



Distribution of Private Health Expenditure Analysis on Provincial in Thailand

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Abstract

This research analysed the distribution of private health expenditure at the provincial level in Thailand. Health expenditure in each household was categorised into three aspects: medicine and medical supplies, medical expenses from visiting the Out Patient Department (OPD) and In Patient Department (IPD) at hospitals. Panel Data from 77 provinces from 2012 – 2017 was used in this research. The data was analysed using Multiple Regression Analysis and a Fixed Effect Model to round up the parameter. The Hausman Test was used to test the rationality of the model. Inequity in the distribution of household health expenditure per each province was studied using the Lorenz Curve and the Gini Index while equity in the healthcare funding system was investigated using the Kakwani Index.

The study found that household medical expenses from visiting the OPD at a hospital was the highest monthly expenditure. For inequity in private health expenditure, the Gini Index showed that the overall health expenditure was 0.36, while the health expenditure in each aspect found that the IPD was highest in inequity in private health expenditure, with the Gini Index equalling 0.49. It was also found that the Gini Index has increased every year. This rise shows that the inequity in private health expenditure is increasing continuously.

The Kakwani Index of expenditure equity yielded a negative value. When considering the factors that contribute to the rise of private health expenditure, it was found that the expenditure often increased in parallel to demand. The results of this research also showed that the health service system affected all 3 aspects of the private health expenditure. Universal Health Coverage was the only system that accounted for the increase of private health expenditure in all aspects. On the other hand, the Social Security Scheme reduced the expenditure.

Keywords

Private Health Expenditure, Equity, Gini coefficient, Panel data, Kakwani Index

Introduction

Health expenditure in Thailand has been increasing and is expected to keep on raising. The increase of this cost is a burden to households and could lead to bankruptcy. (Ministry of Public Health, 2017). Thailand had undergone a reformation of the healthcare system in 2002, which enabled the 3 categories of health financing, the National Health Security, the Social Security Scheme and the Government or State Enterprise Benefits, to cover up to 99.92 percent of the population. (Ministry of Public Health, 2017) This means that although almost all of the population is able to attain health insurance when ill, household health expenditure still exists. A report on Thai public health from the Ministry of Public Health (Ministry of Public Health, 2017) reported that total health expenditure increased from 127,655 million baht (2,160 baht per person) in 1994 to 500,476 million baht (7,966 baht per person) in 2014, an approximately 4 times increase.

The percentage of health expenditure to Gross Domestic Production (GDP) was 3.5 percent in 1994 and increased to 4.1 percent in 2014. Health expenditure in the government sector increased from 45 percent in 1994 to 77 percent in 2014 while private health expenditure decreased from 55 percent in 1994 to 23.0 percent in 2014. The universal healthcare coverage policy in 1994 was responsible for the changes, increasing the government responsibility in health expenditure. Nevertheless, the percentage of private healthcare expenditure has remained constant at 23 percent since 1994, without any reduction. (Ministry of Public Health, 2017)

Since private health expenditure did not diminish, the burden of meeting this cost fell on private households. In some households, the medical expenditure exceeded their income, which resulted in bankruptcy. This incident where households had to be in poverty line from health expenses in 1990 is at 2.33 percent and reduced to 0.3 percent in 2016 (Ministry of Public Health, 2017). Although there was a decrease in households that became impoverished from health expenditure, health expenditure in Thai households during the last 25 years did not decrease. Medicine and medical supplies expenditure have been constantly increasing. In households with high income, medical expenses from visiting the OPD and IPD at hospitals ranked the highest. As medical services are not inclusively available and require a long waiting period, many households decided to pay more for private medical services. Furthermore, health expenditure also rose in parallel with the increase in number of elderly in long term care. Therefore, private health expenditure remains high. (Dongthipsirikul, 2018)

Private health expenditure analysis is an important area of study that national and international researchers' value. The prominent feature of this study is that it examines private health expenditure through provincial data. It employs the analysis of different provincial contexts, including demand, supply and health requirements. Each province has different levels of demands in receiving health treatment, which then also leads to differences in health expenses for each area. Factors which determine such differences can be used as

a crucial guideline to determine health policies and enable stress on the control or promotion of these factors, in order to reduce household health expenditure in each area.

Research Objective

To analyse the inequity and equity of provincial private health expenditure and study factors which affect provincial private health expenditure.

Literature Review

The growth of health expenditure is a problem faced by many countries. Thus, researchers have been conducting studies to identify its causes. Simple regression analysis, pooled Cross-sectional data from various countries and Time-series data had been used to explain the differences in healthcare expenditure in each year as well as the differences in healthcare expenditure from other nations. Ultimately, no research has come up with a theory that is able to clearly explain the changes in private healthcare expenditure. Past research has considered household economy, social conditions, health conditions and health resources to analyse causes from demand and supply sides in healthcare services.

