CHAPTER 4

RESEARCH METHODOLOGY

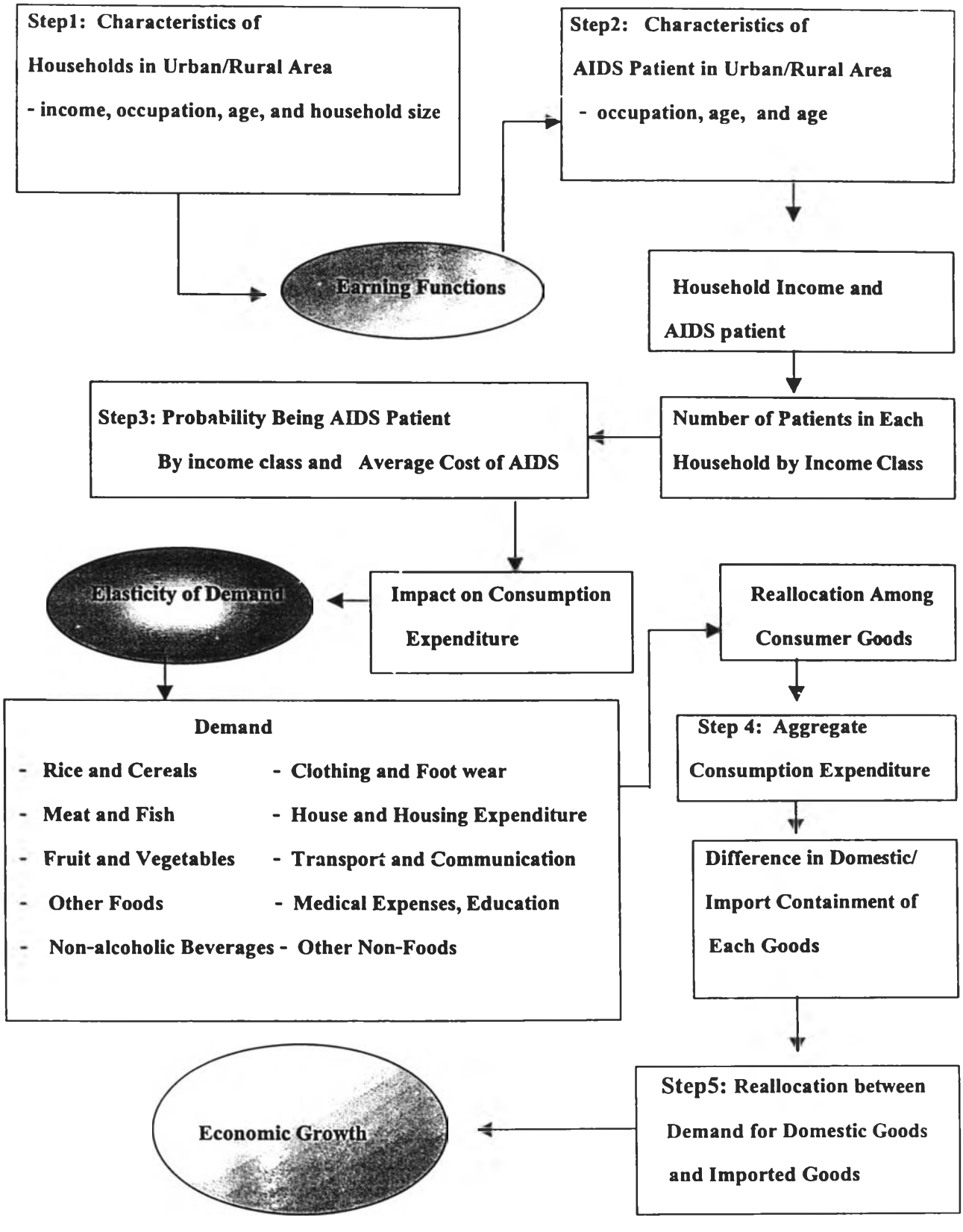
This analytical study aims at examining the economic impact of HIV/AIDS on household consumption reallocation in Thailand. It also attempts to estimate the economic growth in a situation without AIDS in Thailand. This chapter comprises of four sections. The first section presents the conceptual framework of the study. The second section discusses various economic concepts used in the analysis. The third section details about data collection and sources are explained and in the final section, various steps involved in the analysis are illustrated.

4.1 Conceptual Framework

The conceptual framework of this study is presented in Figure 4.1. The impact of HIV/AIDS on household consumption is measured through the earning function and income elasticity estimates. In this model, an earner refers to the head of household only, and members of households are assumed to have the same characteristics as those of the household head. These characteristics are income class, occupation, age, household size, region and area.

When AIDS patient are treated, they manage their budget by reallocating their consumption in each commodity, which depends on their income elasticity of expenditure. On the other hand, in a situation without AIDS, the households would be able to allocate more on other goods as they need not to allocate their scarce resources to medical expenses. Then the pattern of consumption would also change and thus affect household consumption reallocation. The change in household allocation will affect the aggregate consumption of the country and especially the imported contents of medical expense. Thus, in a situation without AIDS, the country can save money from the treatment cost of AIDS.

