

ORIGINAL ARTICLE

Health Insurance Effects on Out-of-pocket Health Expenditure Among the Low-income Groups in Malaysia

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ABSTRACT

Introduction: Health insurance plays a crucial role in healthcare and financial protection. Nonetheless, a considerable portion of Malaysia's low-income population lacks health insurance. This study aimed to investigate the relationship between health insurance and out-of-pocket health expenditure (OOPHE) among the low-income group (B40 households) in Malaysia. **Materials and methods:** The current study used data from the National Health and Morbidity Surveys (NHMS) conducted in 2015 and consisted of 18,616 B40 respondents. Ordinary least squares (OLS) regression and a two-part model were employed for data analysis purposes. The two-part model encompassed a logit regression in the first part and a generalised linear model (GLM) in the second. **Results:** Most B40 households are underinsured, with only 13.81% having insurance. The results also found that insured households (0.44, 95% confidence interval [CI]: 0.01%, 0.87%), those over 65 years old (1.00, 95% CI: 0.41%, 1.60%), utilisation of inpatient care (2.62, 95% CI: 2.24%, 2.99%), women (0.28, 95% CI: 0.20%, 0.35%), higher education (0.27, 95% CI: 0.13%, 0.42%) and retirees (1.18, 95% CI: -0.01%, 2.37%) significantly spent more on OOPHE. In comparison, private workers (-0.32, 95% CI: -0.50%, -0.14%) and self-employed individuals (-0.27, 95% CI: -0.46%, -0.08%) significantly spent less on OOPHE. **Conclusion:** The findings confirm that health insurance significantly increases the OOPHE among B40 households. This highlights the necessity of a national health insurance (NHI) program that is managed by the government and provides a comprehensive benefits package. NHI will achieve much better results in controlling healthcare expenditures and reducing the prevalence of catastrophic OOPHE.

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INTRODUCTION

An essential part of any healthcare system is ensuring that individuals and families are protected from the impact of out-of-pocket health expenditure (OOPHE), which can become catastrophic over time and significantly affect individuals' living standards, especially for the poor. A health shock can boost medical costs for any household, regardless of whether or not they have health insurance. How much a family spends on medical care when facing unexpected health issues depends on whether the family or the sick member has the right health insurance or is part of a program where medical fees are waived. More than 808 million people across the world were reported to have suffered catastrophic health spending in 2010, thus reflecting the rising share of households spending on OOPHE (1).

Past research revealed that Malaysia has a higher rate of

OOPHE (35%) compared to Thailand (9%) and Brunei (6%), which is the same level as developed countries (2). The OOPHE expanded from RM3,166 million to RM22,492 million between 1997 and 2019, accounting for 1.5% of the gross domestic product (GDP) (3). Moreover, OOPHE continues to be Malaysia's second-largest contributor to total health spending and the largest single private sector source of funding. It amounted to RM22,492 million in 2019, which was approximately 35% of all health spending and 74% of health spending in the private sector (3). Ensuring that households are protected from high out-of-pocket health costs involves either funding healthcare services through taxes or implementing insurance mechanisms where risks are shared among a broader community. Since the 1970s, the Medical and Health Insurance (MHI) policy has been offering health insurance coverage across the insurance sector in Malaysia. Such coverage can be obtained through individually purchased or employee-sponsored health insurance plans (4).

Most private hospital inpatient procedures are covered by health insurance; however, patients typically pay the

payment in full before the insurance provider reimburses them (5). Health insurance is anticipated to stimulate the usage of healthcare by minimising the cost barrier (6). It is seen as an alternative to expand access to medical care and lessen the immediate cost of receiving treatment (10, 11). Unfortunately, having health insurance will not always result in lower out-of-pocket expenditure (7). Access to healthcare is nevertheless hampered by high out-of-pocket expenditure among insured individuals in other nations (8, 9). The theory posits that health insurance coverage sometimes provides insufficient financial protection to the insured, frequently due to fairly substantial co-payments and restricted health insurance coverage (12).

Low-income¹ households, or the B40 group, refer to households with the lowest 40% income distribution (13). The Malaysia income range is divided into three groups: the bottom 40% of income (B40), the middle 40% (M40), and the top 20% (T20). The Malaysian Department of Statistics (DOSM) stated the current definition for the B40 group as households earning less than RM4,850 per month. M40 refers to a household income between RM4,850 and RM10,959. The T20 household group earns more than RM10,960 monthly (14).

The insurance's under-penetration of the B40 group is a severe challenge that leads to a higher incidence of OOPHE. Comparatively, in 2019, only 13.3% of B40 households had health insurance, much lower than M40 households with 32.1% and T20 households with 49.9% (15). If the insured is diagnosed with a covered sickness or has been in an accident, a health insurance policy would often cover the cost of private medical treatment, such as hospitalisation and healthcare services only. It can delay health-seeking behaviour as individuals may wait until their conditions worsen and must be hospitalised as their insurance does not cover outpatient care services. Additionally, most private health insurance plans include caps; hence, patients can still be exposed to catastrophic expenses due to OOPHE. Critically ill and high-cost patients who exceed their insurance limits must bear the burden of these expensive healthcare needs.

The healthcare system in Malaysia is made up of both public and private sectors. The government offers significant financial help to lower the overall cost of medical care by heavily subsidising the public healthcare sector. All Malaysian nationals and those who are legally staying in the country can obtain medical care at a reduced cost because to this subsidy. However, no national insurance policy serves as the foundation for the system (16). Rather than national insurance, government subsidies are used to finance it. By contrast, the financing of the private healthcare industry is limited to either out-of-pocket payments (OOPHE) or private insurance (17).

