contrary to the traditional market, where customers pay the total price for goods or services, patients may engage less in healthy behaviours that prevent injury or illness since they can now receive free treatment or only pay a percentage of the utilisation cost. In the Malaysian context, where almost all treatments and healthcare services are available in public health, and PHI premium rates are often interpreted as partial income loss [3], there is, at least in theory, a stronger drive for moral hazard. Without proper regulations, such as efforts to minimise cream skimming, control of insurance market price, and manage the risk for adverse selections, both inequity in access and moral hazard can influence the health-seeking behaviour of the population, frequently observed through the pattern of healthcare utilisation.

1.1. Private health insurance in Malaysia

To deduce the effect of PHI on healthcare utilisation, we need to understand the context in which the product is being studied and the specific role PHI plays in that particular context. The Malaysian government has designated healthcare as one of the target sectors in its privatisation plan since the 1980s. They privatised several healthcare institutions and implicitly encouraged the private sector to deliver healthcare services for those who could afford them, freeing up public resources for those who could not. However, this resulted in ballooning out-of-pocket costs for private health care [10]. Efforts to introduce better private healthcare financing, including introducing and regulating PHI, were embarked on [11,12]. PHI has been available in the Malaysian market since the 1970s under the Medical and Health Insurance (MHI) programme. The government regulates the MHI market through the Central Bank of Malaysia under the Ministry of Finance, primarily through the Private Health Care Facilities and Services 1998's act [13]. Most insurers employ managed care organisations to streamline administrative processes and reduce total costs. PHI in Malaysia is risk-rated, and the premiums vary greatly depending on the extent and duration of the package purchased. There are two types of PHIs; individually purchased or through an employer-sponsored health insurance scheme, with both policies available voluntarily [13]. In 2005, the regulations on PHI were tightened to control the price and ownership of PHI [13]. To boost PHI adoption in Malaysia, efforts were made to address the specific target groups' requirements, such as older adults and lower income groups, and to improve insurance literacy [14–16].

Even though Malaysia's public health systems provide universal coverage while spending only 4.3% of total health expenditure as a percentage of the gross domestic product, the public sector accounts for 52.5% of overall health spending in 2019 [17]. This proportion was similar to Singapore (50.2%) but lower when compared to OECD members (61.7%) and Japan (83.9%) [18]. Household health expenditures accounted for 34.5% through out-of-pocket payments, which was higher than Singapore (30.1%) and OECD countries (13.9%) in 2019 [19]. These reflect the demand for private healthcare instead of the heavily congested public health sector, motivating the drive for PHI ownership. Despite these facts, PHI coverage in Malaysia remains considerably low, slowly increasing over the years. According to the data from the National Health Morbidity Survey 2019, 14.3% of the Malaysian population owns individual-purchased private health insurance (PHI), and 14.6% own employer-sponsored health insurance (ESHI), with others holding both types of health insurance (7.3%), while 63.7% of the population remains uninsured [20]. In contrast, an estimated 15% of the population was covered by the MHI policy in 2005 [13].

While PHI may cover the cost of outpatient care, the coverage in Malaysia is widely for inpatient utilisation, with outpatient coverage usually offered pre and post-inpatient admission [21]. Since PHI in Malaysia plays a supplementary or alternative role to the comprehensive public healthcare systems, PHI mainly covers private hospital inpatient-related costs, including hospitalisation, number of admissions, and length of stay [22]. Deductibles and co-payments also exist, depending on the package purchased.

1.2. Accounting for endogeneity in health insurance

Understanding the effect of health insurance requires considering its endogenous relationship with healthcare utilisation. Otherwise, the evidence generated may be biased [4]. The bias exists due to various institutional and behavioural factors, often unquantifiable and unmeasurable. These 'invisible' factors affect the PHI ownership process making it a non-random phenomenon and potentially affecting any measured outcome [7,9,23]. In the selection process, insurance companies may attract individuals with a higher potential to need and use healthcare. In contrast, healthier people may ignore or buy cheaper insurance packages. Reverse causality may also exist whereby individuals who believe they need health care have stronger motivation to purchase health insurance. Another unmeasurable basis to own health care insurance, such as risk adversity, where individuals who see the role of health insurance outweigh the income loss while at the same time displaying risk-avoiding behaviours, may also influence ownership [9,23]. This study attempts to address the issue of endogeneity.

