WP-06

HEFPA working paper

Institute of Health Policy & Management

Understanding inequity in health care utilization: decomposition of income-related inequality and determination of horizontal inequity

International Health Policy Program (IHPP)

ERASMUS UNIVERSITEIT ROTTERDAM
INSTITUTE OF
HEALTH POLICY & MANAGEMENT

HEFPA Working Paper

Understanding inequity in health care utilization: decomposition of income-related inequality and determination of horizontal inequity

International Health Policy Program (IHPP)
Ministry of Public Health, Thailand

Acknowledgements

The authors gratefully acknowledge support from the EU-FP7 research grant HEALTH-F2-2009-223166-HEFPA on "Health Equity and Financial Protection in Asia".

8 November 2011

Table of contents

Abstract

Existing empirical evidence revealed a pro-poor nature of the utilization of outpatient (OP) service at the district health level and the inpatient (IP) admissions to public hospitals in Thailand. What remained unknown was whether such a pro-poor utilization held true after controlling for variation in the population's health need. This paper estimated an index of horizontal inequity (HI) using a standard method to decompose concentration index (CI) that captured an income-related inequality in the OP visits and IP admissions. Data were obtained from Health and Welfare Survey, a nationally representative household survey during 2003-2009. The analysis found the OP utilization at health centers and district hospitals and the IP utilization at district hospitals and provincial/university hospitals after controlling for age, gender and health status of the adult population remained pro-poor. However, the pro-poor utilization net of health need was weaker than the income-related inequity. For the pro-rich OP-IP utilization at private facilities and OP utilization at provincial/university hospitals, the HI was greater than the CI. Contribution of the individuals' health need on the income-related inequality tended to be stronger in the case of the pro-poor utilization and weaker in the pro-rich utilization, as compared with the income and non-need factors.

Keywords: concentration index, decomposition, horizontal inequity, inequality, inequity

Introduction

Thailand has achieved a universal coverage (UC) of health care for the nationwide population since the Universal Health Coverage Scheme (UCS) was introduced in 2001-02. The UCS that covers approximately 47 million populations in the informal employment sector and the economically inactive people (unemployed, children and the elderly) has effectively complemented two other health insurance schemes, namely Civil Servant Medical Benefit Scheme (CSMBS) for 5 million public employees and dependants and Social Security Scheme (SSS) for 9 million formal private employees, excluding their dependants.

Previous literature reported the relatively poor population received health care from public hospitals and facilities disproportionately more than their counterparts who were economically better off (Prakongsai et al., 2009; Tancharoensathien et al., 2011). The pro-poor utilization by the Thai population of health services in public sector continued to exist through the post-UC period. What left unknown is whether the health utilization remained pro-poor when the individuals' health need has been controlled for.

This paper determined distribution of outpatient (OP) visits and inpatient (IP) admissions during the post-UC period with respect to socio-economic status of the adult population. To better understand the determinants of health inequity, an income-related inequality was decomposed into three major components, including income, health need and non-need. The income-related inequality net of contribution of the health need was estimated to determine whether a horizontal equity or 'equal treatment for equal need (ETEN)' as contrasted to the horizontal inequity (HI) persisted.

Specific objectives

1. To measure the income-related inequality in health utilization using concentration index (CI)
2. To conduct a decomposition analysis of the CI
3. To estimate the index of HI, i.e., an inequity in health utilization adjusted for health need

Method

Data source

The main source for data analysis is Health and Welfare Survey (HWS) in 2003, 2006 and 2009. The HWS is a nationally representative household survey conducted every 1-2 years usually in April (except in January-June for 2006 and 2007) by the National Statistical Office. The Survey relies on a structured face-to-face interview of respondents or proxies who are members of the sampled households, representing approximately 70 thousand individuals.

The health module in HWS contains reported illnesses and health service utilization to follow in terms of OP visits and IP admissions. Recall of the non-hospitalized illness is referent to one month prior to the interview dates. Choices of health facilities for the OP visits for a presence of the last illness episode cover both informal care providers and various levels of public and private providers. The reference period for a recall of the IP admissions is one year prior to the interview. Choices for the hospitalization care exclude the informal providers, health centers and private medical clinics.

