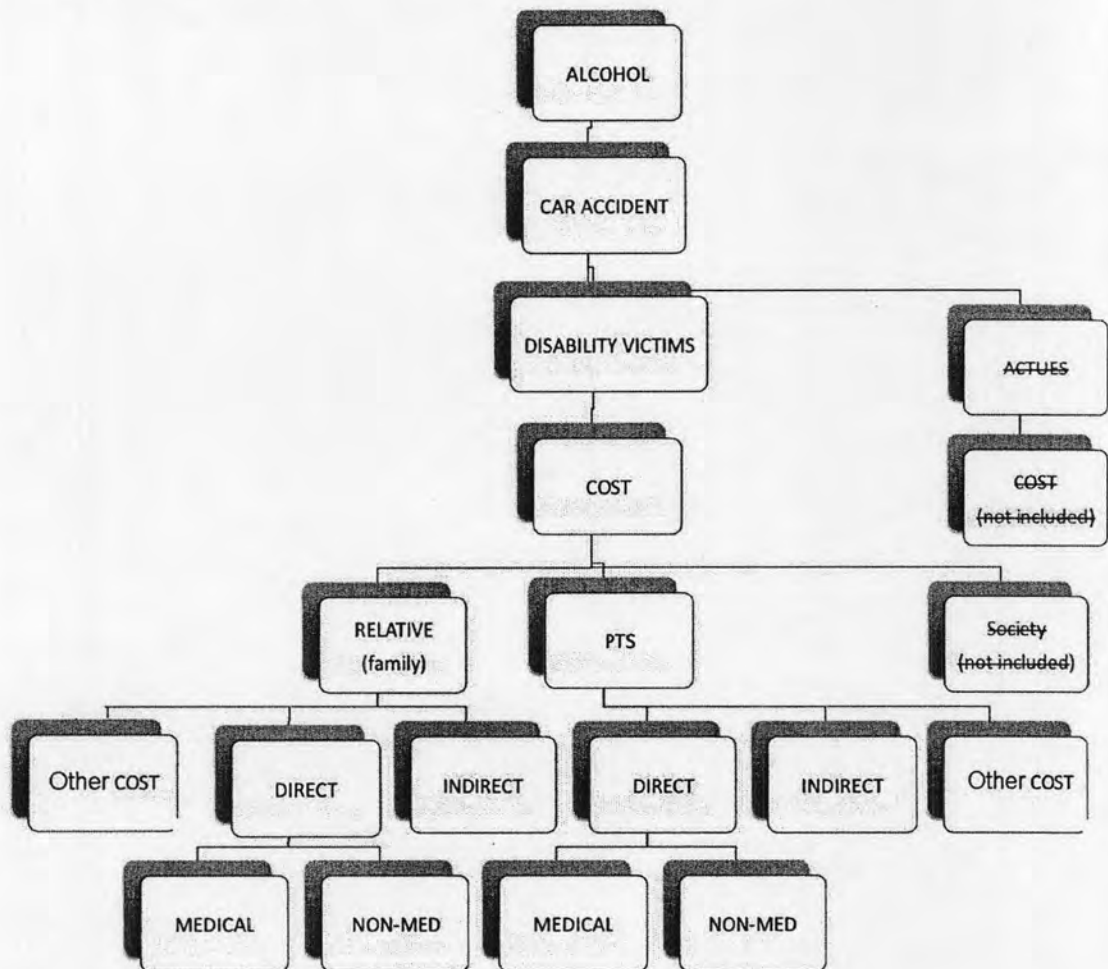


## CHAPTER III

# CONCEPTUAL FRAMEWORK, METHODOLOGY AND MODELLING COSTS

### Conceptual framework



**Figure 3.1: Conceptual Framework**

Cost that are relevant to the disability victim by alcohol drunk driving from traffic accident can be the society costs, patient costs and patient's relatives costs but in the unit of analysis in this thesis. It focuses on the consumer (patients and patient's relatives) point of view only so it does not include the society cost. Also the beginning after accident .the patient has to send to the hospital and received the "Acute care" such as the emergency treatment it has cost for this sector but in this study it isn't included.