Demand Side

Demand in healthcare services is different from demand in goods and services since it is irregular and unpredictable. Therefore, demand for healthcare is difficult to determine when or where it will occur. It depends on the probability of illnesses or accidents that happen. In addition, each illness for each patient does not mean the same circumstance; the severity is not the same for each case and patients don't always have the same symptoms. Some may be suffering slightly from a disease, while others may be suffering greatly due to factors such as age or the condition of their body. (Kenneth, 1963)

Michael Grossman (1972) stated that three factors contributed to the growing demand of healthcare services. Firstly, the increase in age required increasing demand of healthcare service. Secondly, the rise of one's income would increase the benefits gained from investing in healthcare, therefore the rise of income caused the increase of healthcare services demand as well. A person who is cured from illness and is able to live longer because of the healthcare services they received can spend their time to generate more income. Therefore, people with high income have higher demand for healthcare services than people with low income from the advantages received from maintaining good health through healthcare services. Lastly, education, which enhances an individual's performance and contribution, also accounts for the increase of demand in healthcare services because higher levels of education result in higher performance and advantages.

Supply Side

In the study of the supply of healthcare services, other than health resources such as expensive health instruments, number of beds and number of doctors, priority is given to Supplier-Induced Demand (SID). Doctors are seen as the consumer of health resources. The SID concept was taken from research by Shain and Roemer (1959) and Roemer (1961) who found that the number of beds in a hospital to the population in the USA correlates with the rate of services in hospitals (measured by patient-days per population). This phenomenon was called “bed built is a bed filled” and later renamed Roemer’s Law. This phenomenon is caused by 2 factors (1) asymmetric information in choosing health services between the patient and service provider and (2) the service provider serving as the agent of patients in deciding to use health services and also the producer of the service (dual roles as agent-provider). This causes a conflict of interest. When the service provider uses their influence from the knowledge they have over patients to create demand in healthcare services without leaving it to market mechanisms, this may lead to market failure if the patients’ demand in health services are under the discretionary influence of the service provider. Market mechanisms may not be able to maintain the appropriate price and usage of resources, resulting in higher usage of health resources (Shain & Roemer, 1959; Roemer, 1961).

Thus, the state trying to increase health resources such as increasing the number of hospitals, and producing more doctors has resulted in the increase of public health expenditure through the SID hypothesis. In 1970, OECD countries had a large amount of excess supply in the health system. The ratio of doctors to patients increased greatly. Medical schools expanded and increased in numbers to enter the system (Oxley & MacFarlan, 1994). Consequentially, this became the force that exponentially increased public health expenditure (Newhouse, 1992; Uwe, 1989).

Demand and supply in private health expenditure showed that the expenditure increased due to these two factors. Initially, researchers were interested in this occurrence and tried to explain the rise in household health expenditure by testing Grossman’s hypothesis such as Musgrove (1983) Wagstaff (1993) Haveman et al. (1994) and Nocera & Zweifel (1998). Next, researchers included further factors in their analysis. For instance, Daniele & Chiara (2002) took into consideration factors such as lifestyle, access to healthcare services, and other health factors such as living area, unemployment, sex, chronic diseases, drinking and smoking habits, as well as listening and hearing problems.

Moreover, health needs analysed from preference rate were also included in the study. Przywara & Costello (2010) studied the demand and supply factors that affected health expenditure. Demand factors included population structure, health status and Gross Domestic Product (GDP) while supply factors comprised of medical technology advancements and healthcare resources.

Equity in health financing

Equity in the distribution of health financing is reflected in the ability to pay. The proportion between healthcare expenditure and income must be progressive for the distribution to be considered fair. Several methods to evaluate equity have been developed to study equity in health financing. In many studies, the Kakwani Index has been used (Christopher et al., 2003). The Kakwani Index is measured by comparing the ratio of income distribution to health expenditure to determine whether the equity is progressive or regressive. If equity is progressive, meaning that people with high income also have a high proportion of healthcare expenditure, the Index value is positive. On the other hand, the Index yields negative value if equity is regressive, meaning that people with high income have a low proportion of healthcare expenditure.

In Thailand, the studies of private health expenditure have mainly focused on the analysis of household expenditure. For example, Somkotra & Leizal (2009) studied the risk of household's bankruptcy from healthcare spending. The study was conducted after the implementation of universal healthcare coverage policy by using data from the survey in the economic sector and social factor of households. The study found that the medical expenses from IPD of public hospitals and OPD of private hospitals were the main factors that bankrupted low-income households while these expenses were an important expenditure of medium to high income households. Therefore, having elderly people, or family members with risk of diseases, chronic diseases and disability were the main factors that led to high healthcare expenses. The high expenses then created a burden for the household and caused bankruptcy. Furthermore, it was also reported that the surge of private hospitals also raised the healthcare expenses in households, especially in those with high-income and education level, as the medical services fee in private hospitals was not controlled (Somkotra & Leizal, 2009). In addition, a study on the estimation of public health expenditure 15 years into the future by the Thailand Development Research Institute (Wichitakorn, 2018), found that the growth rate of Thai health expenditure is a result of the population's income, followed by impacts from other factors such as healthcare technology, state policies and lastly, the population's age structure. Health expenditure will increase when Thailand enters an aging society, since there is an increase in the elderly which leads to an increase in health expenditure. Health expenditure will increase greatly in the case of elderly patients with non-communicable diseases. The group which will be impacted the most will be those with circulatory system diseases, then diabetes and chronic respiratory diseases.