Private healthcare is non-subsidized; it is provided on a fee-for-service basis to those who can afford it (18). Despite receiving substantial subsidies, the public healthcare system nevertheless faces constraints like a growing incidence of chronic illnesses, an ageing population, and scarce resources. This frequently leads to extremely extended wait times for diagnosis and care. Thus, even if subsidised treatment is available, some low-income households choose to forgo the delays and constraints seen in public facilities by using private hospitals for more costly procedures (19, 20).

To the author's knowledge, there is limited research on OOPHE among the B40 group in Malaysia. Therefore, the purpose of this study is to evaluate the influence of insurance on OOPHE among low-income B40 households in Malaysia. It also assesses the household characteristics that affect OOPHE. The findings hope to add new knowledge to the corpus of literature and fill the theoretical and practical gaps concerning OOPHE in Malaysia.

MATERIALS AND METHODS

Data Source

This study utilised secondary data extracted from the National Health and Morbidity Surveys (NHMS) 2015. The Institute of Public Health (IPH) under the Ministry of Health Malaysia (MOH) conducted Volume III of the NHMS in 2015, which was the first survey in the new cycle. The data was nationally representative of monitored Malaysian health statistics and healthcare utilisation. Most of the modules from NHMS 2011 were carried over into NHMS 2015, including health spending, non-communicable diseases (NCDs), risk factors for NCDs, and family health. Additionally, NHMS 2015 used a two-stage stratified random selection procedure to select representatives from around the country. A total of 29,606 respondents were surveyed with a 96.9% response rate and a total of 29,460 samples were acceptable for analysis. Furthermore, this survey determined the sample size using a single proportion formula (21).

The NHMS 2015 data is nevertheless pertinent for this analysis even with certain limitations, such as its inability to capture current changes in healthcare access, economic situations, or health policy. Changes in healthcare costs and policy after 2015, as well as subsequent economic fluctuations, are not taken into consideration in this data and could have an impact on out-of-pocket health expenditures (OOPHE). Notwithstanding these limitations, the NHMS 2015 data set retains its value. It delivers comprehensive details necessary for this study as well as a historical background for examining patterns throughout time (22). It also makes it easier to analyse surveys from later times in comparison, revealing improvements and patterns (23). Besides that, It sheds light on the early results of programs

or policies that were started around that time (22, 23). This study attempts to provide a clear understanding of the relationship between health insurance and OOPHE among Malaysian B40 households by taking these aspects into account.

The study was reviewed and approved by the Medical Research and Ethics Committee (MREC) in March 2020. Research IDs NMRR-20-783-54767 and NMRR-19-2177-49978 were assigned to the study. All necessary ethical approvals were obtained prior to data collection.

Variables

The dependent variable of this study was OOPHE. The OOPHE metric is the amount households spend on healthcare services, which was calculated using direct medical and non-medical costs (24). The cost of OOPHE was estimated in this study by summing the expenditures of direct medical care and direct non-medical care. Hospitalisation, overnight stay for treatment, medication or appliances, consultation, dental check-up, therapy for toothache or sensitive tooth, swollen gums, tooth loss, denture difficulties, unevenly aligned teeth, mouth ulcers, and jaw pain were all considered direct medical costs, while non-medical direct costs included transportation, lodging, and other fees (e.g., food and drink). On the other hand, age, gender, stratum, and household size were considered demographic variables (DF), whereas education and employment status were considered socioeconomic elements (SOE).

Age was classified into four ranges: 0 to 19, 20 to 39, 40 to 64, and over 65. B40 referred to households with monthly earnings of less than RM3859 (25). Rural or urban was defined as a stratum. At the same time, household size was classified into those with fewer than five members and those with more than five members. Simultaneously, occupation statuses include government employees, private employees, self-employed individuals, unpaid workers, retirees, or others. Inpatient care describes whether services have been sought from inpatient care or not. Payments for inpatient treatment were the primary source of OOPHE for households in the lower income quintiles (26). The household's education was categorized as non-formal, primary, secondary, tertiary, or unclassified. Primary education included UPSR/UPGRA, while secondary education was divided into upper secondary (SPM/STPM) and lower secondary (PT3/PMR/SRP/LCE).

Additionally, this study included insurance variables classified as insured or uninsured households. If one or more members of the household have health insurance, the household is regarded as insured. It covers private health insurance, employer-sponsored plans, or community-based health insurance run by non-governmental organisations (NGOs) (22, 23). Government health insurance includes coverage under the Malaysian Social Security Organisation (SOCSSO)

or government-sponsored health insurance schemes also considered as household insured (22, 23). It is not required for every member of the family to have insurance and a household is considered insured if there is any type of health insurance present. Uninsured household defined as none of household member have any type of health insurance plan.

Model and Variables

The variables that are part of each model are summed up as follows to provide understanding:

- Model 1 (Table II): Display demographic factors (age, gender, strata areas, household size) and socioeconomic factors (education level, occupation status).
- Model 2 (Table III): Display demographic and socioeconomic factors with the utilisation of inpatient care.
- Model 3 (Table IV): Display demographic, socioeconomic factors, and insurance status.
- Model 4 (Table V): Display all variables: age group, gender, strata areas, household size, education level, occupation status, insurance status, and utilisation of inpatient care.

¹ UPSR = Ujian Pencapaian Sekolah Rendah, UPSRA = Ujian Penilaian Sekolah Rendah Agama.

² SPM = Sijil Pelajaran Malaysia, STPM = Sijil Tinggi Persekolahan Malaysia.

