

Incidence and determinants of catastrophic health expenditure among low-income Malaysian households

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ABSTRACT

Introduction: Catastrophic health expenditure (CHE) incurs when out-of-pocket health expenditure (OOPHE) exceeds a certain threshold, therefore exposing households to financial hardship, with the low-income population being most vulnerable. Data related to the incidence and determinants of CHE among the low-income population in Malaysia are lacking. This study aims to determine the incidence and determinants of CHE among Malaysian low-income households.

Methodology: This is a cross-sectional study using data from 6,720 low-income households from the national Household Expenditure Survey (HES) 2016 conducted from May 2016 till February 2017. The data were analysed using IBM SPSS software 25.0. OOPHE in this study included all spending on healthcare products and services by the household. CHE was identified in households with OOPHE of at least 10% of total monthly income.

Results: The incidence of CHE at the threshold of 10% household income was 1.7% (n=112). The determinants of CHE were households with any accident or medical insurance ($p<0.001$), having less than five members in a household ($p<0.001$), presence of elderly ($p=0.024$), and hospitalisation ($p=0.021$). In contrast, employment of the head of household ($p=0.003$) and having a child aged ≤ 5 years old ($p=0.033$) protect households from CHE.

Conclusion: In the context of this study, the incidence of CHE among the low-income Malaysian population was low, indicating that a majority of the low-income population is protected from financial catastrophe. Regardless, the determinants of CHE among low-income population should be considered in future health policies.

KEYWORDS:

Out-of-pocket health expenditure, catastrophic health expenditure, Malaysia, low-income household

INTRODUCTION

Out-of-pocket health expenditure (OOPHE) describes any out-of-pocket payment to receive any form of health services and is considered the most regressive and inequitable way to fund the health system.¹ Once a household reached a certain threshold of OOPHE, they were considered as experiencing catastrophic health expenditure (CHE).² The sustainable development goal (SDG) 3.8.2 has adopted the threshold of CHE at 10% or 25% of income or consumption.² CHE is a

barrier to attain universal healthcare as everyone should be granted access to healthcare based on what they need and not based on what they can pay for.² Unfortunately, CHE has negative consequences on the household economy, health, and overall quality of life. Households experience various negative consequences from CHE, for example, depletion of their savings,³ failure to make household payments,⁴ incurring debt³ as well as selling valuable assets.⁵ Additionally, due to fear of health expenditure, some people refrain from seeking needed health services and instead seek healthcare from unqualified healthcare providers⁶ with subsequent lower quality of life.⁷ Worse still, although CHE can affect anyone, those with low income and burdened with high living costs are the most vulnerable.⁸⁻¹⁰

The healthcare services in Malaysia are provided via a mix of public and private delivery system. Public health care in Malaysia, which is delivered mainly through the Ministry of Health (MOH)-owned facilities is funded predominantly from general taxation.¹¹ Private health care is largely delivered through for-profit hospitals and clinics and is funded by a mixture of OOPHE, private health insurance, and employer-sponsored care.¹¹ Unfortunately, the Malaysia National Health Account had demonstrated that throughout the 2009-2016 annual time series, the share of OOPHE to total health expenditure in Malaysia showed a consistent increase from 29% (2009) to 38% (2016).¹¹ For the Malaysian poorest income quintile, the mean annual per capita OOPHE was RM 279 (USD 92.8) in the year 2011.¹² Unfortunately, despite documenting lower mean per capita OOPHE of RM238 (USD 64.98) in the year 2015, the OOPHE of the Malaysian households in the poorest income quintile were higher than the other quintiles (except for the richest quintiles).¹³ The World Health Organization (WHO) estimated that the CHE incidence among the low-income population in Malaysia is at 0.1%.¹⁴ However, this estimate was based on data more than 10 years ago.

