

Research Article



Systematic Review of Published Studies on Healthcare Economic Evaluation in Cambodia, Myanmar and Laos.

Phung Thu Hoa Tran^{1,2}, Ha Thi Thanh Tran^{1,2}, Thuy Van Ha³, Trung Quang Vo^{1,2*}

¹Department of Pharmacy Administration, Faculty of Pharmacy, University of Medicine and Pharmacy, 700000, Vietnam.

²Professional Healthcare Management, Education and Research center (ProHES), Ho Chi Minh City 700000, Vietnam.

³Department of Health Insurance, Ministry of Health, Hanoi 100000, Vietnam.

*Corresponding author's E-mail: voquangtrungdk@gmail.com

Received: 29-11-2016; Revised: 18-01-2017; Accepted: 09-02-2017.

ABSTRACT

At present, health economic evaluation studies are vital in decision on allocating healthcare resource. All of three developing countries in the Southeast Asia including Cambodia, Myanmar and Laos are facing the limited health care budgets and their healthcare systems have not really improved since 1945. The objective of this study, which is designed as a systematic review, is to explore the situation of economic evaluation studies in three nations. In order to aid the development of this study, in the end of July 2016, databases of numerous sources, namely PubMed, Science Direct, Google Scholar, and Cochrane library by using the following keywords: 'economic evaluation', 'economic analysis', 'cost minimization', 'cost effectiveness', 'cost utility', 'cost benefit', 'Laos', 'Cambodia', 'Myanmar'. All articles were included if: 1) pharmaco-economic or health economic evaluation were conducted in Cambodia, Myanmar and Laos setting; 2) primary or secondary data; 3) published in English; 4) published between 2000 and 2016. Exclusion criteria were as followings: 1) editorial, review or methodological articles; 2) not in health sector. From 1378 records found, sixteen articles met selection criteria. Average number of articles by years is 1-2 papers except in 2015 (3 papers). Base on types of economic evaluation study, 87.5 percent is cost effectiveness analysis, only one study conducted cost saving. This review shows clearly the current situation and an urgent need for an increase of quantity of health economic studies in Cambodia, Myanmar and Laos. Basically, national methodological guidelines for conducting and reporting economic evaluation in individual nation should be developed as soon as possible.

Keywords: Cambodia, cost benefit, cost effectiveness, economic analysis, economic evaluation, Laos, Myanmar, systematic review.

INTRODUCTION

Health is an element of economic growth and a factor of the well-being of the population. Recently, there have been some important developments in health economic. Health economic evaluations are conducted to inform health care resource allocation decisions. Economic evaluation has been defined as "the comparative analysis of alternative courses of action in terms of both their costs and their consequences"². Economic evaluation is one of the tools available to help choose wisely from a range of alternatives and implement efficient resources³. Furthermore, with the objective to evaluate the quality of economic evaluation results, the researchers, policy makers and health care providers need to know including the appropriate methods used in the studies, the valid results and to the ability settings studies be applied⁴. Economic evaluation is used to varying degrees in different countries. How widespread its use is, and the purposes for which it is used, depend to a great extent on the country's dominant health system, whether public, social insurance or private insurance based⁵.

In spite of a number of economic evaluation studies have been performed in various countries and regions, such as Vietnam⁶, Thailand⁷, India⁸, Bangladesh⁹, Japan¹⁰, Nigeria¹¹, Iran¹², and South Africa¹³, up to until now, it was hard to find quality studies with an extensive view

about the health economics in all three countries including Cambodia, Myanmar and Laos. Cambodia, Myanmar, and Laos are three lower middle - income and developing countries, which are located in Southeast Asia. Health system in these countries have not really developed since The Second World War¹⁴⁻¹⁶. Although some differences in the health system's improvement among three nations, limited health care budgets is the same in Cambodia, Myanmar, and Laos¹⁷. Based on the above, we should develop systematic review of literature evaluates health economic evaluation studies conducted in three nations including Cambodia, Myanmar, and Laos involving pharmaceuticals (drugs and vaccines) between 2000 and 2016.

METHODS

Study design

This study was designed as a systematic review based on the PRISMA guidelines¹⁸. It was scoped in publication period of 2000 to July 2016 in international journals.