³ PT3 = Pentaksiran Tingkatan Tiga, PMR = Penilaian Menengah Rendah, SRP = Sijil Rendah Pelajaran, LCE = Lower Certificate of Education.

A number of models were utilised in order to establish a thorough examination of out-of-pocket health expenditures (OOPHE). To provide a baseline, Model 1 incorporates fundamental socioeconomic and demographic variables. Model 2 expands on this by incorporating the use of inpatient care, while Model 3 adds insurance status in addition to assessing its effect on OOPHE. This study can discern the unique contributions of each variable and determine their effect by using this stepwise technique. This study also may observe how each set of parameters affects the outcomes by gradually adding more variables, which offers insightful information about certain links and interactions.

Model 4 provides a comprehensive view and helps reduce problems like multicollinearity and omitted variable bias. It incorporates all variables, including insurance status, inpatient care utilisation, socioeconomic characteristics, and demographic parameters. This approach ensures a thorough grasp of the components driving OOPHE and lessens the possibility of multicollinearity distorting estimates. Our stepwise technique carefully examines the effects of various groups of variables, so successfully addressing potential biases, even though certain models may suffer from omitted variable bias.

Statistical Analysis

This study employed STATA/SE for Windows version 15.1 in OLS regression and a two-part model to investigate the insurance status associated with OOPHE among the B40 sample. Health expenditure figures for those who use healthcare are generally skewed. The OLS and logistic regression had similar B40 observations of 18,616 while GLM had 5,647 observations. There was a significant skewness in the dependent variable's positive values, a large number of observations with zero spending, and heteroscedastic behaviour, which led to the variation in sample size. The study employed a two-part model, which is well-suited for managing highly skewed data and differentiating between people with zero and non-zero health expenses, to solve all of these issues.

The two-part model used logistic regression to distinguish between B40 households with and without OOPHE. The second part involved GLM with an appropriate distribution link function for those with non-zero expenditures. In comparison to ordinary least squares (OLS), this method is frequently employed in healthcare cost studies and has been demonstrated to produce estimates that are more accurate and efficient when handling skewed and zero-inflated data (27-29). Matsaganis et al. (2009) stated that when dealing with these characteristics, using ordinary least squares for estimation can lead to inaccurate and inefficient results (30). Thus, the two-part model and GLM are alternatives to OLS (31, 32).

RESULTS

Descriptive Analysis

This research was based on the NHMS conducted by the Ministry of Health Malaysia in 2015. The sample frame adhered to recommendations from the Department of Statistics Malaysia (DOSM). The total respondents in this analysis were 18,616 individuals from the B40 households. Table I shows the descriptive analysis results concerning the socio-demographic characteristics and economic profile of all respondents. The mean age of the B40 respondents was 38 years old, which was in the young category (20 to 39 years old). The results further demonstrated that the B40 group comprised 6509 respondents (35%) below the age of 19 years old, followed by 5502 respondents (30%) aged between 40 to 64 years old, and 1976 respondents (11%) who were elderly. Additionally, more than half of the respondents were females (n = 9,816, 53%).

Table I: Descriptive analysis (= 18,616).

Variables	n	%
Age		
0 to 19	6509	35.0
20 to 39	4629	24.9
40 to 64	5502	29.6
65 above	1976	10.6

CONTINUE

Table I: Descriptive analysis (= 18,616).

Variables	n	%
Gender		
Female	9816	52.7
Male	8800	47.3
Strata		
Rural	9527	51.2
Urban	9089	48.8
Household Size (1 to 14)		
Education		
No formal education	1555	8.3
Primary	6170	33.1
Secondary	6739	36.2
Tertiary	1576	8.5
Unclassified	2576	13.8
Occupation		
Government employees	726	3.9
Private employees	3461	18.6
Self-employed	2527	13.6
Unpaid workers	2592	13.9
Retirees	544	2.9
Others	8766	47.1
Insurance Status		
Insured	2570	13.8
Uninsured	16046	86.2
In-patient care	1452	7.8

In terms of education, more than one-third of the B40 respondents attained at least secondary education (SPM/STPM or equivalent). Approximately 33% of them had primary education (UPSR/UPSRA or equivalent). Whereas, the remaining B40 respondents either hold at least a PT3/PMR/SRP/LCE certificate or equivalent, had no certificate at all, or completed tertiary education. Furthermore, the majority of them were uninsured (n = 16,046, 86%) and lived in rural areas (n = 9527, 51%). Approximately 19% of the respondents worked in the private sector, 14% worked for themselves, 13% had jobs without receiving any earnings, 3% were retirees, and 4% worked in the government sector. The mean household size of the B40 respondents was 4 members and only 8% of them (n = 1482) utilised inpatient care.

Regression Results

This study further investigated the determinants of the total OOPHE incurred by the B40 household. Table II to Table V present the OLS regression and two-part model analysis results of models 1, 2, 3, and 4. Analysis results from the survey revealed several factors related to incurring OOPHE. Table 2 displays the first model, which contains the B40 group's demographic (age, gender, strata areas, and household size) and socioeconomic factors (education level and occupation status). The results from model 1 indicate that household size and gender were significant impact OOPHE in OLS and logit regression. The results reflect that females and larger household size have more likelihood of getting OOPHE.

Similarly, the findings display that age is significantly

related to OOPHE in OLS and GLM regression. It implies that household spending will also increase as age increases on OOPHE. The marginal effects show that each additional year of age increases OOPHE by 66.69 Malaysia Ringgit ($p = 0.047$). Furthermore, the tertiary education factor was significantly associated with OOPHE in all regression types, indicating that the B40 group with higher education spends more

on OOPHE than those with other education status. Likewise, B40 retirees and unpaid workers are also significantly related to OOPHE. However, those from the B40 group who work in the private sector or are self-employed are negatively associated with OOPHE. The results demonstrate that elderly retirees spend more on OOPHE than private workers or self-employed people in the B40 income group.