Analysis approach

Health service utilization

Health care services in the analysis were limited to those provided by formal sector providers which were classified by levels of public and private health facilities. These included health centers (for OP service), district hospitals, and provincial hospitals combined with university hospitals, as well as private medical clinics (for OP service) plus private hospitals. Self medication, pharmacies/drug stores, herbal or traditional medicines, and local healers which typically are not covered by the public insurance schemes were excluded.

The number of OP visits were obtained by linking directly to the frequency of the reported non-hospitalized illnesses over the reference period (i.e., up to 8 episodes per one month). The annualized (12-month) OP visits per facility type were then calculated.

The number of hospital admissions per capita per year for each health facility was determined similarly, except there is no need to multiply by 12 as the reference period is one year.

Economic status

To measure economic status that captures living standards or ability to pay of the individuals, the analysis used the household's total income averaged across all members. Both in-cash (earned) and in-kind (unearned) incomes were combined together as total income for each individual who reported a positive income. As the numerator, the household income was equal to a summation of the total income over all members of a household. To account for household variation in the economy of scale for the denominator, the number of adults and children per household was transformed into the equivalent adult units using the OECD-modified equivalence scale below (Haagenars et al., 1994). The scale effectively assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child. The household income per equivalent adult, equally shared by each household member measured the economic status of the individuals.

(1) Equivalent adults = 1 + 0.5(Adults – 1) + 0.3(Children)

Concentration index

Calculation of CI followed a standard method for the large scale household surveys (O' Donnell et al., 2008). The distribution of OP visits and IP admissions over an economic gradient of the individuals, which represents income-related inequality, was summarized into the CI for each type of health facilities using a linear regression equation below.

(2) $$2\sigma_r^2\left(\frac{h_i}{\mu}\right) = \alpha + \beta r_i + \varepsilon_i$$

Where σ_r^2 is the variance of the (sampling weighted) fractional rank (r) of an individual (i) in the income distribution ($r_i = i/N$, given N = number of all individuals and i was ranked according to his/her income);

μ is the mean of the number of OP visits or IP admissions (h_i) of an individual (i);

Thus, CI is an ordinary least square (OLS) estimate of the regression coefficient (β) for the fractional rank.

The CI, ranging from -1.0 to +1.0, captures the extent to which health utilization volume concentrates among different population subgroups (in this case, the rich vs. the poor). A CI of zero means an equal distribution of the services throughout the economic

gradient. A negative CI indicates a concentration among those who are poorer and a positive CI reflects a concentration among those who are richer.

Inequity decomposition and horizontal inequity

The analysis decomposed the income-related inequality into contributing factors of the demand for health services, which varied systematically with economic status, i.e., how far the health inequity could be explained by an inequality in one factor rather than another. The decomposition analysis was conducted through a regression of the CI of OP visits and IP admissions on three major factors: (1) household income (in logarithmic scale) per equivalent adult; (2) health need; (3) and non-need.

To estimate horizontal inequity (*HI*), the income-related inequality (*C*) is subtracted by a summation (across all *K* health need factors) of the products between the elasticity of health utilization with respect to each need factor (η_k) and CI for each need factor (C_k) according to the below equation.

(3) $$HI = C - \sum_{k=1}^{K} \eta_k C_k$$

In this paper, factors associated with the need for health services included age, gender and health status. Other (non-need) factors associated with health utilization were education attainment (college vs. below), location of household (urban vs. rural areas), and health insurance entitlement (UC plus uninsured vs. the rest).

Health status

In addition to age and gender, factors to be controlled for the need for OP and IP services included health status. In this paper, the multi-item perceived health profile was used for this purpose.

In 2003, 2006 and 2009, individual household members who were adults (aged over 15 years and no proxies allowed) were also asked if they had encountered some difficulties during a prior month when performing daily activities. In 2009, questions probing the individual health status followed verbatim the standard format of the Euro QoL (known as EQ5D) when the Thai version was readily available. The EQ5D-based health profile contained 5 dimensions related to physical and mental activities, including mobility, self-care, usual activities, discomfort and anxiety/depression, each rated in a 1-3 scale (for example, 1=no problem, 3=unable to perform). The raw data were recoded to make a higher (or lower) score represent a better (or worse) health status. Then, all five-item scores were linearly summed up to a possible range of 5-15, which was used in the analysis. In a sensitivity analysis, the EQ5D health state as revealed by each survey respondent was then transformed

into the cardinal utility score using the newly available Thai tariff for a total of 243 (or 3^5) possible health states (Tongsiri, 2009). The possible score range of a typical utility was 0-1, where 1=perfect health and 0=death. However, there were 68 health states valued worse than death (or the utility score <0) in the Thai tariff, for example, health state '22333'=-0.022; '23333'=-0.143; '33333'=-0.454.