Strategy of exploration

The literature review search was updated in July 2016 with citations from pharmaco-economic and health economic evaluation conducted in Cambodia, Myanmar, and Laos form 2000 to July 2016. The database of PUBMED (MEDLINE), SCIENCE DIRECT, COCHRAN LIBRARY, and GOOGLE SCHOLAR were chosen to search



for scholarly articles and peer-reviewed publications, in which their contents matched the following keywords: ‘economic evaluation’, ‘economic analysis’, ‘cost minimization’, ‘cost effectiveness’, ‘cost utility’, ‘cost benefit’, ‘Cambodia’, ‘Laos’ and ‘Myanmar’. Meanwhile, considering of Science Direct databases, this review is used the builder to create our search such as ‘economic evaluation’ or ‘economic analysis’ or ‘cost minimization’ or ‘cost effectiveness’ or ‘cost utility’ or ‘cost benefit’ AND (‘Laos’OR ‘Cambodia’ OR ‘Myanmar’) with Abstract, Title, Keywords and the period of time from 2000 to 2016.

Inclusion and exclusion criteria

All publications were comprised if systematic review intend to group and include articles which consist of a pharmaco-economic and health economic evaluation of health or any relevant interventions in three included countries. Published articles were considered studies with primary or secondary data. Furthermore, economic evaluation studies were qualified should their publication language was English and the content were related to humans. Nevertheless, exclusion was made in case of publications being review, editorial, or methodological articles or not perform both the costs and outcomes of a study. Studies, which content were not related to the health sector, were not implemented in humans and were not applied in the context of Cambodia, Myanmar and Laos, were rejected. The first author reviewed all identified abstracts. (See **Figure 1**. Flow diagram for systematic literature search and evaluation of including publications).

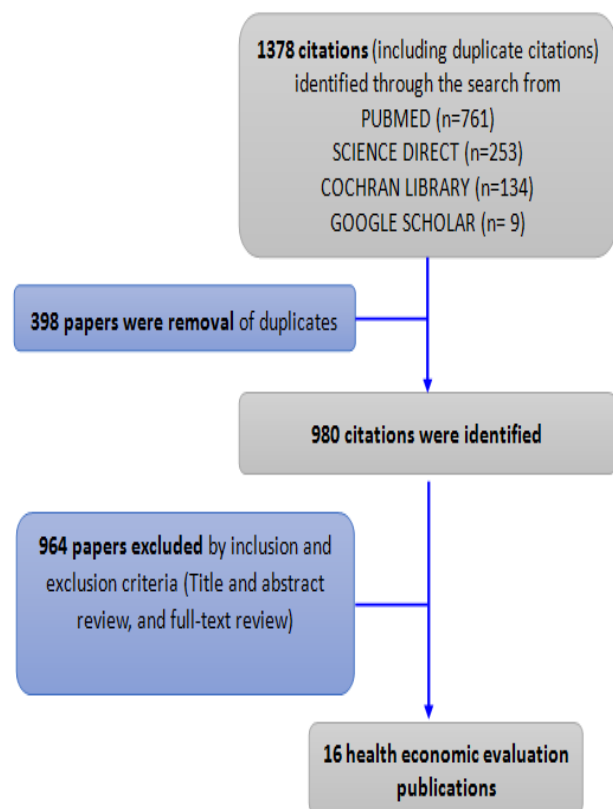


Figure 1: Flow diagram for systematic literature search and evaluation of including publications

Evaluation of economic evaluation studies in healthcare

This study analysed the economic evaluation literature and a review of the technical characteristics of the article which is consisted of the following information such as number of authors, training of primary author, country of residence of primary author, publication year, journal publishing, the journal’s origin (country where the journal is published). Moreover, this study also explored types of costs including economic evaluation used in publications, the primary outcomes, study design, perspective considering if the foremost goal of any study was economic evaluation, and funding source.

RESULTS AND DISCUSSION

After a search conducted in July, 2016 which resulted in a removal of 398 papers of duplicates, a total of 980 citations were identified, in which 964 titles and/or abstracts were excluded by reviewers due to their incompetence to meet required criteria, also there were full-text reviews being rejected as their content was not related to the study question. The review unveiled that sixteen full text publications were retrieved and identified.

See **Figure 1** for flow chart for systematic literature search and evaluation of including publications.