Table II: Result of OLS regression and Two-part model (Logit & GLM) for Model 1

Variables	OLS			Logit			GLM			Marginal Effect		
	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>dy/dx</i>	95% CI	<i>P</i> -value
Age (0 to 19)												
20 to 39	0.14	0.05, 0.24	0.003	-0.53	-0.66, -0.41	<0.001	1.32	0.66, 1.97	<0.001	50.50	6.50, 94.50	0.024
40 to 64	0.06	-0.03, 0.15	0.193	-0.54	-0.66, -0.42	<0.001	1.44	0.86, 2.02	<0.001	60.41	21.47, 99.36	0.002
65 above	0.14	0.04, 0.24	0.007	-0.51	-0.65, -0.38	<0.001	1.49	0.73, 2.24	<0.001	66.69	0.96, 132.42	0.047
Gender (Female)	0.12	0.67, 0.17	<0.001	0.22	0.15, 0.29	<0.001	-0.42	-0.85, 0.01	0.055	-19.66	-52.93, 13.60	0.247
Strata (Urban)	0.01	-0.03, 0.06	0.562	-0.04	-0.11, 0.02	0.210	0.42	0.01, 0.82	0.043	28.17	-2.82, 59.16	0.075
Log Household Size	0.04	-0.004, 0.09	0.076	0.12	0.05, 0.18	0.001	-0.52	-0.95, -0.09	0.17	-32.47	-67.85, 2.91	0.072
Education (Secondary)												
No formal education	-0.04	-0.14, 0.06	0.416	-0.29	-0.43, -0.16	<0.001	0.93	0.09, 1.76	0.029	54.71	-29.87, 139.29	0.205
Primary	-0.02	-0.08, 0.04	0.488	0.03	-0.05, 0.11	0.487	0.35	-0.16, 0.86	0.179	23.59	-10.41, 57.59	0.174
Tertiary	0.36	0.27, 0.46	<0.001	0.36	0.23, 0.48	<0.001	0.60	-0.09, 1.29	0.090	69.70	-9.99, 149.39	0.086
Unclassified	0.05	-0.04, 0.14	0.286	-0.27	-0.38, -0.15	<0.001	0.54	-0.14, 1.22	0.117	21.60	-26.16, 69.36	0.375
Occupation												
(Gov servant)												
Private employee	-0.17	-0.30, -0.03	0.014	-0.32	-0.50, -0.14	<0.001	0.12	-0.98, 1.22	0.834	-6.03	-63.19, 51.14	0.836
Self-employed	-0.15	-0.28, -0.07	0.039	-0.27	-0.46, -0.08	0.006	-0.09	-1.21, 1.03	0.872	-13.25	-69.64, 43.14	0.645
Unpaid worker	0.17	0.03, 0.31	0.016	0.08	-0.10, 0.27	0.383	0.64	-0.45, 1.74	0.251	53.72	-23.47, 130.90	0.173
Retiree	0.22	0.03, 0.40	0.025	0.13	-0.12, 0.39	0.300	1.66	0.19, 3.13	0.027	253.06	-99.53, 605.65	0.160
Others	-0.005	-0.15, 0.14	0.947	-0.02	-0.21, 0.17	0.835	0.25	-0.81, 1.30	0.649	13.77	-44.95, 72.49	0.646
Constant	0.66	0.49, 0.83	<0.001	-0.64	-0.87, -0.42	<0.001	4.34	2.97, 5.71	<0.001	74.01	51.15, 96.86	<0.001
<i>R-squared</i>	0.01			0.02								
<i>Adj R-squared</i>	0.01											
<i>Root MSE</i>	1.63											
No of observation	18616			18616			5647			18616		

OLS = Ordinary least squares, GLM = Generalized linear model, CI = Confident interval, Gov = Government. Reference.

