Research Article

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THE ECONOMIC VALUE OF INFORMAL CARE FOR DENGUE PATIENTS IN VIETNAM

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ABSTRACT

Despite the recorded economic impact caused by dengue disease in many studies, the scarcity of information about the indirect costs and the out-of-pocket (OOP) remains concern. Thus, this study's goal concentrated on the scrutiny the underlying economic encumbrance caused by factors in terms of costs of informal care for dengue illness in Vietnam. A cross-sectional study projected towards the hospitalization of diagnosis-confirmed dengue patients in Cu Chi General Hospital located in Ho Chi Minh city, following International Classification of Disease, tenth revision (ICD-10 codes = A90-A91)was conducted from October 2015 to March 2016. A standard administered questionnaire was used to collect data including general information, work time loss and OOP expenses (e.g. food costs, travel and lodging payments…). Regarding the 168 cases of hospitalized patients, 60 (35.7%) of which were children (under 15 years of age) and the remaining 108 (64.3%) were adults (over 15). The average illness lasted 7.8 days (estimated 51 USD) for patients, whereas caregivers lost 7.6 days (24.18 USD) per dengue episode. The mean indirect cost were 75.18 USD and OOP expenses averaged 16.94 USD. Overall, the informal care might cost 15,476.05 USD (1USD = 21,833 VND at August 2016 rates). Costs of informal care for hospitalized dengue patients create a substantial burden of finance on families and country.

Keywords: Economic value, informal care, out-of-pocket, indirect cost, caregiver, dengue.

INTRODUCTION

Dengue is a viral infectious disease transmitted via *Aedes aegypti* mosquito –an endemic insect commonly found in urban and suburban regions of tropical areas. Infected subjects are known to experience flu-like illness and are even likely to suffer from fatal complications, namely severe dengue[1]. Apparently, the disease frequency has globally increased with the number of reported cases originating from three World Health Organization (WHO) regions ranging from 2.2 million in 2010 to 3.2 million in 2015[1]. Statistically, it seems that dengue is the most common in America, Southeast Asia and the Western Pacific regions with a total number of 1.2 million cases in 2008 and over 3.2 million ones in 2015. Recently, dengue impact has increased rapidly in Latin America, the Caribbean and Africa and even expanded to Europe[1]. Some estimates show the worldwide number at over 50 million dengue infections annually with about 20 thousands deaths every year[2]. A staggering population of 3.9 billion people inhabiting in 128 countries are at risk of being infected with dengue[3]. The more regions become endemic, the more public funds national governments must invest to provide medical healthcare for the affected and prevent disease from spreading.

However, the economic burden is not just about medical healthcare, approximately 60% of dengue treatment costs are not directly associated with healthcare expenditure[4]. Thus, such cue is the hidden threat to national economies due to the significance of the cost of informal care consumed by dengue. Informal caregivers who specialize in long-term care are known to look after certain types of patients such as elderly, the disabled, or those diagnosed with chronic disease which greatly hinders normal daily activities and personal hygiene maintenance. Often, a family member, friend or neighbor with close relationship to the patient might take up this position[5]. In many cases, caregivers decide to reduce their hours or accept lower paid jobs, others can find difficulty in returning to work or experience demotion, some have to retire earlier[6]. All these things mean a reduction in income. In addition, caregivers also incur extra expenses for example traveling, more laundry, diet foods, lodging and the like. A study in eight countries in America and Asia, indirect and OOP expenses accounted for 34% of the total treatment costs in case of hospitalized patients[7]. In Mexico, an estimated average cost per non-fatal dengue patient was 1,327 US Dollar (USD) for hospitalized cases, in which included 143 USD and 174 USD for indirect and OOP costs respectively. The indirect cost per fatal-dengue patient was 63,817 USD[8]. These figure emphasized the importance of determining the hidden cost related to informal care. Therefore, this paper describes the provision and economic value of informal care for dengue patients in Vietnam.

MATERIAL AND METHODS

Study site and participants

A public provincial hospital in Cu Chi district of Ho Chi Minh city in southern of Vietnam – Cu Chi General Hospital –was chosen as the studied site due to the high rate of dengue infection in this district comparing to others of Ho Chi Minh City, as well as the hospital's greatest capacity of over 1000 patient beds in the area.

