

# Financial Burden and Health-seeking Behaviors Related to Chronic Diseases Under the National Health Insurance Scheme in Bolikhamxay Province, Lao PDR: a Cross-sectional Study

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## Research

**Keywords:** chronic disease, finances, health behavior, health insurance, Universal Health Coverage

**Posted Date:** September 17th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-885719/v1>

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# Abstract

**Background:** Financial protection is a key dimension of universal health coverage. In 2016, Lao PDR implemented the National Health Insurance system covering the entire population of certain provinces. This cross-sectional study investigated households' health-seeking behavior and their financial burden with chronic patients, post coverage.

**Method:** The study was conducted in Bolikhamxay province from January 15 to February 13, 2019. In total, 487 households, selected via stratified random sampling, were surveyed, and questionnaire-based interviews conducted. Health care service utilization and financial burden were examined.

**Results:** Totally, 370 households had at least one member with some type of self-reported health problem within the last 3 months prior to the interview, while 170 had at least one member with a chronic condition. More than 75% of the households accessed a health facility when a member experienced health problems. We observed that the prevalence of catastrophic health expenditure (health expenditure/income between 20% and 40%) was 25.1% (threshold of 20%) and 16.2% (threshold of 40%). Through logistic regression, we found that the major factors determining financial catastrophes owing to health problems were household members with chronic illness, hospitalization, household poverty status, family size (both 20% and 40% thresholds), visiting a private facility (20% threshold), and distance from provincial top referral hospital (40% threshold).

**Conclusions:** The National Health Insurance system has positively impacted households' access to health facilities. However, catastrophic health expenditure remains high, especially among chronic patients. Facilities under National Health Insurance should be strengthened to provide more services, including care for chronic conditions.

## Introduction

Universal health coverage (UHC) is a key health target outlined in the Sustainable Development Goals (SDGs) [1]. UHC is defined as a system in which all individuals and communities receive health services without suffering financial hardship; this includes the full spectrum of essential and quality health services, ranging from health promotion to prevention, treatment, rehabilitation, and palliative care [2]. Many countries are working to achieve UHC. In this context, financial protection plays a particularly important role [1–4]. Specifically, ensuring individuals are protected from the financial consequences of paying for health services out-of-pocket (OOP) helps to reduce the risk of poverty. This is because an unexpected illness may require the use of an individual's life savings/assets or loans, and may even have disastrous consequences for their future wellbeing.

Timely access to and affordable health care is a widespread challenge, with reports showing that 1.3 billion people worldwide are unable to access affordable and effective health care services [5]. Even among households with such access, approximately 170 million individuals are forced to spend more than 40% of their income on medical treatment, forcing them into situations of catastrophic health expenditure (CHE)[5]. CHE refers to when the ratio of medical care expenses to income is significantly high, and might force a

household into financial poverty through incurring large debts or selling personal property to receive treatment. The government of Lao PDR has attempted to address these issues as well as facilitate the achievement of UHC through the implementation of a National Health Insurance (NHI) system, which was launched in certain provinces in 2016 [6], and may soon be expanded to all provinces.

Before the NHI, Laos PDR had public health insurance schemes such as the State Authority for Social Security for government staff, the Social Security Organization for active workers, the Health Equity Fund for some categories of poor people, and the voluntary Community-Based Health Insurance for the informal sector, such as self-employed people and farmers. However, these schemes have resulted in a fragmented health insurance system, limiting coverage and implementation. For example, the Community-Based Health Insurance and Health Equity Fund has so far covered only about 12% of their 3.21 million and 192,000 target populations, respectively [7]. To overcome these problems and to realize UHC, the 2016 NHI scheme covering 17 provinces was devised by merging the disparate schemes [6]; it is meant to ultimately cover the entire nation, except for the capital city of Vientiane.

Under the NHI, the payment system for health services has been simplified; health care visits require only a small, fixed, co-payment at the facility level, regardless of the administered treatment. For instance, outpatients at provincial hospitals (referral hospitals), district hospitals, and health centers must submit flat co-payments of 15,000 LAK (1.7\$), 10,000 LAK (1.13\$), and 5,000 LAK (0.56\$), respectively. For inpatients, the co-payments at both provincial and district hospitals amount to 30,000 LAK (3.5\$) and 5,000 LAK (0.56\$) at health centers. The NHI package officially includes a range of services, such as acute, long-term, and even palliative care, and there are no cost limitations.

However, the health problems of the general population are diverse, ranging from relatively simple and short-lived diseases to life-threatening ones, and the latter are likely to require a certain level of advanced medical care and long-term treatment. Moreover, although the NHI officially covers any treatment, medications prescribed to patients may not be directly available at their preferred facilities, due to supply shortage or because these are not covered by the NHI. This means that NHI patients may often need to cover the costs of accessing medication at private pharmacies.

Internationally, disabilities have become a large component of disease burden and health expenditure [8]. Chronic diseases (e.g., major non-communicable diseases [NCDs] such as cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes) can often cause disabilities, posing serious threats to health and longevity. The burden of such diseases is more serious in low- and middle-income countries than in high-income countries because of greater challenges in appropriate treatment, prevention, and early detection [9–11]. As chronic diseases need to be treated over a long term, the ensuing financial burden is often worse than that for non-chronic diseases that can be commonly treated over short periods. Furthermore, chronic patients have a higher risk of developing a comorbid disease, worsening their health condition with time [9].