The health status questionnaires in 2003 and 2006 were similar. However, they contained two additional items, including concentration/recall and social activity participation. These 7 items were scored according to the perceived severity in a 1-5 point rating scale (1=very severe and 5=no problem). Because the 2003 and 2006 questionnaires on health status were not designed with a purpose of conversion to the utility score, the raw scores were used instead. Only the first 5 items similar to the EQ5D were included in the analysis with a possible score range of 5-25.

Results

1. Health utilization and general characteristics

Table 1 describes health utilization profile and related general characteristics of the Thai adult population who responded to the heath status questionnaire surveys in 2003, 2006 and 2009 (n=37,202; 32,747 and 30,668, respectively). The annualized OP visits for all four types of health facilities were approximately 1.6, 1.3 and 1.8 per capita in 2003, 2006 and 2009, respectively. The total IP admissions per year were 0.099, 0.125 and 0.094 per capita over the same period.

Median household income per equivalent adult was approximately 3-6 thousand Baht. Male gender represented a little less than half (41-45%) and those completed college education accounted for 7-8% of the responding adult population. The urban residents and those entitled to the UCS or the uninsured were 30-33% and 74-78%, respectively. These general adult populations tended to perceive their health status as in a very good condition (mean score, 23.4 out of 25 in 2003-2006, 14.5 out of 15 in 2009 for health status profile and 0.90 in 2009 for EQ5D-based utility).

Table 1. Descriptive statistics of health utilization and related factors

	2003 (n=37,202)	2006 (n=32,747)	2009 (n=30,668)
1. *Health utilization*			
1.1 Annualized OP visits per capita (mean, SD) [a]			
- Health center	0.556 (2.523)	0.364 (2.058)	0.578 (2.570)
- District hospital	0.598 (2.611)	0.489 (2.372)	0.587 (2.588)
- Provincial/university hospital	0.324 (1.945)	0.312 (1.911)	0.485 (2.364)
- Private hospital and clinic	0.141 (1.293)	0.126 (1.223)	0.124 (1.211)
1.2 IP admissions per capita per year (mean, SD) [a]			
- District hospital	0.046 (0.271)	0.054 (0.335)	0.038 (0.338)
- Provincial/university hospital	0.039 (0.286)	0.056 (0.336)	0.044 (0.295)
- Private hospital	0.014 (0.146)	0.015 (0.164)	0.012 (0.189)
2. *General characteristics*			
2.1 Ability to pay			
- Income per equivalent adult (median, IQR) [b]	3,103 (1,538-6,207)	5,924 (3,310-10,427)	4,767 (2,667-8,800)
2.2 Health need			

	2003 (n=37,202)	2006 (n=32,747)	2009 (n=30,668)
- Years of age (mean, SD) [c]	40.0 (16.5)	43.1 (15.7)	43.7 (16.3)
- Male (%)	45.2	40.6	41.4
- Health status score (mean, SD) [d]	23.4 (2.8)	23.4 (2.6)	14.5 (1.1)
- EQ5D-based utility (mean, SD)	NA	NA	0.9027 (0.1791)
2.3 Non-need			
- College education (%)	6.5	7.9	8.4
- Urban area (%)	33.2	29.9	31.2
- UCS or uninsured (%)	78.3	73.8	73.6

Note: Sampling weight applied

[a] including zero visit or admission

[b] Household income in current-year Baht, IQR=inter-quartile range

[c] Adults (age $\geq$ 15 years) only

[d] Possible score range: 5-25 in 2003-2006; 5-15 in 2009

2. Income-related inequality

Table 2 summarizes inequity in the annualized utilization of health services with respect to income and horizontal inequity after adjusted for health need of the adult population for each of the three years.