Figure 2: Included studies by authors and publication year

As statistics are shown, the total number of included studies from 2000 to 2016 was 16 which were the works of Cambodia, Myanmar, Laos’s authors or foreign authors. In the years of 2000, 2004, 2005, 2007, 2008, 2009 and it was noticeable that there was only one study published each year. Meanwhile, in the years of 2014 and 2010, there were two and three studies, respectively. In 2015, the number of study rose to four studies, which was acknowledged as the highest rate of publication throughout the survey. In reference of 16 studies with various methodology and the subject of evaluation during a period of 16 years, it was concluded that the average number of publications per year was one (range from 0 to 4), and 100 percent of articles on health economic

evaluations program in Cambodia, Myanmar, Laos were published in international journals. In term of when the articles were published, the major type of correspondent or first authors (n=4: 25.0%) reported by Cambodian author¹⁹⁻²², (n=1: 6.3%) reported by Burmese author (23), (n=0: 0.0%) reported by Lao’s author and the remainder

(n=11: 68.8%) was foreign authors (such as USA, Italia, France, Germany, England, and Thailand). Most of studies included collaboration with foreign institutions (see **Figure 2**).

Table 1: The characteristic of health economic evaluation studies (n=16) in Cambodia, Myanmar and Laos

Characteristics of Included Studies	N	%	Characteristics of Included Studies	N	%			
Type of correspondence or first author			Time horizon					
			≤ 1 year	6	37.5			
			>1 - ≤5 years	3	18.8			
Local	5	31.3	> 5 – ≤10 years	2	12.5			
Foreign	11	68.8	Over 10 years	1	6.3			
Currency of reported results			Not specified	4	25.0			
			US dollars	15	93.8			
			Other	1	6.3			
Type of journal			Type of cost included **					
			1 item	7	43.8			
			2 items	2	12.5			
Medical/Clinical	16	100.0	3 items	1	6.3			
Language published			N/a	6	37.5			
			English	16	100.0			
Methodology of health economic evaluation			Type of outcome					
			QALY/DALY, ICER	11	68.8			
			Cost effectiveness analysis (CEA)	16	100.0			
Cost benefit analysis (CBA)	2	12.5	Monetary	6	37.5			
Cost utility analysis (CUA)	1	6.3	Others	3	18.8			
Cost – savings	1	6.3	Type of sensitivity analysis					
Mixed	4	25.0		One-way analysis	4	25.00		
				Univariate/multivariate regression	1	6.3		
Type of intervention			Probabilistic analysis	1	6.3			
			Prevention interventions	5	31.3	Other	1	6.3
			Diagnostic procedures	1	6.3	Not performed	3	18.8
Curative procedures	1	6.3	N/a	6	37.5			
Treatment	7	43.8	Primary funding resources					
Mixed	3	18.8		Government	3	18.8		
Other	7	43.8		Private non - profit organization	4	25.0		
Type of perspective			Healthcare industry	1	6.3			
			Societal	5	31.3	N/a	8	50.0
			Payer	2	12.5	Type of study design		
Provider	5	31.3	Modeling	8	50.0			
Mixed	2	12.5	Retrospective data analysis	2	12.5			
N/a	6	37.5	N/a	7	43.8			
Type of data used			Data analysis by software					
			Primary data	11	68.8	Microsoft Excel	2	12.5
			Secondary data	4	31.3	TreeAge	3	18.8
Mixed	1	31.3	Other	2	12.5			
			N/a	9	56.3			
<i>* Consisted of public health, health policy</i>			<i>** Consist of direct medical costs; direct non-medical costs; and indirect costs and out of pocket</i>					
<i>n/a: Not available</i>								

As can be seen from Table 1, majority of the papers (n=15: 93.8%) were published in medical/clinical journals, one papers (6.3%) was non-medical journals³⁴. Of the included article, the review showed that CEA was the most frequently published economic evaluation in Cambodia, Myanmar and Laos (n=16: 100.0%). Additionally, a quarter of studies were combined methodology with two studies for CEA and CBA, one study for CEA and cost - saving and one study for CEA and CUA. The benefits in this studies have been define as cost saving (mainly saving in medical costs) without measuring and valuing the monetary values of health gained by the intervention. Among the health and health-related interventions of studies, the characteristics of the interventions that were consisted of prevention interventions (n=2: 12.5 %), curative procedures (n=1: 6.3%), treatment (n=4: 25.0%), mixed types (n=3: 18.8%) and other (n=6: 37.5%). The perspective and study design of the economic evaluation publications which were mentioned in were the same (n=10: 62.5%). Considering the perspective, the perspective of an economic evaluation study is an important issue as it affects the measurement of both costs and outcomes of interventions. Most of studies used disease specific outcome measures such as mortality rates, number of patients detected or number of complications, and none generic measures such as "life years gained or saved. Majority of reviewed studies (62.5%) determined their perspective. This suggests that many authors are aware of the importance of the perspective and its effect on the costs and outcomes. Among the studies which stated their perspective, many studies could be understood, though not explicitly recorded. Societal perspective and were the most common perspective, followed by provider perspective (n=3: 18.8%), the mixed various perspective (n=2: 12.5%), payer perspective (n=1: 6.3%) and not available (n=6: 37.5%). In the term of study design, the most frequently method of study design was modeling (n=8: 50.0%). There were only two studies, which had retrospective data analysis design and six studies did not mention study design term. We found that 62.5% of studies performed some sort of sensitivity analysis. Sensitivity analysis helps to assess reliability of the findings for the context of the study and can facilitate consideration of the generalize ability of findings to other settings. The majority of the studies conducted one – way sensitivity analysis (n=4: 25.0%). In the other hand, there was only one study conducted univariate/multivariate regression and probabilistic analysis and six studies which sensitivity analysis were not clearly.