Several studies based in Lao PDR have reported a high prevalence of morbidity, including chronic diseases [12–15]. Despite this high prevalence, no study has yet examined the health-seeking behavior of the

population in Lao PDR once they have been diagnosed with an illness, especially a chronic one. Furthermore, there is a lack of academic information on health-seeking behaviors post NHI. We deem such data as very important because the main purpose of the NHI is to improve people's access to health facilities, while ensuring that they do not suffer CHE. Therefore, if this objective is not even partially achieved, the NHI may be deemed ineffective. For example, although households may not be incurring CHE, if we uncover data that shows that people are concomitantly not being able to access a health facility for treatment, it means that their condition is likely to only worsen, and the NHI is not helping. We also see a particular lack of information in the literature regarding the health-seeking behaviors and the financial burden of chronic patients in Lao PDR.

There have been some studies aimed at investigating the impacts of the NHI in Lao PDR [16, 17], but data on health access status and CHE for households covered by the NHI are hard to find, pointing out another research gap. This is especially true of households with chronic patients. To bridge these gaps, this study aimed to clarify the health-seeking behaviors, the prevalence of CHE, and the influencing factors of CHE among households, including those with chronic patients, in Bolikhamxay province. We chose this province because the NHI had been operating there for more than 2 years. To help support the achievement of NHI goals nationwide, this study aimed at providing data that made explicit the potential pathways to more well-informed decision-making among stakeholders and policymakers on improving health insurance coverage and affordability.

## Methods

### Study design, area, and sampling method

Using a cross-sectional design, we investigated prevalence of health problems in households in Bolikhamxay province in the past 3 months, and their health-seeking behavior and related financial burden. According to the latest data on this province, its total population is 273,691 and it covers an area of 14,863 km<sup>2</sup> (or 5,739 mi<sup>2</sup>), population density 18/km<sup>2</sup> [18]. It shares borders with Xiengkhouang province to the northwest, Vietnam to the east, Khammouane Province to the south, and Thailand to the west.

Bolikhamxay province contains 7 districts (Pakxanh, Thaphabath, Pakkading, Borikhan, Viengthong, Xaychamphone, and Khamkeuth), and one provincial hospital, six district hospitals, and 40 health centers [19]. We conducted the questionnaire-based interviews with the selected households from January 15 to February 13, 2019, with researchers well-trained in interviewing procedures.

### Sample size and household selection process

The sampling unit was a household, defined as a group of individuals living together, usually parents and children, and sometimes grandparents and uncles. To calculate the acceptable sample size of households for this study, we referred to a previous study on CHE conducted in Vietnam, a neighbor with a similar political system, which showed CHE prevalence of 20% threshold of 17.4% (in 2004) [20]. We also considered margin of error  $e = \pm 5$ , critical value at 99.00% confidence level, and  $Z = 2.57$ ,

and the total number of households in Bolikhamxay Province to be 54,738—a number that was achieved by dividing the total population (273,691) [18] by the average number of members in a household (5) [21]. This yielded a sample size of 384 households with the following calculation formula. To address the possibility of withdrawal, approximately 25% of the households were added to the required sample size, resulting in a final required sample size of 480 households.

$$\text{Sample size, } n = N * \frac{\frac{Z^2 * p * (1 - p)}{e^2}}{[N - 1 + \frac{Z^2 * p * (1 - p)}{e^2}]}$$

Where margin of error,  $e = \pm 5$ ,

Critical value at 95% confidence level,  $Z = 1.96$ ,

Households size in province,  $N = 54,738$ , and

Estimated proportion of households in CHE,  $p = 17.4\%$

Using a stratified systematic sampling method, we selected households as follows. First, we selected three districts, including the provincial capital district (Pakxan). The other two were chosen based on their distance (in km.) from the provincial capital district; the first, Thaphabad, was 50 km away, and the second, Pakkading, about 70–100 km away. Second, based on how rural areas were defined in the data from the national statistical office, we randomly selected five villages in each district: one urban village, two rural villages with roads, and two rural villages without roads. Third, we randomly selected households (32–33 households in each village) using the village registration book, with equal intervals on the lists. To ensure the minimum sample size acceptable for this paper, upon not acquiring sufficient valid responses from the first group of selected households, we conducted a novel batch of interviews with the next households on the list, and this procedure was repeated until we reached valid responses from 32 households per village.

## Definitions

**Chronic disease.** Prior research finds that differences in the conceptualization of the term “chronic disease” occur largely based on research data and the discipline of the lead authors [23]. Because we wanted to focus our investigation on all diseases that involved relatively longer treatment periods (to analyze their possible financial burden), regardless of disease course, we chose to simplify its definition. Specifically, a chronic disease in this study entails a patient having the same disease diagnosis for more than three months at the time of the survey [24].

**Disease category.** We classified the diseases into three categories: first, as communicable diseases, referring to infectious diseases (e.g., a common virus, bacteria, cholera, hepatitis, influenza, malaria, measles, or tuberculosis) transmissible by contact with infected individuals or with their bodily discharges/fluids (e.g., respiratory droplets, blood, or semen) [25]. Second, we defined main NCDs according to the World Health Organization [26] as cardiovascular diseases (e.g., heart attacks and

strokes), cancers, chronic respiratory diseases (e.g., chronic obstructive pulmonary disease and asthma), diabetes, and mental disorders. Third, other NCDs not belonging to the WHO main NCD category, such as injuries, musculoskeletal system diseases, and eye and ear diseases. This classification was created to determine the percentage of NCDs not included in the WHO list. Catastrophic health expenditure (CHE) is defined as a household's medical expenditure exceeding a certain level of capacity to pay. In this study, to calculate CHE, we adapted the proportionality of income approach [27], where we consider the total monthly OOP spending as a proportion of monthly income, or the proportion of household OOP spending for health care greater than the CHE configured in pre-specified proportions. However, a literature review showed a lack of consensus on proportion thresholds to configure CHE; specifically, we observed thresholds varying from 5–40% of total household income.[28–30] While there is no final consensus on the choice of the threshold for CHE, for this paper we employ the more frequently used threshold proposed by K. Xu et al. who define health expenditure as catastrophic if a household's financial contributions to health equals and/or exceed 40% of nonfood expenditure or capacity to spend [30]. However, Rashidian et al. contend that the appropriate cut-off points for the proportion of out-of-pocket health expenses to total expenditure and proportion of health expenditure to ability to pay is 20% of total expenditure [31]. Applying these two previous studies, we set an expenditure on health care of 20% of the total household income as a threshold for CHE and an expenditure of 40% as a threshold for serious CHE.