At the studied hospital, data had been collected throughout 6 months from October 2015 to March 2016. The survey participants were hospitalized patients with diagnosis of dengue by using International Classification of Disease, tenth revision (ICD-10^{TM}codes = A90-A91). Unenrolled cases were transferred patients or patients who did not follow the treatment plan...

A cross-sectional study was conducted with research sampling being based on the formula of Standley Lemeshow and colleagues[9] and preliminary study with a sample size of 12 patients[10]. As a consequence, the sample size was 166 patients in all ages. In the survey period, 168 patients were recruited.

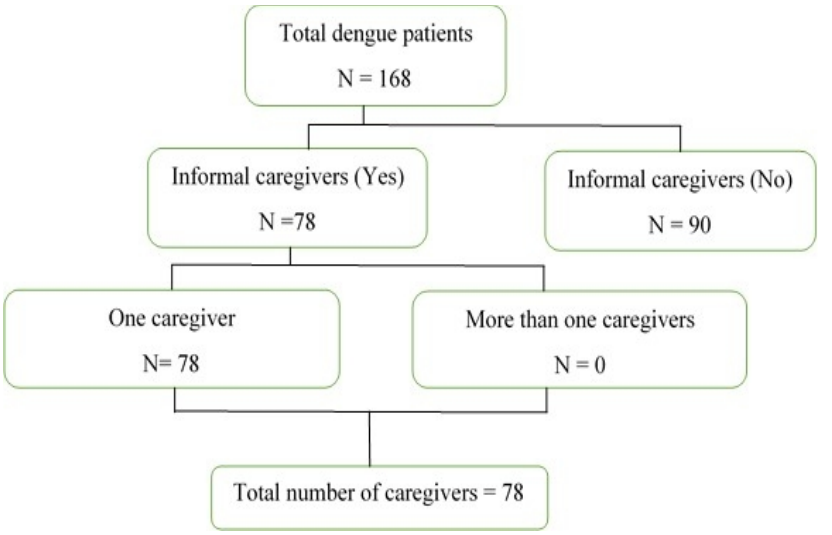

Figure 1: Number of informal caregivers

Follow-up survey and data collection

Figure 2 shows an overview of the study design.
Data was collected from all studied participants via direct patient or caregiver interviews. A structured questionnaire whose content was assessed and pre-tested was administered to the study participants to obtain their information. In the follow-up interview, survey was conducted within hospitalized days, investigators collected personal information of patients and caregivers (if any), and some questions related to the cost of dengue treatment. One week after hospitalization discharge, patients or caregivers would be called by investigators to provide information regarding expenses related to medical visits such as: means of transport, distance travelled (in kilometers), parking fees, lodging and food costs. We also collected information about workplace absence due to illness and normal activities.