1.3. Effect of PHI on private inpatient utilisation

Acknowledging the impact of supplementary PHI and its repercussions on the population's health and health systems, we aim to investigate the effect of PHI ownership on healthcare utilisation. Our contribution to the current literature is twofold. First, this study expands on the scant literature that explores the impact of PHI on healthcare utilisation in Malaysia. To our knowledge, only two studies investigated the effect on inpatient utilisation, combining both public and private utilisation [24,25]. One study investigated the impact of health insurance on public and private inpatients separately using 2006 data [26]. We update the study using more recent data and include frequency and length of stay as outcomes measurements for a more comprehensive utilisation pattern. We investigate private inpatient care utilisation due to the role of PHI as a supplementary or alternative option, mainly providing access to private health care. As the studies on the effect of PHI on utilisation among developing countries and countries where PHI plays a supplementary role are limited, findings from this study could be a reference for countries with similar health systems and economic backgrounds.

Second, this study surmounts a major empirical obstacle to addressing endogeneity bias in nonlinear models about PHI ownership. We employed instrumental variables (IV)-based approach to correcting for endogeneity bias in nonlinear models – two-stage residual inclusion (2SRI) [27,28]. We examined the effect of having PHI on private healthcare inpatient utilisation, frequency of admissions, and length of stay in the setting where PHI serves a supplementary role, controlling for the endogeneity effect. This finding is critical for policymakers as an input to design appropriate interventions for a sustainable healthcare system.

2. Methods

2.1. Study sample and data collection

We used data from the National Health and Morbidity Survey (NHMS) 2015, a nationally representative community survey with data on socio-demographic and healthcare demand [29]. It utilised a two-stage stratified cluster sampling design based on the Department of Statistics Malaysia's sampling frame, from which 75,000 enumeration blocks (EB) of about 80–120 living quarters (LQ) were considered. An average of 500–600 people lived in each living quarter. A total of 536 and 333 EBs were selected from urban and rural areas across all states in Malaysia, giving 10,428 eligible LQs to be included in the survey. Twelve LQs were randomly chosen from each selected EB. All members of the households within the selected LQs were included in the study. The survey was conducted via face-to-face interviews at respondents' places of residence between March and June 2015. We considered adults above 18 years of age, involving 19,959 respondents in this study, as those younger were unlikely to own private health insurance through their own decision. After dropping 1238 respondents from various minor ethnicities, which were too small to form subcategories, 18,721 adults were considered. Among those, 1681 respondents experienced inpatient care and were the focus of this study. All participants provided written informed consent before interviews during the NHMS 2015's data collection. The NHMS survey protocol was approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (NMRR-14-1064-21877).

2.2. Outcome measures

We examined the effect of PHI on utilising private inpatient care compared to those who used public inpatient care. Respondents answered yes or no if they had been admitted to an inpatient healthcare facility at least once in the past year from when the survey was conducted (March–June 2015). They then specified whether the place was a public or private facility.

We further investigated the effect of having PHI on two outcomes of private inpatient healthcare utilisation: i) frequency of admission, which represented the number of times respondents were admitted to a private inpatient facility, and ii) length of stay, which was the total number of days they spent being admitted to a private inpatient facility. Respondents recalled the utilisation in the last 12 months before the survey. Both were count outcomes. While the presence of inpatient utilisation was compared between public and private facilities, we focused on the effect of PHI on frequency and length of stay among those who utilised private inpatient care only, without comparing with public facilities due to various factors and differences between the facilities' management influencing the subsequent care.

2.3. Variables

2.3.1. Independent variable

The independent variable of interest was the ownership status of individually purchased private health insurance (PHI) among respondents. Respondents with PHI were defined as individuals who owned PHI either stand-alone or combined with other healthcare payer modalities. Durbin ($x^2 = 21.03$) and Wu-Hausman (F = 20.95) tests of endogeneity [30] were performed, and both were found significant at p-value <0.001, confirming an endogenous relationship between having PHI and inpatient care utilisation. The other type of health insurance, employer-sponsored health insurance (ESHI), was excluded from the definition of PHI due to the different purposes, coverage, and operation structure. The possible effect of the interaction between ESHI and PHI will be discussed.

2.3.2. Baseline covariates

Various covariates were included to control for socio-demographic, economic, and health status. Socio-demographic and economic variables were age group, gender, strata location, education level, household income level, type of occupation, household size, and

marital status. Body mass index, smoking status, alcohol intake status, and having at least one of the following chronic diseases, Diabetes Mellitus, Hypertension, or Hypercholesterolaemia, were used as a proxy of health status.