## Questionnaire

We used the following questions during the interviews: the household background, total monthly income, education level of the household head, and the distance from the household to a medical facility. Then, we asked: have any members of the household experienced any health problem during the past three months? If yes, what was the health problem experienced? What is the patient's background, including sex and age? Was the health problem a chronic disease? How was the problem treated; for example, whether patients treated themselves without visiting a health care facility, or visited a public health center, district hospital, provincial hospital, or private facility, and if they needed hospital admission?

Finally, we asked: what was the average total monthly household out of pocket health expenditure (including total treatment costs and total transportation costs) for the last 3 months?

## Data analysis

SPSS™ version 25 (IBM Corp., Armonk, NY, USA) was used for statistical analysis. A descriptive analysis was undertaken to understand household background, occurrence and type of health problems, health-seeking behavior in both household unit and individual unit, and out-of-pocket payments on a household. Chi-square statistics were used to compare non- chronic patients and chronic patients for demographic variables, different income groups for health-seeking behavior, and the different types of facility they used for CHE. Mann-Whitney t test was used to compare OOP between different type of facility they used. A logistic regression (logit) model was used to predict probability of CHE. Based on evidence available in the literature, we first assumed that households with CHE are affected by type of illness and treatment episode. The variable treatment episodes included all types of care seeking, from self-medication to health institution care. We expected that chronic illness, hospitalization, treatment in private facility, treatment, and

treatment in provincial top referral hospital would be associated with high health care expenses. The second group of variables included household characteristics, which includes household size, education of the head of household, and distance to nearest health facility and top referral hospital in the province. We also included household's economic status (measured by quintile group of monthly income) [32, 33, 34]. All these variables were entered in the Logit model, using forward stepwise entry function in the SPSS software; if the probability of its score statistic was less than 0.05, a variable was included, and removed if the probability was greater than 0.1. The stepwise entry-removal of the various explanatory variables allowed identifying those that had statistically significant influence on the probability of determining CHE. The variables a) households with expenditure for treating chronic illness and hospitalization (threshold 20% and 40%), b) households in which at least one member visited a private facility (threshold 20%); c) income quintile groups (threshold 20% and 40%), and d) geographical location of household (distance to top referral provincial hospital (threshold 40%) and size of households were included in the model as categorical variables. The probability of CHE was calculated with the Logit model [35] and the model goodness-of-fit was assessed by the Hosmer-Lemeshow test [36].

## Results

### Household demographics and disease prevalence

All of the 487 households in Bolikhamxay province that were surveyed agreed to being interviewed. Of the 487 households, 370 (76.7%) had at least one family member with a health problem in the past three months. Among these, 170 (35.7%) households had at least one person with a chronic condition (Table 1).

In our sample, 292 (84.3%) of the households with a health problem in the last three months visited a health facility, while households in higher income groups tended to use medical facility (more than 85%) and showed a statistically significant difference ( $P = 0.039$ ) (Table 2), and households that self-medicated tended to be higher in the lower income group ( $p < 0.0001$ ). However, even in the lowest income group, more than 75% of the households had experienced a health facility visit (Table 2). Specifically, 205 (55.7%) households had at least one member who had visited a public facility and 75 (20.3%) who had visited a private facility. Among the households that visited a private facility, 32 (8.6%) had at least one member who visited a health facility in a foreign country. Moreover, 117 (31.6%) of the households had at least one member admitted to a hospital for more than one night (Table 1).

Figure 1 about here

Table 1  
Household demographics, disease prevalence, and health-seeking behaviors

	<b>N (% in total households)</b>	<b>N (% in households with at least one family with health problem)</b>
Total household income per month	N = 487	N = 370
Poorest (25%) under 1000000 kip (113.3 US\$)/month	140 (28.7%)	98 (28.1%)
Poor (25%) 1000000 kip (113.3 US\$) – 2000000 kip (226.6 US\$)/month	112 (23.0%)	86 (24.6%)
Rich (25%) 2000000 kip (226.6 US\$) – 3500000 kip (396.7 US\$)/month	102 (20.9%)	70 (20.1%)
Richest (25%) above 3500000 kip (396.7 US\$)/month	109 (22.4%)	95 (27.2%)
Total number of household members		
1–4	277 (58.8%)	192 (51.9%)
More than 5	210 (42.1%)	178 (48.1%)
Education of the household head		
Primary education	242 (49.7%)	186 (55.7%)
Above secondary education	200 (41.0%)	1149 (43.4%)
Distance to the nearest health facility		
<5 km	360 (73.9%)	276 (74.6%)
≥ 5 km	127 (26.1%)	94 (25.4%)
Distance to the provincial hospital (top referral hospital)		
<10 km	95 (19.8%)	78 (21.2%)
≥10 km	392 (80.5%)	292 (78.9%)
Households with at least one member with any self-reported health problem	370 (76.0%)	370 (100%)
Households with at least one member with communicable diseases only	241 (44.5%)	241 (65.1%)
Households with at least one member with a main NCD	45 (9.2%)	45 (12.1%)
Households with at least one member with other NCDs	132 (47.6%)	132 (35.7%)
Households with at least one member with a chronic disease	170 (34.9%)	170 (46.0%)