Figure 4.1 Conceptual Framework



So the effect on GDP in a situation without AIDS can be explained by the change in household consumption. The change in GDP is affected through the trade balance. This can be determined by estimating differences in the quantity demanded of domestic and imported goods.

4.2 Concepts Used in the Study

This study aims to find out how much demand for each goods and services change as a result of change in income of HIV/AIDS affected households, and what will be the economic growth in a situation without HIV/AIDS, by using the concepts of economic theory and by examining the available data from past studies. Various concepts used in the study are discussed below:

Economic Growth

An increase in a nation's or an area's capacity to produce goods and services coupled with an increase in production of these goods and services is termed economic growth. Usually, economic growth is measured by the annual rate of increase in a nation's gross national product, as adjusted for price changes. A better measure, however, is the increase in the real gross domestic product per capita; in some underdeveloped countries yearly gains in output are surpassed by gains in population, leaving the average person with a lowered standard of living. Even when population changes are taken into account, however, growth rates do not always accurately measure changes in the standard of living. Output of a nation does not rise smoothly and evenly from one year to another and as a result, by a careful selection of beginning and terminal year, it is possible to make economic growth over a period of time appear either bad or good in relation to another period. Comparisons of international growth rates are even more complicated because of differences in national income definitions and accounting methods.

Gross Domestic Product (GDP)

Gross domestic product (GDP) is an estimate of income accruing to residents and generated within the country only. GDP is much more frequently used in reference to sectoral industrial analysis. GDP can be calculated either at factor cost or at market prices.

GDP can be measured by three methods :

- Gross value added method
- Income method
- Expenditure method

Under gross value method, GDP is estimated by adding net value added of all sectors in the economy namely primary, secondary and tertiary sectors. This will give the net value added of a coming with whole this figure if we add depreciation costs we get GDP.

Under income method, GDP can be estimated by adding all domestic factor incomes. In other words,

GDP = Net domestic factor earnings + depreciation

= rent + wages + interest + profit + depreciation

Under expenditure method, it is estimated by adding values of final demand (expenditure) incurred on domestic output by households, business firms and government. In other words, final expenditure on domestic output is made up of four components:1) consumption spending by households; 2) investment spending by businesses or households; 3) government (federal, state, and local) purchases of goods and services; and 4) foreign demand(net exports).

Consumption Spending

This includes spending on consumption goods. Semi-durable consumer goods and some times consumer spending on durable goods such as automobiles.

Consumption is the largest of the four expenditures on national product of the economy. Several factors affect the level of consumption expenditures by households. However, one of the most important among them is income. As household income increases, the income is divided between both consumption and saving. Four important measures of the relationship between income, consumption, and saving are the average propensity to consume (APC), the average propensity to save (APS), the marginal propensity to consume (MPC), and marginal propensity to save (MPS). The average propensities to consume and save are calculated by dividing consumption or saving by disposable income. The marginal propensities to consume and save are found by dividing the change in consumption or saving by the change in disposable income.

Consumption Function

Consumption function depicts the relationship between consumption expenditure and disposable income. The slope of the consumption function is the marginal propensity to consume. The positive slope indicates that consumption expenditures are higher at higher levels of income and the slope of less than one indicates that the increase in consumption is less than the increase in income. In other words, households spend only a fraction of any additional income. The three most important determinants of consumption are the interest rate, wealth, and expectations. A change in any of these determinants causes a shift in the consumption function. But a change in income causes a movement along a given consumption function and a change in the amount consumed.

Income Elasticity of Demand:

Income elasticity of demand is the relative response of demand to a change in income. It measure the relationship between quantity demanded and income.

Income elasticity tells us how responsive quantity demanded is to a change in income. Income elasticity can be written as:

$$\varepsilon = \frac{\Delta Q}{\Delta Y} \cdot \frac{Y}{Q} \quad \text{.....(4.1)}$$

Where

ε = income elasticity of demand

Y = income

Q = quantity demanded

Δ Q = change in consumption

Δ Y = change in income

Different types of goods respond differently to a change in income. In this regard there are two types of goods, nominal and inferior goods and services. If the quantity of a good demanded increases as income increases, it is a normal good. In terms of the measure of income elasticity, both the numerator and the denominator have the same sign, meaning the income elasticity of demand is positive. The other is an inferior goods the quantity of demand will decrease if income increase.

Government Purchase of Goods and Services

Government purchases of goods and services includes such items as national defense expenditures, road paving by state and local governments, and a salaries of government employees. Government spending on goods and services also include purchases of consumers and other semi-durable goods and services for the functioning of the government offices, transfers plus purchases as government expenditure.

Investments

Investments means additions to the physical stock of capital. It does not include buying a bond or purchasing stock as these purchases do not add to the real flow of goods and services. Practically, investments includes housing construction,

building of machinery, business construction, and additions to a firm's inventories of goods. The classification of spending as consumption or investments remains to a significant extent a matter of convention. From the economic point of view, there is little difference between a household building up an inventory of peanut butter and a grocery store doing the same. Nevertheless, in the national income accounts, the individual's purchase is treated as a personal consumption expenditure.

