THE EFFECTIVENESS OF PUBLIC HEALTH EXPENDITURES ON HEALTH OUTCOMES IN ASEAN COUNTRIES

By

PHYO PHYO, THANDAR AUNG

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

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Committee in charge:

Professor Tae Hee CHOI, Supervisor

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CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

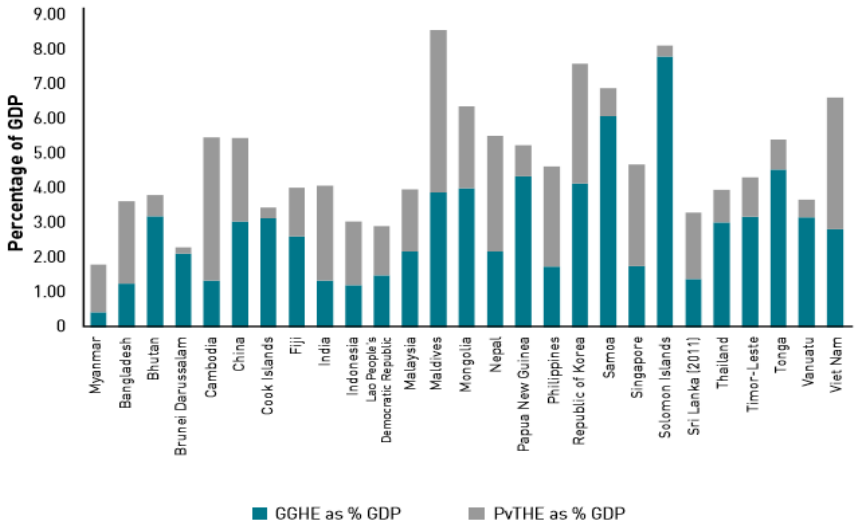
The Government of the Republic of the Union of Myanmar has been implementing reforms on economics, social, health, education as well as policies to promote country's economic development. The government has embraced wide-ranging reforms under the framework of economics and social reform. Fiscal reform is one kind of the framework of economic and social reform. Providing goods and services is to achieve various economic and social objectives of the government for their citizens. The effectiveness of supporting these goods and services is important, not only in the size of the contribution of the government and the private sector but also in the macroeconomic stabilization and economic development.

Investing in health is a kind of investment which has many positive spillover effects on economic prosperity through various ways such as education, productivity, investment, and demographics. If the children are more healthy and well-nourished, they have more chance to go to school and live more longer. This can be directly affected to improve human development. In the production sector, more healthy people can more work hard and less have to take days off. Besides, these people can save more money and increase living standard. As the nation, when their citizens are healthier, the capacity of the country's productivity will be higher. In demographics, when mortality rates decrease, the proportion of working people to their dependents will be increased. From this, a lot of effects, boosting in health sector can improve not only individually income but also national income. At the national level, the economic result is increasing the gross domestic product.

1.2 PROBLEM STATEMENT

According to UN Children's Fund (UNICEF) in 2013, malnutrition, malaria, anaemia, and premature birth rate are the main health problems plaguing Myanmar. Nearly 10 percent of newborns babies had low birth weight. Every year, around 56,000 children in Myanmar die before they are five years old. Between 2001 and 2011, total health expenditure of Myanmar, which is the lowest country among the South-East Asia and Western Pacific Regions of the WHO, was about 2.0 percentage of Gross Domestic Product (GDP) (Fig. 3.1).

Figure 3.1 Health expenditure as share (%) of GDP, selected countries, 2012



Source: WHO Global health expenditure database. Accessed 27 March 2014 [http://apps.who.int/nha/database/DataExplorerRegime.aspx]

Household's out-of-pocket (OOP) payments which are the 79.3% of the total health expenditure is the major source for health sector because of low government spending which is just 13.6% of total health expenditure in 2011. Donation payments which are 7.1% of total health expenditure, half of that government spending are significant. The Ministry of Health (MOH) used 3–5% of the budget for medical goods so that expenditure is not adequate to meet demand. A larger portion of the budget is

used for health-related functions which are food and drug control, research and development, capital formation, nutrition promotion and education, environmental health and 18 education and training of health personnel.

1.3 STUDY OBJECTIVES

The objective of this paper is to analyze the effectiveness of Myanmar's government health expenditure on health outcomes, especially in the infant mortality rate by comparing with other's ASEAN countries over the period 1995 and 2014. By analyzing the data of six ASEAN countries, we can see the results and determine how to change the policy to improve the health outcomes of Myanmar.

1.4 STUDY SIGNIFICANCE

The study analyzes not only the effectiveness of public health expenditures but also other socio-economic factors such as life expectancy, improved sanitation facilities, improved water source, urban population, food production index, GDP per capita, maternal mortality ratio and prevalence of HIV on the infant mortality rate in the ASEAN community with high statistical significance. From this analysis, reasonable high policy recommendation can be implemented for Myanmar. This research would prove to be useful to improve health outcomes, economic development, and budget allocation for the health sector.

1.5 STUDY MOTIVATION

Analyzing the effect of government health expenditure and other's health outcomes are the motivation of this paper. Examining data in advance on Myanmar show

that the trend of public health expenditure is increasing, while health indicators such as life expectancy rate was increasing and infant mortality rates are decreasing dramatically from 1995 to 2014. The effect of others' indicators by comparing among ASEAN Community will also be conducted to arrive at an overall picture.

1.6 RESEARCH QUESTIONS AND HYPOTHESES

The important questions that would be attempted to be answered by this paper, is whether public health expenditure in the ASEAN Community has an impact on the health outcomes.

1. Does reduction in infant mortality rate improves as public health expenditure increases?
2. How does infant mortality rate relate to Socio-Economic factors?

1.7 THE STRUCTURE OF THE PAPER

Five chapters are included in this paper. Chapter One is Introduction which briefly explains about my research thesis. After the introduction, the existing literature is reviewed in Chapter Two. Following which, the analytical methodology and data are presented in Chapter Three, the related results are discussed in Chapter Four and policy implications and conclusions are shown in Chapter Five.

CHAPTER TWO: LITERATURE REVIEW

Andrew, Finn and Phyllida (2013) reported that although the health sector in Myanmar faces a lot of challenges, there is a reduction in the under-five and maternal mortality rate between 1998 and 2010. Moreover, health's expenditure portion of the GDP has been increasing by 1% a year, from the previous 0.9% in 2010, and has a target of 5 % by 2015. Out of pocket total health spending is about 80 - 90%. They also mentioned that there have 3 donors for the external health funding: the 3MDGs (Millennium Development Goals) Fund; the Global Fund and GAVI (The Global Alliance for Vaccines and Immunizations). Currently, UNOPS (United Nations Office for Project Services) arranges Global Fund and 3DMG resources, while GAVI funds are controlled by UNICEF and WHO.(Andrew, Finn, & Phyllida, 2015)

In neonatal and child health country profile of Myanmar, the major indicators of human and other resources of health sectors are nurses & midwives per 10,000 population, community health workers per 10,000 population, physicians per 10,000 population and hospital beds per 10,000 population. In 2013, infant mortality rate per 1,000 live births is 39.8 and under-five mortality rate is 50.5 respectively. This report showed that there are inequalities in under-five mortality depending on the place of residence (urban and rural), position of wealth (highest and lowest) and mother's education (highest and lowest). (Profile & C. H, 2014)

Maternal and Newborn Health Country Profiles of Myanmar mentioned that pneumonia, diarrhoea, and other complications are the major causes of child mortality. Urban children and the richest children are more likely to survive than children in rural areas or those who belong to a poorer socio-economic status. (Health & Profiles, 2015)

Among the main health problems in Myanmar, the rate of innutritious children who are under five years old has obviously improved in 1997, 2000. 2003 and 2010. According to prevalence of worm infestation, Anemia in pregnant women and children under-five is also raise. Malaria, Tuberculosis, and HIV/AIDS are the most three important diseases of public health in Myanmar. (Pyi, Council, & Index, 2012)

During 1990 and 2010, the mortality rate of children who are under five has fallen from 130 per 1000 live births to 46 per 1000 live births. If this rate continues, Myanmar is likely to achieve the target of 43 in MDG 4 (two-thirds reduction in U5MR). Although the maternal mortality rate has been decreasing regularly, it remains high and cannot be able to achieve the MDG 5 target of three-quarters reduction with comparison its baseline year 1990. In the 1990s, the decreasing of mortality in children has slowed down lately. In analyzing the gap narrowed between under-five mortality rate and infant mortality rate, most of the under-five mortality rate happens in the first-year old. Life expectancy at birth is higher in urban area than it is in rural. (Pyi et al., 2012)

Department of Health manages primary health care, environmental sanitation, nutrition promotion and research, maternal and child health services, and school health services. The support of primary and secondary healthcare is the Township Health Department which is working for 100,000 to 200,000 people.