	N (% in total households)	N (% in households with at least one family with health problem)
Households with at least one member that visited any health facility	292 (60.0%)	292 (78.8%)
Households with at least one member that visited a provincial top referral hospital	51 (10.2%)	51 (13.8%)
Households with at least one member that visited a private facility (including foreign facility) for treatment	75 (15.4%)	75 (20.3%)
Households with at least one member that visited a foreign facility for treatment	32 (6.6%)	32 (8.6%)
Households with at least one member that was admitted to the hospital for more than one night	117 (24.0%)	117 (31.6%)

Table 2

Percentage of households who had visited a health care facility and who had self-medicated when a family member had a health problem, by household income

	Richest 1st Quintile N = 99	Rich 2nd Quintile N = 85	Poor 3rd Quintile N = 69	Poorest 4th Quintile N = 95	P values
Households who visited health facility when a family member had health problem	85 (85.9%)	78 (91.8%)	52 (75.4%)	78 (82.1%)	0.039
Households who self-medicated	13 (13.1%)	10 (11.8%)	20 (29.0%)	32 (33.7%)	< 0.0001

## Distribution of total monthly household health expenditure and monthly health cost/monthly income (%)

Medium out-of-pocket health expenditure per month was 100.000 LAK (11.3 US\$) (interquartile range, 25.000 LAK (2.8 US\$) to 423.750 LAK (47.9 US\$)). Most households (56.9%) spent 30,000 LAK (3.4 US\$) on health per month, which is the maximum value covered by the NHI. The distribution of the other expenditure values was polarized; in the second largest group, households spent more than 300,000 LAK (34.0 US\$) on health per month, which is 10 times the maximum value covered by the NHI (16.2%, Fig. 2). The out-of-pocket health expenditure between households that used public facility only for treatment [60.000 LAK (6.8 US\$) (interquartile range, 20.000 LAK (2.3 US\$) to 250.000 LAK (28.3 US\$))] and others (e.g., visiting private facility, self-medication) [160.000 LAK (18.1 US\$) (interquartile range, 50.000 LAK (5.3 US\$) to 762.500 LAK (86.4 US\$))] was statistically different ( $P < 0.0001$ ).

**Figures 2 and 3 about here**

Regarding CHE, 96 (25.1%) of the households met the requirement for CHE (20%) and 60 (16.1%) met the requirement for CHE (40%). Households with CHE that used public facility only for treatment were statistically different ( $p < 0.0001$ ) from others (Table 4). 367 households (75.4%) had the highest total out-of-pocket health expenditure/income ratio of less than 20%. This was followed by 36 households (7.4%) in the 20%-40% out-of-pocket expenditure/income ratio. The third largest group of households, 28 (5.7%), had out-of-pocket expenditure /income ratio of more than 100% (Fig. 3).

Table 4

Out of Pocket Payment and Catastrophic health expenditure prevalence comparison between households that visited public facilities and those that used other facilities for treatment

	<b>Total N = 370</b>	<b>Households that visited only public facilities (health center, district hospital, provincial hospital) for treatment N = 189</b>	<b>Households that used private facility, including self-medication N = 181</b>	<b>P values</b>
Out-of-pocket health expenditure per month (interquartile range) (LAK)	100.000 (interquartile range, 25.000 to 423.750)	60.000 (interquartile range, 20.000 to 250.000)	160.000 (interquartile range, 50.000 to 762.500)	< 0.0001
Out-of-pocket health expenditure/income (threshold 20%)	96 (25.9%)	39 (20.0%)	57 (35.0%)	< 0.0001
Out-of-pocket health expenditure/income (threshold 40%)	60 (16.2%)	21 (11.1%)	39 (23.9%)	< 0.0001

## Household health-seeking behavior

### Differences between chronic and non-chronic patients regarding health-seeking behavior and demographics

In the 487 surveyed households, there was a total of 2,692 members. Among these, 375 (13.9%) members reportedly experienced health problems in the past three months, and 198 (7.4%) had a chronic disease. In both groups (i.e., chronic vs. non-chronic patients), around 41.9% non-chronic and 40.9% chronic members were male. Regarding age, chronic patients were older than non-chronic patients, and the difference was statistically significant (medium [25%-75%]; 56 [46–62], 33 [8–54];  $p < 0.0001$ ).

Among non-chronic patients, most reported communicable diseases (58.9%), while among chronic patients, most reported having some kind of NCD (99.5%). Among chronic patients with NCDs, cardiovascular diseases, cancers, chronic respiratory diseases, diabetes, and mental disorders were not common only 23.2% had such NCDs, while the rest 76.8% had other NCDs.

The percentage of non-chronic patients (40.0%) that visited health centers for treatment was higher than that of chronic patients (10.6%), and the difference was statistically significant ( $p < 0.001$ ). The percentage of chronic patients (34.8%) that visited hospitals for treatment was higher than that of non-chronic patients (7.7%), and the difference was statistically significant ( $p < 0.0001$ ). The percentage of chronic patients (18.6%) that visited facilities for treatment was higher than that of non-chronic patients (14.4%), and the difference was not statistically significant ( $P = 0.19$ ; Table 5).