Net Exports

The item "Net exports" show the effects of domestic spending on foreign goods and services and foreign spending on domestic goods and services on the aggregate demand for domestic output. The total demand for the goods and services we produce includes exports, the demand from foreigners for our goods.

Net exports = X – M, where X = value of exports

M = value of imports

The final expenditure on GDP may be written as = C + I + G + (X- M)

where C = consumption expenditure of households

I = Investment Expenditure by the private sector

G = government expenditure on goods and services

4.3 Data Collection

This study is based on secondary data collected from different sources. The details of data collected and the sources are given below:

- Details of AIDS cases by region, area (rural and urban), age, and occupation up to 1997 were collected from the Ministry of Public Health, Thailand (appendix-1).
- Characteristics of the head of household by 1988 SES according to regions, areas (rural and urban), age, and occupation (appendix-2).
- Characteristics of the head of household by 1988 SES are shown by the average determined age group of 15 to 60 year olds according to occupations, number of

households, household size, per capita household income, regions and area (appendix-3)

- Characteristics of urban and rural households by various income quintile groups in the year 1988 were collected from Samtisart (1993) in appendix-4. The values of household income and expenditure by these quintile groups are then converted into 1997 value (appendix-5).
- Details of household size by both urban and rural quintiles based on 1988 SES were collected from Samtisart (1993). These figures are shown in appendix 6.
- The details of average monthly per capita households expenditure by commodity and quintile in 1988 were collected from the same study, (1993) (appendix-7). These figures are converted into 1997 value (appendix-8).
- Details of the own price and cross price elasticities of demand for ten commodities by five quintiles in both rural and urban areas were collected from the same study,1993 (appendix-9).
- Details of domestic and imported content by consumer goods were also collected from Samtisart,1993 (appendix-10).

4.4 Steps Followed in the Analysis

According to the conceptual framework in figure 4.1 there were five steps involved in the analysis impact of AIDS on household in a situation without AIDS. The steps are shown below.

Step 1:

In this step, earning function was used to estimate per earner household income. Household is defined as a persons or group of person, who together make decisions to consume goods and services. In the earning function a dependent variable is the per earner household income, instead of per capita household income. Note that

it will be re-calculated into per capita household income to predict actual income of the household. Independent variables are occupation, age of head of household, and household size. Sex is assumed to have no effect on income.

There are six earning functions. Two functions for urban and rural areas of each of three regions namely Bangkok Metropolitan Area (BMA), Northern region, and Other regions. The general form of earning function used in the study to estimate per earner household income in these regions is illustrated below.

$$Y = \alpha+\beta_1(Occ_1)+\beta_2(Occ_2)+\beta_3(Occ_3)+\beta_4(\text{HH Size})+\beta_5(\text{HdAge})+\beta_6(\text{HdAge}^2)...(4.2)$$

Where

Y = Per earner household income in each region

α = Constant's coefficient

$\beta_{1,2,3,...,n}$ = Coefficient of each of the following independent variables respectively

Occ_1 = Government and private worker

Occ_2 = Labourer

Occ_3 = Entertainment

HH size = Mean of household size

Hd Age = Head of household's age

Hd Age^2 = Head of household's age square

Characteristics of household heads are used to represent individuals' characteris tics. Moreover, in order to estimate per earner household income the mean of each variable according to age group between 15-60 were used in each model of the earning function. These figures are shown in appendix1. The per capita income of household heads does not represent exactly individual income. In fact, there are many factors affecting household earnings, such as the number of household earners, and

the household size. These factors were used to calculate per earner household income as shown by the following formula:

$$\text{Per earner household income} = \left[\frac{\text{Per capita household income}}{\text{number of earners}}\right] * \text{household size} \quad ..(4.3)$$

The occupations of the households are separated into four broad categories: Government and private workers (including military officers and policemen entrepreneurs, merchants, farmers and state enterprise workers), labourer (including fishery workers and employees in factories), entertainment (restaurant workers, beauticians, actors, singers and musicians), and other occupations (including drivers, casual labour, unemployed, housekeeping, prisoners, and others). To retain a high degree of freedom in the regression method, other occupations in each model were dropped.

Head of households' age has been considered as an independent factor affecting per earner household income. The study assumed only the labour force which can contribute to household income. Generally, earning members fall in the 15 to 60 year olds age group.

Age square has been incorporated into the equation because age is considered one of the factors influencing per earner income. If we put only age, the equation will show a linear trend. When people get older, most of them are not able to work as hard, their hours of work will usually decrease and some of them may retire from their work. Age square nonlinearises the role of age in the earning.

Household size affects the per earner income. A large household size will have lower per earner income as well as lower per capita income, compared with a small household size. However, it is also related with the number of earners in that family.

People selected for this study are assumed to have the same characteristics of the people in SES1988. This study refers to the patients with AIDS in 1997. The

actual data required for this study is per capita household income. Recognizing that, the number of earner and size of household are not always equal. Due to availability of data, this study attempt to use the characteristics of the head of household to estimate per earner household income. Based on the estimate of per earner household income, the number of earner, and size of household, per capita household income is calculated.