Table 1 revealed that over half of surveyed articles using primary data (n=11: 68.8%) while the majority of remaining using secondary data (n=4: 25.0%) and one articles were mixed both primary and secondary data (n=1: 6.3%). The analysis showed that 62.5% of the studies reported their time horizon clearly. Among

those, six studies had time horizons of less than one year (37.5%), three studies (18.8%) between one and five years, two studies (12.5%) between 5 and 10 years and only one study (6.3%) over 10 years. The number of articles using US dollars as currency were the most common type with 15 studies, and only one study using other currency (n = 1: 6.3%). About funding resources, 25.0% of economic evaluation studies were supported by private non – profit organization, 18.8% were supported by government, 6.3% were supported by healthcare industry, none studies had no funding and 50.0% had no clearly funding resources. The interest of researchers and funding agencies could also play the role as the majority or research in Cambodia, Myanmar and Laos. Budget was funded by government and private non- profit organizations (such as Rockefeller Foundation, Bill and Melinda Gate's Foundation, German Federal Ministry for Economic Cooperation and Development). Microsoft Excel (n=2), TreeAge (n=3) were the most favorable software to be used to analysis data in the papers.

Table 2: Comparison of the proportion of economic evaluation publications in Cambodia, Myanmar, Laos from 2000 to 2016.

Disease categories	N (%)	Disease categories	N (%)
Vaccination	3 (18.8)	Schistosomiasis	1 (6.3)
HIV	2 (12.5)	Encephalitis	1 (6.3)
Diarrhea	1 (6.3)	Traumatic osteomyelitis	1 (6.3)
Malaria	3 (18.8)	Mental Health	2 (12.5)
Dengue	2 (12.5)	Diabetes mellitus Type 2	1 (6.3)

As can be seen from Table 2, fifty percent of disease was infection disease, including HIV (n=2, 12.5%)^{30,22}, diarrhea (n=1: 6.3%)²⁸, malaria (n=3: 18.8%)^{23,32,33} and dengue (n=2: 12.5%)^{24,27}. Non - infection disease counted for 31.3%, including schisto somiasis (n=1: 6.3%)²⁹, encephalitis (n=1: 6.3%)¹⁹, traumatic osteomyelitis (n=1: 6.3%)²⁵, mental health (n=2: 12.5%)^{21,26}, diabetes mellitus Type 2 (n=1: 6.3%)³¹. While vaccination counted for 18.8%. Thus, the table highlights non - infection diseases, especially malaria, that was mentioned major disease categories in Cambodia, Myanmar and Laos and vaccination was also interested in research on economic evaluation in these countries. In both two groups including infection diseases and non -infection diseases, there were three publications about malaria, took the first place in three countries. Studies about HIV, dengue and mental health took the second place with two studies. Economic evaluation of infectious diseases has been studied more than non-infectious diseases.

There were some other systematic review of healthcare economic evaluation published studies in different

countries (including Viet Nam⁶, Thailand⁷, India⁸, Bangladesh⁹, Japan¹⁰, Nigeria¹¹, Iran¹², South Africa¹³). Economic evaluation is one of the tools available to help choose wisely from a range of alternatives and implement efficient resources³. We believe that comparing the economic evaluation literature in Cambodia, Myanmar, and Laos can provide a useful starting point for discussing future priorities for economic evaluation research. Most of first authors were local scientist and review all articles published during the period over 20 years, five of eight studies mentioned quality of reporting and analysis but this study researched 16 health economic evaluation publications on the period 16 years in both Cambodia, Myanmar and Laos. Comparison with other health economic evaluations in other countries (Thailand: 41 articles (1982-2005)^{4,7}, India: 104 articles (1980-2014)⁸, Bangladesh: 12 articles (1971-2008)⁹, Nigeria: 31 articles (1988-2009)¹¹, Japan: 17 articles (1980-2014)¹⁰, Vietnam: 26 articles up to 2013⁶, Iran: 30 articles (1999-2012)¹²), the figure for three included nations is less than but more updated.