Early research on private health expenditure used data from each household. However, later researchers included data from certain areas such as states or provinces. Wang (2009) studied the private health expenditure using Panel data through a Fixed Effect Model with GPP per capita, proportion of elderly population, growing urbanisation, number of

hospital beds, poverty rate, number of hospitals, number of doctors and unemployment rate per area as variables. Research found that different social and economic factors as well as the number of people in each area resulted in different private health expenditure. The increased supply of the number of doctors and nurses, medical technology, etc. caused private health expenditure to increase. In 2015, Wang (2015) conducted an international level study in order to answer the question, "Does increased health expenditures in economy growth or not?" by using Panel data of OECD countries. The study found that the increased health expenditure resulted in economy growth. Therefore, the research concluded that for a country to have increased health expenditure is not always negative. From another perspective, it is positive since it will allow the economy to grow, as a population with good health will also lead to better productivity.

Research by Camenzind (2012) used econometrics and panel data from 26 states. Factors studied in his research were demand, supply, finance, culture and politics. Both a Fixed Effect Model (FEM) and a Random Effect Model (REM) were used in the analysis which was tested using the Hausman test. The study reported that the number of hospital beds, number of doctors and number of aging people affected private healthcare expenditure. Cuckler & Sisko (2013) also used econometrics to study factors that affect healthcare expenditure using Panel data and a Fixed Effect Model. Their study found that characteristics of population, economic status as well as health status were factors that affected healthcare expenditure in the long run. Moreover, the risk of NCDs diseases, which require high healthcare services expenses and long periods of treatment, was varied by the differences of physical attributes of each surveyed area. Therefore, healthcare expenses in each area also differed (Debasis & Sonalde, 2014).

Bose (2015) studied factors that affected healthcare expenditure in each state of America. It was reported that the different characteristics of each state caused a clear difference in the health expenditure rate. Panel data from 2000-2009 was used in her study. GPP per state, number of elderly people, poverty rate, number of hospitals that vary in each state were factors that all lead to a clear distinction in health expenditure per state.

Furthermore, many researchers have studied factors that affect healthcare expenditure in provinces or states. Most studies have made use of Panel Data and the Fixed Effect Model and found that demand factors affecting healthcare expenditure were income, age, education, drinking and smoking habits, living in urban areas, unemployment and poverty rate. (DiMateo, 2004; Acemoglu et al., 2013; Rettenmaier & Saving, 2010; Chen et al., 2014; Bose, 2015; Herring & Trish, 2015; Bose et.al., 2016) While supply factors that affected private health expenditure included the number of hospital beds and number of doctors (Rettenmaier & Wang, 2012; Bose, 2015; Herring & Trish, 2015; Bose et.al., 2016).

Previous studies have also found that equity in private healthcare expenditure yielded a negative Index, which showed a regression equity or the ratio of health expenditure in high-income households was less than expenditure in low-income households. Many studies were conducted after the reform of the healthcare system in different countries to find out whether healthcare financing after the reform had progressive characteristics or not. Ongoing research has found that even though many countries have reformed their healthcare system to create more equity, healthcare financing, especially in developing countries, still has regressive characteristics (Christopher et al., 2003).

Methodology

The quantitative data analysis used secondary data as a pooling of Cross-sectional and Time-series data or Panel data. The unit of analysis in this research was Thailand's 77 provinces and used data from 2012-2017 for analysed provincial private health expenditure. Panel data which includes a combination of Time-series data and Cross-sectional data will allow more data and increase the degree of freedom. It will also reduce issues with collinearity. This results in a more efficient econometrics estimation. Using Panel Data also allows the analysis of social issues and testing of complex models which cannot be analysed using Cross-sectional data or Time-series Data. Multiple Regression Analysis and a Fix Effect Model were employed to find possible factors which impact private health expenditures. The study aimed to study both expenditures from an overview and in various aspects categorised into 3 aspects: medicine and medical supplies, medical expenses from visiting the Out Patient Department (OPD) and In Patient Department (IPD) at hospitals.

Additionally, the study analysed the inequity of household provincial health expenditure using Lorenz Curve, concentration Index, as well as Gini Index at the provincial level. The equity of the provincial health system is measured using the Kakwani Index. (Christopher et al., 2003)

The data sources used in this study are from the Thai Ministry of Public Health, Office of the National Economic and Social Development Council and National Statistical Office, which have been adapted into data according to the indicators of the required variables. They were recalculated to be suitable for analysis.

Findings

The study found that the private sector has 85.74 baht of health expenditures per capita. There was a large difference in expenses for each province. The lowest was at 9 baht per month and the highest was at 373 baht per month. The expenses were categorised into medicine and medical supplies at a mean per capita of 28 baht per month, OPD expenses per capita at 37 baht per month and IPD expenses per capita at 19 baht per month.

Table 1 Mean and standard deviation of 77 provincial health expenditure in 2012-2017 (Number of Obs = 462)

Variable	Mean	Std. Dev.	Min	Max
Private health expenditure per capita (baht/capita/month)	85.74	54.30	9.15	373.73
Medicine and medical supplies expenditure per capita (baht/capita/month)	28.55	22.44	1.43	210.35
OPD expenditure per capita (baht/capita/month)	37.67	29.01	0.66	189.95
IPD expenditure per capita (baht/capita/month)	19.51	18.38	0.04	152.65

When examined in detail by year, the average household health expenditure from 2012-2017 increased slightly (Figure 1). When categorised by region, the average monthly household health expenditure was 177 baht per month in the Bangkok Metropolitan Area. The lowest was in the North Eastern region at 52 baht per month. The two regions had a 3.4 times difference in expenditures (Figure 2).