The figures can vary greatly from household to household, depending on such factors as the workers' original income, education level, and experience as emphasized by Proctor Thompson (1969). The life cycle model of Chapman (1993) was also confirmed, which explained earning in the family related with income, and earner.

The per capita income of households in different income classes in three regions of Thailand by both rural and urban areas are calculated for the year 1988. This figure was then converted into 1997 values. The year 1988 was chosen primarily because the study used per capita income of households in various income classes as estimated by an earlier study (Sarntisart, 1993) which used the 1988 NSO data base. Moreover, this study used only three regions in Thailand because the available figures show that the case finding proportion of AIDS in the year 1997 vary among these regions. For example, the monthly report of AIDS by MOPH (1997) shows that the case finding in December 1997 is highest in the northern region (37.63%), followed by BMA (14.10%), the northeastern (12.43%), eastern (10.60%), southern region (9.17%), western (9.02%), and central region (7.05%) respectively. These figures are shown in Appendix-1. Therefore all the regions have been grouped into three regions based on the proportion of case findings of AIDS. Other regions having the highest proportion of case findings were grouped (48.27%), the region having the lowest case

findings was Bangkok (14.10%), and the region having medium case findings was northern region(37.63%).

The study separates each region into two areas; namely rural and urban households. An urban household means those households in municipal areas and sanitary districts. All others are rural households. Not all AIDS cases reported by MOPH indicate the area of living of AIDS patients, i.e. urban or rural areas. Then this study adjusts the unknown cases by the HIV/AIDS monthly surveillance obtained from MOPH (1997). The adjusted figure was then put into urban and rural areas. The adjusted method used in the study is called proportional to size. The formula is shows below:

$$\text{Proportional to size} = \frac{\text{sum} * U}{\text{sum} - O}, \text{ for the number of urban AIDS patients....(4.4)}$$

$$\text{Proportional to size} = \frac{\text{sum} * R}{\text{sum} - O}, \text{ for the number of urban AIDS patients...(4.5)}$$

Where

U = Number of AIDS cases in urban area

R = Number of AIDS cases in rural area

O = Number of unknown cases

sum = U+R+O

Note that this method is also used for other variables such as occupation and age.

Step 2:

Per earner household income was estimated by multiple regression method, based on the estimated coefficients and the average values of all independent variables of each age group. The study has only per earner household income to represent the

income of the household. This is because in a unit of household, there may be one or several members. However, this does not really explain individual income. Therefore, the per earner household income as shown in equation 4.3 has to be reversed to be per capita household income. It is shown by the following formula:

$$PCHI=\left[\frac{\text{Per earner household income}}{\text{Household size}}\right]*\text{mean number of earners} \quad \ldots\ldots\ldots\ldots(4.6)$$

Where PCHI = Per capita household income

From equation 4.5 the per capita household income represents individuals in appendix-4. In order to find out which income class they belong to, according to quintile income classes available in both urban and rural areas.

Because of economic changes between 1988 and 1997, the study needs to adjust the range between minimum and maximum per capita expenditure of each income quintile in the appendix 4 from the earlier study. This study uses income divided by expenditure, then uses the ratio multiplied by the maximum of capita expenditure in each income class. The table 1-2 in the appendix-4 shows the new range of per capita expenditure.

Table 4.1 Dummy Table of Estimated Per Capita Household Income of AIDS According to Region and Area Based on SES: 1988

Age	AIDS cases (Cases)	Mean Number of Earners (E_I) (Person)	Mean Household Size (H_i) (Person)	Per Capita Household Income (PC_{ih}) (Baht)	Per Capita Income (PC_i) (Baht)	Per Earner HH.Income (Pe_i) (Baht)
15	$AIDS_{15}$	E_{15}	H_{15}	PC_{15h}	$(Pe_{15}*E_{15})/H_{15}$	$(H_{15}* PC_{15})/E_{15}$
16	$AIDS_{16}$	E_{16}	H_{16}	PC_{16h}	$(Pe_{16}*E_{16})/H_{16}$	$(H_{16}* PC_{16})/E_{16}$
⋮	⋮	⋮	⋮	⋮	⋮	⋮
60	$AIDS_{60}$	E_{60}	H_{60}	PC_{60h}	$(Pe_{60}*E_{60})/H_{60}$	$(H_{60}* PC_{60})/E_{60}$

Note: $AIDS_i$ = AIDS in each age group

E_i = Mean of Earner, i = 15,16,...,60

H_i =Mean of Household Size, i = 15,16,...,60

F_i = Per Capita Household Income, i = 15,16,...,60

Pe_i = Per Earner Household income , i= 15,16,...,60

Table 4.1 shows the per capita income of AIDS patients according to age group in three separate regions and both urban and rural areas. The per capita household income used to find per earner household income is in the last column. Column two represents the number of AIDS cases according to age group and belonging to each per earner household income and each per capita income. These figures were obtained from appendix-1. In order to know which income class the AIDS patient belongs to, the study needs quintile income class to compare. This study used the quintile income class from the earlier study as shown in appendix-4 to determine per capita expenditure as per capita income. The study under reference also showed the minimum and maximum range of per capita expenditure. This range is used to determine the income class of households. For instance, the estimated per

capita income of AIDS patients among 40 year olds, 1988 in the urban area of BMA in this study is 2,301.98 baht. This figure lies between upper and lower range of income class U_4 in the above study. Therefore the household is considered belonging income class U_4. In a similar way, income classes of all AIDS cases are determined, for both rural and urban areas. All AIDS cases were then put in the various income classes in table 4.2.