Table 5  
Individual comparison between non-chronic patients and chronic patients for demographic variables

	Non-chronic patients	Chronic patients	P-values
	N = 375	N = 198	
Age	33 [8–54]	56 [46–62]	< 0.0001
Sex			0.82
Male	157 (41.9%)	81 (40.9%)	
Female	218 (58.1%)	117 (59.1%)	
Disease type			
Communicable disease	221 (58.9%)	1 (0.5%)	< 0.0001
Main non-communicable diseases	6 (1.6%)	45 (22.7%)	< 0.0001
Other non-communicable diseases	148 (39.5%)	152 (76,8%)	< 0.0001
Did nothing	30 (8.0%)	0 (0.0%)	< 0.0001
Took care of themselves	83 (22.1%)	42 (21.2%)	0.80
Visited a health center	150 (40.0%)	21 (10.6%)	< 0.0001
Visited a district hospital	41 (10.9%)	37 (18.7%)	0,01
Visited a province top referral hospital	29 (7.7%)	69 (34.8%)	< 0.0001
Visited a private facility	54 (14.4%)	37 (18.6%)	0.19

## Catastrophic health expenditure influencing factors

The logistic regression analysis yielded a wide range of determinants associated with an increased risk of incurring in CHE (Table 6,7). It revealed that the odds of facing CHE were 3.773 [CI95% 2.081–6.8441,  $p < 0.0001$ ] (threshold 20%) and 4.430 [CI95% 2.177–9.016,  $p < 0.0001$ ] (threshold 40%), and [CI95% 1.404–4.667,  $p < 0.0001$ ] (threshold 20%) and 3.405 [CI95% 1.721–6.738,  $p < 0.0001$ ] (threshold 40%) times higher among households having incurred expenditure for treating chronically diseased persons and those that had a case of hospitalization, respectively. Households in the richest quintile were 3.972 [CI95% 1.807–8.730,  $p = 0.0001$ ] (threshold20%), and 3.339 times [CI95% 1.264–8.819,  $p = 0.015$ ] (threshold40%) less

likely to face CHE when compared with the poorest quintile; as household monthly income increased, the probability of facing catastrophic health expenditure declined. Finally, the odds of facing CHE were 2.490 [CI95% 1.323–4.667, p = 0.005] times higher for the households that got treatment in private facility (threshold 20%), and 2.669 [CI95% 1.688–13.558] times higher for households more than 10 km away from the provincial hospital (threshold 40%). Households with less than 5 members were 2.112 [CI95% 1.173–3.803, p = 0.013] (threshold 20%) and 2.669 [CI95% 1.688–13.558, p = 0.006] (threshold 40%) times more likely to incur CHE.

Table 6  
Estimated coefficients in Logit model for CHE (threshold 20%) (Household level data)

Variable	B	Wald	P value	Odds ratio	CI 95.0% for Odds Ratio
Household with at least one member with a chronic disease	1.314	18.703	< 0.0001	3.720	2.051–6.704
Household with at least one member admitted to a hospital for more than one night	0.93	9.215	0.002	2.535	1.390–4.620
Household with at least one member who visited a private facility for treatment	0.903	7.831	0.005	2.466	1.310–4.640
Richest Quintile (Reference Group)		14.936	0.002		
2nd Quintile	0.148	0.105	0.746	1.160	0.473–2.845
3rd Quintile	0.946	5.476	0.019	2.576	1.165–5.688
4th Quintile	1.387	11.923	0.001	4.002	1.821–8.792
Household size < 5	0.755	6.338	0.012	2.127	1.182–3.829
Log likelihood	304.877				
Pseudo R2	0.166				
Hosmer-Lemeshow test	$\chi^2(8) = 5.085$				
	P = 0.748				
Observations	312				

Table 7  
Estimated coefficients in Logit model for CHE (threshold 40%) (Household level data)

Variable	B	Wald	P value	Odds ratio	CI 95.0% for Odds Ratio
Household with at least one member with a chronic disease	1.471	16.442	< 0.0001	4.354	2.138–8866
Household with at least one member admitted to a hospital for more than one night	1.214	12.155	< 0.0001	3.367	1.702–6.663
Richest Quintile (Reference Group)		8.253	0.041		
2nd Quintile	0.066	0.013	0.908	1.069	0.345–3.310
3rd Quintile	0.662	1.681	0.195	1.940	0.713–5.280
4th Quintile	1.212	5.994	0.014	3.361	1.273–8.872
Household size < 5	0.989	7.471	0.006	2.669	1.321–5.434
Distance to Provincial level hospital > 10	1.566	8.689	0.003	4.587	1.690–13.560
Log likelihood	234.767				
Pseudo R2	0.147				
Hosmer-Lemeshow test	$\chi^2(8) = 10.074$				
	P = 0.260				
Observations	314				

## Discussion

Our study clarified the health-seeking behaviors, especially in chronic disease and related financial burdens of households in Bolikhamxay province, one of the provinces in LoA PDR where all individuals are covered by the current NHI system. Regarding the positive aspects of the NHI, most patients (non-chronic 69.9%, chronic 78.8%) said that they visited a health facility for treatment. Still, our study does not clarify whether this trend is an effect of the NHI because we did not have data from before NHI. Still, we highlight that in Bolikhamxay province, where the NHI has been implemented, more than 75% of the households in the poorer income household group visited a health facility when one of the members had an illness, even

though there are some gaps between income groups. Our study concurs with two past studies conducted in a different province [16–17] that found NHI has had positive impacts on access to health care.

Nonetheless, this study found financial problems for households under the current NHI scheme. We observed that 25% and 16% of the households with at least one member with any self-reported health problem were found to be experiencing CHE (20%) and serious CHE (40%) per month, respectively. Furthermore, CHE was more likely to occur in households with at least one member with a chronic disease and hospitalization. Out-of-pocket health expenditure for chronic and severe diseases was found to be a big burden on households, especially poorer ones, and it is very important for the design of future CHE prevention interventions to take these factors into account [37–40]. Hence, our evidence indicates that the financial burden of households under the NHI remain high, especially when they have a member with a chronic and/or severe disease. Moreover, our analysis of sample demographics showed that even among households covered by the NHI system, the reality is that out-of-pocket health expenditure is greatly polarized between small payments (i.e., within the value covered by the NHI) and very large payments (i.e., which greatly exceeds the value covered by the NHI) among the households.