The Rwandan Government's measures may be useful to look at. Rwanda took several steps to improve access to medical facilities and related infrastructure, proxied by urbanization, consumption of nutritious food, and reduction of HIV/AIDS prevalence rates, improving per capita income and broadening access to water and sanitation to reduce the infant mortality rate. Increasing access to pipe water may significantly reduce the number of hours and kilometres girls must travel to get and carry

water, thereby providing them more time to focus on their education, by including increased time for their after-school assignments. This, in turn, has the potential to reduce the infant mortality rate. Moreover, government expenditures should place more emphasis on the expansion of water and sanitation expenditures since they are more effective in achieving the objective of health sector public expenditures (Abel, 2014).

Chunling, Matthe, Paul, Katherine, Dean, and Christopher (2001) showed that "public health financing from domestic sources in developing countries improved by nearly 100% from 1995 to 2006. At the country level, while many regions increased their government health expenditures, many sub-Saharan African countries decreased expenditures." The statistical analysis presented that domestic government health expenditures was reduced by $0.43 to $1.14 and Development Assistance for Health (DAH) to government had a negative effect on domestic government health spending. However, DAH to the non-governmental sector had a good effect on domestic government health spending. Both results were solid to multiple conditions and analyses. Another factor which is debt relief had no measurable effect on domestic government health spending.(Lu et al., 2001)

Anil Shetty and Shraddha Shetty mentioned that "Asian countries had a decrease in IMR by increasing health expenditure and mostly had a large portion of their GDP in health spending. Singapore, South Korea, Qatar and the UAE had a higher per capita income. Therefore, they could spend more on health and achieved better results than their peers. In Middle Eastern countries, they had higher state subsidizing for health. Thus, private health expenditure is very low. There is a larger share of private health expenditure in poorer countries because of lower quality of accessing in public health care. In determining mortality, public health spending, gross national income/capita,

poverty, inequality, and female illiteracy were the important socioeconomic predictors. In that study, private health spending did not have a positive significant effect on infant mortality rate due to affordability and impacting private health care. On the other hand, the effectiveness of public health expenditure is weak in society." (Shetty & Shetty, 2014)

Sonia Bhalotra identified that "public health expenditure seems to have no effect on society." They have argued that this may be a sign of balancing between public and private inputs. It may also be associated with the public health expenditure in India is non-progressive. It can be more progressive by making allocations in favour of public health, water and family welfare programmed in rural areas and, within rural areas and by rising information and access for politically and socially deprived groups. The impact of health expenditure is not the same between the states, that have no obvious correlation to primary levels of mortality rate and their income.(Bhalotra, 2007)

From 1960s to 1980s, Infant Mortality Rate in China decreased dramatically and then stabilized. They found that the infant mortality risks of girls at the national level expanded from 1990 to 2000. IMR in urban areas was significantly lower than in rural areas and the gap of IMR extended from 1.5 to 2.1 during 1981 and 2000. At the same time, the ratio of female to male IMR rose from 0.9 to 1.3. During 1990-2000, female IMR in rural areas increased from 34.9 to 36.7. Rural residents, in general, prefer having boys, and due to the family planning policy, there are more boys are born than girls in China. They examine the regional distribution of IMR and overall regional inequality was high within-rural, within-urban, and between rural-urban inequalities from 1981 to 2000. It seems that in both rural and urban areas, the regional variation in health outcomes has widened over the reform period.(Zhang & Kanbur, 2005)

CHAPTER THREE: MODEL SPECIFICATION AND METHODOLOGY

3.1 MODEL SPECIFICATION

In this research, it uses a panel data fixed effects regression by using the STATA econometric software, for the period between 1995 and 2014, to demonstrate the effectiveness of public health expenditures on health outcomes that is infant mortality rate. It includes the currently six ASEAN Community Countries (i.e. Myanmar, Indonesia, Malaysia, Thailand, Cambodia, and Singapore). The data in this study came from the "World Bank's World Development Indicators database". The standard static model enables the predicator intercepts to represent country effects, it takes the structure, with "i" defining each county, whereas "t" defines a period as follows:

$$LIMR_{it} = \beta_0 + \beta_1 LPHE_{it} + \beta_2 LISF_{it} + \beta_3 LIWS_{it} + \beta_4 LUP_{it} + \beta_5 LFPI_{it} + \beta_6 LGDP_{it} + \beta_7 MMR_{it} + \beta_8 LPofHIV_{it} + \mu_{it} \quad \ldots\ldots (1)$$

$$LLE_{it} = \beta_0 + \beta_1 LPHE_{it} + \beta_2 LISF_{it} + \beta_3 LIWS_{it} + \beta_4 LUP_{it} + \beta_5 LFPI_{it} + \beta_6 LGDP_{it} + \beta_7 LPofHIV_{it} + \mu_{it} \quad \ldots\ldots... (2)$$

Where:

LIMR = logarithmic transformation of Infant Mortality Rate.

LLE = logarithmic transformation of Life Expectancy at birth.

LPHE = logarithmic transformation of Public Health Expenditures as a % of government expenditures **("- sign in Model 1 and + sign in Model 2")**. **LPHE** is the main indicator of this study.

LISF = logarithmic transformation of Improved Sanitation Facilities **("- sign in Model 1 and + sign in Model 2")**.

LIWS = logarithmic transformation of Improved Water Source **("- sign in Model 1 and + sign in Model 2")**.

LUP = logarithmic transformation of Urban Population **("- sign in Model 1 and + sign in Model 2")**.

LFPI = logarithmic transformation of Food Production Index **("- sign in Model 1 and + sign in Model 2")**.

LGDP = logarithmic transformation of Gross Domestic Product per capita **("- sign in Model 1 and + sign in Model 2")**.

LMMR = logarithmic transformation of Maternal Mortality Ratio **("+ sign in Model 1 and - sign in Model 2")**.

LPofHIV= logarithmic transformation of Prevalence of HIV **("= sign in Model 1 and - sign in Model 2")**.

μ_{it} = Error Term

Model 1 measures the effectiveness of Public Health Expenditures (PHE) on reducing the Infant Mortality Rate (IMR), while **Model 2** measures Public Health Expenditures (PHE) effectiveness on increasing Life Expectancy at birth (LE). The expected sign of the controlled variables is shown in above variables' explanation.

In this research, while analyzing the effectiveness of Public Health Expenditures on health outcomes such as Infant Mortality Rate and Life Expectancy, GDP per capita, Urban Population, Food Production Index, Improved Sanitation Facilities, Improved Water Source, Maternal Mortality Ratio, and Prevalence of HIV are controlled for these two models.

3.2 VARIABLES AND DATA DESCRIPTION [1]

1. Mortality rate, infant (per 1,000 live births)

The World Bank defines "the Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year". This is one of the health outcomes and is used as the dependent variable.

2. Life expectancy at birth, total (years)

In the World Bank's definition, "Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life". This is also one kind of health outcomes and being tested as a dependent variable in this study.

3. Health expenditure, public (% of government expenditure)

According to World Bank, "Public health expenditure consists of recurrent and capital spending from government (central and local) budgets, external borrowings, and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance funds." These expenditures can directly affect the good health outcomes and so we used this variable to know how may effective on infant mortality rate and life expectancy.

4. Improved sanitation facilities (% of population with access)

As shown in World Bank, this means that "access to improved sanitation facilities refers to the percentage of the population using improved sanitation facilities. Improved sanitation facilities are likely to ensure hygienic separation of human excreta from human contact. They include flush/pour flush (to piped sewer system, septic tank, pit latrine),

[1] *As indicated in this chapter, the data is used from "World Bank's World Development Indicators database". Therefore, the definitions of all variables are also used from the World Bank's definitions to keep the meanings as defined by the World Bank.*

ventilated improved pit (VIP) latrine, pit latrine with slab, and composting toilet." This variable is also important to reduce the infant mortality rate and increase life expectancy.

5. Improved water source (% of population with access)

The World Bank also explain that "access to an improved water source refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot, or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection)." Cleaning water is needed for good health result. Most of the diseases are occurred by falling water access system.

6. Urban population (% of total)

As per the World Bank, "Urban population refers to people living in urban areas as defined by national statistical offices. The data are collected and smoothed by United Nations Population Division." Health outcomes can be different between rural and urban area. Thus, I used this variable as one kind of independent variable which is affected the infant mortality rate and life expectancy.

7. Food production index (2004-2006=100)

The World Bank defines "Food production index covers food crops that are considered edible and that contain nutrients. Coffee and tea are excluded because, although edible, they have no nutritive value." Food is also important for human being because we cannot live without food. Thus, food production index is used to analyze the reduction infant mortality rate and increasing life expectancy.