Table 4.2 Dummy Table of AIDS Cases in Each Income Class in Urban and Rural Areas, 1997

Income Class	Region			Total
	BMA (B_{Ui})	Northern (N_{Ui})	Other (O_{Ui})	(AS_{ai})
U_1	B_{U1}	N_{U1}	O_{U1}	$B_{U1}+N_{U1}+O_{U1}$
U_2	B_{U2}	N_{U2}	O_{U2}	$B_{U2}+N_{U2}+O_{U2}$
⋮	⋮	⋮	⋮	⋮
U_5	B_{U5}	N_{U5}	O_{U5}	$B_{U5}+N_{U5}+O_{U5}$
R_1	B_{R1}	N_{R1}	O_{R1}	$B_{R1}+N_{R1}+O_{R1}$
R_2	B_{R2}	N_{R2}	O_{R2}	$B_{R2}+N_{R2}+O_{R2}$
⋮	⋮	⋮	⋮	⋮
R_5	B_{R5}	N_{R5}	O_{R5}	$B_{R5}+N_{R5}+O_{R5}$
Tatal				

Note: U_i = Urban quintile Income Classes, i = 1,2,...,5

R_i = Rural quintile Income Classes, i = 1,2,...,5

B_{Ui}, B_{Ri} = Bangkok Metropolitan (U,R) Area, i = 1,2,...,5

N_{Ui}, N_U = Northern Region, (U,R) Area, i = 1,2,...,5

O_{Ui} ,O_{Ri} = Other regions, (U,R) Area, i = 1,2,...,5

A = Urban (U) and Rural (R)

Table 4.2 shows the number of AIDS patients in each income class by region. There are three regions in the surveillance of AIDS monthly report by MOPH, (1997).

This study separates each of these regions into two areas namely urban and rural areas.

Step 3

The expected cost of AIDS was estimated in the following way. Table 4.3 illustrates the expected cost of AIDS among various income classes in the year 1997. The mean cost of AIDS in 1994 was obtained from a study by Pitayanon (1994), this figure was then calculated into the average cost per month, and then converted into 1997 value. It is shown in the following calculation.

Table 4.3 Dummy Table of Calculation of Expected Cost of AIDS in Each Income Classes, 1997

Income Class	AIDS Cases	Cost of AIDS in Each Income Class	Number of Households in Each Income Class	Probability Being AIDS Patient	Expected Cost of AIDS
	(Person)	(Baht)	(Person)		(Baht)
(1)	(2)	(3)	(4)	(5)	(6)
U_1	AS_{U1}	$3,718.83*AS_{U1}$	$N_{U1}*W_{U1}*H_{U1}$	(2)/(4)	3,718.83*(5)
U_2	AS_{U2}	$3,718.83*AS_{U2}$	$N_{U2}*W_{U2}*H_{U2}$	(2)/(4)	3,718.83*(5)
U_3	AS_{U3}	$3,718.83*AS_{U3}$	$N_{U3}*W_{U3}*H_{U3}$	(2)/(4)	3,718.83*(5)
U_4	AS_{U4}	$3,718.83*AS_{U4}$	$N_{U4}*W_{U4}*H_{U4}$	(2)/(4)	3,718.83*(5)
U_5	AS_{U5}	$3,718.83*AS_{U5}$	$N_{U5}*W_{U5}*H_{U5}$	(2)/(4)	3,718.83*(5)
R_1	AS_{R1}	$3,718.83*AS_{R1}$	$N_{R1}*W_{R1}*H_{R1}$	(2)/(4)	3,718.83*(5)
R_2	AS_{R2}	$3,718.83*AS_{R2}$	$N_{R2}*W_{R2}*H_{R2}$	(2)/(4)	3,718.83*(5)
R_3	AS_{R3}	$3,718.83*AS_{R3}$	$N_{R3}*W_{R3}*H_{R3}$	(2)/(4)	3,718.83*(5)
R_4	AS_{R4}	$3,718.83*AS_{R4}$	$N_{R4}*W_{R4}*H_{R4}$	(2)/(4)	3,718.83*(5)
R_5	AS_{R5}	$3,718.83*AS_{R5}$	$N_{R5}*W_{R5}*H_{R5}$	(2)/(4)	3,718.83*(5)

Note: 1). AS_{U_i,R_i} = AIDS cases in urban, rural quintile income class in (U_i,R_i), i = 1,2,...,5

2). 3,718.83 baht/case/month = mean cost of AIDS

3). N_{U_i,R_i} = Number of observation in each income class

4). W_{U_i,R_i} = Mean weight of populations in each income class

5). H_{U_i,R_i} = Mean of household sizes in each income class

Table 4.3 shows calculations of the expected cost of AIDS in various income classes in 1997. All variables in each column were coded as shown in this table, the details are explained below.