So the “cost” in this conceptual framework means “Total Cost which affect to the household costs of the disability victims and their relatives by alcohol drunk driving from traffic accident in Bangkok (in term of patient’s and their relatives point of view)” that could be both of patient’s costs and relative’s costs.

This study divides the patient cost who’re disability victims into direct and indirect cost .The direct cost of patient cost can be divided again into medical and non- medical cost. About the patient’s relatives cost it can be divided into direct and indirect cost and each of them can be divided to medical and non medical cost as well.

Moreover in the conceptual framework .There’re other cost of patient and patient’s relative separately included in cost of patient and patient’s relative in this cost components too.

## **Research Methodology**

### **Research design**

Descriptive Cross Sectional Analysis

### **Population and samples in research**

#### **1. Target population**

Disability victims by alcohol drunk driving from traffic accident and now living in Bangkok

#### **2. Population to be sampled**

The members of Don’t Drive Drunk foundation who’re disability victims by alcohol drunk driving from traffic accident and now living in Bangkok.

#### **3. samples**

95 samples from members of Don’t Drive Drunk foundation who’re disability victims by alcohol drunk driving from traffic accident now living in Bangkok.

## Data collection

### Sampling technique

Simple random Sampling

### Sample size

This research study about the cost and right now we don't know the exact number of disability by drunk driving in Bangkok because nobody did for the real statistic survey for finding the number of disability victims by alcohol drunk driving in Bangkok or Thailand,

Due to this problem using the existing of data to estimate could be the way of the estimation of population for sample size calculation.

Population(N) can be calculated by the number of disability data from national statistic office who did the survey in disability in Thailand 2008(look at table 2 in appendix A),the number of disability in Thailand(2008) is 1,871,860 and number of disability in Bangkok is 33,392.

According to Taejing Siripanich,M.D.(2008) estimated the disability victims by alcohol drunk driving in Thailand are about 100,000 people ,so can use the ratio among disability in Bangkok and in All country to calculate for "Number of disability victims by alcohol drunk driving in Bangkok by estimation (N) =

$$\frac{100,000}{1,871,860} \times 33,392 = 1,783$$

From this number can use the statistic calculation for the sample size by using

### Yamane formula:

$$n = \frac{N}{1 + Ne^2}$$

n = Sample size

N = number of Population

e = The margin of the errors

Give the value of e = the margin of the errors = 0.05,

Confident Interval = 95%

$$n = \frac{1,738}{1 + 1,738 + (0.05)^2} = \frac{1,738}{5.4575} = 327 \text{ samples}$$

Due to the budget constraints and the limited time of the research, the selection of the confident interval (C.I). could be used as 90% of C.I, so the sample size can be calculated by

$$\begin{aligned} &\text{Give the value of } e = \text{the allowance of the errors} = 0.10, \\ &\text{Confident Interval} = 90\%, N = 1,783 \\ n &= \frac{1,738}{1 + 1,738 + (0.10)^2} = \frac{1,738}{18.83} = 95 \text{ samples} \end{aligned}$$

### Eligibility Criteria

#### Inclusion criteria

- The victims must disability by alcohol drunk driving from traffic accident more than 12 months,
- Now being the member of Don't Drive Drunk foundation
- The disability victims have got an accident in Bangkok or another province but now living or having a treatment in Bangkok.
- All type severity of disability victims were included and can answer questionnaire.(in case patient cannot communicate the relatives can takeover as a representative to answer the questionnaire.)
- The patient's relatives are the person who take care the responsible to the patients and pay for the cost of treatment for the patients.

#### Exclusion Criteria

- The victims who disability *less than* 12 months.
- The disability who's *not* disability by alcohol drunk driving from traffic accident.
- The disability victim who's *not* the member of Don't Drive Drunk foundation
- Disability victims who's *not* living in Bangkok now
- The patient's relatives who *are not* the person that take care the responsible to the patients and pay for the cost of treatment for the patients.