8. GDP per capita (constant 2010 US$)

According to World Bank, "GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars." It can demonstrate the image of people's wealth and health to analyze the health outcomes in this study.

9. Maternal mortality ratio (modeled estimate, per 100,000 live births)

In the World Bank's definition, "Maternal mortality ratio is the number of women who die from pregnancy-related causes while pregnant or within 42 days of pregnancy termination per 100,000 live births. The data are estimated with a regression model using information on the proportion of maternal deaths among non-AIDS deaths in women ages 15-49, fertility, birth attendants, and GDP." This is also concerned with studying to reduce infant mortality rate and increase life expectancy.

10. Prevalence of HIV, total (% of population ages 14-49)

The World Bank defines "Prevalence of HIV refers to the percentage of people ages 15-49 who are infected with HIV." HIV prevalence rates can reflect the infant mortality rate and life expectancy in each country's population. In many developing countries, most new infections occur in young children through their parents.

To be clear and easy, a tabular draw in Table 1 shows the acronym and description of the data used in this study and their related sources that is used from that website are shown below:

Table 1: Data and their related sources

VARIABLE	ACRONYM	DESCRIPTION	SOURCE
"Mortality rate, infant (per 1,000 live births)"	IMR	Dependent Variable	WDI
"Life expectancy at birth, total (years)"	LE	Dependent Variable	WDI
"Health expenditure, public (% of government expenditure)"	PHE	Independent Variable	WDI
"Improved sanitation facilities (% of population with access)"	ISF	Independent Variable	WDI
"Improved water source (% of population with access"	IWS	Independent Variable	WDI
"Urban population (% of total)"	UP	Independent Variable	WDI
"Food production index (2004-2006=100)"	FPI	Independent Variable	WDI
"GDP per capita (constant 2010 US$)"	GDP	Independent Variable	WDI
"Maternal mortality ratio (modeled estimate, per 100,000 live births)"	MMR	Independent Variable	WDI
"Prevalence of HIV, total (% of population ages 14-49)"	PofHIV	Independent Variable	WDI

3.3 HAUSMAN TEST

In panel data analysis, we need to use the Hausman test to choose between fixed effects model and random effects model. According to Statistical Theory, if the p-value is small (p-value < 0.05), it can reject the null hypothesis and the preferred model is fixed effects. If the p-value is not small (p-value >0.05), it can accept the null hypothesis and

the random effects model is preferred. As shown in below two results, fixed effects model is more preferred for this study.

Hausman Test for Infant Mortality Rate

```
. hausman re fe
```

	Coefficients (b) re	(B) fe	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
LPHE	.1741363	-.0545521	.2286883	.077297
LISF	-.1436269	1.527165	-1.670792	.381855
LIWS	1.864231	-3.703347	5.567578	.9823218
LUP	-.849854	-1.082012	.2321578	.2434259
LFPI	-.4469161	-.4483049	.0013889	.1180772
LGDP	-.366942	.5365565	-.9034986	.1392414
LMMR	.4660973	.2601157	.2059817	.1113769
LPofHIV	-.0391686	-.0214069	-.0177617	.0895455

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 30.09
Prob>chi2 = 0.0002
(V_b-V_B is not positive definite)

Hausman Test for Life Expectancy

```
.
. hausman re fe
```

	Coefficients (b) re	(B) fe	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
LPHE	.0055614	.0011892	.0043722	.0038892
LISF	.0018639	-.090358	.0922219	.0203968
LIWS	.1501362	.4308221	-.2806858	.059737
LUP	-.0070808	.0685089	-.0755897	.0135982
LFPI	.0213905	.003993	.0173975	.0070399
LGDP	.0334045	-.013714	.0471185	.0074167
LPofHIV	.00838	-.0011084	.0094884	.0052618

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 3830.31
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

CHAPTER FOUR: RESULTS OF EMPIRICAL ANALYSIS AND RELATED DISCUSSION

4.1 DESCRIPTIVE ANALYSIS

In analyzing my research study, firstly I would like to present the descriptive statistics such as Summary statistics and Correlation Matrix with Logarithmic Variables as shown in Table 2 below.

Table 2: Descriptive Statistics

Panel A: Summary Statistics

```
. su
```

Variable	Obs	Mean	Std. Dev.	Min	Max
Country	0				
Year	0				
LE	120	69.58285	6.507457	55.12166	82.64634
IMR	120	29.16583	24.19737	2.2	88.2
PHE	120	8.000927	5.438058	.765524	23.24722
ISF	120	71.46167	27.68097	7.7	100
IWS	120	82.25	17.89935	30.3	100
UP	120	49.48316	27.23802	17.311	100
FPI	114	101.5625	28.16478	57.32	181.39
GDP	120	9198.027	13960.81	237.9569	51440.82
MMR	120	157.7917	157.9822	10	730
PofHIV	100	.871	.5207405	.1	2
Country1	120	3.5	1.714986	1	6
Year1	120	10.5	5.790459	1	20

In this summary statistics, we can easily see the total observation, Mean, Standard Deviation, Minimum and Maximum for each variable. Although some variables have 120 observations, some are not because of the data unavailable.

Panel B: Correlation Matrix with Logarithmic Variables

```
. correlate LLE LIMR LPHE LISF LIWS LUP LFPI LGDP LMMR LPofHIV
(obs=95)
```

	LLE	LIMR	LPHE	LISF	LIWS	LUP	LFPI	LGDP	LMMR	LPofHIV
LLE	1.0000									
LIMR	-0.9420	1.0000								
LPHE	0.3334	-0.3469	1.0000							
LISF	0.8287	-0.7233	-0.1078	1.0000						
LIWS	0.9267	-0.7993	0.0509	0.9493	1.0000					
LUP	0.8066	-0.8307	0.0061	0.7279	0.8171	1.0000				
LFPI	0.4204	-0.2952	0.1825	0.2683	0.3741	0.1553	1.0000			
LGDP	0.9329	-0.9264	0.4140	0.6808	0.8287	0.8749	0.2809	1.0000		
LMMR	-0.8891	0.8441	-0.4988	-0.7701	-0.7951	-0.5763	-0.2750	-0.8089	1.0000	
LPofHIV	-0.0543	-0.0376	0.3793	-0.0487	-0.2052	-0.3974	0.0449	-0.1539	-0.3116	1.0000

In above **Table 2 - Panel B**, it is shown that LPHE is negatively related to LIMR, LMMR and LISF. And then, LPHE is also positively related to LLE, LIWS, LUP, LFPI, LGDP and LPofHIV. LIMR is positively related to only LMMR and negative relationship with other variables. Although LLE is negatively related with LLIMR, LMMR and LPofHIV, it is positively related with other variables.

Secondly, as shown in **Table 3**, this is the tabular illustrations of Six ASEAN Countries and their Mean Variables between 1995 and 2014.

Table 3: Six ASEAN Countries and their Mean Variables (1995-2014)

COUNTRY	*LE*	*IMF*	*PHE*	*ISF*	*IWS*	*UP*	*FPI*	*GDP*	*MMR*	*PofHIV*
MYANMAR	63.319635	54.425	1.749923955	68.3	71.59	29.0326	95.573684	623.957	264	0.77
THAILAND	72.095302	16.24	16.71713691	92.175	93.915	37.79895	101.91842	4320.124	23.8	1.515
MALASIA	73.428482	7.945	5.602025498	92.955	95.48	65.72825	95.645263	7995.064	53.3	0.605
INDONESIA	67.061905	35.3	5.000707393	51.38	80.725	45.24885	99.346842	2670.013	220.45	0.225
CAMBODIA	62.056756	58.36	9.897081207	24.125	51.79	19.0903	104.71105	605.249	370.6	1.24
SINGAPORE	79.535	2.725	9.038685162	99.835	100	100	112.17947	38973.75	14.6	
6 ASEAN	69.582847	29.166	8.000926687	71.462	82.25	49.48316	101.56246	9198.027	157.79	0.871

From the above data, Myanmar has the lowest mean of public health expenditure (PHE) (1.749923955) among the Six ASEAN Countries which has average of (8.000926687). Thailand is the highest public health expenditures mean (16.71713691) among Six ASEAN Countries. In the infant mortality rate, Cambodia is the highest mean (58.36) above the Six Countries' mean (29.166) although his average public health expenditure (9.897081207) is above the average Six Countries. Myanmar has the second largest mean of infant mortality rate. Among these ASEAN Countries, Singapore has the highest life expectancy average (79.535) and Myanmar has the second lowest mean of life expectancy (63.319635) which are below the Six Countries' average (69.582847). Visibly from the above data, Singapore has the fully improved water access and urban population. Otherwise, it does not have any data of HIV Prevalence Rate.