Previous literature had established several factors associated with CHE, in particular socio-demographic factors like age,^{15,16} gender,¹⁷ education level,^{18,19} and employment.^{19,20} Other factors include the presence of chronic disease or disability^{21,22} or healthcare utilisation²³ and household factors like household size^{24,25}, presence of elderly^{21,22} and having children.^{21,26} Within the Malaysian context, the factors contributing towards CHE among the elderly are cancer, being male and Malay ethnicity²⁷ while among cancer patients, those from low-income households and seek treatment at private health facilities were associated with CHE.⁴ Nevertheless, the determinants of CHE among the

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Malaysian low-income population are largely unknown. Therefore, with the intention to fill the data gap, our study had two objectives: first, to investigate the CHE incidence among low-income Malaysian households and second, to identify the determinants towards CHE among the low-income Malaysian households.

MATERIALS AND METHODS

This is a cross-sectional study.

Data source

This study utilised the available data from the Household Expenditure Survey (HES) 2016 conducted by the Department of Statistics Malaysia (DOSM) which was obtained with permission from the Universiti Putra Malaysia (UPM) Sultan Abdul Samad Library Databank. The HES 2016 was a survey organised by the Department of Statistics Malaysia (DOSM) from May 2016 till February 2017, conducted in all states in Peninsular Malaysia, Sabah, and Sarawak, including urban and rural areas with a selection of households living in private living quarters based on a two-stage stratified sampling approach.²⁸ However, the survey excluded certain remote and aboriginal ('Orang Asli) settlement and those living in residential institutions such as hostels, elderly homes, and welfare homes.²⁸ Trained interviewers visited selected households to obtain information on demography, income, and the household expenditure using a set of questionnaires based on the Classification of Individual Consumption According to Purpose (COICOP) published by the United Nations Statistics Division (UNSD).²⁸ The HES 2016 survey yielded data for a total of 48,491 households,²⁸ in which random data for around 14,000 households were shared with the UPM Sultan Abdul Samad Library.

Participant

The sample population is the low-income households selected in the HES 2016. We applied the hypothesis testing method with calculated sample size of 6,052 based on a previous study,²⁶ hence we applied universal sampling. We included households with a total monthly income of less than RM4,360.00, which represent households at the bottom 40% of the household income tier in the year 2016.²⁹

Components of OOPHE

The OOPHE included in the HES 2016 were categorised into four classifications; medicine and health products (e.g., medications, consumables and medical equipment), outpatient care, inpatient health services, and payments for any accident or medical insurance. The recall periods for medicinal products and accident or medical insurance were 1 month while expenditure for outpatient services, inpatient treatment, and health equipment were set at 1 year.

Data analysis and outcome

The outcome in this study was CHE, which was estimated based on the 'budget share' approach. Using this approach, we calculated the average total monthly OOPHE for each household and divided them with the monthly household income to obtain the proportion of monthly OOPHE expenditure for the respective household relative to their monthly household income. Households with the proportion

of OOPHE of at least 10% of monthly total household income were considered as experiencing CHE.² The independent variables were selected based on published studies. Data analysis was conducted using the IBM SPSS 25.0. Descriptive analysis was used to describe the household characteristics and prevalence of CHE. Subsequently, single and multiple logistic regression were conducted to identify the determinants of CHE.

Ethics

We obtained ethical permission from the Universiti Putra Malaysia Ethical Committee for Research Involving Human Subject (JKEUPM) (Reference Number : JKEUPM-2020-061).

RESULTS

A total of 6,720 households were included in our study. Descriptive analysis demonstrated that Sarawak (n=1181) and Sabah (n=1118) contributed to the highest number of low-income households. The majority of the head of households (HHH) were mostly male (79.8%), married (72.3%), and employed (90.3%). The distribution and socio-demographic characteristics of households are presented in Table I.

Our findings noted that a significant portion of households (88%) reported having any amount of OOPHE. The incidence of CHE at the threshold of 10% of total monthly household income among the low-income households was 1.7% (n=112). Analysis of OOPHE pattern revealed that more than half (56.9%) of households reported expenditure for medicine and health products while two-third of households (71.6%) reported expenditure to obtain outpatient healthcare services. Unfortunately, only a minority of the households (3.9%) reported expenditure for some accident or medical insurance. Table II gives the summary of characteristics of OOPHE.