Column 1: $U_1,...,U_5$ represents income classes of all regions in urban areas. $R_1,...,R_5$ represents income classes of all regions in rural areas.

Column 2: The number of AIDS cases in each income class.

Column 3: The cost of AIDS in each income class obtained by multiplying the number of AIDS cases by the mean cost of AIDS per case per month(3,718.83 baht). This figure is shown in equation (4.6).

Column 4: The number of people in each income class is obtained by multiplying the number of observations of that class by mean weight and mean of household size of each income class. The number of observations and weight mean of each income class are shown in appendix-4, mean of household size in appendix-6.

Column 5: the probability of being an AIDS patient is obtained by using the number of AIDS cases in each income class divided by the number of people in the same income class.

Column 6: The expected cost of AIDS is obtained by using the probability of being AIDS multiplied by the average cost of AIDS in each income class(3,718.83).

The cost of AIDS as shown in table 4.3 is based on the mean expenditure on HIV/AIDS until death (24,344.08 baht) estimated by Pitayanon et al (1994). This was according to the average time length of AIDS cases falling ill until death being estimated as 8.08 months by the same study. Therefore, the average expenditure on AIDS would be calculated by the mean expenditure on AIDS until death divided by the mean length of AIDS cases falling ill until death. Thus, the average expenditure on AIDS cases falling ill until death was 3,012.88 baht per case per month, as shown below. This figure was then converted into 1997 values by using the average expense of AIDS in the year 1994 multiplied by ratio of CPI between 1997 per 1994. So, the current cost of AIDS in 1997 is equal to 3,012.88 baht. The result are shown below:

$$Cost\ of\ AIDS_{1997} = \frac{CPI_{1997}}{CPI_{1994}} * Average\ Expense\ on\ AIDS_{1994} \quad \text{.....(4.7)}$$

$$= (147.5/119.5)* 3{,}012.88 \quad = 3{,}718.83 \text{ baht/month/case}$$

Where CPI_{1994} is 119.5, and CPI_{1997} is 147.5

Table 4.4 Dummy Table of The Expenditure and Expected Reallocation in a Situation With and Without AIDS in Each Income Class in the year 1997

Commod-ities	Average Per Capita Expenditure C_i (Baht/Month)	Expected Cost of AIDS (Baht/Month)	Average Expenditure Per Capita W/OAIDS (Baht/Month)	Elasticity ε_i	Relative Change in Income (Baht/Month)	Relative Change in Consumption ε_i*A/(C-A)	Change in Consumption ΔTC_i (Baht/Month)	Net Change in Consump Tion ΔC_{ih} (Baht/Month
1	2	3	4	5	6	7	8	9
1	C_1	0	C_1	ε_1	A/(C-A)	ε_1*A/C-A	ε_1*(A/C-A)* C_1	ΔTC_1
2	C_2	0	C_2	ε_2	A/(C-A)	ε_2*A/C-A	ε_2*(A/C-A)* C_2	ΔTC_2
3	C_3	0	C_3	ε_3	A/(C-A)	ε_3*A/C-A	ε_3*(A/C-A)* C_3	ΔTC_3
4	C_4	0	C_4	ε_4	A/(C-A)	ε_4*A/C-A	ε_4*(A/C-A)* C_4	ΔTC_4
5	C_5	0	C_5	ε_5	A/(C-A)	ε_5*A/C-A	ε_5*(A/C-A)* C_5	ΔTC_5
6	C_6	0	C_6	ε_6	A/(C-A)	ε_6*A/C-A	ε_6*(A/C-A)* C_6	ΔTC_6
7	C_7	0	C_7	ε_7	A/(C-A)	ε_7*A/C-A	ε_7*(A/C-A)* C_7	ΔTC_7
8	C_8	0	C_8	ε_8	A/(C-A)	ε_8*A/C-A	ε_8*(A/C-A)* C_8	ΔTC_8
9	C_9	A	C_9-A	ε_9	A/(C-A)	ε_9*A/C-A	ε_9*(A/C-A)* (C_9-A)	ΔTC_9-A
10	C_{10}	0	C_{10}	ε_{10}	A/(C-A)	ε_{10}*A/C-A	ε_{10}*(A/C-A)* C_{10}	ΔTC_{10}
Total	C	A	C-A	-	A/(C-A)	-	A	0

Note: 1). C = Consumption of each commodity

2). A = Expenditure on AIDS

3).ΔC_{ih} = Net change in consumption by commodity, i = 1,2,...,10 of household-h

Table 4.2 shows calculating the expenditure and expected reallocation in a situation with and without AIDS in each income class in the year 1997. The details are shown below:

Column 1: represents the 10 commodies selected in the study

Column 2: shows the average per capita expenditure of each income class in both rural and urban areas as estimated by Samtisart (1993).

Column 3: represents the expected cost of AIDS/month for each income class as estimated by this study as shown in the previous table (4.3). Note that only the consumption expenditure on commodity item number 9 is affected by AIDS expense.