We offer the following reasons for these results. First, there are many households who prefer or may be forced to visit private facilities, because our result showed that households with members who used private facilities are more likely in CHE than those who used only public facilities. A previous study confirms this assumption; it showed that people in Lao PDR preferred to utilize private health services as their first choice regardless of socioeconomic status, opting for private clinics and treatment abroad for those with high socioeconomic status [41], and utilization of government services is low, with a high likelihood of an individual seeking care from a modern health provider when ill [42]. Another study found that many people from Lao PDR sometimes use health services from Thailand provinces, where most health workers speak Isan Thai (a dialect of the Lao language) as their native tongue [43]. Furthermore, our results demonstrated that a large percentage of the households chose to visit private facilities in foreign countries, even with NHI coverage. For these households, we hypothesize that the members may have diseases that are difficult to treat, or can only be treated in private facilities, or it could be that people still preferred to use private facility even if costlier and not covered by NHI. Therefore, to avoid CHE in Lao PDR households covered by the NHI, we see the need for stakeholders to ensure that effective treatment of these differential, and often more complex, patients can be provided at facilities covered by the NHI scheme. To achieve that, they need to find ways to attract the population and increase their willingness to visit public facilities, mainly by improving service quality and coverage in public hospitals.

Furthermore, our study revealed that, among patients with NCDs, the proportion of main NCDs was relatively lower than that of other NCDs. Nonetheless, we highlight that the variety of diseases [8] among the households that had at least one member who visited a health facility in our sample was quite large. Thus, we suggest that local public hospitals strengthen their human and structural resources to ensure that they can deliver care to all patients.

Our results also showed that many households experienced CHE even at public hospitals. This may be due to the existence of additional costs related to visiting a health facility that go beyond those covered by the

NHI co-payment scheme, including the indirect transportation costs. Previous research has also pointed out the existence of additional expenditures for patients visiting public health facilities, including those related to medications or supplies not available at the public health facilities or not covered by the NHI [44]. Thus, to prevent CHE among households covered by the NHI, we see the need to expand the scope of the insurance coverage, especially for chronic patients (mainly those with NCDs), who require more complex and often prolonged treatments.

Among chronic patients in our sample, most visited the provincial, top referral hospital; importantly, there is only one such hospital in Bolikhamxay province. This denotes that travelling to the hospital entails a high cost (both in time and money) for some households [44, 45]. Coupled with the abovementioned CHE rate, this becomes a critical area of concern for stakeholders. For achieving UHC, primary care must be emphasized [46]. However, this emphasis in primary care may lead patients to continue to suffer from complex and/or life-threatening problems if they are not referred to higher level facilities, especially in aging societies, such as that of Lao PDR [47, 48]. These patients require advanced treatment, which often entails high costs and leads to CHE. Hence, we see the need for stakeholders to place additional focus on methods for providing NHI patients with advanced care while considering the realistic financial situation, and constraints of the NHI. The results of the study, which show that the groups in medical expenditure and ratio of medical expenditure to income are polarized, suggest the importance of supporting high medical expenditures. For example, in the Japanese NHI, not only is there a set percentage (10–30%) for co-payments by treatment but also a maximum amount of total co-payment per month called “ceiling amount application” [49]. We see the possibility of considering a similar financial system for the NHI in Laos PDR, which may help prevent CHE among households with chronic patients.

To achieve UHC, it is important to enhance population and service coverage, as well as financial protection. In Lao PDR, the NHI was initially introduced with the aim of covering the entire population of the specific provinces in which it was implemented, as well as to provide financial protection through a fixed payment system. Nonetheless, this aim did not necessarily consider the enhancement of service provision; accordingly, we believe that the potential preventive effect of NHI on CHE was limited.

Even in poor households, it is common for people to seek better medical services when they become sick. Our findings underpin that CHE was more likely to occur in households with lower incomes. Similarly, previous international studies have highlighted the importance of ensuring a reasonable distribution of health services across different community-based and socioeconomic strata, especially for patients with chronic diseases [50]. Accordingly, our discussion suggests that the NHI requires additional improvements regarding health facility placement; patients especially need to be able to access reasonably located health facilities that deliver quality services. This is valid for facilities aimed at treating chronic patients, which often require long-term and frequent care delivery. To achieve UHC in Lao PDR, the government needs to take a comprehensive approach related to the NHI that better reflects its current situation.

This study has some limitations. First, we obtained information regarding household finance (i.e., health expenditure and income) by interviewing the household heads; this methodology may have caused issues regarding data preciseness. Second, diagnoses based on self-reporting was included for those who did not

visit a health facility, and estimates (prevalence) were not weighted to obtain province-representative evidence, and a longitudinal design was not followed to assess the difference between pre and post NHI situations.

Nevertheless, to the best of our knowledge, this is the first study to investigate the health-seeking behaviors and financial burdens of households covered by the NHI in Lao PDR, including those with chronic patients. Most past studies related to the NHI in Lao PDR were conducted by targeting only patients who visited health facilities [35]; their study design did not allow for collecting evidence from patients who did not visit or could not access a health facility. We felt it was important to understand the situation of households who did not/could not visit health facilities for assessing the effectiveness of interventions aimed at achieving UHC, such as the NHI in Lao PDR. This is because the main purpose of the NHI is to improve the access of the general population to health facilities while ensuring they do not incur major financial burdens related to health care.

In conclusion, our results provide a clear picture of the current status of the general population in provinces covered by the NHI regarding access to health services and their financial burden. We hope that our evidence provides a valuable theoretical framework for stakeholders and policymakers, who may use our data to conduct well-informed decision-making that facilitates the achievement of UHC in the future of Lao PDR.