The single logistics regression analysis demonstrated that 11 variables were significantly associated with CHE; namely sex of head of household (HHH), age of HHH, marital status of HHH, HHH employment status, household size, presence of elderly in a household, presence of female, presence of children 5 years old and less, household income, presence of accident or medical insurance and presence of hospitalisation in a household. These variables were then included in the preliminary models for multiple logistic regression. For the final model, the forward LR method was applied. The Hosmer–Lemeshow test accepted the goodness-of-fit hypothesis ($\chi^2=7.332$, $df=7$, $P=0.395$). The model made the correct classifications 98.1% of the time. However, the model only explained 10.9% (Naglekerke R²) of variance in the CHE status. No multicollinearity or interaction between variables was found. The receiver operating characteristics (ROC) curve showed area under the curve of 0.783 ($p<0.001$), hence the model had fairly good predictive power.

The final model revealed that six variables predict the probability of CHE among low-income households; in particular employment status of head of household (HHH), household size, presence of elderly in a household, having children aged 5 years old or less, enrolment in accident and

Table I: Household Distribution and Characteristics (N=6702)

Characteristics	Frequency	Percentage
State		
Sarawak	1181	17.6
Sabah	1118	16.6
Kelantan	646	9.6
Perak	574	8.5
Kedah	551	8.2
Johor	469	7.0
Pahang	424	6.3
Selangor	364	5.4
Terengganu	304	4.5
Pulau Pinang	302	4.5
Negeri Sembilan	249	3.7
Melaka	171	2.5
Perlis	163	2.4
WP Kuala Lumpur	139	2.1
WP Labuan	57	0.8
WP Putrajaya	8	0.1
Strata		
Urban	3716	55.3
Rural	3004	44.7
Gender*		
Male	5361	79.8
Female	1359	20.2
Age*		
< 60 years old	5105	76
≥60 years old	1615	24
Marital status*		
Single/widowed/divorced	1861	27.7
Married	4859	72.3
Education level*		
No/informal	546	8.1
Primary	1685	25.1
Secondary	3981	59.2
Tertiary & above	508	7.6
Employment*		
Unemployed	275	4.1
Employed	6086	90.6
Retired	359	5.3
Household size		
≤ 4 members	4594	68.4
≥ 5 members	2126	31.6

WP = Wilayah Persekutuan, *referring to head of household (HHH)

Table II: Characteristics of Out-of-pocket Health Expenditure (OOPHE)(N=6720)

Characteristics	Frequency (n)	Percentage (%)
Household having any amount of OOPHE		
No	756	11.1
Yes	5964	88.9
Household experiencing CHE		
No	6,608	98.3
Yes	112	1.7
Type of health expenditure		
Medicine and health products		
No	2894	43.1
Yes	3826	56.9
Outpatient health services		
No	1975	29.4
Yes	4745	71.6
Inpatient health services		
No	6526	97.1
Yes	194	2.9
Medical or accident insurance		
No	6457	96.1
Yes	263	3.9

Note: CHE, catastrophic health expenditure

Table III: Logistic Regression Analysis for Predictors of Catastrophic Health Expenditure Among Low-income Households

Variable	Single logistics regression				Multiple logistics regression			
	COR	95% CI for COR		p-value	AOR	95% CI for AOR		p-value
		Lower	Upper			Lower	Upper	
Sex of HHH								
Male	1							
Female	1.547	1.022	2.343	0.039				
Age of HHH								
Age <60 years old	1							
Age ≥60 years old	3.874	2.656	5.649	<0.001				
Marital status of HHH								
Single/widow	1							
Married	0.472	0.324	0.688	<0.001				
Employment status of HHH								
Unemployed	1				1			
Employed	0.285	0.157	0.518	<0.001	0.385	0.206	0.720	0.003
Household size								
≤4 members	4.265	2.283	7.965	<0.001	2.025	1.028	3.987	0.041
≥5 members	1				1			
Presence of elderly								
No	1				1			
Yes	3.7	2.48	5.52	<0.001	1.918	1.091	3.372	0.024
Presence of female								
No	1							
Yes	0.482	0.281	0.825	0.008				
Having child ≤5-year-old								
No	1				1			
Yes	0.163	0.071	0.371	<0.001	0.383	0.158	0.927	0.033
Household income								
Q1 (poorest)	1							
Q2	0.78	0.287	0.804	0.005				
Q3	0.474	0.283	0.794	0.005				
Q4	0.495	0.298	0.823	0.007				
Having accident/medical insurance								
No	1				1			
Yes	3.494	1.999	6.108	<0.001	4.076	2.288	7.260	<0.001
Hospitalisation								
No	1				1			
Yes	2.343	1.125	4.881	0.023	2.426	1.143	5.149	0.021