In 2003, the OP visits to health centers and district hospitals concentrated more among those living with a relatively low income (as represented by the negative sign of CI). In contrast, the visits to provincial/university hospitals and private hospitals/clinics concentrated more among relatively high income adults (as represented by the positive CI). The utilization of OP service at the district health level remained statistically and significantly pro-poor in 2006 and 2009, whereby the pro-rich nature of the OP visits in the larger level and private facilities persisted through out the three years.

The IP admissions to district hospitals and provincial/university hospitals were statistically and significantly pro-poor in all three years. Similar to the private OP visits, admissions to the private hospitals statistically and significantly concentrated more among the economically better off.

Table 2. Concentration index and horizontal inequity in health utilization

	2003		2006		2009	
	CI	HI	CI	HI	CI	HI
1. *OP visits*						
- Health center	-0.3205	-0.2802	-0.2776	-0.2432	-0.2106	-0.1751
- District hospital	-0.2659	-0.2226	-0.2444	-0.2019	-0.2404	-0.1969
- Provincial/university hospital	0.0297 [a]	0.0824	0.0921	0.1414	0.1354	0.2007

	2003		2006		2009	
	CI	HI	CI	HI	CI	HI
- Private hospital and clinic	0.3391	0.3786	0.4281	0.4516	0.4570	0.5109
2. *IP admissions*						
- District hospital	-0.3086	-0.2705	-0.2679	-0.2296	-0.2330	-0.1676
- Provincial/university hospital	-0.1072	-0.0692	-0.0759	-0.0336	-0.1277	-0.0838
- Private hospital	0.3058	0.3449	0.3569	0.3877	0.3168	0.4091

[a] P>0.10; otherwise, P<0.05

3. Decomposition of income-related inequality

3.1 Concentration of factors contributing to health inequity

Table 3 presents concentration indices of all factors, both need and non-need contributing to an inequity in health utilization. As expected, the income even in logarithmic scale remained pro-rich. Those who were relatively older and entitled to the UCS or were uninsured tended to concentrate more among the relatively low income adults. Those who were male, had relatively better health status, were college educated and lived in the urban area tended to concentrate more among the relatively high income group. Notably, the CIs for all factors were statistically significant (P<0.05).

Table 3. Concentration index for health utilization related factors

	2003	2006	2009
1. *Economic status*			
- Income [a]	0.0733	0.0564	0.0635
2. *Health need*			
- Years of age	-0.0318	-0.0225	-0.0099
- Male	0.0134	0.0231	0.0581
- Health status score	0.0122	0.0098	0.0045
- EQ5D-based utility	NA	NA	0.0120
3. *Non-need*			
- College education	0.6375	0.6613	0.8496
- Urban area	0.3393	0.3310	0.3280
- UCS or uninsured	-0.1264	-0.1517	-0.2074

[a] Household income per equivalent adult (in logarithmic scale)

3.2 Association between health utilization and the inequity contributing factors

Tables 4A, 4B, 4C1 and 4C2 show magnitude of the association between economic status, health need and non-need factors and the number of OP visits and IP admissions to various types of health facilities in 2003, 2006, 2009 for health status profile and 2009 for EQ5D-based utility score, respectively.

Consistently with the sign of CI measures (in Table 2), adult population who had relatively high income tended to seek the OP service less often from health centers and district hospitals but more often from provincial/university hospitals and private hospitals and

clinics than the low-income counterpart. Similarly, frequency of the IP admissions was associated with the population income negatively for district hospitals but positively for private hospitals. The admission-income association for provincial/university hospitals was inconsistent, modestly negative in 2003, moderately positive in 2006, and strongly negative in 2009.

Those who were older tended to have the OP visits more often for all three types of the public facilities but less often to private hospitals and clinics than the younger counterpart. In contrast, the older age group got admitted less frequently to district hospitals. Associations between the IP admissions and years of age for provincial/university hospitals and private hospitals were inconsistent over the three study years.

Regardless of the health facility types, male adults had health utilization less frequently than the female (except for private hospitalization in 2006). Similarly, those who reported a relatively higher score on their health status (as represented by health profile in 2003-2009 or utility score in 2009) consistently sought less health services than the poorer health group.