2.3.3. Instrumental variable

An endogeneity problem must be accounted for in exploring the relationship between PHI and inpatient healthcare utilisation. We employed the instrumental variable (IV) estimation to address the endogeneity issues in our models. This is a commonly used approach to handling causal inference in health services research and epidemiological studies and to control for the selection bias associated with inpatient healthcare utilisation, the outcome of interest in this study. The tendency is introduced when the observed differences in the outcome variable as per observed differences in an explanatory variable fail to adjust for unobserved variables correlated in sampling both variables. An effective 'instrument' is a third variable that causes changes in the explanatory variable but has no direct impact on the outcome variable [28]. Since the data employed in this study was from a community survey that was not designed to explore health insurance ownership, we needed to find variables that could be applied to all respondents and fulfil the theoretical criteria of becoming an IV, which are i) it must correlate strongly with the independent variable of interest, in this case, the PHI status, ii) uncorrelated with the error in the health equation, and iii) uncorrelated with the dependent outcome (private inpatient utilisation) except through mediation via the endogenous regressor (PHI). We tested several variables that potentially fit the theoretical criteria for IV requirement through the instrument relevance and weak instrument tests [31] along with all other relevant covariates and found that ethnicity is a good IV which fulfils the statistical requirement for all intended outcomes related to private inpatient care utilisation. However, when an instrument fulfilling all criteria is found, the estimates generated are still subject to bias, in which the instrument is considered 'weak'. It explains slight variations of the explanatory variable, rendering the endogenous problem unsolved [32]. We performed several weak-IV identification tests to ensure that the instrument did not suffer from weak-IV problems. The null hypothesis tested was that the estimator is weakly identified and is subject to unacceptably significant bias, with a test value of less than 10 confirming the hypothesis. We found that the Cragg–Donald Wald F-statistics and Kleinbergen–Paap Wald F-statistics are large (>20) for all three different outcomes, rejecting the null hypothesis of the weak instrument [33].

2.4. Statistical analysis

We described the characteristics of the current study population utilising inpatient service based on the place attended, either a public or private inpatient facility, further categorised according to PHI ownership.

Most IV analyses use two-stage least squares (2SLS) to assess an endogenous variable's effect on an outcome of interest. To account for non-linear second-stage private healthcare inpatient utilisation outcomes, we computed a two-stage residual inclusion (2SRI) method by Joseph Terza [27,28]. The first stage of 2SRI predicted PHI status and yielded the residuals, representing variance in PHI, not due to randomisation or variation due to other unobservable factors. We ran a Probit regression to estimate the probability of having PHI on the selected set of covariates and IV, then generated the residuals.

The Probit regression model fitness predicting PHI status was evaluated in the first stage. A dichotomous outcome was based on PHI ownership. The outcome was independent and mutually exclusive among all respondents, with no possibility of cross-interaction. The sample size required surpassed the criterion set, a ratio of 10:1 respondents per independent variable [34]. Univariate analyses were performed separately to examine the association between independent variables (sociodemographic and economic factors) and the dependent variable (PHI status). Crude odds ratios (OR) were used to estimate the strength of the association between independent and dependent variables. Variables with a p-value of <0.25 [35] in the univariate analysis were included in the final multivariate analysis models. Areas under the curve (AUC) and receiver operating characteristic curves (ROC) were used to evaluate the sensitivity of the model, with a value of more than 0.7 indicating a good accuracy in predicting the outcome [36]. The Pearson Chi-square goodness-of-fit test was performed to assess model fit [37]. The multicollinearity was examined using the variance inflation factor (VIF), with a value greater than 10 indicating a multicollinearity problem [38].

Subsequently, the second-stage regression was performed. In the first model of private inpatient utilisation, the residuals from the first stage, coupled with the PHI status and other relevant covariates, were used as independent variables to predict private inpatient healthcare utilisation in the second stage. The second stage coefficient analyzed through the Generalised Linear Model (GLM) yielded a consistent estimate of the causal influence of PHI status on non-linear outcomes under IV assumptions. For the private inpatient healthcare utilisation, we analyzed GLM using a binomial distribution with link logit, with 1 = utilised private inpatient care and 0 = utilised public inpatient care. In contrast, we used a Poisson distribution with a link log for the second model on the frequency of admission and the third model on length of stay since they were both count variables. We bootstrapped the analysis with 500 replications to obtain a more accurate standard error, as fitting two sequential regression analysis stages renders the standard error estimation inaccurate [39]. To demonstrate the consequence of addressing the endogeneity effect, we compared the results from the 2SRI method with other conventional methods. We compared the outcome of private inpatient utilisation with results run through logistic regression. As they were count outcomes, we ran Poisson and negative binomial regression for the frequency of admission and length of stay. The study flowchart demonstrating the steps and analysis performed is in Appendix 1. All analysis was performed with Stata version 14 (Stata Corp, College Station, TX, USA).