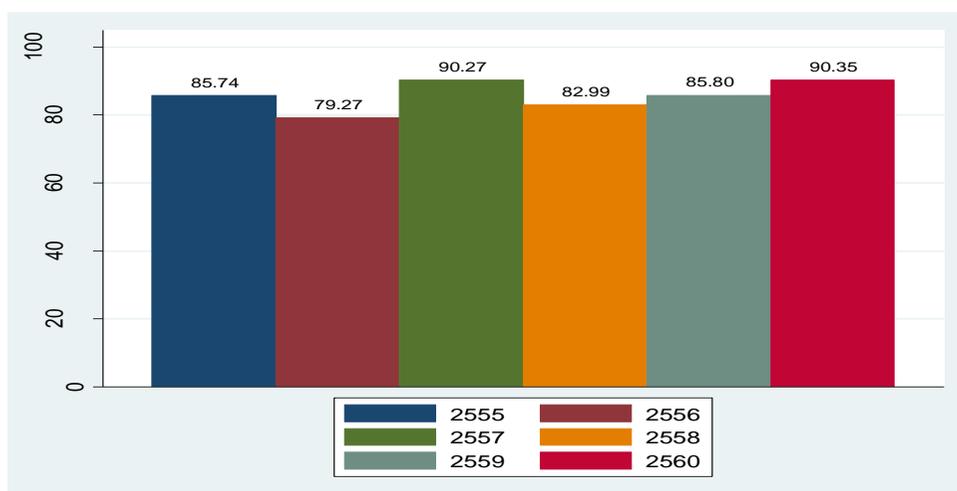


Figure 1 Monthly private health expenditure by year

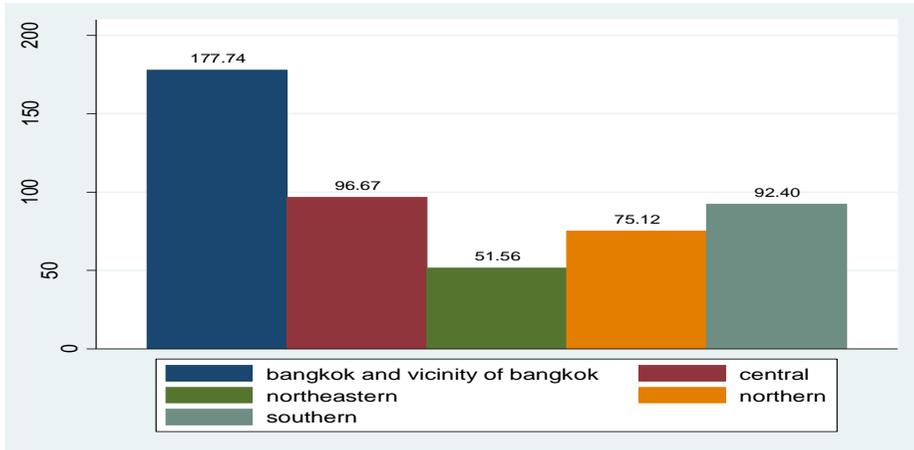


Figure 2 Monthly private health expenditure by region

This study found that each province had different health expenditures. The Bangkok Metropolitan Area had the highest health expenditure in all aspects. Most expenses were from out patient treatment and medicine and medical supplies. The lowest health expenses were in the North Eastern region, while Bangkok Metropolitan Area households had 3-4 times higher expenses in all aspects in comparison to the region with the lowest expenditure. The 10 provinces with the highest health expenditure in 2017 were Bangkok, Rayong, Nakhon Pathom, Pathum Thani, Phuket, Phitsanulok, Saraburi, Ratchaburi, Nonthaburi, and Lamphun. The 10 provinces with the lowest health expenditure were Narathiwat, Loei, Surin, Kalasin, Buriram, Srisaket, Ubon Ratchathani, Yasothon, Mae Hong Son and Nakhon Phanom.

Analysis of inequity in provincial income and health expenditure

The Gini coefficient and Lorenz curve are Indexes that can measure the equity in the standard of living. The Lorenz curve shows the correlation between the accumulated proportion of the standard of living (income or expenses) on the y axis and the accumulated proportion of population, ranked from those with the lowest to highest standard of living on the x axis. In cases where there is complete equity, meaning that all population units have the same income, the Lorenz curve will be a 45 degrees line called the “equality line”. However, in reality, equity in standards of living is something rare and has almost zero probability. That is why the Lorenz curve is a curve under the equality line. The more curve the Lorenz curve has (i.e., further from the 45 degrees line), then the more inequity there is. The Gini coefficient is an Index that is able to measure income distribution. It can be an indicator of the equity of income distribution within the population group. This shows clear inequality by calculating the area between the Lorenz curve and equality line. The Gini Index

is between 0 and 1. The higher the Index, the higher the inequality. If the Gini Index reaches 1 that would mean the highest level of inequality and if the Gini Index reaches 0 that would mean there is no inequality. This study uses the Gini Index as an indicator for inequality for provincial income and expenses. Provinces are the unit of analysis, categorised by income into 5 economic groups according to the gross provincial product per capita which are lowest income provinces (quintile 1), low-income provinces (quintile 2), middle income provinces (quintile 3), high income provinces (quintile 4) and highest income provinces (quintile 5).