COR: crude odds ratio, AOR: adjusted odds ratio, CI: confidence interval, Bold = p-value significant at <0.05

Note: HHH, Head of Households,

medical insurance as well as the presence of hospitalization in a household. Table III presented our regression analysis showing the determinants of CHE among the low-income Malaysian households.

DISCUSSION

Incidence of CHE

In the context of our study where OOPHE data included all expenditure on healthcare products and services by the households, the results demonstrated that the incidence of CHE among low-income households in Malaysia (1.7%) is lower than the CHE estimate for the general Malaysian population at 4.6%³⁰ or other specific Malaysian populations, in particular, the elderly at 2%²⁷ and cancer patients at 51%.⁴ This proportion is also lower than reported by another study involving low-income population in Thailand (10.3%), Indonesia (19.3%), Delhi (42.1%), and Bhubaneswar (18.3%) in India.⁶ Therefore, it is evident that the current available healthcare system appears to be able to protect the larger part of the low-income Malaysian population from financial catastrophe. Nevertheless, despite

the small proportion of CHE demonstrated from our study, as these households represented 2.7 million low-income Malaysian households,²⁹ this proportion reflects more than 46,000 low-income households at risk of experiencing CHE in Malaysia. Hence, identifying these vulnerable population and carrying out appropriate interventions could improve the financial protection among the low-income Malaysian households. Despite the low incidence of CHE found among the study population, the incidence of CHE in our study might be an underestimated value for several reasons. First, the ‘budget share’ approach has no consideration of actual household consumption for basic necessities like food and shelter. In reality, low-income households may spend a sizable portion of their income on food and other basic needs, hence their remaining income which represents the actual ability to pay for healthcare is much lower. Therefore, using the ‘budget share’ approach may underestimate the incidence of CHE among poor households. Secondly, long recall periods and having proxy respondents to recall health events for the whole household may cause underreporting of health expenditure.

Determinants of catastrophic health expenditure

Our results revealed that only 3.9% of households reported some form of accident or medical insurance, implying that insurance does not play many roles in healthcare financing among the low-income Malaysian households. Enrolment in medical insurance is expected to protect households from experiencing CHE. In line with this, previous studies had demonstrated higher CHE among households which did not have any form of medical insurance.³¹⁻³³ Interestingly, our study demonstrated that a household which reported any accident or medical insurance has 4.0 times higher odds of incurring CHE as compared to non-insured households. Supporting our finding, a study in Thailand demonstrated that households which register with their government civil servant insurance scheme were significantly associated with CHE.³⁴ Several theories have been proposed to explain why insurance enrolment is linked with CHE. To begin with, certain insurance may have limited coverage, with specific hospital services such as drugs, beds, and procedures being excluded from the policy.³⁴ Furthermore, insurance plans may not cover outpatient charges, rehabilitation, or long-term care, leaving households to pay for these treatments out-of-pocket.⁹ Secondly, enrolment in insurance scheme subject patients and health providers for moral hazard, indicated by induced demand; albeit unnecessary medical services for patients.^{9,35} Third, there is a possibility of adverse selection in the commercial insurance market. As insurance participation and its premium are based on voluntary choice, the high-risk people are more inclined to buy medical insurance.¹ These people are those with existing disease which definitely needs healthcare services, therefore they are also at risk for CHE.¹ The mechanism of CHE among the low-income households reported having insurance in Malaysia is beyond the scope of this study; hence, we recommend further research into this issue in order to be able to plan for an equitable, inclusive, and affordable insurance for the low-income population in Malaysia.