Figure 1: Infant Mortality Rate's trend in the Six ASEAN Countries

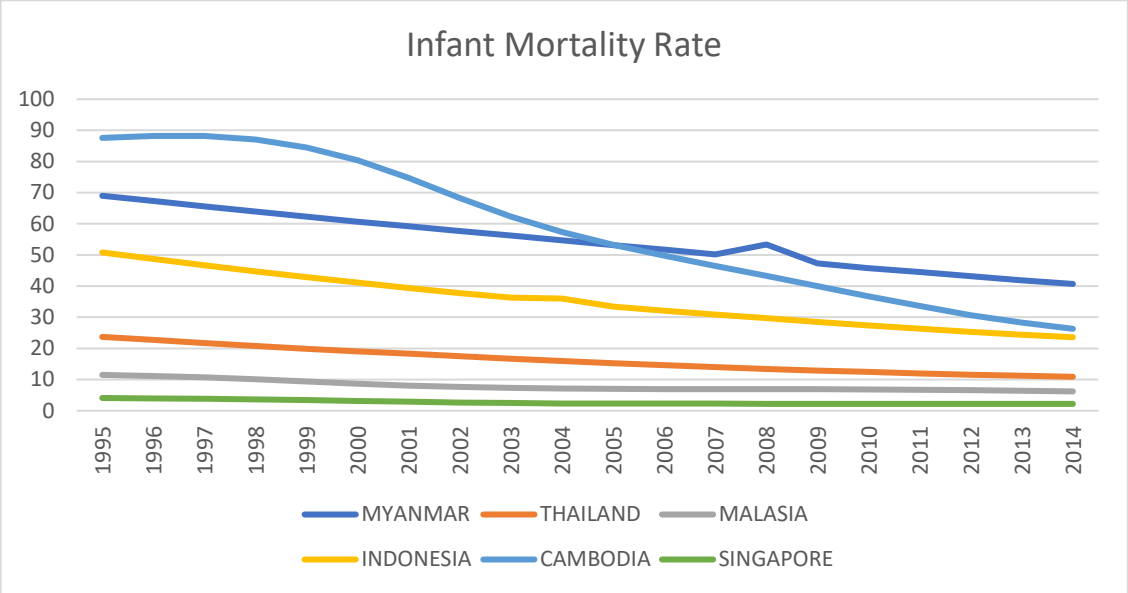


Figure 1 shows the movement of the infant mortality rate in the Six ASEAN Countries from 1995 to 2014. It can see visibly the trend of infant mortality rate. Before 2005, Cambodia has the highest infant mortality rate and then it is rapidly declined. After 2005, Myanmar has the highest infant mortality rate even it is decreasing dramatically. From 1994 to 2015, Singapore has the lowest infant mortality rate below the value of 10 per 1000 live births.

Figure 2: Life Expectancy's trend in the Six ASEAN Countries

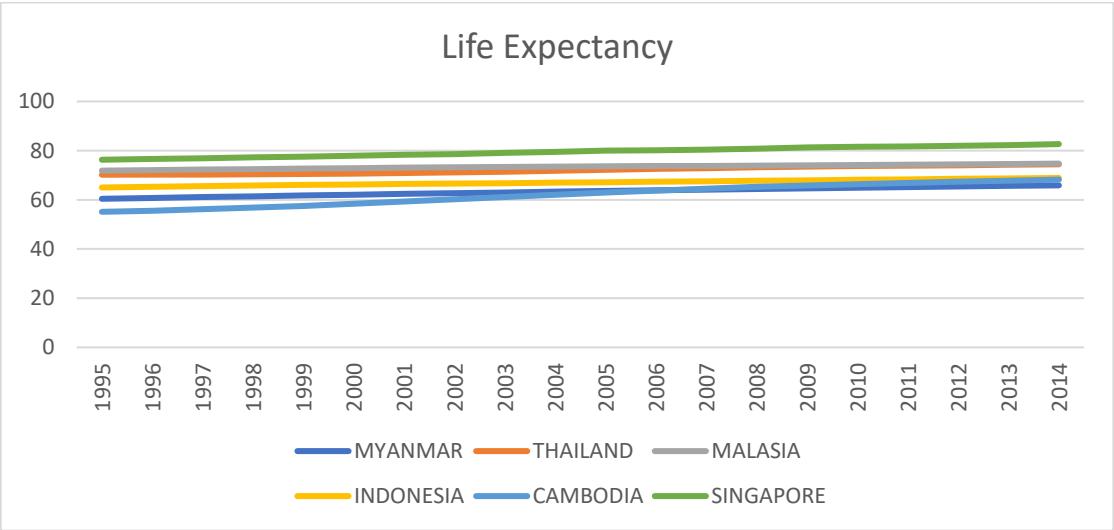


Figure 2 demonstrates the trend of the life expectancy from 1995 to 2014 in the Six ASEAN Countries. The idea to illustrate the figure is to see clearly the process of life expectancy. Life expectancies of these Six ASEAN Countries are between 50 years and 85 years. These are not too difference among these Six Countries and they are increasing slowly.

Figure 3: Public Health Expenditure's trend in the Six ASEAN Countries

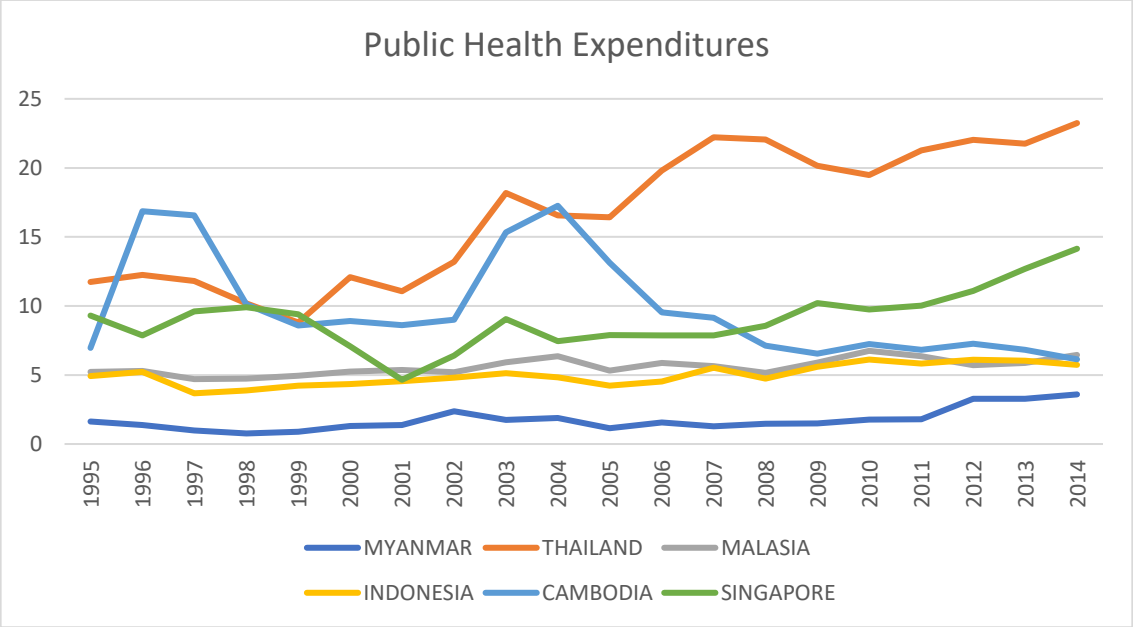


Figure 3 displays the movement of the public health expenditures in the Six ASEAN Countries between 1995 and 2014. Thailand is obviously increased the public health expenditures after 2014. Myanmar is the lowest public health expenditures among these Six ASEAN Countries. Thus, the Myanmar Government is trying to increase health expenditures after 2011 in which is changed to New Democracy Government System. The fluctuation of Cambodia is so high and it is intensely declined under the average level.