#### Source of data

##### Primary data

Using the questionnaire and interviews by meeting in person and telephone call to get the data from the patients and their relatives.

Questionnaire; can be divided to 3 parts

For the patient's answer

Part 1 General data of disability victims from drunk driving.

Part 2 The data about the medical treatment of patient .

For the patient's relative answer.

Part 3 the general data of disability victim's relative and the data about the medical treatment that patient's relative pay for patient.

For the questionnaire Must be test for validity, Test the reliability by test-retest method and use the questionnaire to test 20 disability victims by alcohol drunk driving in Pathumthani province, the reason that researcher select this province to test validity and reliability is from the demographic reasons such as the living of people in Pathumthani are most likely similar to Bangkok and also have enough samples who are disability victim by drunk driving from traffic accident in Bangkok.

### **Secondary data**

The study based on using The secondary and cross sectional data from reports, statistics or journals from Don't Drive Drunk foundation, [www.Thaihealth.com](http://www.Thaihealth.com), The Road Safety Division, The Ministry of Public Health, The National Police Office and the hospital reports, etc.

### **When (duration)**

Collecting the data by questionnaire during 1<sup>st</sup> Feb-28<sup>th</sup> Feb 2009 (4 weeks)

### **Study sites**

- Don't Drive Drunk foundation,  
28/12 Soi Sukhumvit 19 (Wattana)  
Sukhumvit Rd., North Klong Toey,  
Wattana, Bangkok, Thailand 10110  
Tel: +662 354 5959 Fax: +662 254 0044  
Hotline : 1717
- Public hospital and private hospital
- Patient's house (list from the Don't Drive Drunk foundation)



### Modelling Costs

**Table 3.1; Summary of the modelling cost in “Cost of the disability victims by alcohol drunk drivers from traffic accident: A case study in Bangkok.”**

Type of costs	Variable	Cost (Baht)
<b>Patient's costs</b>		
<i>Direct cost</i>		
<i>Medical</i>		
1. Medical equipment cost	P1	
2. Supplement food cost(for patient)	P2	
3. Home nursing	P3	
4. Doctor cost and drug cost	P4	
<i>Non Medical</i>		
5. Travelling Cost (pay for transportation) of patients	P5	
6. Electricity and water cost	P6	
7. Accommodation cost	P7	
<i>Indirect cost</i>		
<i>Non Medical</i>		
8. Total travelling time cost of Outpatients and Inpatient	P8	
9. Total waiting time cost of Outpatient	P9	
10. Loss of income due to illness during treatment in hospital for Inpatient	P10	
11. Loss of income due to illness of Outpatient	P11	
12. Other costs of patient	P12	
<b>Patient's relative costs</b>		
<i>Direct cost</i>		
<i>Medical</i>		
13. Medical equipments cost(Relative pay for patient)	R1	
14. Supplement food cost(Relative pay for patient)	R2	
15. Home nursing cost (Relative pay for patient)	R3	
16. Doctor cost and drug cost (Relative pay for patient)	R4	
<i>Non Medical</i>		
17. Travelling Cost (Relative pay for transportation for patient)	R5	
18. Travelling cost of relative pay for transportation visit IP	R6	
19. Electricity and water cost (Relative pay for patient)	R7	
20. Accomodation (Relative pay for patient)	R8	
<i>Indirect cost</i>		
<i>Non Medical</i>		
21. Total Travelling time cost of Outpatient's relatives	R9	
22. Total Travelling time cost of Inpatient's relatives	R10	
23. Total waiting time cost of Outpatient's relative	R11	
24. Loss of relative's income due to leaving the job to take care the patient	R12	
25. Other costs of patient's relative	R13	
<b>Total cost (summary of cost from 1- 25)</b>	<b>Total cost (TC)*</b>	

\*Where,  $TC = (P1+P2+... +P12) + (R1+R2+ ...+R13)$

## Explanation for the modelling costs and their calculations.

The explanation of each cost components and calculation are necessary to understand how to calculate for each of all related cost components below.