From categorising provinces by socio-economic status, it was found that private health expenditure increases according to socio-economic status. Lowest income provinces (quintile 1) have a monthly health expenditure of 57 baht and the highest income provinces (quintile 5) have a monthly health expenditure of 129 baht, with a difference of around 2.3 times. When broken down into aspects of expenditure, it was found that most expenses of every quintile are from Out Patient treatment, followed by medicine and medical supplies (Table 2).

Table 2 Mean of private health expenditure by provincial socio-economic statuses

(baht/capita/month)

Socio-economic	Overall private health expenditure	Medicine and medical supplies	Out Patient treatment	In Patient treatment
quintile1	57.19	18.89	24.21	14.08
quintile2	61.50	17.04	28.71	15.75
quintile3	77.26	26.19	34.13	16.92
quintile4	103.43	35.21	45.11	23.11
quintile5	129.72	45.52	56.39	27.80

When comparing the provincial income with the paid health expenses, provinces with the lowest income (quintile 1) had an income proportion of 7.76 percent, a medicine and medical supplies proportion of 13.33 percent, OPD expenses proportion of 12.94 percent, an IPD expenses proportion of 14.52 percent and an overall health expenditure proportion of 13.43 percent.

Provinces with low income (quintile 2) had an increased income proportion of 10.05 percent, a medicine and medical supplies proportion of 11.89 percent, an OPD expenses proportion of 15.17 percent, an IPD expenses proportion of 16.08 percent and an overall health expenditure proportion of 14.29 percent.

Provinces with middle income (quintile 3) had an increased income proportion of 13.11 percent, a medicine and medical supplies proportion of 18.47 percent, an OPD

expenses proportion of 18.24 percent, an IPD expenses proportion of 17.45 percent and an overall health expenditure proportion of 18.14 percent.

Provinces with high income (quintile 4) had an increased income proportion of 19.02 percent, a medicine and medical supplies proportion of 24.56 percent, an OPD expenses proportion of 23.84 percent, an IPD expenses proportion of 23.59 percent and an overall health expenditure proportion of 24.02 percent.

Provinces with the highest income (quintile 5) had an increased income proportion of 50.06 percent, a medicine and medical supplies proportion of 31.75 percent, an OPD expenses proportion of 29.81 percent, an IPD expenses proportion of 28.36 percent and an overall health expenditure proportion of 30.12 percent (Table 3).

It can be observed that in the lowest income provinces (quintile 1), the highest expenditure proportion was IPD, but for highest income provinces (quintile 5) the highest expenditure proportion was medicine and medical supplies. Overall, provinces with high income will also have higher household health expenditures compared to lower income provinces in all aspects. When taken into account the Spearman's rho value which was statistically significant in all aspects and had a positive correlation, showing that in all levels of income, when there is an increase of income, health expenses are also likely to increase, especially from medicine and medical supplies and OPD. However, it is observable that the income proportion of quintile 1 when compared with quintile 5's income proportion had a 6.4 times difference, but at the same time the health expenditure ratio of quintile 1 and quintile 5 only had a 2.2 times difference.

Table 3 Ratio of income and provincial private health expenditure

Income level of provinces	Ratio of private health expenditure				
	Proportion of income	Medicine and medical supplies	Out Patient treatment	In Patient treatment	Overall (%) ****+
Quintile 1 (poorest)	7.76	13.33	12.94	14.52	13.43
Quintile 2 (second)	10.05	11.89	15.17	16.08	14.29
Quintile 3 (third)	13.11	18.47	18.24	17.45	18.14
Quintile 4 (fourth)	19.02	24.56	23.84	23.59	24.02
Quintile 5 (richest)	50.06	31.75	29.81	28.36	30.12
total	100.00	100.00	100.00	100.00	100.00

* Spearman's rho = 0.5376, ** Spearman's rho = 0.4202, *** Spearman's rho = 0.2966,

**** Spearman's rho = 0.5234 + statistically significant at 0.01

In terms of the inequity of private health expenditure, it was found that there is inequity for each province, as can be seen from the Lorenz curve being far away from the 45 degrees line. When compared regionally, the Southern region has the highest inequity, and interestingly, the Southern region is also the region where inequity increases annually.