Figure 4: Improved Sanitation Facilities' trend in the Six ASEAN Countries

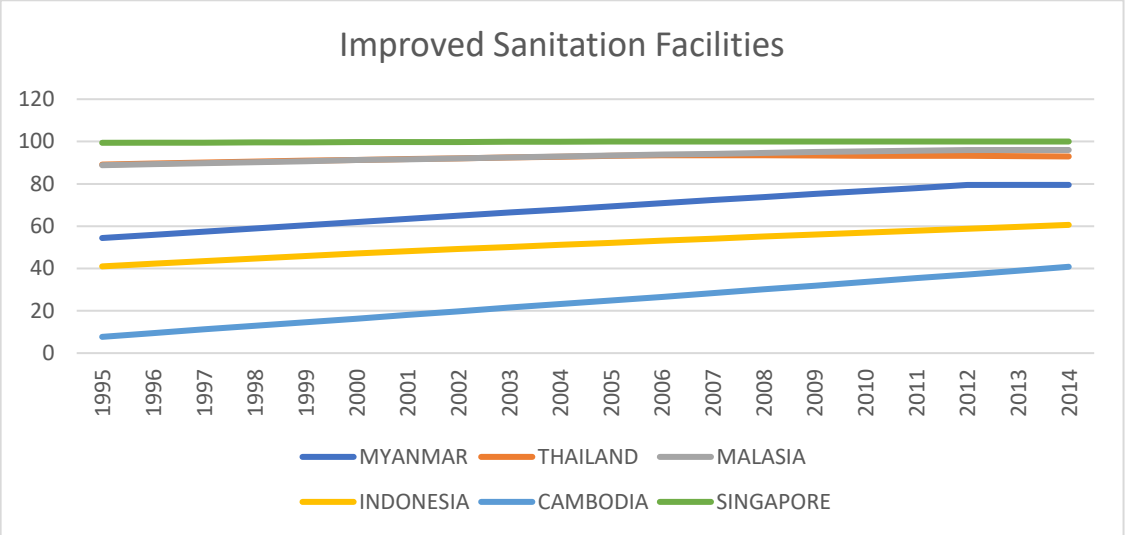


Figure 4 illustrates the trend of the improved sanitation facilities in the Six ASEAN Countries from 1995 to 2014. In this figure, although Cambodia has the lowest sanitation system among these 6 countries, we can see that it has been increasing year by year. The sanitation facility of the Singapore is the best which is almost the 100 percent. The results of the sanitation facilities of Thailand and Malaysia are not too different.

Figure 5: Improved Water Source's trend in the Six ASEAN Countries

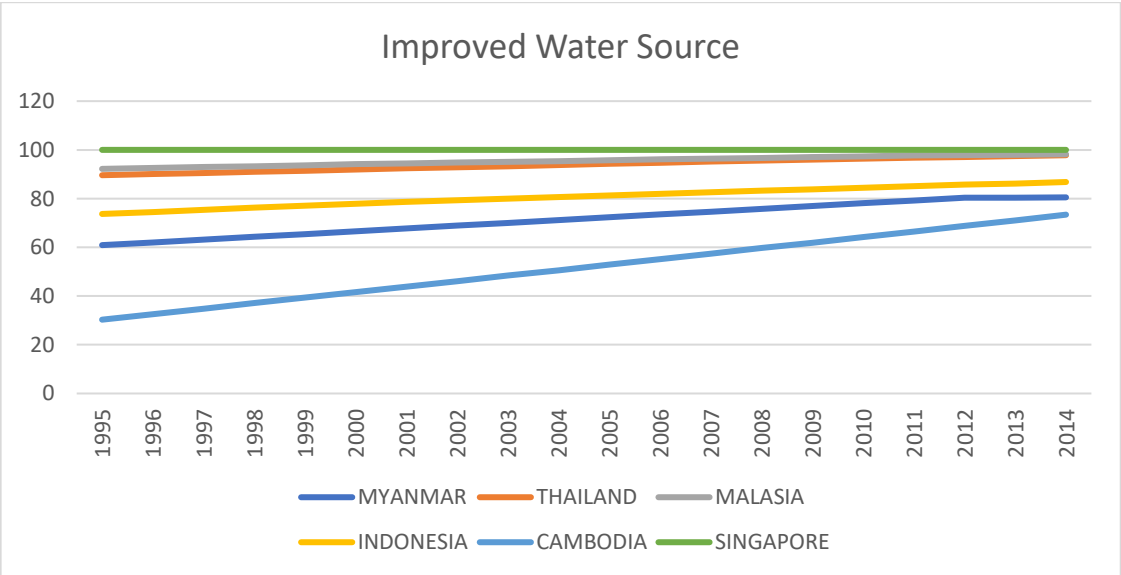


Figure 5 presents the movement of the improved water source of the Myanmar, Thailand, Malaysia, Indonesia, Cambodia, and Singapore for these 20 years. Cambodia has the lowest water source among these six countries. Then, we can see it has been significantly increasing. Indonesia has the medium situation of water source among these countries. Malaysia and Thailand have similar result and Singapore has the highest water source. Water sources is essential to live healthy and for improving health outcomes.

Figure 6: Urban Population's trend in the Six ASEAN Countries

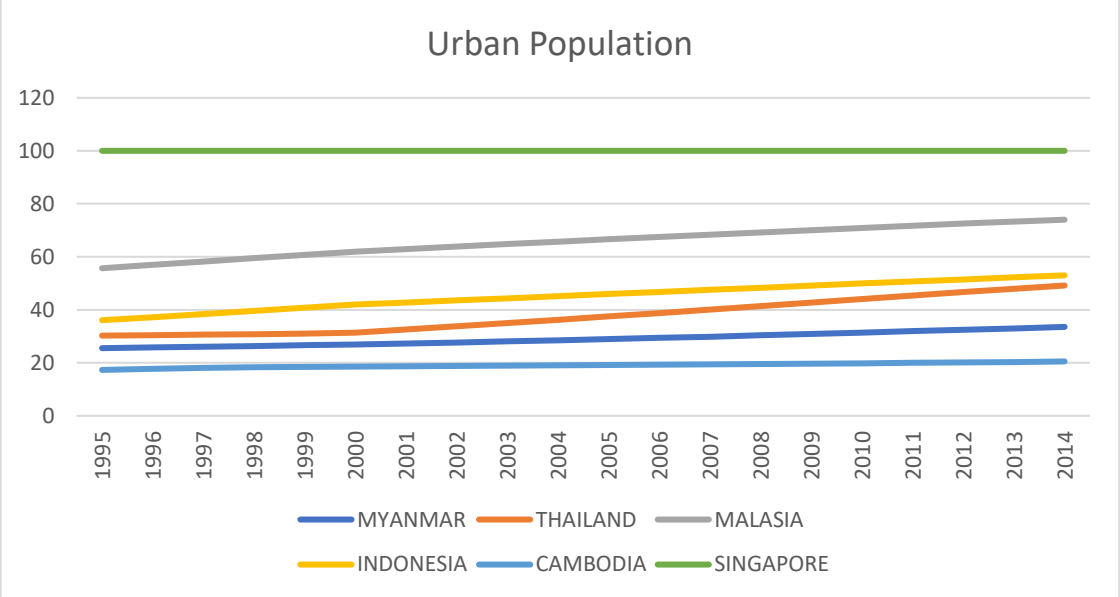


Figure 6 shows the situation of the urban population in the Six ASEAN Countries between 1995 and 2014. Singapore has the highest urban population, which has the full value of 100. Therefore, Singapore has no rural area. On the other side, Cambodia has the lowest urban population. In this figure, we can see that the situation of urban population is not noticeably changed for all Six ASEAN Countries. Thus, we can conclude that the living standard of the people from these countries has slowly changed.

Figure 7: Food Production Index's trend in the Six ASEAN Countries

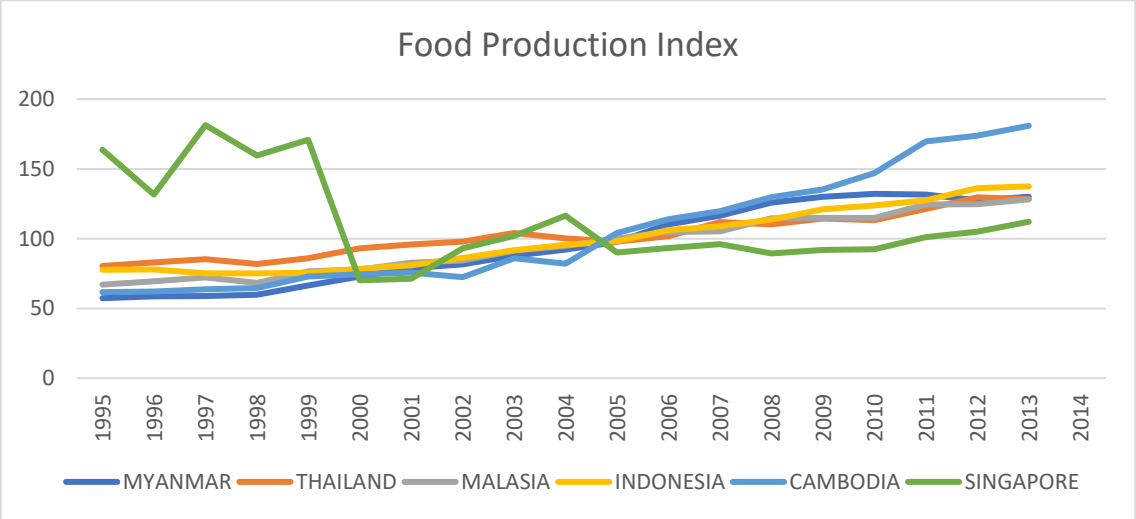


Figure 7 illustrates the movements of Food Production Index for the Six ASEAN Countries from 1995 to 2014. Before 2000, food production of index of Singapore is extremely higher than other five countries. Between 1999 and 2000, it has sharply declined and a little fluctuated until 2014. Other Five Countries has been increasing slightly. After 2008, Cambodia has the highest food production index among these Six ASEAN Countries. After 2005, Singapore has the lowest food production index among these countries.