CONCLUSION

This study is necessary and vital for the health system in three countries including Cambodia, Myanmar and Laos. It is considered to be pioneering, which was conducted in the particular context of three nations. In addition, it helps to understand clearly the present situation and the crucial demand in order to help the Ministry of Health create the national methodological guideline for conducting and reporting economic evaluation in the individual country in the near future.

Acknowledgements: The authors express their gratitude to Nguyen Dang Tu Le, Minh Duc Dao and Hien Thu Bui under-graduated students in Faculty of Pharmacy, University of Pharmacy and Medicine, Ho Chi Minh City for their supporting.

REFERENCES

- Mwabu G, Health Economics for Low-Income Countries, Yale University Economic Growth Center Discussion Paper No. 955, 2007,81.
- Husereau D, Drummond M, Petrou S, Carswell C, Moher D, Greenberg D, Augustovski F, Briggs AH, Mauskopf J, Loder E, Consolidated Health Economic Evaluation Reporting Standards (CHEERS)--explanation and elaboration: a report of the ISPOR Health Economic Evaluation Publication Guidelines Good Reporting Practices Task Force, *Value Health*, 16, 2013, 231-250.
- World Health Organization, Economic Evaluation, Workbook 8, 2000,7-30.
- Teerawattananon Y, Chaikledkaew U, Thai health technology assessment guideline development, *J Med Assoc Thai*, 91 Suppl 2, 2008, S11-515.
- Akeem BO, Juni MH, Health economics evaluation in health planning, *International Journal of Public Health and Clinical Sciences*, 2, 2015, 93-103.
- Tran BX, Nong VM, Maher RM, Nguyen PK, Luu HN, A systematic review of scope and quality of health economic evaluation studies in Vietnam, *PLoS One*, 9, 2014, e103825.
- Teerawattananon Y, Russell S, Mugford M, A systematic review of economic evaluation literature in Thailand: are the data good enough to be used by policy-makers?, *Pharmacoeconomics*, 25, 2007, 467-479.
- Prinja S, Chauhan AS, Angell B, Gupta I, Jan S, A Systematic Review of the State of Economic Evaluation for Health Care in India, *Appl Health Econ Health Policy*, 13, 2015, 595-613.
- Hoque ME, Khan JA, Hossain SS, Gazi R, Rashid HA, Koehlmoos TP, Walker DG, A systematic review of economic evaluations of health and health-related interventions in Bangladesh, *Cost Eff Resour Alloc*, 9, 2011, 12.
- Akiyama M, Yoo BK, A Systematic Review of the Economic Evaluation of Telemedicine in Japan, *J Prev Med Public Health*, 49, 2016, 183-196.
- Gavaza P, Rascati KL, Oladapo AO, Khoza S, The state of health economic evaluation research in Nigeria: a systematic review, *Pharmacoeconomics*, 28, 2010, 539-553.
- Haghighparast-Bidgoli H, Kiadaliri AA, Skordis-Worrall J, Do economic evaluation studies inform effective healthcare resource allocation in Iran? A critical review of the literature, *Cost Eff Resour Alloc*, 12, 2014, 15.
- Gavaza P, Rascati KL, Oladapo AO, Khoza S, The state of health economic research in South Africa: a systematic review, *Pharmacoeconomics*, 30, 2012, 925-940.
- World Health Organization, Regional Office for the Western Pacific, Asia Pacific Observatory on Health Systems and Policies, The Lao People's Democratic Republic Health System Review, *Pacific MWROftW*, 4, 2014.
- World Health Organization, Regional Office for the Western Pacific, Asia Pacific Observatory on Health Systems and Policies, The Republic of the Union of Myanmar Health System Review, *Pacific MWROftW*, 4, 2014.
- World Health Organization, Regional Office for the Western Pacific, Asia Pacific Observatory on Health Systems and Policies, The Kingdom of Cambodia Health System Review, *Pacific MWROftW*, 4, 2015.
- Walker D, Fox-Rushby JA, Economic evaluation of communicable disease interventions in developing countries: a critical review of the published literature, *Health Econ*, 9, 2000, 681-98.
- Moher D, Liberati A, Tetzlaff J, Altman DG, Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement, *Ann Intern Med*, 151, 2009, 264-9.
- Allan S, Treatment of uncomplicated Plasmodium falciparum malaria in Myanmar: a clinical decision analysis, 2000, 238-245.
- Shepard DS, Suaya JA, Halstead SB, Nathan MB, Gubler DJ, Mahoney RT, Wang DNC, Meltzer MI, Cost-effectiveness of a pediatric dengue vaccine, *Vaccine*, 22, 2004, 1275-1280.