Table III: Result of OLS regression and Two-part model (Logit & GLM) for Model 2

Variables	OLS			Logit			GLM			Marginal Effect		
	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>dy/dx</i>	95% CI	<i>P</i> -value
Age (0 to 19)												
20 to 39	-0.101	-0.18, -0.02	0.009	-0.88	-1.03, -0.74	<0.001	0.586	0.04, 1.14	0.037	23.73	-6.85, 54.31	0.128
40 to 64	-0.11	-0.18, -0.03	0.004	-0.80	-0.93, -0.67	<0.001	0.690	0.19, 1.19	0.007	32.11	3.01, 61.21	0.031
65 above	-0.15	-0.23, -0.07	<0.001	-0.94	-1.10, -0.79	<0.001	0.943	0.37, 1.51	0.001	51.38	1.39, 101.37	0.044
Gender (Female)	0.13	0.09, 0.17	<0.001	0.27	0.20, 0.35	<0.001	-0.146	-0.47, 0.17	0.372	-7.11	-29.62, 15.41	0.536
Strata (Urban)	0.02	-0.02, 0.06	0.354	-0.04	-0.11, 0.03	0.245	0.164	-0.15, 0.48	0.306	10.85	-10.91, 32.61	0.329
Log Household Size	-0.003	-0.04, 0.04	0.878	0.08	0.01, 0.16	0.029	-0.366	-0.68, -0.05	0.024	-24.19	-47.59, -0.80	0.043
Education (Secondary)												
No formal education	-0.06	-0.14, 0.02	0.140	-0.38	-0.54, -0.23	<0.001	0.151	-0.49, 0.79	0.643	6.12	-39.71, 51.94	0.794
Primary	-0.02	-0.07, 0.03	0.384	0.03	-0.06, 0.12	0.500	-0.138	-0.53, 0.26	0.492	-8.33	-33.40, 16.74	0.515
Tertiary	0.23	-0.15, 0.30	<0.001	0.30	0.16, 0.44	<0.001	0.306	-0.23, 0.84	0.264	28.57	-20.26, 77.40	0.251
Unclassified	-0.04	-0.12, 0.03	0.226	-0.40	-0.51, -0.25	<0.001	0.187	-0.34, 0.72	0.488	8.88	-30.21, 47.97	0.656
Occupation (Gov employee)												
Private employee	-0.11	-0.22, -0.01	0.037	-0.33	-0.53, -0.13	0.001	0.555	-0.27, 1.38	0.189	33.87	-18.74, 86.48	0.207
Self-employed	-0.11	-0.22, 0.004	0.060	-0.28	-0.48, -0.07	0.010	0.156	-0.70, 1.02	0.722	6.13	-40.29, 52.55	0.796
Unpaid worker	-0.02	-0.14, 0.09	0.705	-0.11	-0.32, 0.10	0.314	0.291	-0.55, 1.13	0.499	16.37	-31.29, 64.02	0.501
Retiree	0.05	-0.10, 0.21	0.494	-0.03	-0.32, 0.26	0.823	1.028	-0.11, 2.17	0.078	92.67	-38.34, 223.67	0.166
Others	-0.12	-0.23, -0.002	0.045	-0.17	-0.38, 0.04	0.114	0.120	-0.72, 0.96	0.779	5.05	-39.50, 49.60	0.824
Inpatient care	3.61	3.54, 3.68	<0.001	4.14	3.91, 4.37	<0.001	2.680	2.33, 3.03	<0.001	695.04	476.16, 913.92	<0.001
Constant	0.67	0.53, 0.80	<0.001	-0.59	-0.84, -0.34	<0.001	3.507	2.50, 4.52	<0.001	69.30	50.53, 88.07	<0.001
<i>R</i> -squared	0.35			0.16								
<i>Adj R</i> -squared	0.35											
<i>Root MSE</i>	1.32											
No of observation	18616			18616			5647			18616		

OLS = Ordinary least squares, GLM = Generalized linear model, CI = Confident interval, Gov = Government. Reference.

Table IV: Result of OLS regression and Two-part model (Logit & GLM) for Model 3

Variables	OLS			Logit			GLM			Marginal Effect		
	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>dy/dx</i>	95% CI	<i>P</i> -value
Age (0 to 19)												
20 to 39	0.14	0.05, 0.23	0.003	-0.54	-0.67, -0.41	<0.001	1.172	0.55, 1.79	<0.001	40.93	3.97, 77.89	0.030
40 to 64	0.06	-0.03, 0.15	0.167	-0.54	-0.67, -0.42	<0.001	1.421	0.86, 1.98	<0.001	61.212	22.15, 100.27	0.002
65 above	0.16	0.06, 0.26	0.002	-0.50	-0.63, -0.36	<0.001	1.691	0.95, 2.43	<0.001	94.263	8.64, 179.89	0.031
Gender (Female)	0.12	0.07, 0.18	<0.001	0.22	0.15, 0.29	<0.001	-0.332	-0.75, 0.08	0.116	-13.714	-46.74, 19.32	0.416
Strata (Urban)	-0.01	-0.05, 0.04	0.831	-0.06	-0.12, 0.01	0.075	0.295	-0.09, 0.69	0.138	19.31	-11.24, 49.86	0.215
Log Household Size	0.06	0.01, 0.10	0.027	0.13	0.06, 0.19	<0.001	-0.430	-0.86, -0.004	0.048	-26.54	-62.36, 9.28	0.146

CONTINUE

Table IV: Result of OLS regression and Two-part model (Logit & GLM) for Model 3. (CONT.)

Variables	OLS			Logit			GLM			Marginal Effect		
	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>dy/dx</i>	95% CI	<i>P</i> -value
Education (Secondary)												
No formal education	-0.03	-0.12, 0.07	0.583	-0.28	-0.42, -0.15	<0.001	0.594	-0.21, 1.40	0.148	27.51	-38.53, 93.56	0.414
Primary	-0.01	-0.07, 0.05	0.715	0.04	-0.05, 0.12	0.377	0.302	-0.18, 0.79	0.221	22.72	-12.18, 57.62	0.202
Tertiary	0.34	0.24, 0.43	<0.001	0.34	0.21, 0.46	<0.001	0.586	-0.09, 1.26	0.088	73.18	-11.93, 158.30	0.092
Unclassified	0.05	-0.04, 0.14	0.263	-0.27	-0.38, -0.15	<0.001	0.454	-0.19, 1.10	0.170	17.27	-29.80, 64.35	0.472
Occupation (Gov employee)												
Private employee	-0.17	-0.30, -0.03	0.013	-0.32	-0.50, -0.14	<0.001	0.344	-0.74, 1.43	0.535	4.99	-44.25, 54.22	0.843
Self-employed	-0.10	-0.24, 0.03	0.138	-0.23	-0.42, 0.04	0.017	-0.010	-1.10, 1.08	0.986	-7.03	-53.18, 39.12	0.765
Unpaid worker	0.21	0.07, 0.35	0.004	0.12	-0.07, 0.31	0.225	0.922	-0.15, 1.99	0.091	75.12	-1.30, 151.54	0.054
Retiree	0.25	0.06, 0.44	0.009	0.16	-0.09, 0.42	0.198	2.000	0.55, 3.45	0.007	317.28	-92.26, 726.81	0.129
Others	0.04	-0.11, 0.18	0.624	0.02	-0.17, 0.21	0.871	0.427	-0.60, 1.45	0.415	23.97	-25.73, 73.67	0.345
Insurance status (insured)	0.28	0.21, 0.36	<0.001	0.25	0.16, 0.35	<0.001	0.995	0.47, 1.52	<0.001	131.13	29.59, 232.67	0.011
Constant	0.58	0.41, 0.75	<0.001	-0.72	-0.95, -0.49	<0.001	3.894	2.55, 5.24	<0.001	77.71	50.82, 104.61	<0.001
<i>R</i> -squared	0.02			0.02								
<i>Adj R</i> -squared	0.02											
<i>Root MSE</i>	1.63											
No of observation	18616			18616			5647			18616		