3. Results

3.1. Descriptive results

Table 1 shows the sector for inpatient utilisation, either public or private, based on the PHI ownership status. 1681 respondents utilised inpatient care during the study period, with the majority (77.8%) attending public facilities. Less than half of those who owned PHI used private inpatient care (47.3%), with a lower percentage among those without PHI (14.3%).

The characteristics of respondents who owned PHI based on the sector of inpatient care utilised are shown in Table 2. Overall, among those who used private inpatient care, 51.1% of them owned PHI. In contrast, 16.3% of those attending the public sector owned PHI. Among them, there was a decreasing trend of utilisation in both sectors as age increased. In variables representing socioeconomic status (income and education level), the trend was increasing in both sector utilisations, indicating higher ownership of PHI with increasing socioeconomic status. Among those who utilised public inpatient care by occupation groups, more than one-third of government employees own PHI. In comparison, most self-employed individuals held PHI among those who used private inpatients. On chronic diseases, fewer people owned PHI in both sectors among those with at least one disease compared to those without any.

Table 3 below shows the private inpatient utilisation pattern for frequency of admission and length of stay. Generally, the utilisation pattern is similar between those who own PHI and those who do not.

3.2. Effect of PHI on private healthcare inpatient utilisation

We found that ownership of PHI significantly increased private inpatient utilisation compared to public inpatient utilisation (Table 4). Those with PHI had a higher chance of being admitted to private inpatient care as compared to those without PHI, as shown in Model 1. Compared to the model run through logistic regression, the direction of association was retained but with a more significant margin. The coefficient was higher with the 2SRI method ($\beta = 4.39$ through 2SRI and $\beta = 1.27$ through logistic regression). However, PHI had no significant influence on both frequencies of admission and length of stay among those who utilised private inpatient care (Models 2 and 3). Several variables were significantly associated with private inpatient utilisation. Those aged 35 and above had a higher chance to use private inpatient care than those younger, with those above 50 more prominently but without significant differences in frequency of admission and length of stay. Only a few income quintiles were significantly different in terms of utilisation compared to those from the lowest quintile. Having a tertiary education significantly increased the utilisation and admission frequency. Household size was a significant factor; increasing household size showed reduced utilisation, admission frequency, and length of stay. All other occupation groups were found to have significantly increased utilisation compared to government employees. The health variables used in this study had no significant association with private inpatient utilisation, with only a few exceptions. Smoking and alcohol intake was found to significantly increase the frequency of admission, while higher body mass indexes were associated with an increased length of stay.

Assessment of the first stage Probit regression predicting PHI status found the AUC to be 0.82, indicating a good accuracy of the model in predicting the outcome. Pearson's Chi-square goodness-of-fit test specified a good model fit ($p > 0.05$). The mean of the variance inflation factor (VIF) was found to be 2.67, with the VIF for all independent variables less than 10, ranging from 1.06 to 8.76, suggesting multicollinearity was unlikely.

Table 5 below compares the 2SRI method with alternative methods for frequency of admission and length of stay. The direction of association was similar among all three methods in the frequency of admission, with the association found significant through Poisson and Negative binomial regressions but non-significant through 2SRI. None of the methods showed a significant relationship with the length of stay.

4. Discussion

We set out to investigate the effect of supplementary PHI on private inpatient utilisation, controlling for its endogenous effect. There was a significant increase in private inpatient utilisation, as opposed to public inpatient utilisation, among those who owned PHI compared to those who did not. There was no significant difference in the frequency of admission and length of stay among those who utilised private inpatient care. The finding of increased utilisation of private inpatient care supports the previous result of a Malaysian study examining data from the year 2006, suggesting the underlying motivation for using PHI remained the same [26]. This finding is

Table 1

Sector of inpatient care utilisation stratified by the PHI ownership (n = 1681).

PHI ownership	Utilised Public Inpatient		Utilised Private Inpatient		p-value[a]
	n	(%)	n	(%)	
Have PHI	213	52.7	191	47.3	<0.001
Do not have PHI	1094	85.7	183	14.3	
Total	1307	77.8	374	22.3	

PHI = Private health insurance, n = count, % = percentage.

[a] Chi-square test, H0: There is no association between place of inpatient utilisation with PHI ownership; H1: There is a significant association between place of inpatient utilisation with PHI ownership.

Table 2

Characteristics and percentage of respondents who have PHI based on the sector of inpatient care utilisation (n = 1681).