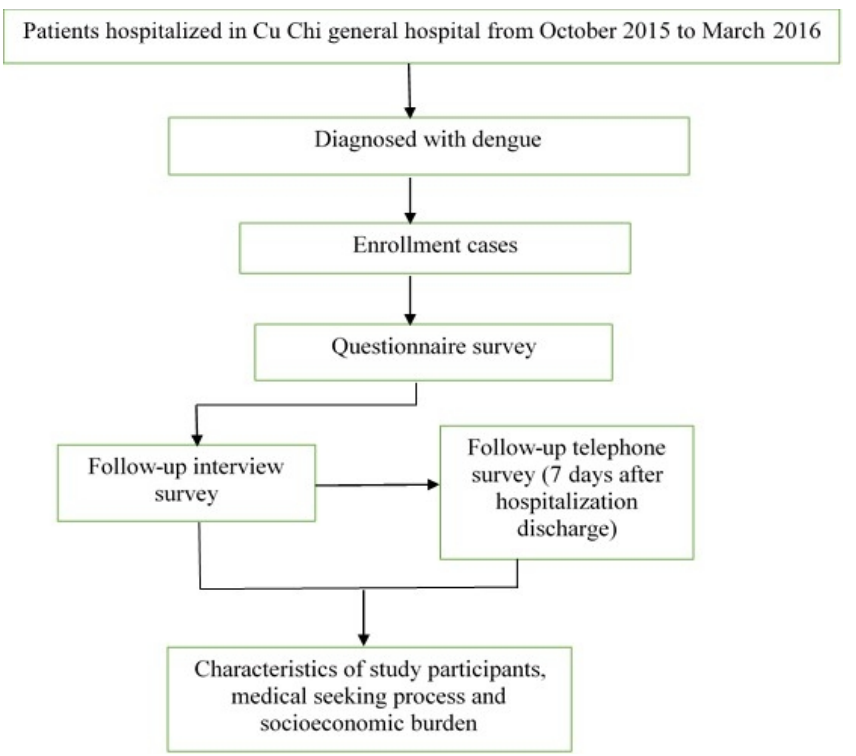

Figure 2: **Study flowchart**

Valuation method

OOP and indirect costs were calculated with data from follow-up interviews and analyzed with the use of Microsoft Excel 2013. The loss of earning could be estimated by patients or caregivers' salaries, or multiplying the number of days off by the GDP per capital in 2016[11]. Transportation costs would be provided by personal interviews or converted into petro fees which were estimated by 0.10 USD per kilometer for motorcycle or 0.39 USD per kilometer for car.

Transportation costs would be provided by personal interviews or converted into petro fees which were estimated by 0.10 USD per kilometer for motorcycle and 0.39 USD per kilometer for car. The expenses of transportation, lodging and food to obtain OOP costs were summed to obtain OOP costs. Means, standard deviations [SD]; minimum and maximum values were determined to use standard descriptive statistics to rate the average cost per dengue case.

Ethics statement

Ethical approval was given by the Biomedical Research Ethics Council at University of Medicine and Pharmacy, Ho Chi Minh City. Written informed consent was obtained from all participants before questionnaire survey. Some sensitive information is encrypted. The collected data is confidential and only used for research purposes.

RESULTS

Table 1 represents general information of patients with hemorrhagic fever (DHF) among the chosen 168 patients. This survey statistics coped with issues in terms of their age, gender, occupation, anamnesis of dengue and health insurance status.

According to a random survey including a group of dengue patients with their mean age being 23.15 ± 13.29, participants was divided into 2 group including children (under 15 years of age) and adults (over 15). The proportion of the former was 35.7%, while the proportion of latter nearly doubled with 64.3%. This proved that there was a correlation between age and the incidence of dengue as the greater age one gets, the higher chance of being infected. Even though children are more sensitive and have weakened immune system, adults are subjective about prevention as well as surrounding environment and infected factors.

In term of gender, it is cleared that the percentage on the dengue for male and female had little disparity with 49.4% and 50.6% respectively. Therefore, the dengue fever does not depend on the gender, but on the lack of proper prevention.

Base on the data of Table 1, the number of patients recorded with anamnesis of dengue accounted for approximate 7%, which reflected the possibility of dengue reinfection in previously infected subjects, despite the minority of said percentage comparing to the entire proportion of sample size. As there are 4 variants of dengue, namely DEN 1, DEN-2, DEN-3 and DEN-4, individuals who were formerly infected with a type of said variants are yet to be completely immune from the remaining three or cross-infection caused by them.

Table 1: **Characteristics of surveyed patients**

	N=168	%
Age		
Mean ± SD	23.15 ± 13.29	
≤15	60	35.7
>15	108	64.3
Gender		
Male	83	49.4
Female	85	50.6
Occupation		
Student	67	39.9
Farmers	8	4.8
Workers	55	32.7
State officials	10	6.0
Business	2	1.2
Domestic	10	6.0
Others	16	9.4
Anamnesis of dengue		
Yes	12	7.1
No	156	92.9
Health insurance		
0%	42	25.0
50%	7	4.2
80%	105	62.5
95%	4	2.4
100%	10	5.9
Loss of work-days	Mean ± SD	
Patients	7.8 ± 2.9	
Caregivers	7.6 ± 2.1	

Table 1 displays an overview of the division in 3 groups of cost including direct medical cost, direct non-medical cost (OOP cost) and indirect cost. They were the componential factors of the total costs, of which the dengue treatment in Cu Chi Hospital acknowledged a statistics of 23,397.11 USD.