Column 4: shows the hypothetical average per capita expenditure without AIDS. Expenditure on all commodities except medical expense are assumed to be the same as expenditures with AIDS case, i.e. in the case of without AIDS the expenditure on AIDS is subtracted from medical expenses (item 9), and is expected to be reallocated among other commodities.

Column 5: shows the income elasticities of demand for various commodities.

Column 6: represents a relative change in income ($\Delta Y/Y$) made available by the situation without AIDS.

where $\Delta Y = A$

Column 7: shows a relative change in consumption of each commodity by multiplying column 5 by column 6. In other words when a relative change in income is multiplied by income elasticity it can be changed into relative change in expenditure for each commodity.

Column 8: this column is obtained by multiplying column 7 by column 4. It represents changes in consumption. These figures are derived from relative changes in consumption due to consumption expenditure in each commodity.

Column 9: represents net ΔC_{ih}, obtained by (column 8 - column 3). It represents net changes in consumption of household h.

Step 4

The aggregate consumption expenditure of each commodity in a situation without AIDS as calculated separately in urban and rural areas. This process involved 2 steps to calculate net change in aggregate consumption expenditure in this situation. In the first step the net change in consumption of each commodity was selected from

table 4.4 according to all 5 income classes which the people belong to. In the second step the net change in consumption expenditure of each commodity in each income class was multiplied by the number of people in those income classes. Note that the number of people were derived from multiplying the number of observations, the mean weigh of the household, and the mean of the household size. These figures will imply the monthly consumption expenditure of each income class, (see the table 4.5). The figures could be change into annual aggregate net changes in consumption expenditure of the country overall by multiplying 12 months and adding the both the aggregate consumption of urban and rural households. These figures are shown in the table 4.6.

Table 4.5 Dummy Table on Net Change in Aggregate Consumption Expenditure in a Situation Without AIDS by Income Class Per Month, 1997.

Commodities	Net Change in Consumption					ΔC_{iU}
	U1 (Baht/Month)	U2 (Baht/Month)	U3 (Baht/Month)	U4 (Baht/Month)	U5 (Baht/Month)	Total Net Change (Baht/Month)
1	$Pop_{U1}*\Delta C_{1U1}$	$Pop_{U2}*\Delta C_{1U2}$	$Pop_{U3}*\Delta C_{1U3}$	$Pop_{U4}*\Delta C_{1U4}$	$Pop_{U5}*\Delta C_{1U5}$	$\sum_{i=1}^{5} Pop_{Ui}*\Delta C_{1U}$
2	$Pop_{U1}*\Delta C_{2U1}$	$Pop_{U2}*\Delta C_{2U2}$	$Pop_{U3}*\Delta C_{1U3}$	$Pop_{U4}*\Delta C_{1U4}$	$Pop_{U5}*\Delta C_{1U5}$	$\sum_{i=1}^{5} Pop_{Ui}*\Delta C_{1}$
3	$Pop_{U1}*\Delta C_{3U1}$	$Pop_{U2}*\Delta C_{3U2}$	$Pop_{U3}*\Delta C_{1U3}$	$Pop_{U4}*\Delta C_{1U4}$	$Pop_{U5}*\Delta C_{1U5}$	$\sum_{i=1}^{5} Pop_{Ui}*\Delta C_{1}$
⋮	⋮	⋮	⋮	⋮	⋮	⋮
10	$Pop_{U1}*\Delta C_{10U1}$	$Pop_{U2}*\Delta C_{1U2}$	$Pop_{U3}*\Delta C_{10U3}$	$Pop_{U4}*\Delta C_{1U4}$	$Pop_{U5}*\Delta C_{10U5}$	$\sum_{i=1}^{5} Pop_{Ui}*\Delta C_{1}$
Total	0	0	0	0	0	0

Table 4.5 (Continued)

Commodities	Net Change in Consumption					ΔC_{iR}
	R1 (Baht/Month)	R2 (Baht/Month)	R3 (Baht/Month)	R4 (Baht/Month)	R5 (Baht/Month)	Total Net Change (Baht/Month)
1	$Pop_{R1}*\Delta C_{1R1}$	$Pop_{R2}*\Delta C_{1R2}$	$Pop_{R3}*\Delta C_{1R3}$	$Pop_{R4}*\Delta C_{1R4}$	$Pop_{R5}*\Delta C_{1R5}$	$\sum_{i=1}^{5} Pop_{Ri}*\Delta C_{1R}$
2	$Pop_{R1}*\Delta C_{2R1}$	$Pop_{R2}*\Delta C_{2R2}$	$Pop_{R3}*\Delta C_{1R3}$	$Pop_{R4}*\Delta C_{1R4}$	$Pop_{R5}*\Delta C_{1R5}$	$\sum_{i=1}^{5} Pop_{Ri}*\Delta C_{1}$
3	$Pop_{R1}*\Delta C_{3R1}$	$Pop_{R2}*\Delta C_{3R2}$	$Pop_{R3}*\Delta C_{1R3}$	$Pop_{R4}*\Delta C_{1R4}$	$Pop_{R5}*\Delta C_{1R5}$	$\sum_{i=1}^{5} Pop_{Ri}*\Delta C_{1}$
⋮	⋮	⋮	⋮	⋮	⋮	⋮
10	$Pop_{R1}*\Delta C_{10R1}$	$Pop_{R2}*\Delta C_{1R2}$	$Pop_{R3}*\Delta C_{10R3}$	$Pop_{R4}*\Delta C_{10R4}$	$Pop_{R5}*\Delta C_{10R5}$	$\sum_{i=1}^{5} Pop_{Ri}*\Delta C_{1}$
Total	0	0	0	0	0	0

Note: Pop_{Ui} and Pop_{Ri} as mentioned in previous step

Table 4.5 shows the aggregate net change in consumption expenditure divided into quintile income classes according to each area.