Figure 8: GDP per capita variable's trend in the Six ASEAN Countries

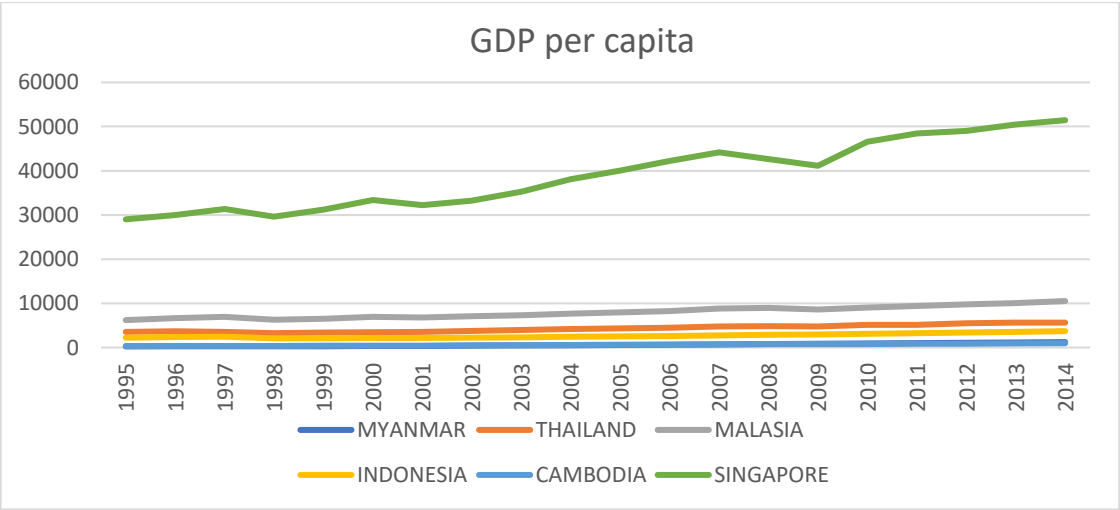


Figure 8 demonstrates the trends of the GDP per capita from 1995 to 2014 in the Six ASEAN Countries. In this figure, GDP per capita of Singapore is extremely large among Six ASEAN Countries. Moreover, it has been increasing strongly comparing with other countries. Myanmar and Cambodia have the lowest GDP per capita and their values are quite similar. The GDP per capita of the other five countries which are excluding Singapore are not too different and under the value of 10000.

Figure 9: Maternal Mortality Rate's trend in the Six ASEAN Countries

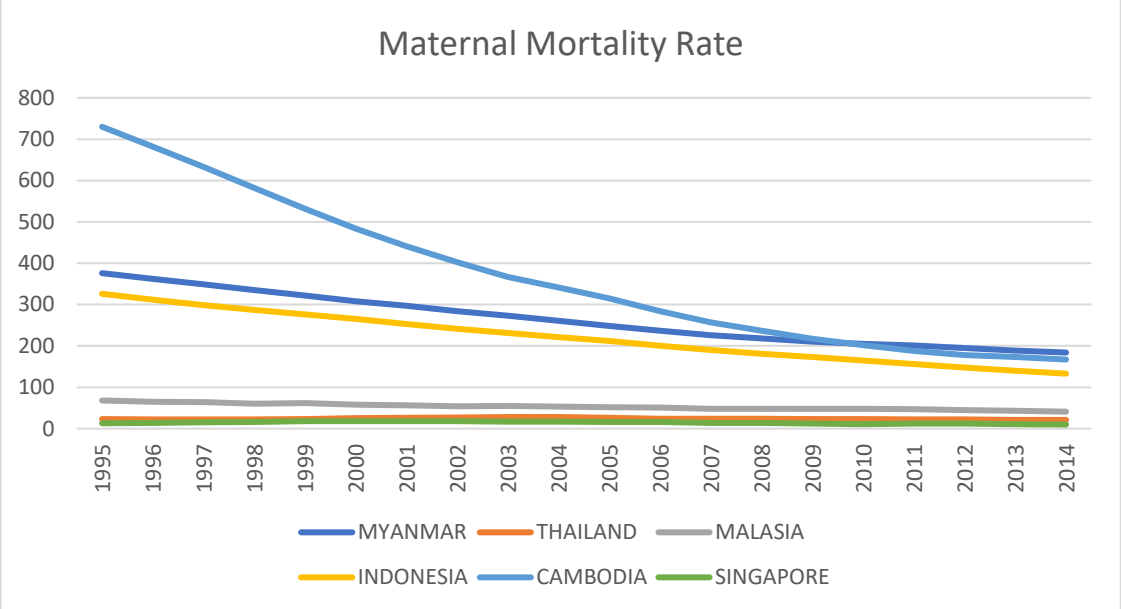


Figure 9 presents the movement of maternal mortality rate of the Myanmar, Thailand, Malaysia, Indonesia, Cambodia, and Singapore for 20 years. From 1995 to 2007, the maternal mortality rate of Cambodia is declined steeply. Moreover, Myanmar and Indonesia have been decreasing gradually. Maternal mortality rates of Malaysia, Thailand and Singapore are under the value of 100 per 100,000 live births and then their rates are quite similar.

Figure 10: Prevalence of HIV's trend in the Six ASEAN Countries

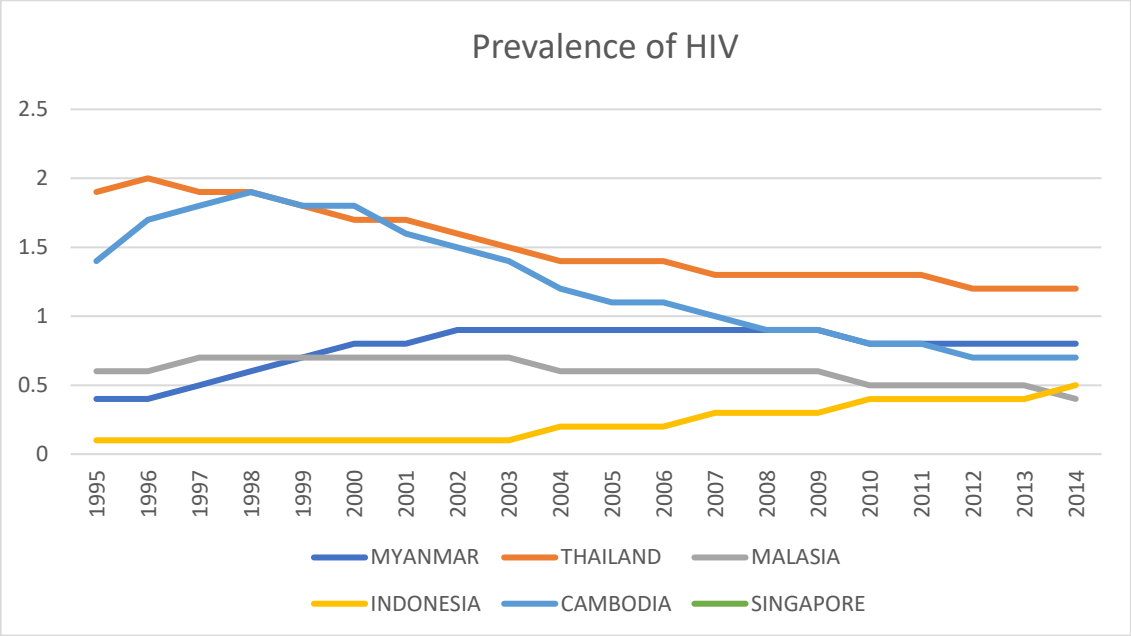


Figure 10 shows the situation of the prevalence of HIV in the Six ASEAN Countries between 1995 and 2014. In this figure, we can see that no HIV prevalence rate in Singapore because it cannot be found the data about prevalence of HIV for Singapore. Cambodia had increased between 1995 and 1998 and then it declines dramatically. Before 2003, the prevalence of HIV in Indonesia is stable and later it is increasing slowly. We can obviously see the falling of HIV prevalence rate in Thailand. In Myanmar, it is a little increased before 2002 and then it is stable up to 2014.

4.2 REGRESSION RESULTS ON EFFECTIVENESS OF PUBLIC HEALTH EXPENDITURE IN REDUCING INFANT MORTALITY RATE AND INCREASING LIFE EXPECTANCY

As mentioned above Chapter-3, the collected data is analyzed with Panel data – Fixed effects regression model by using in STATA econometric software. Table 4 and 5 presents the regression models 1 and 2 mentioned in Chapter 3. Initially, **Table (4)** illustrates the variation in infant mortality rate in Six ASEAN Countries between the period 1995 and 2014.