After 6 months of survey. Specifically, indirect cost took the major proportion with 53.98% (12,630.62 USD) of the whole treatment course. Meanwhile, Direct cost value was considerably high with 33.85% (7,921.01 USD), and was followed by OOP cost with 12.16% (2,845.43 USD) that took 12.16% of the total cost.

Table 2: Types of costs of dengue treatment (N=168)

	Direct cost	OOP cost	Indirect cost	Total cost
Cost (USD)	7,921.07	2,845.43	12,630.62	23,397.11
%	33.85	12.16	53.98	100

Indirect cost

Indirect cost was calculated with reference to the length of workplace/school absence due to illness. According to follow-up interview result, it was discovered that 7.8 days were the average period a dengue patient needed to recover, and 7.6 days needed their family spend on taking care of them. The estimates of the indirect cost per dengue case was 75.18 USD with its range from 15.27 to 203.75 USD, of which there were 51.00 USD from direct patient time cost and the remaining 24.18 USD from caregiver's. Regarding the two age groups involved in this study, their average indirect costs are not equal. Specifically, the indirect cost per child was estimated to be 93.09 USD, including 47.60 USD for patient time cost and 45.49 USD born by caregivers. Meanwhile, the average indirect cost in adult cases was slightly lower in value with 65.24 USD in which patient and caregivers incurred 52.89 and 12.35 USD respectively. The

compared results of two groups showed that there were little differences between the time cost of a dengue child case and that of an adult (47.60 USD and 52.89 USD respectively)

However, in term of caregiver time cost, the disparity was not negligible since the expense for child caring tripled that of adult per case due to children's extensive need for supervision and care from parents/ caregivers at all time during their recovery from dengue**.**

Out-of-pocket costs

OOP expenses obtained from interviewed patients or caregivers were shown in Table 5. In total, it cost 16.94 USD per case for non-medical services, including 10.01 USD for patient's food, 4.56 USD for caregivers' food and 2.37 USD for transportation. Meanwhile, the estimated mean for OOP costs in children was 21.10 USD, mainly spent on food for patients and caregivers (10.48 USD and 8.46 USD respectively). The OOP payments per adult was slightly lower with 14.62 USD.

Table 3: Indirect cost and OOP expenses of dengue treatment per patient or caregiver

Indirect costs (USD)	≤15 years old	>15 years old	Total cost
	Mean ± SD	Mean ± SD	Mean ± SD
Caregivers time cost	45.49 ± 23.58	12.35 ± 27.90	24.18 ± 24.88
Patients time cost	47.60 ± 17.35	52.89 ± 25.09	51.00 ± 22.72
TOTAL	93.09 ± 36.39	65.24 ± 37.57	75.18 ± 39.39
OOP payments (USD)			
Transportation	2.16 ± 2.57	2.48 ± 6.99	2.37 ± 5.81
Food for patients	10.48 ± 3.82	9.75 ± 3.70	10.01 ± 3.75
Lodging	-	-	-
Food for caregivers	8.46 ± 2.71	2.39 ± 2.84	4.56 ± 2.76
TOTAL	21.10 ± 7.66	14.62 ± 9.94	16.94 ± 9.68

SAMPLE OF QUESTIONNAIRE

Patient Information			
1	Patient ID from hospital record	|___|___|___|___|___|___|___|___|___|	
2	Date of birth	|___|___/___|___/___|___|___|___|	
3	Gender	❍ Male ❍ Female	
4	Date of admission	|___|___/___|___/___|___|___|___|	
5	Date of discharge	|___|___/___|___/___|___|___|___|	
6	Anamnesis of dengue	❍ Yes ❍ No	
7	Health insurance	❍ 0% ❍ 50% ❍ 80%	❍ 95% ❍ 100%