Variables[a]	Public Inpatient (n = 1307)		Private Inpatient (n = 374)	
	n	(%)	n	(%)
Total	213	16.3	191	51.1
Gender				
Male	74	14.7	71	46.7
Female	139	17.3	120	54.1
Age (years old)				
18–34	110	21.4	81	60.5
35–59	78	16.9	103	58.9
60 & above	25	7.5	7	10.8
Education level				
No formal/Primary education	28	6.0	16	24.6
Secondary education	82	15.3	72	52.9
Tertiary education	99	33.0	102	60.4
Occupation				
Government employee	65	40.9	32	62.8
Private employee	56	22.3	81	57.5
Self-employed	22	12.4	37	74.0
Unpaid worker/Housewife	27	8.9	24	44.4
Retiree/Student/Not working	27	8.9	17	21.8
Household income quintile				
Quintile 1	15	6.9	13	36.1
Quintile 2	19	6.6	7	22.6
Quintile 3	47	15.0	21	43.8
Quintile 4	49	19.5	42	49.4
Quintile 5	83	34.7	108	62.1
Marital status				
Single	23	15.0	29	61.7
Married	184	18.1	157	52.3
Widow/Widower/Divorcee	6	4.3	5	18.5
Strata				
Urban	128	19.3	150	52.6
Rural	85	13.2	41	46.1
Have chronic disease				
None	91	20.1	73	58.9
At least one	122	14.3	118	47.2
Body Mass Index				
Underweight	8	10.7	7	46.7
Normal	78	17.5	76	52.8
Overweight	61	17.5	58	52.3
Obese	38	16.8	35	49.3
Smoking status				
Daily smoker	26	14.5	34	54.0
Occasional smoker	5	14.7	3	33.3
Former smoker	4	8.7	4	33.3
Never smoke	178	17.0	150	51.7
Alcohol intake				
Non drinker	191	15.7	159	48.8
Ex drinker	3	25.0	4	57.1
Current drinker	9	23.7	24	72.7
Unclassified	10	24.4	4	50.0
Household size				
Mean (SD)	4.52 (2.6)		4.28 (2.1)	
Median (IQR)	3 (2–4)		4 (3–5)	

PHI = Private health insurance, n = count, % = percentage, SD = Standard Deviation, IQR = Interquartile range.

[a] Missing value across all independent variables' subcategories <1%.

similar to a study done in South Korea, where PHI was found to increase the initiation of inpatient care but does not affect the subsequent quantity of utilisation [40]. PHI plays a supplementary role in both countries. Likewise, an investigation of the impact of supplementary PHI on other healthcare utilisation, such as specialist visits, demonstrated a similar trend [41]. In contrast, a recent systematic review found no significant difference in the hospitalisation rate and length of stay between individuals with and without PHI [42]. The context, setting, and specific role of PHI in all included studies vary and findings from each included study may not be fully comparable to the Malaysian system, where PHI serves a supplementary role to a comprehensive public health care system where almost all health services and treatment are delivered at minimal costs [43].

The period of this study is when Malaysia's health system faces a growing population, rapidly changing socioeconomic patterns and a shift in disease burden that leads to several challenges, such as heavily congested public healthcare facilities and long waiting times amid constraint resources [3]. Concurrently, rapid growth and demand for the private health sector are observed, with more private

Table 3
Frequency of admission and length of stay at private inpatient utilisation based on PHI ownership.

		Have PHI	No PHI
Total private Inpatient utilisation:			
Frequency of admission	Median (Q1, Q3)	1 (1–1)	1 (1–1)
(n = 372)	Min - Max	1–5	1–7
Length of stay	Median (Q1, Q3)	3 (1–15)	4 (1–23)
(n = 368)	Min - Max	1–150	1–30
Utilisation by category:		n (%)	
Frequency of admission	Once	164 (86.3)	154 (84.6)
(n = 372)	Twice	17 (8.9)	15 (8.2)
	More than twice	9 (4.7)	13 (7.1)
Length of stay	≤4 days	130 (69.5)	105 (58.0)
(n = 368)	5–7 days	39 (20.9)	47 (25.9)
	>7 days	18 (9.6)	29 (16.0)

PHI = Private Health Insurance, SD = Standard Deviation, Q = Quartile, Min = Minimum, Max = Maximum, n = count, % = percentage.

hospitals developed over the past decade. The high health expenditures through out-of-pocket payments (34.5%), as opposed to 13.9% among OECD countries, further reflect the demand, regardless of PHI ownership [19]. Our findings, therefore, highlight the role of a supplementary PHI in the intersectoral relationship between the public and private health sectors. With the public health sector accommodating larger populations, its capacity is stretched thin. The discrepancy in workload between the public and private sectors is apparent, with the 202 private hospitals housing 17,155 beds (28%), while the 146 public hospitals accommodated 44,117 (72%) beds in 2020 [44]. Waiting times to see a doctor in public hospitals were rated as inadequate by 25.8% of the population, compared to 3.6% in private hospitals [29]. Congestion and long waiting time also lead to delays in admission, treatments and surgeries [45–47], making having access to timely care in the private health sector through ownership of PHI appealing and may be regarded as necessary by some people.