OLS = Ordinary least squares, GLM = Generalized linear model, CI = Confident interval, Gov = Government. Reference.

Table V: Result of OLS regression and Two-part model (Logit & GLM) for Model 4

Variables	OLS			Logit			GLM			Marginal Effect		
	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>dy/dx</i>	95% CI	<i>P</i> -value
Age (0 to 19)												
20 to 39	-0.10	-0.18, -0.03	0.009	-0.89	-1.03, -0.75	<0.001	0.54	-0.02, 1.11	0.060	20.57	-0.955, 50.69	0.181
40 to 64	-0.10	-0.18, -0.03	0.005	-0.80	-0.93, -0.67	<0.001	0.68	0.16, 1.20	0.010	30.95	1.40, 60.51	0.040
65 above	-0.14	-0.22, -0.06	0.001	-0.93	-1.09, -0.77	<0.001	1.00	0.41, 1.60	0.001	56.92	1.72, 112.11	0.430
Gender (Female)	0.14	0.10, 0.18	<0.001	0.28	0.20, 0.35	<0.001	-0.13	-0.46, 0.21	0.460	-5.47	-28.50, 17.55	0.641
Strata (Urban)	0.004	-0.04, 0.04	0.841	-0.06	-0.13, 0.01	0.113	0.11	-0.21, 0.44	0.495	7.13	-15.23, 29.49	0.532
Log Household Size	0.005	-0.03, 0.04	0.798	0.09	0.02, 0.17	0.016	-0.35	-0.68, -0.02	0.036	-23.03	-47.11, 1.05	0.061
Education (Secondary)												
No formal education	-0.05	-0.13, 0.03	0.218	-0.37	-0.53, -0.22	<0.001	0.12	-0.54, 0.78	0.718	3.96	-41.55, 49.46	0.865
Primary	-0.01	-0.06, 0.04	0.568	0.04	-0.05, 0.13	0.418	-0.14	-0.54, 0.27	0.508	-8.08	-33.51, 17.35	0.533
Tertiary	0.21	0.13, 0.28	<0.001	0.28	0.13, 0.42	<0.001	0.32	-0.24, 0.87	0.267	28.89	-21.51, 79.29	0.261
Unclassified	-0.04	-0.11, 0.03	0.245	-0.38	-0.51, -0.25	<0.001	0.18	-0.37, 0.73	0.517	8.14	-31.31, 47.58	0.686

CONTINUE

Table V: Result of OLS regression and Two-part model (Logit & GLM) for Model 4. (CONT.)

Variables	OLS			Logit			GLM			Marginal Effect		
	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>b</i>	95% CI	<i>P</i> -value	<i>dy/dx</i>	95% CI	<i>P</i> -value
Occupation (Gov employee)												
Private employee	-0.11	-0.22, -0.01	0.036	-0.33	-0.53, -0.13	0.001	0.63	-0.24, 1.49	0.155	35.85	-15.25, 86.95	0.169
Self-employed	-0.08	-0.19, 0.03	0.178	-0.24	-0.45, -0.03	0.023	0.25	-0.65, 1.14	0.593	10.52	-34.19, 55.24	0.645
Unpaid worker	0.005	-0.11, 0.12	0.932	-0.08	-0.29, 0.13	0.451	0.41	-0.47, 1.29	0.357	22.83	-23.83, 69.49	0.338
Retiree	0.08	-0.07, 0.23	0.299	-0.01	-0.29, 0.28	0.973	1.18	-0.01, 2.37	0.052	104.58	-36.46, 245.63	0.146
Others	-0.09	-0.20, 0.03	0.136	-0.14	-0.35, 0.07	0.194	0.20	-0.67, 1.07	0.647	9.17	-32.68, 51.02	0.668
Insurance status (insured)	0.21	0.15, 0.27	<0.001	0.22	0.12, 0.32	<0.001	0.44	0.01, 0.87	0.047	37.47	-3.37, 78.31	0.072
Inpatient care	3.61	3.53, 3.68	<0.001	4.14	3.90, 4.37	<0.001	2.62	2.24, 2.99	<0.001	665.513	446.09, 884.93	<0.001
Constant	0.61	0.47, 0.74	<0.001	-0.65	-0.90, -0.40	<0.001	3.36	2.31, 4.42	<0.001	68.44	49.05, 87.93	<0.001
<i>R</i> -squared	0.36			0.16								
<i>Adj R</i> -squared	0.36											
<i>Root MSE</i>	1.32											
No of observation	18616			18616			5647			18616		

OLS = Ordinary least squares, GLM = Generalized linear model, CI = Confident interval, Gov = Government. Reference.