1	Before admission, did patient receive treatment for this illness somewhere else or buy any drug? (If patient visit OPD or ER in this facility but other illness, it exclude)	❍1. No **(**skip to**4)** ❍2. Yes ❍3. Refer from other hospital ❍4. Don't know
2	Those facilities as follow (multiple answer possible)	❍1. Over the counter ❍2. Private hospital or clinic ❍3.Admitting hospital ❍ OPD ❍ ER ❍4. Public hospital ❍5. Other (specify)…….
3	How much did you pay for treatment before admission?	❍ Total fee paid to facility |___|___|___|___|___|___|___VND ❍ Not paid; used health insurance ❍ Paid; don't known
4	During treatment, how much did you pay for this admission?	❍ Total fee paid to facility |___|___|___|___|___|___|___VND ❍ Not paid; used health insurance ❍ Paid; don't known
5	After discharge, do patient rehabilitate or receive additional treatment?	❍1 Yes because of symptom ..... ❍2. No**)**skip to **8(**
6	Those facilities as follows (multiple answer possible)	❍1. Over the counter ❍2. Private hospital or clinic ❍3. Admitted hospital ❍ OPD ❍ ER ❍ward ❍4. Public hospital ❍5. Other (specify)…….
7	How much did you pay for treatment after discharge?	❍ Total fee paid to facility |___|___|___|___|___|___|___VND ❍ Not paid; used health insurance ❍ Paid; don't known

8	How much did you paid for transportation to get to those facilities? (Total cost; include your own vehicle and public vehicle; multiple answer possible)	❍1. Public vehicle |___|___|___|___|___| ___VND ❍2. Own vehicle; please determine cost for public vehicle |___|___|___|___|___| ___VND ❍3. Paid; don't known
9	How much addition cost does you and family member pay for buying meal?	❍ Not paid ❍Paid |___|___|___|___|___| ___VND ❍ Paid; don't known
10	Do you and family members have to pay for accommodation?	❍1. Not paid ❍2.Total paid |___|___|___|___|___| ___VND ❍3. Paid; don't known
11	Do you employ someone to take care of patient? (additional payment because of illness)	❍1. Not paid ❍2. Total paid |___|___|___|___|___| ___VND ❍3. Paid; don't known
12	Do you and family member stop working due to illness or to take care of patient?	❍1. No ❍2. Yes
13	It someone leave from work, please give detail (multiple answer possible; 0.5 day for not full day) (If normally child have full-time nanny, it exclude)	❍1. Father |___|___| day ❍2.Mother |___|___| day ❍3.Cousin 1 |___|___| day ❍4. Cousin 2 |___|___| day ❍5. Employee |___|___| day
14	Ask a convenient time for interview within 7 day after the patient is discharged.	Convenient time..... Phone number for next interview..... Home/ office.....