This observation of an 'access effect' where a preferred care pathway unavailable through the public system is made possible via PHI [41] may explain the increased utilisation observed in this study. Coupled with other benefits of attending private health facilities such as choice of healthcare providers, better environment, and infrastructures, further support this theory. This is further substantiated by our finding that only 51.1% of those who utilised private inpatient care own PHI, reflecting the possibility of high demand for timeliness and hospitality provided by the private sector [48]. A study showed that the rationality of monetary charges for private healthcare services in Malaysia is indeed reflected by the demand for a more comprehensive and timely service [49]. Studies have also demonstrated that timely and quality care are essential factors influencing the market and utilisation of PHI [41].

While the utilisation of private inpatient was increased as opposed to public inpatient utilisation among those who owned PHI, we found that PHI did not significantly affect the frequency and length of stay among those admitted to a private inpatient facility. This may reflect that having PHI does not affect the quality and duration of treatment given in private healthcare facilities, regardless of PHI ownership. It could also reflect timely care received at a private inpatient facility, leading to a faster recovery and reduced need for a frequent or extended stay, as postulated by another study [50].

Assuming PHI increases access to preferred choice and timeliness of care, which could eventually contribute to better well-being, this observation of differences in utilisation may broaden the gap of inequity regarding access and fulfilment of health needs in Malaysia. A study investigating demand and effect of health insurance among European countries discussed the possibility of inequity caused by health insurance [7]. Likewise, previous studies in Malaysia have shown that only those more affluent could afford to own PHI, leaving the vulnerable subgroups with more limited opportunities for preferred care [2,51]. For policymakers, this issue requires a thorough examination. While the original role of PHI is to shift the burden and optimise care by sharing the workload with the private sector, there is a need to understand whether the current policies have created a gap between the two spectrum ends of socio-economic and how policy and regulation changes may improve or exacerbate the situation. The idea of introducing national health insurance could be revisited, as previously discussed [52], to expand access to preferential care. Otherwise, other mechanisms to promote PHI ownership by extending the public-private oriented programs could be considered.

Nevertheless, the increase in utilisation may still point toward a moral hazard. Those who owned PHI may tend to utilise private inpatients more as a demand of service in return for the prepayment that they have forked out to hold and sustain the ownership of PHI. The PHI premiums in Malaysia indeed are costly; depending on the coverage and whether co-payment is selected, the premiums can go as high as RM200 – RM300 (USD 45–68) per month [53], in comparison to RM2442 (USD 555) median salary per month of Malaysian in 2019 [54]. Similar to findings from other studies, the moral hazard could also be due to the exertion of less effort in maintaining health among PHI owners, who are complacent that the cost will be taken care of if they become ill [9]. This effect is plausible with the longstanding availability and maturity of PHI in the Malaysian market since its introduction in the 1970s [55].

The study also found several variables significantly associated with private inpatient utilisation. Those over 50 have a higher tendency for increased private inpatient utilisation. This is similar to a previous Malaysian study, which found that increasing age was associated with higher private inpatient utilisation [26]. While older age groups are less likely to own PHI due to higher premiums, the demand for health needs and timely care is higher among this age group. Higher-income quintiles, proxies for the more affluent groups, were found to have higher utilisations. In contrast, larger household sizes showed an opposite association, reflecting the subgroups which were less likely to own PHI or able to pay high out-of-pocket expenditure when utilising private facilities, as also shown in previous studies on private healthcare utilisation in Malaysia [26,56]. The health variables used in this study were found to have no

Table 4
Effect of PHI on private inpatient utilisation.