## Abbreviations

NCDs: Non-communicable diseases

NHI: National Health Insurance

SDGs: Sustainable Development Goals

UHC: Universal health coverage

CHE: Catastrophic health expenditure

OOP: Out-of-pocket

## Declarations

- **Ethics approval and consent to participate:** This study was approved by both the National Center for Global Health and Medicine and the National Ethics Committee for Health Research of the Lao Ministry of Health. Verbal informed consent (approved by the Ethical Committee) was obtained from each respondent and key participant prior to commencing their respective interviews. All documents were de-identified. Caregivers or mothers provided consent for children when they took part in the interviews. Privacy and confidentiality were assured for all respondents.
- **Consent for publication:** Not applicable.

- **Availability of data and materials:** The data that support the findings of this study are available from the corresponding author upon reasonable request.
- **Competing interests:** The authors declare that they have no competing interests.
- **Funding:**

International Medical Research and Development Fund in National Center for Global Health and Medicine

Project number: 28-3

Title of Research Project

Research on the use of overseas centers for health policy research on universal health coverage and other issues

- **Authors' contributions:** Tomoo Ito was involved in study design, data analysis and interpretation. All authors critically revised the report, commented on drafts of the manuscript, and approved the final report.
- **Acknowledgements:**

We are grateful to Dr. Khouanchay Soundavong

, Dr Kethmany Chanthakouman and Lao TPHI team of data collectors for survey arrangement and data collection

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## Figures

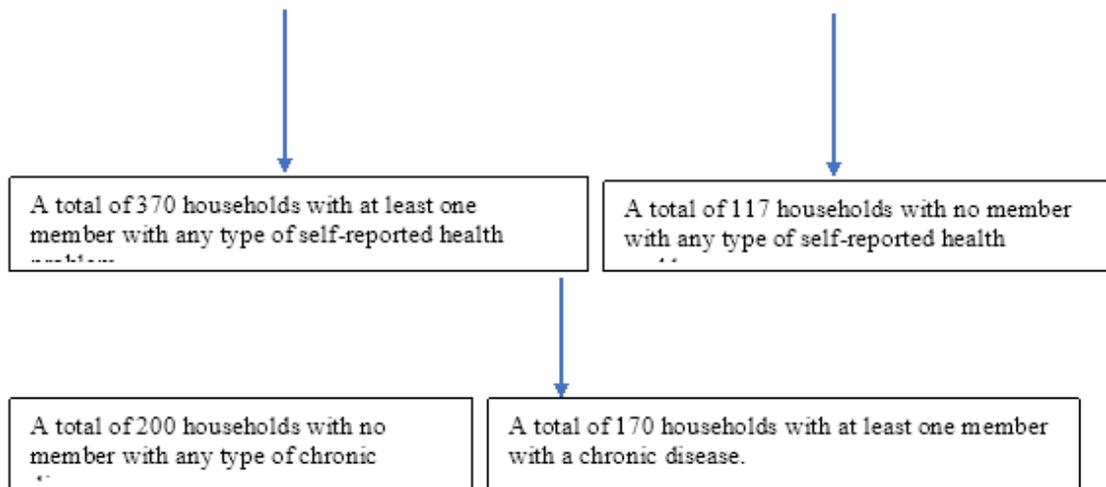
Bolikhamsay province was selected because the National Health Insurance scheme has been implemented here.

Stage 1: Three districts were selected based on distance (in km) from the provincial capital town:

1. The capital district (Pakxan),
2. The district 50 km from the capital district (Thaphabad)
3. The district 70–100 km from the capital district (Pakkading)

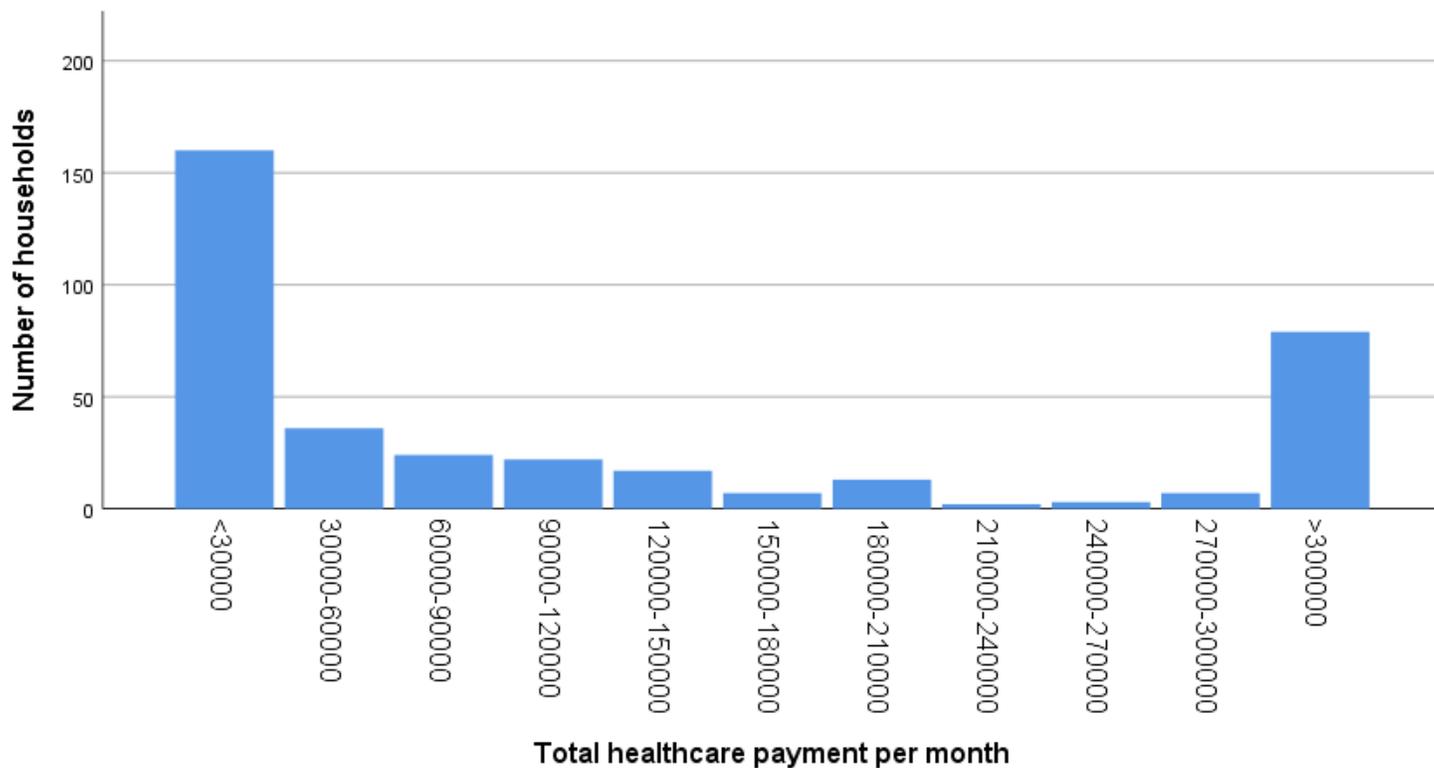
Stage 2: Five villages were selected in each district (one urban village, two rural villages with roads, and two rural without roads)