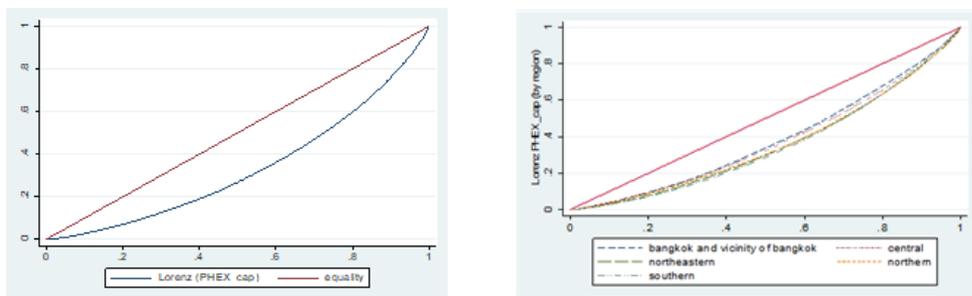


Figure 3 Lorenz curve of provincial health expenditure per capita and regional comparison

For a clearer picture, the Gini Index shows that the health expenditure for each province from 2012 to 2017 increased in inequity in all aspects, especially for inpatient treatment expenses with the highest inequity distribution.

Table 4 Gini coefficient of provincial health expenditure per capita by expenses, 2012 - 2017

Year	Overall private health expenditure	Private health expenditure for medicine and	Private health expenditure for Out Patients	Private health expenditure for In Patients
2012	0.30	0.32	0.38	0.44
2013	0.31	0.33	0.40	0.43
2014	0.33	0.37	0.40	0.45
2015	0.34	0.38	0.40	0.46
2016	0.34	0.53	0.49	0.54
2017	0.36	0.38	0.39	0.49

Table 5 Gini coefficient of provincial health expenditure per capita by region, 2012 - 2017

Year	Gini coefficient of overall private health expenditure				
	Bangkok Metropolitan	Central	North-eastern	Northern	Southern
2012	0.25	0.24	0.24	0.28	0.23
2013	0.24	0.26	0.35	0.25	0.25
2014	0.13	0.21	0.26	0.26	0.30
2015	0.19	0.24	0.24	0.28	0.31
2016	0.20	0.24	0.31	0.27	0.30
2017	0.22	0.24	0.25	0.28	0.31

Analysis of equity of provincial private health expenditure

The equity of healthcare finances is reflected in people's ability to pay. The analysis of the equity of health finances is a progressive analysis, comparing those with low and high income in order to examine the progress in paying health expenditure. This progressive principle means those with high income should be paying health expenditure a higher proportion to those with low income in order for there to be equity. On the contrary, inequity is regressive finances, which is when those with high income pay for health in a lower proportion when compared to those with low income.

Varies studies have measured the equity of the finance system using the Kakwani Index (Christopher et al., 2003) in order to examine the income distribution proportion compared to the health expenditure proportion. The correlation between income distribution and health expenditure proportion can have a progressive or regressive rate. If the rate is progressive, that means those with high income have a high proportion of health expenditure. The Kakwani Index will be positive. On the contrary, if it is regressive, that means those with high income pays health expenditure in a low proportion, then the Kakwani Index will be negative.

When analysed for equity to discover if high income provinces paid high expenses for health expenditure as well or not through an analysis of equity of health expenditure, it was found that the Kakwani Index was negative (pro rich) every year. This means the correlation between income distribution and health expenditure is regressive and that the rich provinces are at a higher proportion compared to the poorer provinces, but once the income distribution is considered, it is regressive. The high-income provinces pay in a lower

proportion than low-income provinces, showing that Thailand's private health expenditure still lacks equity when considering income distributions. Similarly, this is supported by many studies which found that private health expenditure is regressive, such as Christopher et al. (2003) Gonzalez & Paker (1999) Valladares & Barillas (1999). This is especially true in countries where the private sector is responsible for most of the expenses such as in America, that the Kakwani Index will be highly negative. In addition, Christopher et al. (2003) also found that in Thailand, the poor pay a higher proportion for treatment than the rich, which means that it is also regressive. In this study, the province with the lowest income had 13 percent of proportion health expenditure while the richest province had 30 percent health expenditure which is 2.3 times more. While the income proportion for quintile 1, compared to the income proportion of quintile 5, has a 64 times difference. The Kakwani Index is also negative in every year. This means the correlation between income distribution and health expenditure proportion is regressive, or those with high income pay less than those with low income. This shows that provincial health expenditure contains inequity when compared with income distribution. This confirms that the equity of private health expenditure is regressive.

Table 6 Provincial Kakwani Index

Year	Concentration Index (C)	Gini coefficient (G)	Kakwani Index
2012	0.13	0.30	-0.17
2013	0.10	0.31	-0.21
2014	0.20	0.33	-0.13
2015	0.20	0.34	-0.14
2016	0.19	0.34	-0.15
2017	0.21	0.36	-0.15
overall	0.17	0.33	-0.16

Analysis of factors affecting private health expenditure

In analysing factors that affect private health expenditure, all variables were recalculated in a format suitable to analysis. For example, health expenditure was changed to per capita, before the data was inputted into the model.