VARIABLES	Model 1: Inpatient utilisation				Model 2: Frequency of admission		Model 3: Length of stay	
	Logistic regression		2SRI					
	β	S. E	β	S. E	β	S. E	β	S. E
Insurance status								
No PHI (ref)								
Have PHI	1.27***	0.16	4.39***	0.81	0.55	0.20	0.10	0.57
Age group								
18–34 years old (ref)								
35–59 years old	0.56**	0.19	0.51*	0.22	0.1017	−0.11	0.29*	0.15
60 years & above	0.64*	0.31	0.83*	0.35	−0.06	0.10	0.19	0.29
Gender								
Male (ref)								
Female	0.13	0.21	0.18	0.24	0.65***	0.07	−0.04	0.14
Education								
None formal/Primary (ref)								
Secondary	0.47*	0.22	0.35	0.24	0.09	0.10	−0.21	0.22
Tertiary	0.96***	0.26	0.55*	0.30	0.89***	0.10	0.04	0.27
Household income quintile								
Quintile 1 (ref)								
Quintile 2	−0.42	0.30	−0.40	0.33	−0.51	0.09	−0.03	0.33
Quintile 3	−0.40	0.29	−0.59*	0.32	−0.20	0.11	−0.17	0.34
Quintile 4	0.54	0.28	0.32	0.32	0.44	0.09	0.06	0.34
Quintile 5	1.13***	0.30	0.29	0.39	0.59*	0.10	−0.24	0.31
Household size	−0.17	0.04	−0.09*	0.04	−0.07*	0.01	−0.08*	0.04
Marital status								
Single (ref)								
Married	0.04	0.26	0.00	0.30	0.88***	0.08	−0.38	0.20
Widow/Widower/Divorcee	0.12	0.38	0.18	0.41	0.57	0.11	−0.25	0.30
Occupation								
Government employee (ref)								
Private employee	1.33***	0.25	1.47***	0.29	0.80	0.09	0.08	0.23
Self-employed	0.84**	0.30	1.05***	0.33	0.29	0.10	−0.08	0.32
Unpaid worker/Housewife	1.10***	0.30	1.39***	0.35	0.59*	0.10	0.11	0.35
Retiree/Student/Not working	0.79*	0.31	1.11***	0.36	0.80*	0.12	0.31	0.51
Strata								
Urban (ref)								
Rural	−0.61***	0.17	−0.28	0.18	−0.41*	0.06	0.07	0.18
Have chronic disease								
No NCD (ref)								
At least one NCD	0.10	0.17	0.07	0.20	0.12	0.05	−0.19	0.15
Body mass index								
Normal (ref)								
Underweight	0.00	0.36	0.05	0.40	−0.46	0.08	−0.07	0.36
Overweight	0.12	0.17	0.09	0.20	0.04	0.06	0.51***	0.16
Obese	−0.11	0.20	0.04	0.22	0.14	0.07	0.82***	0.22
Smoking status								
Never smoker (ref)								
Daily smoker	0.31	0.25	0.52*	0.26	0.57*	0.09	0.32	0.25
Occasional smoker	−0.09	0.49	−0.11	0.62	0.90*	0.21	−0.28	0.24
Former smoker	0.32	0.43	0.33	0.56	1.13*	0.21	−0.03	0.46
Alcohol intake								
Never drinker (ref)								
Ex-drinker	0.18	0.64	−0.37	0.80	0.84*	0.18	1.27**	1.27
Current drinker	0.97*	0.33	0.67	0.53	0.53*	0.10	−0.11	0.20
Unclassified	−0.22	0.46	−0.71	0.76	−0.65	0.10	−0.32	0.53
Residuals			−3.31***	0.84	0.09	0.20	−0.13	0.56
Constant	−3.16***	0.50	−3.91***	0.59	−5.86***	0.19	1.78**	0.69
Pseudo-R2	0.22							

Model 1 assessed the association between PHI ownership with private inpatient utilisation. The model showed results ran through the 2SRI method compared to the logistic regression. Model 2 assessed the association between PHI ownership and the frequency of admission to private inpatient facilities. Model 3 assessed the association between PHI ownership and the length of stay at private inpatient facilities, and both models 2 and 3 were analyzed through the 2SRI method. All analyses were adjusted for sociodemographic and economic covariates. PHI = Private health insurance, 2SRI: two-stage residual inclusion, S.E = Standard errors. The standard errors for all models ran through 2SRI were bootstrapped 500× for a better estimate. Multicollinearity and interaction terms were checked. *p < 0.05 **p < 0.01 ***p < 0.001.

Table 5

Alternative specifications for frequency of admissions and length of stay at private inpatient facilities.