For the non-need factors, an association for all types of health facilities between the utilization volume and education attainment was relatively weak and inconsistent. In a contrary, location of households and health insurance entitlement played an additional important role in health service utilization. The district health system including health centers and district hospitals was in favor of those living in the rural area and the UCS beneficiaries as well as the uninsured people than the urban residents and those entitled to other insurance schemes. This was just opposite to the utilization of provincial/university hospitals and private facilities.

Table 4A. Partial elasticity of health utilization with respect to each factor, 2003

	OP visits				IP admissions		
	HC	DH	PH/UH	Private	DH	PH/UH	Private
1. *Economic status*							
- Income [a]	-1.83	-1.14	1.15	2.87	-2.38	-0.02	3.38
2. *Health need*							
- Years of age	0.46	0.33	0.33	-0.18	-0.48	0.09	-0.04
- Male	-0.14	-0.09	-0.07	-0.16	-0.14	-0.06	-0.11
- Health status score	-6.15	-7.86	-10.17	-7.22	-7.78	-7.58	-7.46
3. *Non-need*							
- College education	0.0005	-0.01	-0.01	-0.03	0.001	-0.02	0.08
- Urban area	-0.22	-0.18	0.08	0.28	-0.11	0.04	0.10
- UCS or uninsured	0.26	0.07	-0.60	-1.09	0.04	-0.13	-0.57

[a] Household income per equivalent adult (in logarithmic scale)

Table 4B. Partial elasticity of health utilization with respect to each factor, 2006

	OP visits				IP admissions		
	HC	DH	PH/UH	Private	DH	PH/UH	Private
1. *Economic status*							
- Income [a]	-1.93	-1.78	1.34	3.99	-1.95	0.25	5.58
2. *Health need*							
- Years of age	0.72	0.37	0.52	-0.85	-0.37	-0.07	-0.03
- Male	-0.07	-0.07	-0.11	-0.03	-0.07	-0.06	0.03
- Health status score	-5.19	-7.82	-8.44	-6.73	-8.52	-8.88	-7.39
3. *Non-need*							
- College education	-0.005	0.0003	-0.01	-0.005	-0.01	-0.005	-0.06
- Urban area	-0.20	-0.11	0.05	0.27	-0.14	-0.06	0.06
- UCS or uninsured	0.17	0.06	-0.58	-0.98	0.07	-0.09	-0.82

[a] Household income per equivalent adult (in logarithmic scale)

Table 4C1. Partial elasticity of health utilization with respect to each factor, 2009 (with health profile)

	OP visits				IP admissions		
	HC	DH	PH/UH	Private	DH	PH/UH	Private
1. *Economic status*							
- Income [a]	-1.09	-2.08	1.92	2.88	-1.33	-1.50	6.57
2. *Health need*							
- Years of age	1.11	0.86	0.96	-0.53	-0.30	0.01	0.34
- Male	-0.11	-0.05	-0.06	-0.07	-0.20	-0.14	-0.20
- Health status score	-4.13	-7.25	-11.71	-12.31	-12.75	-7.97	-17.30
3. *Non-need*							
- College education	-0.01	0.01	-0.03	0.03	-0.03	-0.02	-0.05
- Urban area	-0.14	-0.12	0.01	0.31	-0.09	0.05	0.24
- UCS or uninsured	0.24	0.12	-0.47	-0.87	-0.07	-0.09	-0.13

[a] Household income per equivalent adult (in logarithmic scale)

Table 4C2. Partial elasticity of health utilization with respect to each factor, 2009 (with utility)

	OP visits				IP admissions		
	HC	DH	PH/UH	Private	DH	PH/UH	Private
1. *Economic status*							
- Income [a]	-1.09	-2.09	1.91	2.87	-1.43	-1.52	6.53
2. *Health need*							
- Years of age	1.08	0.83	0.91	-0.58	-0.21	0.01	0.31
- Male	-0.10	-0.04	-0.06	-0.07	-0.20	-0.14	-0.20
- EQ5D utility	-1.63	-2.75	-4.46	-4.65	-4.10	-2.88	-6.35
3. *Non-need*							
- College education	-0.01	0.01	-0.03	0.03	-0.03	-0.02	-0.05
- Urban area	-0.14	-0.12	0.01	0.31	-0.09	0.05	0.24
- UCS or uninsured	0.24	0.12	-0.48	-0.88	-0.07	-0.10	-0.14

[a] Household income per equivalent adult (in logarithmic scale)

3.3 Horizontal inequality

After the individuals' health need factors including age, gender and health status have been controlled for, the remaining concentration in health utilization became less pro-poor for the OP visits to health centers and district hospitals and for the IP admissions to district hospitals and provincial/university hospitals (Table 2). In contrast, the pro-rich utilization of OP service in provincial/university hospitals and of the OP and IP services in private facilities became stronger when the individuals' health need was taken into account.