Table III shows the second model, which consists of demographic and socioeconomic factors and utilisation of inpatient care among B40 households. The NHMS 2015 data denoted that B40's utilisation of inpatient care is significantly positive at a 1% level in all regression types. This suggests that individuals from the B40 income group who utilise inpatient care have more likelihood to spend extra on OOPHE. The marginal effects indicates that B40 that utilizing inpatient care increases OOPHE by 695.04 Malaysia Ringgit ($p < 0.001$). Additionally, the B40 females were positive in OLS and logit regression. This finding demonstrates that females are likely to spend more on OOPHE. Model 2 (table 3) also shows that tertiary education and retirees are associated with OOPHE. It signifies that the B40s with higher education and retired are likely to spend more on OOPHE. On the other hand, private workers and self-employed people among the B40 income group are negatively related to OOPHE, indicating their less likeliness to spend on OOPHE. Based on a positive sign in GLM regression, B40s with older age tend to spend more on OOPHE. The marginal effects show that each additional year of age increases OOPHE by 51.38 malaysia Ringgit ($p = 0.044$).

The third model in Table IV involves demographic, socioeconomic, and insurance status among the B40 households. The OLS and GLM regression results showed that females in this group and their age had significantly positive relationships with OOPHE. The findings imply that both females and the elderly in the B40 households tend to spend more on OOPHE. The

marginal effects reported that each additional year of age increases OOPHE by 94.26 Malaysia Ringgit ($p = 0.031$). Furthermore, the B40s with tertiary education were significantly related to OOPHE in the OLS, logit, and GLM regression. The table also shows that unpaid workers and retirees in the B40 income group had a significant relationship with OOPHE, while private workers and self-employed individuals demonstrated a negative association. The findings confirm that within the B40 income group, unpaid workers and retirees are likely to spend more on OOPHE than private and self-employed workers.

Table V shows the final model comprising all variables: age group, gender, strata areas, household size, education level, occupation status, insurance status, and utilisation of inpatient care. B40 households utilising inpatient care had positively significant relationships at a 1% level in all regression types. For B40 households, utilizing inpatient care leads to a significant increase in OOPHE, with an average rise of 665.51 Malaysian Ringgit ($p < 0.001$). Age group was positively related to OOPHE as displayed in the GLM regression. This implies that the B40 households tend to spend more on OOPHE as they age. Moreover, female households and tertiary education were positively associated with OOPHE in OLS and logit regression. It suggests that females and those who are highly educated in the B40 households may spend more on OOPHE. The results further showed that while the B40 retirees were positively related to OOPHE, both private workers and self-employed people had negatively significant relationships with

OOPHE. The findings consolidate that B40 retirees are likely to spend more on OOPHE than those working in the private sector and self-employed individuals.

Regression analysis indicates that in the model 3 (table 4) B40s with insurance had significant relationships with OOPHE in all regression types. The marginal effect demonstrated that the insured B40s increases OOPHE by 131.13 Malaysia Ringgit ($p = 0.011$). Similarly, in model 4 (table 5), the insured B40 households had positively significant relationships at a 1% level in all regression types. The results demonstrate that individuals from the B40 income group who have insurance coverage tend to spend more on OOPHE. This suggests that insured B40 households incur higher out-of-pocket health expenditures due to increased access to healthcare services. In this analysis, health insurance refers to government health schemes, community-based health insurance, employer-sponsored insurance and private health insurance. Due to the limitations of the dataset, this study do not distinguish between individuals who possess only one type of insurance. This comprehensive definition of health insurance is intended to capture the general impact of having insurance coverage on out-of-pocket health expenditures (OOPHE) among the B40 income group.

DISCUSSION

The analysis suggests that B40 individuals with insurance spend more on OOPHE than those without insurance. An earlier research conducted in China reported that enrolling in health insurance is associated with large increases in both total and OOPHE spending. People with health insurance spend more overall and on OOPHE than those without it (9). Another study in India also revealed that the likelihood of incurring any OOPHE, including inpatient and outpatient costs, increases due to the health insurance scheme (33).

Health insurance acts as a financial risk protection for households. However, the total medical cost depends on whether the insured has enough health insurance coverage. Even with health insurance, additional medical costs may incur during emergencies. Descriptive analysis indicates that nearly half of the B40 households with insurance coverage are diagnosed with chronic diseases, highlighting the significant health challenges faced by this group (34). Chronic diseases impose unforeseen catastrophic expenses on most households with many at risk of impoverishment. Generally, insurance only covers the direct cost of healthcare needs. Unfortunately, the household will bear indirect costs such as outpatient care, travel, and accommodation. Conversely, questions have been raised about the minimum essential coverage level for chronic care and the quality of insurance in the local market.

The B40 households utilising inpatient care had a strong

associated with increased OOPHE. It indicates that those from the B40 households who utilise inpatient care will spend more on OOPHE. This observation align with past studies in the United States which found that individuals with insurance coverage spend a significant amount of out-of-pocket expenditure for inpatient care and the trend increased considerably from 2009 to 2013 (35). Similar result was also reported in Turkey where an inpatient in a household puts the family at a greater risk of catastrophe payment due to OOPHE (36). Additionally, a previous research in Nigeria indicated that individuals who use inpatient care are burdened with higher catastrophic payments because they pay a significant amount of out-of-pocket expenditure on healthcare (37).