Table 4: Public Health Expenditures and Infant Mortality Rate

Infant Mortality Rate	Fixed Effects	Fixed Effects	Fixed Effects
"Variables"	Model (1)	Model (2)	Model (3)
LPHE	-0.055**	-0.026	0.051
	(0.022)	(0.026)	(0.031)
LISF	1.527***		
	(0.234)		
LIWS	-3.703***	-0.565***	-0.312
	(0.496)	(0.153)	(0.189)
LUP	-1.082***	-1.065***	-1.198***
	(0.079)	(0.096)	(0.120)
LFPI	-0.448***	-0.562***	-0.146*
	(0.070)	(0.083)	(0.077)
LGDP	0.537***	0.350***	
	(0.048)	(0.048)	
LMMR	0.260***	0.169*	0.296***
	(0.071)	(0.086)	(0.107)
LPofHIV	-0.021	0.061***	0.090***
	(0.021)	(0.021)	(0.026)
Constant	13.840***	8.720***	8.111***
	(1.206)	(1.125)	(1.429)
Observations	95	95	95
R-squared	0.978	0.966	0.945

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Anil Shetty and Shraddha Shetty (2014) found that Asian countries had a decrease in IMR by increasing health expenditure. In this study, **Table (4) Model (1)**, LPHE is a

negative relationship with LIMR as expected and statistically significant at 5 % level. LIWS, LUP and LFPI are also negatively related with LIMR with a statistical significance of 1% level. LMMR has a positive relationship with LIMR and as a statistical significance of 1% level. LISF and LGDP are positively related to LIMR, which is contrary to theory, and statistically significant. Moreover, LPofHIV is a negative relationship with LIMR that is opposing with the theory.

In the same Table (4), LISF is excluded in **Model (2)** because the sign of LISF in model (1) was different from the theory and as statistically significant. Subsequently, although LPHE is negatively related with LIMR, it is statistically insignificant. LIWS, LUP and LFPI are negative relationship with LIMR along with a statistical significance of 1% level. Although LISF is excluded in model (2), LGDP is still opposing the theory and positive relationship with LIMR as a statistically significant. LMMR and LPofHIV are positively related with LIMR and as a statistically significant of 0.1 % and 1 % respectively. In Model (2), LPofHIV is consistency with the theory after removing the LIWS.

Finally, in **Model (3),** both LISF and LGDP are left out from the analysis and the results show that LPHE is changed to be positive relationship with LIMR, which is contrary to theory, and as statistically insignificant. LIWS is negatively related with LIMR but not statistically significant. LUP and LFPI have negative relationship with LIMR and as statistically significant 1% and 0.01% respectively. Moreover, LMMR and LPofHIV are positively correlated with LIMR along with a significant of 1 % level.

Table (5) will present the correlation of the life expectancy in the Six ASEAN Countries for 20 years that is from 1995 to 2014.

Table 5: Public Health Expenditures and Life Expectancy

Life Expectancy	Fixed Effects	Fixed Effects	Fixed Effects
"Variables"	Model (1)	Model (2)	Model (3)
LPHE	0.002	0.001	0.010***
	(0.002)	(0.002)	(0.002)
LISF	-0.099***	-0.090***	-0.083***
	(0.017)	(0.018)	(0.028)
LIWS	0.430***	0.431***	0.398***
	(0.037)	(0.038)	(0.060)
LUP	0.068***	0.069***	
	(0.006)	(0.006)	
LFPI	-0.003	0.004	0.036***
	(0.005)	(0.005)	(0.006)
LGDP	-0.013***	-0.014***	-0.019***
	(0.004)	(0.004)	(0.006)
LMMR	-0.014***		
	(0.005)		
LPofHIV	-0.003*	-0.001	-0.002
	(0.002)	(0.002)	(0.002)
Constant	2.685***	2.547***	2.785***
	(0.090)	(0.076)	(0.116)
Observations	95	95	95
R-squared	0.994	0.993	0.983

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In this study, **Table (5) Model (1)**, LPHE is a positively correlated with LLE but as a statistically insignificant. LIWS and LUP are also positive relationship with LLE in a statistical significance of 1% level. Moreover, LMMR and LPofHIV are negatively related with LLE, at 1 % and 0.01% level of significance respectively. LISF and LGDP have negative coefficient signs, which is contrary to theory, at a statistical significance level of 1 %. LFPI has negative correlated with LLE, which is also different from theory, but statistically insignificant.

In the same Table (5), LMMR is excluded in **Model (2)** to explain more the effectiveness of public health expenditures in increasing life expectancy. But the results

show that LPHE is positive relationship with LLE and still as insignificant. LIWS and LUP are positively correlated with LLE, along with a statistical significance of 1% level. LFPI is positive relationship with LLE and it has statistically insignificant. And then, LPofHIV is negatively related with LLE and it is also not significant. In this model, LISF and LGDP are controversial with the theory. Both of LISF and LGDP have negative relationship with LLE and along with statistically significant.

Finally, in **Model (3),** both LMMR and LUP are removed from the analysis and the results show that LPHE has positive relationship with LLE and it changed statistically significant of 1 % level. LPofHIV are negatively correlated with LLE, but not statistically insignificant. Also in this model, LISF and LGDP are still controversial with the theory. Both of LISF and LGDP have negative relationship with LLE and along with statistically significant.

CHAPTER FIVE: SUMMARY CONCLUSION AND POLICY IMPLICATION

5.1 CONCLUSION

This research paper employed a panel data fixed effects regression by using the STATA econometric software, between the period 1995 and 2014, to express the effectiveness of public health expenditures on health outcomes such as infant mortality rate and life expectancy. The data used in this research are from the Six ASEAN Countries, which are Myanmar, Thailand, Cambodia, Malaysia, Indonesia, and Singapore. It is emphasized to give policy recommendation, especially for Myanmar by comparing with other Five ASEAN Countries.

It is shown in the result that Myanmar had the second largest of average infant mortality rate and it is above the 6 ASEAN Countries' average. And then, Myanmar had second lowest of average life expectancy among other countries. Nevertheless, the average of public health expenditures is the lowest in Myanmar within these Six Countries. Although Cambodia had the second highest of average public health expenditures, it had the highest average of infant mortality rate and the lowest average of life expectancy.

5.2 POLICY IMPLICATIONS

In the correlation matrix in Panel B, public health expenditure is negatively correlated with the improved sanitation facilities. It means that the higher the public health expenditures, the lower the improved sanitation system. The policy recommendation drawn from that result is that we need to invest to improve sanitation and sewage system. Most of the children under five are died every year due to diarrheal diseases. The improvement of water and sanitation is important to save infants and children from the incident of diseases such as diarrhoea and malaria.

Moreover, in this correlation matrix shows the positive relationship between public health expenditures and HIV prevalence rate. This means that the increasing public health expenditure cannot be able to reduce incidence of HIV/AIDS. It is because of spending public health expenditures do not affect in preventing and curing on HIV/ AIDS. So, it should be more emphasized on spending on that project.

In regression result Table (4) Model (1), we can see the negative relationship between infant mortality rate and public health expenditures. An increase in public expenditure on health care will reduce the infant mortality rate by 5.5 deaths per 1000 live births. An improving water source by 1 percent will also decrease the infant mortality rate by 370.3 percent. In this result, an increasing GDP per capita cannot affect in reducing infant mortality rate. So, we are not able to decide reducing death of infant by viewing the GDP progress.

Increasing public health expenditures and medical facilities, improving water source, more providing food and nutritious, reduction of HIV/ AIDS prevalence rate are key factors that to increase life expectancy. Furthermore, we need to change our lifestyle to be healthy and well-being in our lives and to extend to years of life. To get a better and longer life, as personally, we should do exercise regularly, eat the healthy food, avoid the alcohol, cigarette and fast food which may get side effect for our health, reduce our stress as much as possible, be optimistic and be happy with other people.

For the whole country's performance, our government needs to provide human basic needs and infrastructure of their citizens. And they must reduce unemployment and inequality, build human capital, provide effective health care system, educate their citizens concerning with health's knowledge.