Stage 3: Selection of households was random (around 30–33 households in each village based on the



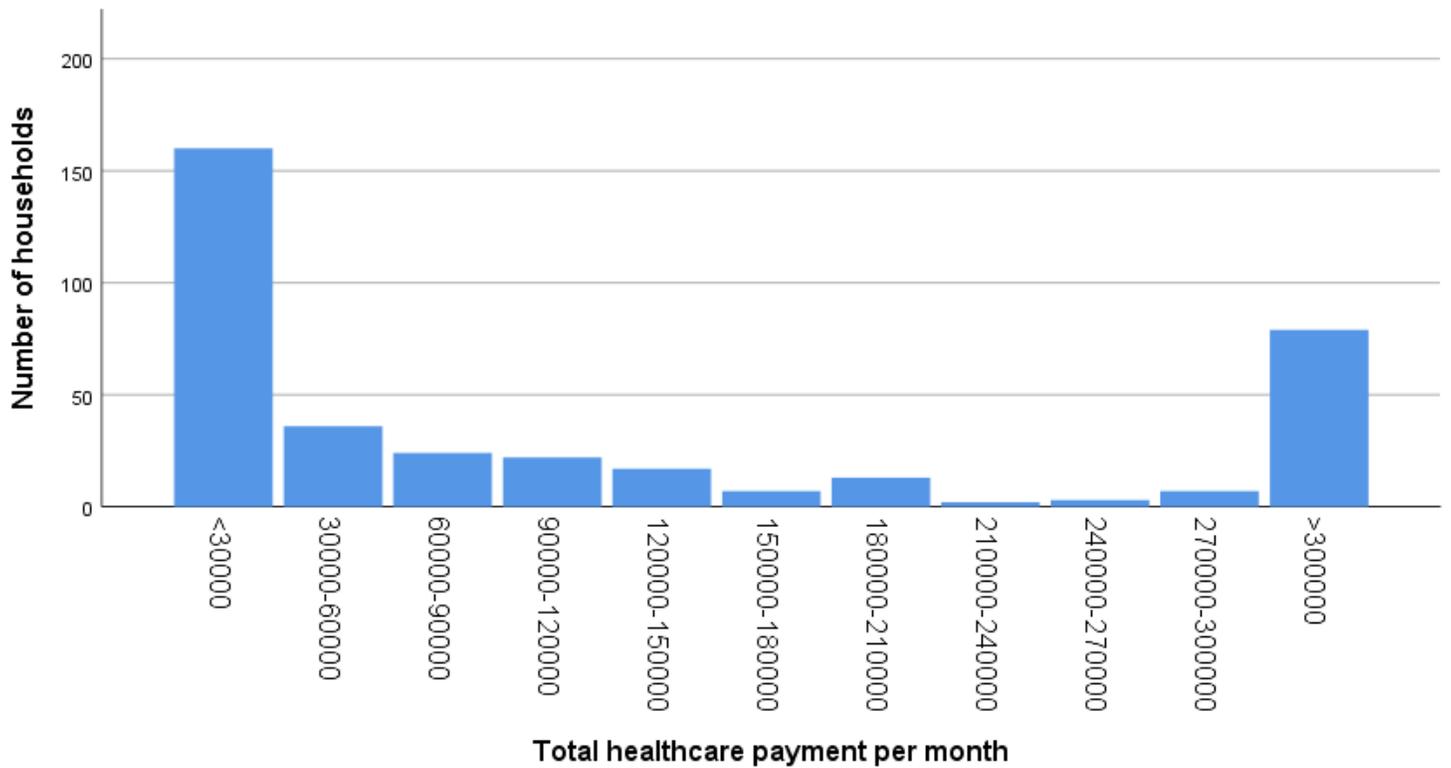
**Figure 1**

Flow of household sample selection



**Figure 2**

Distribution of household monthly health out-of-pocket expenditure. The distribution of total household monthly health expenditure is shown by each 30,000 LAK, until reaching a group that spent over 300,000 LAK.



**Figure 3**

Distribution of household monthly health out-of-pocket expenditure. The distribution of total household monthly health expenditure is shown by each 30,000 LAK, until reaching a group that spent over 300,000 LAK.