In sum, the strongest pro-poor utilization of health services net of health need was found in 2003 on health center visits (HI, -0.280) and district hospital admissions (HI, -0.271), whereas the strongest pro-rich utilization was on the OP visits to private hospitals and clinics (HI, 0.511 and 0.452 in 2006 and 2009, respectively).

3.4 Contribution of economic status, health need and non-need factors on health inequity

Figures 1A, 1B, 1C1 and 1C2 illustrate magnitudes of the contribution of various factors on the income-related inequality in health utilization in 2003, 2006 and 2009 for health status profile and for EQ5D-based utility, respectively.

For the pro-poor utilization (i.e., negative CI) of OP and IP services, contribution of the health need on the CI for health centers and district hospitals in 2003-2009 ranged from 12-28%, which was smaller than that of the income (in all cases) and non-need (except for admissions to district hospitals in 2009). For the pro-poor IP admissions to provincial/university hospitals, the contribution of health need was relatively higher (34-56%). The health need contribution was even larger than the income contribution (except in 2009) and the non-need contribution (in all three years).

For the pro-rich utilization (i.e., positive CI), the health need-related inequality in utilization still had a negative sign just opposite to the signs of the income-related and non-need inequalities. Notably, the income and non-need factors played a very strong contribution to such a pro-rich utilization of OP visits to provincial/university hospitals and both OP visits and IP admissions to private facilities.

Notably, change in the use of health status measures for representing the health need from health profile (Figure 1C1) to the EQ5D-based utility (Figure 1C2) had very little effect on the percentage contribution to the income-related health inequity.