Our study found that hospitalisation among any household members increases the odds of CHE by 2.4 folds, most likely due to direct medical expenses related to admission to hospital, as supported by other studies from India³⁶ and Iran.³⁷ In fact, duration of hospitalization and admission to tertiary hospital further increased the risk for CHE.³⁸ In addition, indirect medical costs like transportation costs to visit the sick and indirect costs involving loss of income for the patients or their carer due to hospital admission may aggravate the already limited financial resources for low-income households.

Previous study argued that larger household size render more household members at risk for needing healthcare,¹⁵ therefore these households were more likely to slip into CHE. Interestingly, our study found that households with four or less members are associated with CHE as compared to households with five or more members. Although our study is unable to provide any explanations related to these findings, previous studies suggested that having more household members provide a better ability to care for other family members, hence reducing the need to seek health service²¹ and more household members that contribute towards household income, hence the pooling of income protect

households from CHE.³⁹ Therefore, it is possible that households with less members have less ability to provide care for other members, resulting into higher demand for healthcare services. Additionally, they may have a reduced ability to generate household income, increasing the risk of CHE.

Our study demonstrated that the presence of elderly in a household increased the odds of incurring CHE by 1.9 folds, which was not surprising considering the elderly are associated with a higher prevalence of chronic diseases like diabetes, hypertension, and cancer as demonstrated by other studies.^{20,40} As a result, there is increased demand for healthcare services from either conventional or alternative care providers among the elderly, likely resulting into a subsequent increase in OOPHE.

Finally, we found that employment of head of household and the presence of children aged 5 years old and less were protective factors from CHE. Supporting these findings, studies in other countries had demonstrated the association between unemployment and CHE.^{9,33} As the results also show that households belonging in the better income quartile (Q2, Q3 and Q4) have lower risk for CHE, these findings highlighted that better household economic conditions increase the protection from CHE. Interestingly, our findings pointed out that the presence of children aged ≤5 years old protected households from CHE. Another study demonstrated a similar finding, thus argued that younger children were associated with younger parents which are expected to be healthy with a lower need of healthcare services for the household.²⁶ Additionally, it is possible that the free-of-charge preventive and curative primary care services for children in Malaysia have contributed to financial protection among households with younger children.

We believe that this study has provided useful insight into the financial protection among low-income Malaysia household using a nationwide survey data. Regardless, our study has several limitations. First, the cross-sectional study design only allows for demonstration of the association among variables with CHE. However, further study will provide more understanding on the pathways towards CHE. Secondly, recall bias may result into underestimation of household health expenditure. Third, certain aboriginal household and population in institutions like old folk's homes were excluded from the study. Finally, some possible factors contributing towards CHE were not investigated, for example, having chronic disease, disability or injuries, geographical differences, and interracial inequalities. Therefore, future studies should include these variables to further understand how these factors affect healthcare payments.

CONCLUSIONS

This study had proved that the incidence of CHE among low-income households in Malaysia is low, implying that healthcare provision in the country had provided financial protection to the low-income households. However, the low incidence of CHE is not negligible especially considering the study was conducted among low-income households who are vulnerable to financial distress and poverty.

Several factors are found to predict CHE among low-income households; employment status of head of household, household size, presence of elderly, presence of child aged 5 years old and less, having any accident or medical insurance and hospitalisation among household members. Assimilating this knowledge in future planning of health intervention and policies is imperative to enable the provision of high-quality health services while protecting households from the unintended consequences of financial hardship. However, there is still much to learn with regards to CHE among Malaysian population. Therefore, we recommend future research to investigate the utilisation of health insurance among the low-income households and explore the coping mechanism of households burdened with CHE in order to better formulate future healthcare finance policies.

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