DISCUSSION

In this cross-sectional study conducted at Cu Chi General Hospital from October 2015 to March 2016, the OOP and indirect costs of a sample of patients hospitalized with diagnosis of dengue were estimated. The average age of the studied participants was 23.15 years old, in which adult patients took the major proportion. It is clear that the significant difference between children and adults randomly selected for the study could be recognizable. Proportion of adults suffering from dengue fever (64.3%) was on the rise and almost doubled that of children (35.7%), while previous it prevailed among children. For example another study in Can Tho province of Vietnam between 2006 to 2007, the percentage of adult patients among the surveyed was somewhat meager with only 17.4%[12]. Nevertheless this result also shows that the impact of dengue virus is mainly on adults rather than children. In 168 surveyed patients approximately 7% had a history of dengue. And the two groups with highest risk of susceptibility to dengue virus were students (39.9%) and workers (32.7%). Specifically, the proportion of adult patients without health insurance is negligible (3%), which suggests that awareness of people with health insurance has been enhanced more than in 2006 and 2007 (43.8%)[12]. The high proportion in the case of using health insurance leads to the significant reduction of patient-paid dengue fever treatment costs in adults and thus, a relief in the direct economic impact on the income of their family.5.23 ± 2.10 days was the average length of hospitalization in this stage of dengue, which shared a relative value with results presented in another study in Cambodia in 2009 (4.8 ± 1.6 days)[13]. The length of workplace absence due to illness in three stages: before, during and after hospitalization were all lower than their counterparts in the study in Pakistan in 2011 (Before: 1.79 ± 0.97 versus 6.25 ± 4; During: 5.23 ± 2.10 versus 6.76 ± 5 and After: 3.64 ± 2.35 versus 18.89 ± 9)[14]. However, it was quite similar when compared with the study in Can Tho province with the treatment time in three stages were 2.5 ± 1.4, 6.0 ± 1.7 and 1.2 ± 3.6 days respectively[12]. Consequently, total wages and self-employed income lost of dengue case amounted to 12,630.62 USD summed at 12,630.62 USD which was mostly wasted expenses taking up to over 50%. Hence, the estimated average indirect cost was 75.18 USD, which was substantially higher than previous studies in Vietnam about dengue. For example, estimation in Can Tho province provided a lower statistics than our study with its value being 38.61 USD per case[12], whereas the figure in Ho Chi Minh City being only 12.78 USD[15]. Despite certain commons shared among said studies and ours in term of participants and enrolled cases, they did not include the time cost of patients that underestimated the economic impact of hospitalized cases. In contrast, the average indirect costs calculated in our study were much lower than those estimated for North America and the Caribbean countries conducted by Shepard and others, which was the study with the most thorough comprehension about the economic impact of dengue in America[16]. This difference was due the Vietnam's conditions of being the lower-middle income country[17], hence, loss of cost for a day off is much lower than its counterpart in high-income countries in the region and around the world. However, our calculations were comparable to those reported in Peru where hospitalized patients averaged 78.7 USD[18], and closer to the findings in Cuba for patients who required hospitalization (86.01 USD per case)[19].

In accordance with our estimations about medical resource utilization, several researches coping with hospitalized dengue patients have as well come to the same conclusion about the OOP costs for a total 16-17 USD per case[15, 20] and lower calculated for Cambodia averaged 9.5 USD[13]. Such finding was remarkable, despite the much higher figures in term of OOP payments for upper-middle income countries (Malaysia, Thailand) and high-income countries e.g. Singapore[21] discovered in other studies conducted in South East Asia.

CONCLUSION

Dengue is the leading cause of hospitalized cases in the South of Vietnam, but economic burden has not been fully evaluated despite it being one of the most crucial parts in the process of strategic planning for disease prevention. There have been records about studies targeting cost of dengue treatment, yet most of them focused specifically on direct medical costs. Furthermore, concerning the large proportion taken by medical care expenses in an entire treatment course, it would be a mistake to not mention the value of resources lost due to disease or consumed for caretakers, which are also the main causes of economic burden. Also, a considerable economic impact of informal care on families having dengue patients was found contributing to the in already substantial medical costs. However, several limitations, such as the paucity of information for further comprehensive evaluation and detailed understanding

about dengue's impact on families' economic status could also be detected in our study. Therefore, researches with similar or relevant surveyed issue give great sources of reference for dengue-related burdens scrutiny and comprehension. Nevertheless, the association between negative health effects and dengue care giving seemed impossible to be assessed. Additionally, the project and Cu Chi General Hospital shared the same common in the small sample size chosen for survey. Consequently, it is suggested that further researches with similar pattern and target should be projected on a national scale so that a nationwide – levelled comparison, as well as a complete synthesis about the cost of treating dengue in Vietnam, could be made. Since then, government could have a fully assessment of economic burden caused by dengue to prioritize strategies to control the illness as well as to invest and allocate funds for treatment and prevention of dengue fever.