21. Carrara V, Terris-Prestholt F, Kumaranayake L, Mayaud P, Operational and economic evaluation of an NGO-led sexually transmitted infections intervention: north-western Cambodia, *Bulletin of the World Health Organization*, 83, 2005, 434-442.
22. Suaya JA, Shepard DS, Chang MS, Caram M, Hoyer S, Socheat D, Chantha N, Nathan MB, Cost-effectiveness of annual targeted larviciding campaigns in Cambodia against the dengue vector *Aedes aegypti*, *Trop Med Int Health*, 12, 2007, 1026-1036.
23. Gosselin RA, Heitto M, Cost-effectiveness of a district trauma hospital in Battambang, Cambodia, *World J Surg*, 32, 2008, 2450-2453.
24. Gosselin RA, Heitto M, Zirkle L, Cost-effectiveness of replacing skeletal traction by interlocked intramedullary nailing for femoral shaft fractures in a provincial trauma hospital in Cambodia, *Int Orthop*, 33, 2009, 1445-1448.
25. Croce D, Porazzi E, Foglia E, Restelli U, Sinuon M, Socheat D, Montresor A, Cost-effectiveness of a successful schistosomiasis control programme in Cambodia (1995-2006), *Acta Trop*, 113, 2010, 279-84.
26. Micol R, Tajahmady A, Lortholary O, Balkan S, Quillet C, Dousset JP, Chanroeun H, Madec Y, Fontanet A, Yazdanpanah Y, Cost-effectiveness of primary prophylaxis of AIDS associated cryptococcosis in Cambodia, *PLoS One*, 5, 2010.
27. Touch S, Suraratdecha C, Samnang C, Heng S, Gazley L, Huch C, Sovann L, Chhay CS, Soeung SC, A cost-effectiveness analysis of Japanese encephalitis vaccine in Cambodia, *Vaccine*, 28, 2010, 4593-4599.
28. Rattray KW, The cost effectiveness of reconstructive surgery in Cambodia, *Asian Biomed*, 7, 2013, 319-324.
29. Flessa S, Zembok A, Costing of diabetes mellitus type II in Cambodia, *Health Econ Rev*, 4, 2014, 2-15.
30. Yadav RP, Nishikiori N, Satha P, Eang MT, Lubell Y, Cost-effectiveness of a tuberculosis active case finding program targeting household and neighborhood contacts in Cambodia, *Am J Trop Med Hyg*, 90, 2014, 866-872.
31. Bishai D, Sachathep K, LeFevre A, Thant HN, Zaw M, Aung T, McFarland W, Montagu D, Cost-effectiveness of using a social franchise network to increase uptake of oral rehydration salts and zinc for childhood diarrhea in rural Myanmar, *Cost Eff Resour Alloc*, 13, 2015, 3.
32. Chen IT, Aung T, Thant HN, Sudhinaraset M, Kahn JG, Cost-effectiveness analysis of malaria rapid diagnostic test incentive schemes for informal private healthcare providers in Myanmar, *Malar J*, 14, 2015, 55.
33. Drake TL, Kyaw SS, Kyaw MP, Smithuis FM, Day NP, White LJ, Lubell Y, Cost effectiveness and resource allocation of *Plasmodium falciparum* malaria control in Myanmar: a modelling analysis of bed nets and community health workers, *Malar J*, 14, 2015, 376.
34. Kingkaew P, Werayingyong P, Tin N, Singh A, Myint P, Teerawattananon Y, An ex-ante economic evaluation of the Maternal and Child Health Voucher Scheme as a decision-making tool in Myanmar, *Health policy and planning*, 2015, 5-11.

Source of Support: Nil, Conflict of Interest: None.