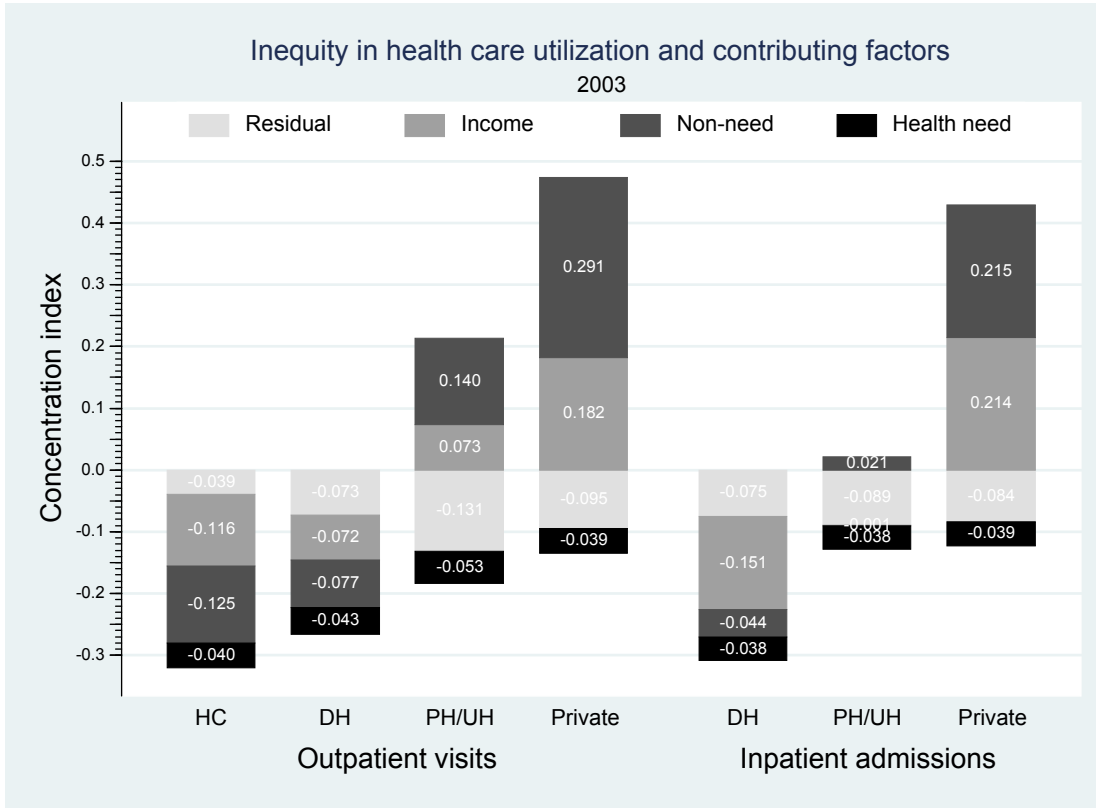

Figure 1A Contribution of factors on inequity in health utilization, 2003

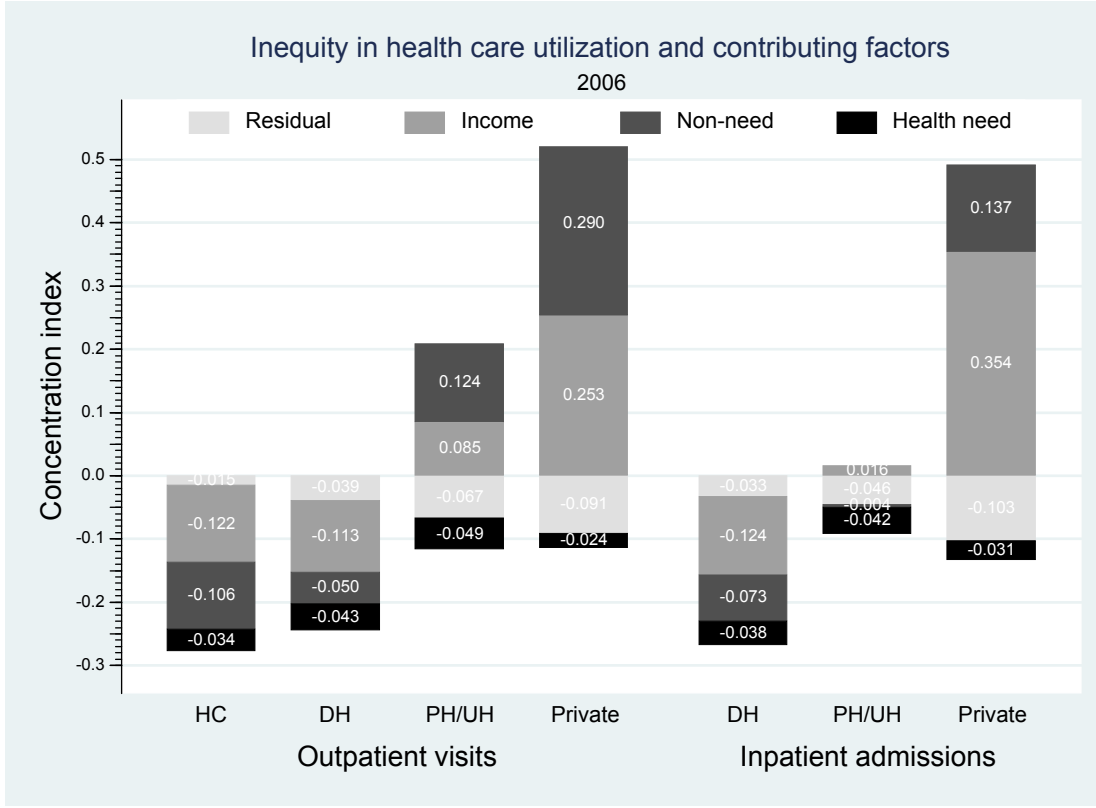

Figure 1B Contribution of factors on inequity in health utilization, 2006

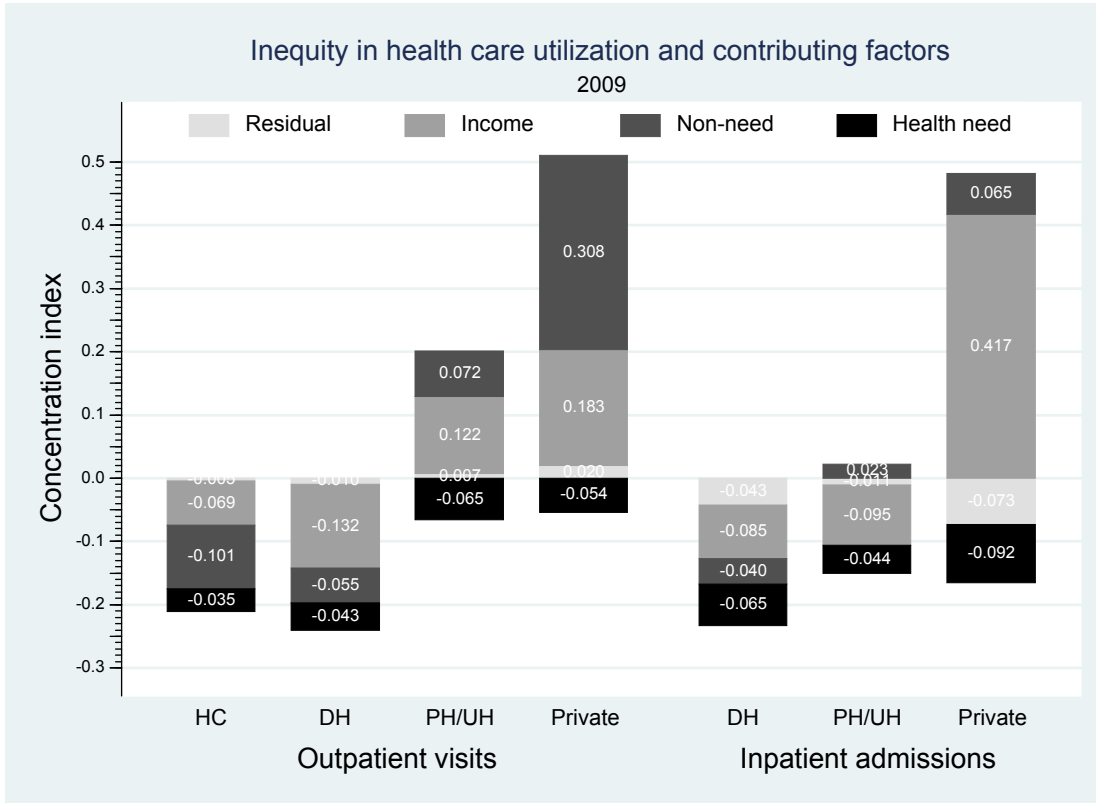

Figure 1C1 Contribution of factors on inequity in health utilization, 2009 (with health profile)

Conclusion

This paper confirms that during the post-UC period (2003-2009), the utilization of OP service at the district health level (health centers and district hospitals) and the IP admissions to public hospitals (district hospitals and provincial/university hospitals) after controlling for age, gender and health status of the Thai adults remained pro-poor. As the need for health services among the low-income population was disproportionately larger than in the high-income counterpart, the pro-poor utilization net of the health need in the public sector became weaker. In a contrary, the pro-rich, net-of-need utilization of OP and IP services in private sector and OP service in provincial/university hospitals became stronger. Contribution of the individuals' health need on the income-related inequality tended to be stronger in the case of the pro-poor utilization and weaker in the pro-rich utilization, as compared with the income and non-need factors.

Reference

Hagenaars A, de Vos K, Zaidi MA. Poverty Statistics in the Late 1980s: Research Based on Micro-data. Office for Official Publications of the European Communities, Luxembourg. 1994.

O'Donnell O, van Doorslaer E, Wagstaff A. Analyzing health equity using household survey data: a guide to techniques and their implementation. Washington, DC: The World Bank Institute, 2008.

Prakongsai P, Limwattananon S, Tangcharoensathien V. The equity impact of the universal coverage policy: lessons from Thailand. Advances in Health Economics and Health Services Research. 2009; 21: 57-81.

Tangcharoensathien V, Limwattananon S, Prakongsai P. The equity impact of Universal Coverage: health care finance, catastrophic health expenditure, utilization and government subsidies in Thailand. Report of the Consortium for Research on Equitable Health Systems (CREHS), International Health Policy Program (IHPP), June 2011.

Tongsiri S. The Thai population-based preference scores for EQ5D health states, Aug 2009.