The high volume of patient seeking medical treatment at public facilities means that the system suffers from overcrowding and a backlog of workloads for those involved, namely patients, medical personnel, and general workers. The congested of public facilities can result lengthy consultations or extended surgical waiting lists, making it challenging to receive timely care. individual with chronic conditions suffer harm as a result of these flaws in public healthcare. Delays in treatment can cause further health issues for those with chronic conditions. Although they cannot afford it, patients from the B40 households are driven to seek treatment at private health facilities, which are costly in terms of their OOPHE. Besides facing financial hardship, it also pushes some to borrow money and sell their assets to pay for the needed medical treatment.

Analysis show that older adults in the B40 group are more likely to spend on OOPHE than the younger group. Similarly, a study in Kenya reported that the elderly had increased odds of incurring catastrophic OOPHE compared to younger households (38). Malaysia is moving towards an ageing population like other rapidly developing countries with increasing affluence. The Malaysian healthcare system ensures the provision of health services for the elderly. However, non-medical costs such as travel and home care to manage their illness require the patients' OOPHE. The situation poses concern particularly when the elderly needing constant care depends significantly on the household. It also shows that the public provision of healthcare services for long-term senior care is still lacking (39, 40).

As shown by the logistic regression, females from the B40 households had a significantly increasing probability of spending on OOPHE more than males. The association between household gender and spending on OOPHE suggests that the B40 females spend more on OOPHE than the B40 males. This result is supported by a study in the Czech Republic which revealed that the female group is a significant predictor of a higher OOPHE compared to the male group (41). Females need more healthcare consumption due to natural biological

factors such as birth control, pregnancy, delivery, and ante-natal care. Nevertheless, women, on average, tend to earn less when they are responsible for taking care of their families, and this might mean that they will stay out of work for longer periods (42).

Further analysis demonstrated that B40 households with tertiary education are more likely spend on OOPHE compared to those with lower education levels. The result aligns with a previous study in Nigeria where individuals with higher education are more inclined to seek and use healthcare services, leading to increased health expenditures and a heightened risk of financial catastrophe (37). A study in the Czech Republic also found that people with more education generally have a higher burden of OOPHE, and this burden hikes as their level of education increases (41). These findings demonstrate that a well-educated family is more likely to seek better healthcare for themselves and their family members. The higher earnings also give them better affordability for high-quality healthcare services.

Meanwhile, the study indicates that B40 retirees tend to experience higher OOPHE than those working in the private sector and self-employed who generally incur lower OOPHE. Previous studies also reported that an unemployed person (43) is more likely to experience catastrophe due to OOPHE than those with formal employment or who own a business (44). The retirees either earn less or have no earnings during retirement. Additionally, their retirement savings can be affected by unforeseen healthcare costs as they become prone to illnesses. This situation will put retirees in financial hardship due to increasing healthcare costs. On the contrary, salaried households spend less on OOPHE. These two B40 households are protected by social protection nets such as the Employees' Provident Fund (EPF), Social Security Organisation (SOCSO), and employer-provided insurance. This subsequently lowers their probability of having to spend on OOPHE.

To the author's knowledge, there is limited research on OOPHE among the B40 households in Malaysia. Although there has been much debate on OOPHE in policy circles, there is a scarcity of systematic analysis concerning the B40 income group. The gap in OOPHE among B40 in Malaysia can be filled with a comprehensive analysis of the demographic, socioeconomic status, insurance status, and inpatient care impacts. This study addresses the theoretical and practical gaps concerning OOPHE in Malaysia by contributing new knowledge to the body of literature. Moreover, the outcomes of this study will support initiatives to better protect low-income groups from the financial impact of OOPHE. It aims to address the challenge of low insurance enrolment among these groups without compromising the quality of services and fairness in health financing.

The use of a nationwide survey sample in this study

provided trustworthy and valid data for measuring OOPHEs among Malaysian adults. Nevertheless, one disadvantage of this study is that it is cross-sectional, which precludes the detection of causal links between identified components and OOPHEs. The potential of reverse causality is also present. There were no established causal links in the study; it could only identify associations between health insurance coverage and OOPHE. Therefore, future research can utilise data spanning several years to determine the causal impact of insurance programs on various outcomes. Despite these limitations, this cross-sectional method can provide an estimation and analysis regarding the prevalence of outcomes because the sample was taken from the whole population. Additionally, the data could capture many outcomes, factors, and characteristics associated with it that can be assessed.

This study suggests that the link between high OOPHE and particular health status may change based on illness, symptom swings, and disease duration. How OOPHE burdens alter over time with service utilisation structures that impact OOPHE must also be thoroughly investigated. Furthermore, exploring differences in private insurance policy and government-sponsored insurance, plan features, and demographic factors may enhance the comprehension of how medical financial burdens uniquely impact the variability of health risk protection plans across diverse consumer groups. Future research can also examine the effect of national health insurance schemes, such as MySalam and PekaB40, on OOPHE to determine how well these national schemes target the poor. Further analysis can also focus on whether new schemes provide sufficient financial protection for targeted groups against OOPHE and catastrophic payments.

CONCLUSION

Given the scarcity of research on insurance and health expenditure in Malaysia, this research explored the correlation between health insurance coverage and out-of-pocket health expenditures within the demographic of low-income households, specifically focusing on B40 households in Malaysia. The results showed that most B40 households are underinsured, with 86.19% of them had no insurance coverage and only 13.81% had insurance coverage. The present research offers a prominent contribution to the literature by conducting an in-depth investigation and analysis of the indicator. The results demonstrated that B40s with insurance coverage spend more on OOPHE than other income groups. Furthermore, it was found that B40 households who are insured, over 65 years old, utilise inpatient care, women, have higher education, and retired spend significantly more on OOPHE, while private workers and self-employed individuals spend less on OOPHE. These findings can be useful for stakeholders and the government to review current policies and design more

effective policies.

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