APPENDICES

APPENDIX A

STATA Output for Table 4, Model (1): Infant Mortality Rate and Public Health Expenditures (ASEAN)

```
. xtreg LIMR LPHE LISF LIWS LUP LFPI LGDP LMMR LPofHIV,fe

Fixed-effects (within) regression               Number of obs      =        95
Group variable: Country1                        Number of groups   =         5

R-sq:                                           Obs per group:
     within  = 0.9779                                         min =        19
     between = 0.4993                                         avg =      19.0
     overall = 0.4971                                         max =        19

                                                F(8,82)            =    453.21
corr(u_i, Xb)  = 0.3275                         Prob > F           =    0.0000
```

LIMR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LPHE	-.0545521	.0219113	-2.49	0.015	-.0981407	-.0109635
LISF	1.527165	.2335454	6.54	0.000	1.062569	1.991761
LIWS	-3.703347	.4957747	-7.47	0.000	-4.689601	-2.717093
LUP	-1.082012	.0785748	-13.77	0.000	-1.238322	-.9257015
LFPI	-.4483049	.0701983	-6.39	0.000	-.5879518	-.3086581
LGDP	.5365565	.0484304	11.08	0.000	.440213	.6329001
LMMR	.2601157	.0714549	3.64	0.000	.1179691	.4022622
LPofHIV	-.0214069	.0211845	-1.01	0.315	-.0635496	.0207359
_cons	13.84048	1.206387	11.47	0.000	11.44059	16.24037
sigma_u	.66831457					
sigma_e	.03963267					
rho	.99649555	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(4, 82) = 605.13                     Prob > F = 0.0000
```

APPENDIX B

STATA Output for Table 4, Model (2): Infant Mortality Rate and Public Health Expenditures (ASEAN) excluding LSF from Model (1)

```
. xtreg LIMR LPHE LIWS LUP LFPI LGDP LMMR LPofHIV,fe

Fixed-effects (within) regression               Number of obs      =        95
Group variable: Country1                        Number of groups   =         5

R-sq:                                           Obs per group:
     within  = 0.9664                                         min =        19
     between = 0.5668                                         avg =      19.0
     overall = 0.5845                                         max =        19

                                                F(7,83)            =    340.52
corr(u_i, Xb)  = 0.3183                         Prob > F           =    0.0000
```

LIMR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LPHE	-.0256318	.0263108	-0.97	0.333	-.0779629	.0266993
LIWS	-.5651703	.152519	-3.71	0.000	-.8685244	-.2618163
LUP	-1.065324	.0962834	-11.06	0.000	-1.256828	-.8738201
LFPI	-.5621671	.0833748	-6.74	0.000	-.7279962	-.3963381
LGDP	.3503422	.0480273	7.29	0.000	.2548178	.4458666
LMMR	.1693345	.0859357	1.97	0.052	-.0015881	.3402571
LPofHIV	.0608221	.0209018	2.91	0.005	.0192493	.1023949
_cons	8.720257	1.125166	7.75	0.000	6.482347	10.95817
sigma_u	.60439254					
sigma_e	.0485904					
rho	.99357808	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(4, 83) = 395.97                     Prob > F = 0.0000
```

APPENDIX C

STATA Output for Table 4, Model (3): Infant Mortality Rate and Public Health Expenditures (ASEAN) excluding LISF and LGDP from Model (1)

```
. xtreg LIMR LPHE LIWS LUP LFPI LMMR LPofHIV,fe

Fixed-effects (within) regression               Number of obs      =        95
Group variable: Country1                        Number of groups   =         5

R-sq:                                           Obs per group:
     within  = 0.9448                                         min =        19
     between = 0.8013                                         avg =      19.0
     overall = 0.8133                                         max =        19

                                                F(6,84)            =    239.53
corr(u_i, Xb)  = -0.3183                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        LIMR |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        LPHE |   .0509727   .0307199     1.66   0.101    -.0101172    .1120627
        LIWS |  -.3122551   .1891341    -1.65   0.102    -.6883691    .0638588
         LUP |  -1.197541    .120416    -9.95   0.000    -1.437001   -.9580805
        LFPI |  -.1455784    .077353    -1.88   0.063    -.2994032    .0082465
        LMMR |   .2959284   .1071766     2.76   0.007      .082796    .5090608
     LPofHIV |   .0896207   .0261374     3.43   0.001     .0376435    .1415979
       _cons |   8.111004   1.428843     5.68   0.000     5.269592    10.95242
-------------+----------------------------------------------------------------
     sigma_u |  .40095381
     sigma_e |  .06187545
         rho |   .9767391   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(4, 84) = 266.83                     Prob > F = 0.0000
```

APPENDIX D

STATA Output for Table 5, Model (1): Life Expectancy and Public Health Expenditures (ASEAN)

```
. xtreg LLE LPHE LISF LIWS LUP LFPI LGDP LMMR LPofHIV,fe

Fixed-effects (within) regression               Number of obs      =        95
Group variable: Country1                        Number of groups   =         5

R-sq:                                           Obs per group:
     within  = 0.9939                                         min =        19
     between = 0.8788                                         avg =      19.0
     overall = 0.8958                                         max =        19

                                                F(8,82)            =   1663.69
corr(u_i, Xb)  = -0.5005                        Prob > F           =    0.0000
```

LLE	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LPHE	.0020523	.001626	1.26	0.210	-.0011823	.0052868
LISF	-.0993712	.0173307	-5.73	0.000	-.1338475	-.0648949
LIWS	.4296032	.0367899	11.68	0.000	.3564163	.5027901
LUP	.0681287	.0058308	11.68	0.000	.0565294	.079728
LFPI	-.0031158	.0052092	-0.60	0.551	-.0134786	.007247
LGDP	-.0132716	.0035939	-3.69	0.000	-.020421	-.0061222
LMMR	-.0141935	.0053024	-2.68	0.009	-.0247418	-.0036453
LPofHIV	-.0026857	.001572	-1.71	0.091	-.0058129	.0004416
_cons	2.685451	.0895223	30.00	0.000	2.507362	2.863539
sigma_u	.03204546					
sigma_e	.00294102					
rho	.99164743	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(4, 82) = 408.22                     Prob > F = 0.0000
```

APPENDIX E

STATA Output for Table 5, Model (2): Life Expectancy and Public Health Expenditures (ASEAN) excluding LMMR from Model (1)

```
. xtreg LLE LPHE LISF LIWS LUP LFPI LGDP LPofHIV,fe

Fixed-effects (within) regression               Number of obs     =         95
Group variable: Country1                        Number of groups  =          5

R-sq:                                           Obs per group:
     within  = 0.9933                                         min =         19
     between = 0.8041                                         avg =       19.0
     overall = 0.8387                                         max =         19

                                                F(7,83)           =    1768.95
corr(u_i, Xb)  = -0.3155                        Prob > F          =     0.0000

------------------------------------------------------------------------------
         LLE |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        LPHE |   .0011892   .0016518     0.72   0.474    -.0020962    .0044745
        LISF |   -.090358   .0176205    -5.13   0.000    -.1254045   -.0553115
        LIWS |   .4308221   .0381289    11.30   0.000     .3549852    .5066589
         LUP |   .0685089   .0060417    11.34   0.000     .0564922    .0805255
        LFPI |    .003993   .0046449     0.86   0.392    -.0052454    .0132314
        LGDP |   -.013714    .003721    -3.69   0.000     -.021115   -.0063131
     LPofHIV |  -.0011084   .0015106    -0.73   0.465    -.0041129    .0018961
       _cons |    2.54739   .0758404    33.59   0.000     2.396547    2.698234
-------------+----------------------------------------------------------------
     sigma_u |  .03644466
     sigma_e |  .00304829
         rho |  .99305268   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(4, 83) = 423.06                     Prob > F = 0.0000
```

APPENDIX F

STATA Output for Table 5, Model (3): Life Expectancy and Public Health Expenditures (ASEAN) excluding LMMR and LUP from Model (1)

```
. xtreg LLE LPHE LISF LIWS LFPI LGDP LPofHIV,fe

Fixed-effects (within) regression               Number of obs      =        95
Group variable: Country1                        Number of groups   =         5

R-sq:                                           Obs per group:
     within  = 0.9830                                         min =        19
     between = 0.7759                                         avg =      19.0
     overall = 0.7837                                         max =        19

                                                F(6,84)            =    810.83
corr(u_i, Xb)  = 0.4138                         Prob > F           =    0.0000
```

LLE	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LPHE	.0103064	.00229	4.50	0.000	.0057525	.0148604
LISF	-.0827763	.0279451	-2.96	0.004	-.1383481	-.0272045
LIWS	.3978962	.0603379	6.59	0.000	.2779076	.5178848
LFPI	.0359101	.0058641	6.12	0.000	.0242487	.0475714
LGDP	-.0193845	.005852	-3.31	0.001	-.0310218	-.0077472
LPofHIV	-.0017166	.0023959	-0.72	0.476	-.0064811	.0030479
_cons	2.785076	.1156764	24.08	0.000	2.555041	3.015111
sigma_u	.04382091					
sigma_e	.00483789					
rho	.98795832	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(4, 84) = 155.66                     Prob > F = 0.0000
```

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