Outcomes	Poisson		NBREG		2SRI	
	β	S. E	β	S. E	β	S. E
Frequency of admission	0.67*	0.11	0.84*	0.13	0.55	0.20
Length of stay	−0.03	0.06	−0.11	0.09	0.10	0.57

NBREG: Negative binomial regression, 2SRI: two-stage residual inclusion, S.E = Standard errors. *p < 0.001.

significant association with private inpatient utilisation, as opposed to findings from another study [26], with a few exceptions. This could be due to the limited number of health variables available from the data source employed in this study. However, few tested health variables were found to significantly affect the frequency of admissions and length of stay.

Addressing the endogeneity of PHI towards healthcare utilisation is crucial to avoid the bias it introduced, hence formulating better estimates. We utilised the 2SRI method with an IV instrument generating the residuals to address the endogeneity, handling the non-linear second-stage equations of this study [27,28]. We found that the coefficient generated for private inpatient utilisation was higher when compared to the traditional logistic regression, indicating that the true impact of PHI on health utilisation is more significant when the effect of endogeneity is addressed. PHI was found to be significantly associated with the frequency of admission when analyzed through two traditional regression analyses but rendered insignificant through 2SRI. This is similar to findings from various studies demonstrating the difference when the endogeneity effect is considered [5,57–59]. Discerning the direction and actual margin of the relationship is crucial from a policy standpoint as it may influence any proposed changes. While various other methods exist to address endogeneity [60], the study's cross-sectional nature and the small sample utilising private inpatient care led us towards the selected mode. We also argued earlier that finding a reliable IV instrument was challenging because of the nature of the community survey. While we have shown that the selected IV surpassed the statistical requirements, a study tailored for PHI incorporating a range of more robust IV instruments is recommended [32]. The first stage regression generated a relatively small pseudo-R^2. However, other studies on the effect of health insurance have also obtained low pseudo-R^2 of less than 20%. This is due to the complexity of the healthcare systems and health behaviours such that many causes are unmeasurable [61]. This is also possibly due to the study's cross-sectional nature, which did not account for other factors that change over time and within people.

The study utilised a community-based nationwide survey involving a large population sample. It targets health-seeking behaviours and utilisation patterns but does not emphasise health insurance. While the study focused on the effect of PHI, another form of private health insurance, ESHI, was measured in the survey. While ESHI may be utilised for private inpatient care, it differs from PHI in terms of its coverage and role, depending on the objectives of different employers in covering their employees' health needs. Due to these variations and coverage uncertainty, we decided to exclude ESHI, fully acknowledging its possible interaction with private inpatient utilisation. We suggest further study to focus on the effect of ESHI alone, with details of variations in premiums and coverage captured, if possible. Along with the same argument, we also suggest the same for PHI. A more detailed study capturing the details of variations in premiums and coverage should be done for a better estimate and comprehensive understanding of its effect. Exploring the behaviour and motivation behind healthcare utilisation among those who own PHI is highly recommended. Finally, our study on healthcare utilisation was based on the dichotomous healthcare systems of Malaysia, where the public and private health sectors operate independently, allowing the population to choose and attend to either sector. Thus, the findings are relatable to similar health systems. Despite its limitations, our analysis is one of the few examining the impact of supplementary private health insurance towards inpatient utilisation.

5. Conclusion

PHI significantly increased private inpatient utilisation without affecting the frequency of admission and length of stay. PHI's context and intended role are critical in interpreting the results, with the interaction between Malaysia's public and private sectors playing a crucial role. The increase in private inpatient utilisation among PHI owners may reflect better access to their preferred choice, timely care, and hospitality provided by the private sector, with the presence of moral hazard still possible. While Malaysia is recognised for delivering good and wide comprehensive health services, these findings raised the question of whether those with PHI have the upper hand in healthcare access and, ultimately, improved health outcomes. Further exploration of this topic is necessary to support the regulatory bodies of Malaysia in reviewing the private health insurance system with consideration of various policy options that could best regulate the private health market and in line with the government policies to protect the population's rights and of minimal moral hazard.

Author contribution statement

Nur Zahirah Balqis-Ali: Conceived and designed the experiment; Performed the experiment; Contributed reagents, materials, analysis tools or data; Analyzed and interpreted the data; Wrote the paper.

Anis Syakira Jailani: Performed the experiment; Contributed reagents, materials, analysis tools or data, Analyzed and interpreted the data; Wrote the paper.

Suhana Jawahir: Contributed reagents, materials, analysis tools or data; Analyzed and interpreted the data; Wrote the paper.

Weng Hong Fun, Sondi Sararaks, Grace Lee: Conceived and designed the experiment; Analyzed and interpreted the data; Wrote the paper.

Data availability statement

Data will be made available on request.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

Supplementary content related to this article has been published online at [URL].

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e14025.

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