Table 7 Factors which affect overall provincial private health expenditure

Independent Variable	B	S. E.	t	Sig.	95% C.I.	
Gross provincial product per capita	0.54	0.28	1.89	0.062*	-0.03	1.10
Unemployment rate	0.00	0.03	0.13	0.896	-0.05	0.06
Poverty proportion	-0.11	0.04	-2.92	0.005**	-0.18	-0.03
Tax per capita	-0.01	0.01	-1.82	0.072*	-0.04	0.00
Proportion of urban population	0.77	0.29	2.56	0.012**	0.16	1.31
Proportion of population aged 60-69 years old	-0.04	0.12	-0.33	0.742	-0.27	0.20
Proportion of population aged 70-79 years old	-0.26	0.22	-1.18	0.241	-0.69	0.17
Proportion of population aged 80-89 years old	0.05	0.11	0.47	0.637	-0.16	0.26
Proportion of population aged 90-99 years old	0.09	0.13	0.66	0.511	-0.18	0.36
Proportion of population aged over 100 years old	0.18	0.10	1.79	0.077*	-0.02	0.38
Proportion of female population	-0.79	0.52	-1.53	0.131	-1.82	0.24
Proportion of population that received compulsory education	2.12	1.88	1.13	0.264	-1.63	5.87
Amount of medical instruments per capita	-0.10	0.10	-1.01	0.316	-0.29	0.09
Amount of government hospital beds per capita	0.15	0.11	1.38	0.171	-0.06	0.36
Amount of private hospital beds per capita	-0.01	0.01	-0.86	0.390	-0.04	0.02
Amount of physician per capita	-0.05	0.18	-0.27	0.785	-0.42	0.32
NCDs patients' rate	-0.01	0.12	-0.05	0.963	-0.25	0.24
Proportion of disabled people	0.09	0.09	1.07	0.287	-0.08	0.26
Proportion of smoking population	-0.23	0.19	-1.22	0.225	-0.60	0.14
Proportion of population that consumes alcohol	0.08	0.13	0.58	0.563	-0.18	0.34
Out Patients rate	-0.14	0.15	-0.96	0.339	-0.43	0.15
In Patients rate	-0.12	0.10	-1.23	0.223	-0.32	0.08
Proportion of population with Universal Health Coverage Scheme	2.15	0.63	2.94	0.004**	0.60	3.10

Table 7 Factors which affect overall provincial private health expenditure (Continued)

Independent Variable	B	S. E.	t	Sig.	95% C.I.	
Proportion of population with Social Security Scheme	-0.12	0.05	-2.83	0.006**	-0.22	-0.04
Proportion of population with Government Benefit	-1.20	0.69	-1.83	0.071*	-2.66	0.11
year_1	0.08	0.16	0.49	0.628	-0.24	0.39
year_2	-0.12	0.14	-0.88	0.383	-0.39	0.15
year_3	-0.10	0.13	-0.73	0.466	-0.36	0.17
year_4	-0.17	0.11	-1.60	0.114	-0.38	0.04
year_5	0.08	0.13	0.58	0.563	-0.19	0.34
Constant	-17.25	9.59	-1.58	0.118	-34.26	3.96
R-square Overall	0.12					
F-Statistics	152.3					
Prob (F-statistics)	0.000					

** , * denote 5%, 10% significant level respectively, Hausman test with statistical significance of .05

From studying the factors that affect overall provincial private health expenditure using the Fixed Effect model, it was found that factors which positively affect the overall provincial private health expenditure are gross provincial product per capita, proportion of urban population, proportion of population aged over 100 years old, and proportion of the population covered under the Universal Health Coverage Scheme. Factors with negative effects were proportion of poor people, tax per capita, proportion of the population under the Social Security Scheme, and the proportion of the population with Government Officer welfare. Independent variables are able to explain dependent variables at 10 percent and from deploying the Hausman test for the rationality of the model, there is a statistical significance of .05. It can be concluded that the FEM formula is suitable for analysis.

$$\text{Private health expenditure} = -17.25 + 0.54\text{GPP} - 0.1\text{POV} - 0.01\text{TAX} + 0.77\text{URB} + 0.18\text{AGPOP100} + 2.15\text{USC} - 0.12\text{SSS} - 1.20\text{OFC}$$

Conclusion

It can be seen that health expenditure in each province is different. The lowest health expenditure is in the North Eastern region. Households in the Bangkok Metropolitan Area have higher health expenditures in all aspects compared to the region with the lowest expenditure at 3-4 times difference from categorising province groups by socio-economic status. For provinces in each economic status group, it was found that private health expenditure is likely to increase according to economic status. The rich group has the highest private expenditure proportions for medicine and the medical supplies that they buy themselves, including supplements and vitamins, but the poor group's expenditure proportion is necessary expenditure which is healthcare services while being treated in hospital.

When the equity of private health expenditure is considered, it was found that each province has equity. This can be seen from the Lorenz curve which is far from the 45 degrees line. In comparison by region, it was found that the Southern region has the highest disparity in health expenditure. It is observable that it is the only region where the equity continues to increase annually. For each aspect of expenditure, IPD expenses has the highest disparity.

The data was analysed in order to find equity, in order to know if high income provinces also pay higher health expenditure or not. This was conducted through an equity analysis on health expenditure. The Kakwani Index was negative (pro rich) in every year. This means the correlation between income distribution and health expenses proportion is regressive. This then means that when comparing only the expenses proportions, rich provinces proportionally pay higher than poor provinces but once the income distribution is also compared, it is found to be regressive. This means high income provinces proportionally pay less than low income provinces. This shows that provincial health expenditure in Thailand still contains inequity when compared to income distribution.

When compared to the distribution of private health expenditure at the national level on the map, the province with the darkest red has the highest private health expenditure. In 2012, dark red and orange is spread all across the Northern region, North Eastern region and Southern region. However, map data in 2017 indicates that dark red and orange are mainly clustered together in the Central region and Southern region.