### 1. Patient's costs

#### 1.1 Direct cost

##### 1.1.1 Medical

##### 1.1.1.1 Medical equipment cost

Definition: Medical equipment cost (P1) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay for medical equipments. That can be the cost of wheel chair, wheel chair electricity, cushion, gel cushion, staff, tri-staff, walker, crutch, airbed, hospital bed ,pamparse ,toilet chair ,urine set ,alcohol set etc.

Medical equipment cost (P1) = The summary of total medical equipments in first year after patient's accident for each patient (PME) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$P1 = \frac{\sum_{i=1}^n (PME_i \times CPI_i)}{95}$$

Where;

P1 = Medical equipment cost = average medical equipment cost that patient pay themselves per 1 person in first year after patient's accident.

PME<sub>i</sub> = Total medical equipments in first year after patient's accident for each patient pay for

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 159)

n = Number of observations = 95

For patient who didn't pay by themselves (patient's relative pay for it already), Total medical equipments in first year after patient's accident of that patient pay for is equal to zero (PME = 0).

### 1.1.1.2 Supplement food cost (for patient)

Definition: Supplement food cost (P2) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay for Supplement food cost. That can be the cost of any herbs, vitamins or other supplement food for patient.

Supplement food cost (P2) = The summary of total supplement food cost in first year after patient's accident for each patient (PSF) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$P2 = \frac{\sum_{i=1}^n (PSF_i \times CPI_i)}{95}$$

Where;

P2 = supplement food cost = average supplement food cost that patient pay themselves per 1 person in first year after patient's accident.

PSF<sub>i</sub> = Total supplement food cost in first year after patient's accident for each patient

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient who didn't pay by themselves (patient's relative pay for it already), Total supplement food cost in first year after patient's accident of that patient is equal to zero (PSF = 0).



### 1.1.1.3 Home nursing

Definition: Home nursing cost (P3) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay for home nursing cost. That can be the cost of hiring nurse or any person to take care patient because they're disability and don't have relative or relative's not available to take care patient all day due to have to working.

Home nursing cost(P3) = The summary of total home nursing cost in first year after patient's accident for each patient (PHN) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$P3 = \frac{\sum_{i=1}^n (PHN_i \times CPI_i)}{95}$$

Where;

P3 = home nursing cost= average home nursing cost that patient pay themselves per 1 person in first year after patient's accident.

PHN<sub>i</sub> = Total home nursing cost in first year after patient's accident for each patient.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient who didn't pay by themselves (patient's relative pay for it already), Total home nursing cost in first year after patient's accident of that patient is equal to zero (PHN = 0).

#### 1.1.1.4 Doctor cost and drug cost

Definition: Doctor cost and drug cost (P4) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay for doctor cost and drug cost . That can be the cost that patient pay for doctor cost and drug cost due to disability from drunk driving only in private hospital, public hospital or any medical clinic.

Doctor cost and drug cost (P4) = The summary of total doctor cost and drug cost in first year after patient's accident for each patient (PDD) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$P4 = \frac{\sum_{i=1}^n (PDD_i \times CPI_i)}{95}$$

Where;

P4 = Doctor cost and drug cost = average doctor cost and drug cost that patient pay themselves per 1 person in first year after patient's accident.

PDD<sub>i</sub> = Total doctor cost and drug cost in first year after patient's accident for each patient.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient who didn't pay by themselves (patient's relative pay for it already), Total doctor cost and drug cost in first year after patient's accident of that patient is equal to zero (PDD = 0).

### 1.1.2 Non Medical

#### 1.1.2.1 Travelling Cost (pay for transportation) of patients

Definition: Travelling Cost (pay for transportation) of patients (P5) refers to the average travelling cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay amount of money spent on each visit (return trip) to the hospital by patients with or without relatives to receive treatment both of inpatient and outpatient.