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REFERENCES

1. World Health Organization (WHO). Dengue and severe dengue 2016 [cited 2016 August 22]; Available from: http://www.who.int/mediacentre/factsheets/fs117/en/.
2. World Health Organization (WHO). Dengue: the fastest mosquito-borne disease in the world. 2010 [cited 2016 August 22]; Available from: http://www.who.int/neglected_diseases/integrated_media/integrated_media_2010_Dengue_vs_malaria/en/.
3. Brady OJ, Gething PW, Bhatt S, Messina JP, Brownstein JS, Hoen AG, et al., Refining the global spatial limits of dengue virus transmission by evidence-based consensus. PLoS Negl Trop Dis, 2012. 6(8): p. e1760.
4. Sanofi Pasteur. Dengue matter. 2014 [cited 2016 August 22]; Available from: http://www.denguematters.info/content/issue-2-economic-burden-dengue.
5. Brouwer W, Rutten F and Koopmanschap M, Costing in economic evaluations. 2001, Economic evaluation in health care: merging theory with practice. Oxford: Oxford University Press.
6. Arksey H, Kemp P, Glendinning C, Kotchetkova I and Tozer R, Carers' aspirations and decisions around work and retirement. 2005: Corporate Document Services Leeds.
7. Suaya JA, Shepard DS, Siqueira JB, Martelli CT, Lum LC, Tan LH, et al., Cost of dengue cases in eight countries in the Americas and Asia: a prospective study. The American journal of tropical medicine and hygiene, 2009. 80(5): p. 846-855.
8. Undurraga EA, Betancourt-Cravioto M, Ramos-Castañeda J, Martínez-Vega R, Méndez-Galván J, Gubler DJ, et al., Economic and disease burden of dengue in Mexico. PLoS Negl Trop Dis, 2015. 9(3): p. e0003547.
9. Lemeshow S, Hosmer DW, Klar J, Lwanga SK and Organization WH, Adequacy of sample size in health studies. 1990.
10. Julious SA, Sample size of 12 per group rule of thumb for a pilot study. Pharm Stat, 2005. 4(4): p. 287-291.
11. World Bank national accounts data and OECD National Accounts data files. GDP per capital (current US$) [cited 2016 September 22]; Available from: http://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=VN.
12. Tam PT, Dat NT, Thi XCP, Duc HM, Tu TC, Kutcher S, et al., High household economic burden caused by hospitalization of patients with severe dengue fever cases in Can Tho province, Vietnam. The American journal of tropical medicine and hygiene, 2012. 87(3): p. 554-558.
13. Huy R, Wichmann O, Beatty M, Ngan C, Duong S, Margolis HS, et al., Cost of dengue and other febrile illnesses to households in rural Cambodia: a prospective community-based case-control study. BMC public health, 2009. 9(1): p. 1.
14. Rafique I, Saqib MAN, Munir MA, Siddiqui S, Qureshi H, Habibullah S, et al., Economic burden of dengue in four major cities of Pakistan during 2011. Hospital, 2015. 6(5): p. 3-15.
15. Harving ML and Ronsholt FF, The economic impact of dengue hemorrhagic fever on family level in Southern Vietnam. Dan Med Bull, 2007. 54(2): p. 170-172.
16. Shepard DS, Coudeville L, Halasa YA, Zambrano B and Dayan GH, Economic impact of dengue illness in the Americas. The American journal of tropical medicine and hygiene, 2011. 84(2): p. 200-207.
17. The World Bank (2015) VN. 2005 [cited 2016 September 20]; Available from: http://www.worldbank.org/vi/country/vietnam.
18. Salmon-Mulanovich G, Blazes DL, Lescano AG, Bausch DG, Montgomery JM and Pan WK, Economic Burden of Dengue Virus Infection at the Household Level Among Residents of Puerto Maldonado, Peru. The American journal of tropical medicine and hygiene, 2015. 93(4): p. 684-690.
19. Baly A, Toledo ME, Rodriguez K, Benitez JR, Rodriguez M, Boelaert M, et al., Costs of dengue prevention and incremental cost of dengue outbreak control in Guantanamo, Cuba. Tropical Medicine & International Health, 2012. 17(1): p. 123-132.
20. Luong QC CL, Pollisard L, Do QK, Bricout H, et al, Assessing the economic burden of dengue in Southern Viet Nam: Results of a prospective multicenter cost study. Ho Chi Minh City, Viet Nam: Pasteur Institude. 2012.
21. Shepard DS, Undurraga EA and Halasa YA, Economic and disease burden of dengue in Southeast Asia. PLoS Negl Trop Dis, 2013. 7(2): p. e2055.

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