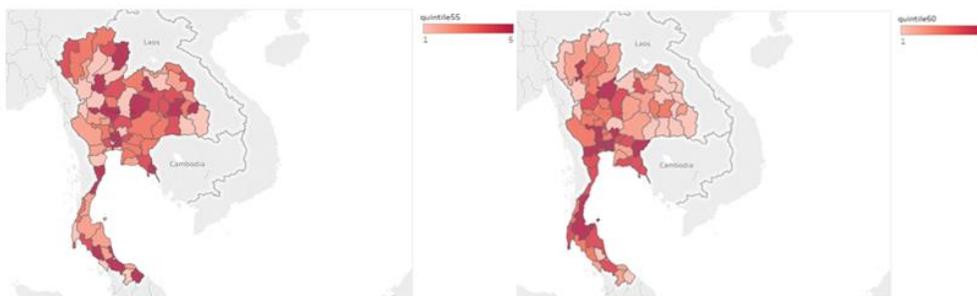


Figure 4 Private health expenditure by area in 2012 and 2017

When factors affecting the increase of private health expenditure were considered, it was found that private health expenditure increases according to demand and necessity more than supplies. This means the people's health expenses, other than health necessity, is also dependent on demand. Since demand is created from the need and ability to pay, if the people's income or their ability to pay increases, their health expenditure also increases. In addition, easy access due to being within an urban area and aging population increases demand, thus private health expenditure also increases. It was also found that if a province's rate of poverty increases, private health expenditure decreases.

It was discovered that all 3 governmental health services impact private health expenditure. The Universal Health Coverage Scheme is the only system which causes private health expenditure to increase in almost all aspects. Research conducted by Xu et al. (2011) which studied private health expenditure in 143 countries found that each form of health system has an important variable which affects private health expenditure. Their research found that if the state invests when there is higher health expenditure and there is a healthcare system through the tax system supported by the state, people in poor countries are able to reduce private health expenditure. However, for low-middle income countries to rich countries, private health expenditure increases.

A mixed healthcare system which merges state welfare and the Social Security Scheme leads to increase in health expenditure in almost all income groups in each country with increased treatment expenses, except for middle to middle-high income countries where the private expenditure decreases. Thailand has a mixed healthcare system which includes a state welfare system and Social Security system. Data from the study found that provinces with high proportions of population with the Social Security Scheme and government officer welfare leads to reduced health expenditure. Provinces with a high population with the Universal Health Coverage Scheme leads to increased private health expenditure. In 2019, there were 47.5 million people (the goal is 47.58 million people) with the national health scheme (National Health Security Office, 2019). Non & Kidsom (2020)'s research collected data from 500 people with the Universal Health Coverage Scheme. They found that the

sample group had additional expenses in using health services at an average of 1,926.67 baht per visit. In one year they paid from 2.98 to 3.80 times more to use the welfare. The additional payments included medicine and medical supplies and other things such as out of hours clinic fees and room fees. Thus, this research shows that those with the Universal Health Coverage Scheme still have additional payments when using health services. Therefore, from the above research, it is possible that the Universal Health Coverage Scheme leads to an increase in private health expenditure.

Policy Implication

Firstly, it can be seen that most private health expenditure is from OPD, medicine and medical supplies. According to data provided by the National Statistical Office, this refers to nonprescriptive household drugs, including vitamins and supplements, especially for the urban population that have easy access to these services. Thus, it leads to their increase in expenses. Therefore, health literacy is important in order for the people to have knowledge and understanding of their health. Reducing the burden of buying medicine and vitamins can reduce expenses. Reducing the need to buy medicine and vitamins will also reduce expenses, improve the Out Patient healthcare system, reduce hospital wait times, and reduce overcrowding. When people cannot endure the long wait time in state hospitals, they go to private hospitals, only to be faced with another problem which is the expensive prices (Pinprateep, 2019). Thus, the state sector should support private hospitals to disclose prices which will partly allow people to have an alternative and partly help them to reduce their expenses. The state sector should also review additional welfare in necessary benefits of medical treatment in order to reduce the private sector's burden in paying additional healthcare services. Implementing technology and providing services to people through an application or a household doctor system will help to reduce hospital visits, and may lead to a reduction in health expenditure.

Secondly, the increase of private health expenditure is dependent mainly on demand, both economically and socially, especially for income, urbanity, and aging population, all leads to an increase of out-of-pocket health expenses possibly since these factors lead to an increase in a need for healthcare. This includes how the Social Security Scheme can result in a decrease in private health expenditure, so the state sector should focus on pulling all labour outside the system into the Social Security Scheme such as farmers, motorcycle taxi drivers, taxi drivers, street vendors so that they can apply according to Article 40 to help reduce the people's health expenditure.

Lastly, the lack of equity in private health expenditure, as well as the annually increasing Gini Index, shows that poor people pay more for their healthcare compared to rich people. Most low-income citizens live in rural areas, so giving importance to income distribution, improving health service distribution to rural areas, and increasing the

accessibility to state health services is greatly needed for poor people, especially in regions with high inequity such as the Southern region.

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