Travelling Cost (pay for transportation) or (P5) = The summary of total travelling Cost (pay for transportation) in first year after patient's accident for each patient (PTC) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

Due to year of patient's accident are different as same as money value.the travelling cost must be multiplied by CPI Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100 (please look at CPI table in appendix ,page )

The formula for calculation is :

$$P5 = \frac{\sum_{i=1}^n (PTC_i \times CPI_i)}{95}$$

Where;

P5 = Travelling Cost (pay for transportation) of patients = average Travelling Cost (pay for transportation) of patients that patient pay themselves per 1 person in first year after patient's accident.

PTC<sub>i</sub> = Average travelling cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay amount of money spent on each visit (return trip) to the hospital by patients

PTC = Taxi fare per 1 return trip x ( number of follow up as inpatient + number of follow up as outpatient)

For Inpatient. it can have number of follow up = 1 return trip to hospital (first on the date of admittance, and on the final day of hospitalization.)

For Out patient ,number of follow up can be more than 1 return trip due to need to visit hospital for receiving treatment, purchasing medicine or see doctor in first year of accident due to disability.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100

(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

### Taxi fare trip calculation. (Per 1 return trip)

According to the limitation of data collection for some of observations, patients answered travelling cost each time as the taxi fare per 1 return trip from their home to hospital by average (Baht). But for some patient who didn't know exactly taxi fare from their home to hospital or use their own car, the alternative method was chosen to estimate the travelling costs by comparing the distance travelled with the taxi rates for patients by ask them about distance from patient's home to hospital (Km) and calculate to taxi fare by using taxi rate (use the taxi rate table below).

#### Taxi rate (distance)

Table 3.2 ; Taxi fare table

Distance (Km.)	Fare rate (baht or baht per Km.)
Between 0 and 2nd	35.00 Baht
Between 2nd and 12th	5.00 Baht per kilometer
Between 12th and 20th	5.50 Baht per kilometer
Between 20th and 40th	6.00 Baht per kilometer
Between 40th and 60th	6.50 Baht per kilometer
Between 60th and 80th	7.50 Baht per kilometer
More than 80 <sup>th</sup>	8.50 Baht per kilometer

Source: Land Transportation Department (2008)

This calculation is included only taxi rate by distance for the rate for time surcharge due to traffic or incase speed lower than 6km/hour, surcharge if call taxi from home or airport and highway fee are not included in this calculation.

From this data can use for necessary to know patient's travelling time spend hour for transportation(hour) and use it for calculation in other cost components calculation.

$$\text{Distance(Km)} = \text{average speed(Km/hour)} \times \text{travelling time spend hour for transportation(hour)}$$

Use the average speed of vehicle in Bangkok traffic road (v) is 20Km/hour by the Land Traffic Department surveys for calculation to find travelling time spend hour for transportation(t) from distance(S) that received data from patient's. Therefore. The formula for calculation is :

$$S = v \times t$$

Where ;

S = Distance(Km)

v = Average speed of vehicle in Bangkok traffic road (v) is 20Km/hour by the Land Traffic Department surveys

t = travelling time spend hour for transportation (hour)

For patient who didn't pay by themselves (patient's relative pay for it already), Travelling Cost (pay for transportation) of patient in first year after patient's accident of that patient is equal to zero (PTC = 0).

### 1.1.2.2 Electricity and water cost

Definition: Electricity and water cost (P6) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay for electricity and water cost . That can be the cost that patient pay for electricity and water cost in 1<sup>st</sup> year after patient accident.

Electricity and water cost (P6) = The summary of total electricity and water cost in first year after patient's accident for each patient (PEW) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$P6 = \frac{\sum_{i=1}^n (PEW_i \times CPI_i)}{95}$$

Where;

P6 = Electricity and water cost = average electricity and water cost that patient pay themselves per 1 person in first year after patient's accident.

PEW<sub>i</sub> = Total electricity and water cost in first year after patient's accident for each patient pay for = Total electricity and water cost per month of first year after patient's accident that patient pay for x 12.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient who didn't pay by themselves (patient's relative pay for it already), Total electricity and water cost in first year after patient's accident of that patient is equal to zero (PEW = 0).