Table 4.6 Dummy table on Aggregate Consumption in the Whole Kingdom per Year, 1997

Commodities (C_I)	ΔC_{iU}	ΔC_{iR}	ΔC_I
1	$12*\Delta C_{1U}$	$12*\Delta C_{1R}$	$12(\Delta C_{1U}+\Delta C_{1R})$
2	$12*\Delta C_{2U}$	$12*\Delta C_{2R}$	$12(\Delta C_{2U}+\Delta C_{2R})$
⋮	⋮	⋮	⋮
10	$12*\Delta C_{10U}$	$12*\Delta C_{10R}$	$12(\Delta C_{10U}+\Delta C_{10R})$

Note: C_i = Commodities, i = 1,2,...,10

C_{iU}= Net change in consumption in urban areas

C_{iR} = Net change in consumption in rural areas

ΔC_i = Aggregate change in consumption

Table 4.6 shows the aggregate consumption expenditure of both urban and rural areas for each commodity in 1977. Note that total change in consumption of each commodity in both areas multiplied by 12 months represent aggregate consumption within a year.

ΔC_{iU} was obtained by adding the net change in consumption in quintile income classes in urban and rural areas which belongs to the same commodity.

Table 4.7 Dummy Table on Aggregate Change in Total Domestic and Imported Consumer Goods

Variable	Consumer goods	Share Containment		Values	
ΔC_1		D (%)	M (%)	D (%)	M (%)
ΔC_1	Rice and cereals	D_1	M_1	$\Delta C_1 * D_1$	$\Delta C_1 * M_1$
ΔC_2	Meat and fish	D_2	M_2	$\Delta C_2 * D_2$	$\Delta C_2 * M_2$
ΔC_3	Fruits and vegetables	D_3	M_3	$\Delta C_3 * D_3$	$\Delta C_3 * M_3$
ΔC_4	Other foods	D_4	M_4	$\Delta C_4 * D_4$	$\Delta C_4 * M_4$
⋮	⋮	⋮	⋮	⋮	⋮
ΔC_9	Medical expenses	D_9	M_9	$\Delta C_9 * D_9$	$\Delta C_9 * M_9$
ΔC_{10}	Other (non foods)	D_{10}	M_{10}	$\Delta C_{10} * D_{10}$	$\Delta C_{10} * M_{10}$
Total				$\sum_{i=1}^{10} \Delta_i C * D_i$	$\sum_{i=1}^{10} \Delta_i C * M_i$

$\Delta C*D = \sum_{i=1}^{10} \Delta C_i * D_i$ is the increased value of consumption demand for domestic goods and $\Delta C*M = \sum_{i=1}^{10} \Delta C_i * M_i$ is the increased value of consumption demand for imported goods. This study determines the total net change in demand for each of the consumption goods, ΔC_i is equal to the net change in consumption.

Step 5

It is expected that HIV/AIDS will have a negative effect on the growth of the economy. In order to know the magnitude of such an effect, an attempt has been made to estimate the expected economic growth rate in Thailand, assuming a situation without AIDS. The relationship between (GDP), and components such as aggregate consumption, aggregate investment, government consumption, and net imports is shown in the following equation:

$$Y = C+I+G+(X-M) \quad \text{.....(4.8)}$$

Where Y is Gross Domestic Product (GDP), C is Consumption, I is Investment, G is Government spending, X is Export D and M shows domestic and imported items respectively.

This study analyzes the impact of AIDS expenditure on GDP by using a macroeconomic model to measure the situation without AIDS. This process was expected to shift aggregate demand on imported goods by using the multiplier shown below. Based on the following macro economic model (Sarntisart, Kraipornsook, et al 1998, 140 p) this study analyzes the impact of AIDS expenditure on GDP.

$$Y = \frac{1}{1-c(1-t)-b+m}[C+I+G+X-M] \quad \text{.....(4.9)}$$

where

c = marginal propensity to consume, c = 0.336846

t = marginal tax rate, t = 0.043323

b = marginal propensity to invest, b = 0.383599

m = marginal propensity to import, m = 0.387805

dY = change in national income

dM = change in import consumption

Thus, change in national income can be calculated from equations (4.10) and (4.11).

$$\frac{dY}{dM} = \frac{1}{1-c(1-t)-b+m} = -1.4664 \quad \text{.....(4.10)}$$

$$dY = -1.4664 * (dM) \quad \text{.....(4.11)}$$