### 1.1.2.3 Accommodation costs

Definition: Accommodation cost (P7) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay for accommodation costs . That can be the costs that patient pay for accommodation such as costs due to renovate ,construction,build the house changing the accommodation and its facilities,toilet for disability patient or slope for wheelchair or any house renovations for necessary to patient's living.

Accommodation cost (P7) = The summary of total accommodation cost in first year after patient's accident for each patient (PAC) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95).

The formula for calculation is :

$$P7 = \frac{\sum_{i=1}^n (PAC_i \times CPI_i)}{95}$$

Where;

P7 = Accommodation cost = average accommodation cost that patient pay themselves per 1 person in first year after patient's accident.

PAC<sub>i</sub> = Total accommodation cost in first year after patient's accident for each patient pay for

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient who didn't pay by themselves (patient's relative pay for it already), Total accommodation cost in first year after patient's accident of that patient is equal to zero (PAC = 0).

## 1.2 Indirect cost

### 1.2.1 Non Medical

#### 1.2.1.1 Total travelling time cost of outpatients and inpatient

Definition: Total travelling time cost of outpatients and inpatient (P8) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay for total travelling time cost of outpatients and inpatient . That can be the income foregone of patient who have salary due to travelling and spend time during the way to hospital in 1<sup>st</sup> year after patient accident. It also means that patient who have income will loss their income if they travel to hospital.

Total travelling time cost of outpatients and inpatient (P8) = The summary of total travelling time cost of outpatients and inpatient in first year after patient's accident for each patient (PTT) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$P8 = \frac{\sum_{i=1}^n (PTT_i \times CPI_i)}{95}$$

Where;

P8 = Total travelling time cost of outpatients and inpatient = average total travelling time cost of outpatients and inpatient that patient pay for themselves per 1 person in first year after patient's accident.

PTT<sub>i</sub> = Total travelling time cost of outpatients and inpatient in first year after patient's accident for each patient pay for = income of patient before accident per minute x travelling time patient spend (minute) x number of patient's following to hospital (return trip).

Where :

Income of patient before accident per minute =

$$\frac{\text{Income /hr before accident}}{60} = \frac{\text{income/month before accident}}{60 \times 154}$$

154 is from in 1 month patient work 7 hours x 22 day

and 60 is from in 1 hour has 60 minutes.

Travelling time patient spend (minute) calculate from;

Travelling time was calculated by the distance divided by average speed as in this formula.

$$t = \frac{S}{v}$$

Where ;

S = Distance(Km)

v = Average speed of vehicle in Bangkok traffic road (v) is 20Km/hour by the Land Traffic Department surveys

t = travelling time spend hour for transportation (hour)

Number of patient's following to hospital (return trip)

For Inpatient. it can have number of follow up = 1 return trip to hospital (first on the date of admittance, and on the final day of hospitalization.)

For out patient ,number of follow up can be more than 1 return trip due to need to visit hospital for receiving treatment 1 round trip as inpatient , and another following for purchasing medicine or see doctor in first year of accident due to disability.

So,

For outpatient ; Number of patient's following to hospital (return trip) =

1 (no. of following as IP= 1 round trip) + number of following as OP

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100

(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient who didn't have an income or unemployed ,Total travelling time cost of Outpatients and Inpatient in first year after patient's accident of that patient is equal to zero (PTT = 0).

### 1.2.1.2 Total waiting time cost of outpatient

Definition: Total waiting time cost of outpatient (P9) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident. That can be the income foregone of patient who have salary due to waiting and spend time in hospital in 1<sup>st</sup> year after patient accident. It means those patients who have income will loss their income if they wait for receiving medical treatment or wait to see the doctor at hospital.

Total waiting time cost of Outpatient (P9) = The summary of total waiting time cost of outpatient in first year after patient's accident for each patient (PWO) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$P9 = \frac{\sum_{i=1}^n (PWO_i \times CPI_i)}{95}$$

Where;

P9 = Total waiting time cost of outpatient = average total waiting time cost of outpatient that patient forgone per 1 person in first year after patient's accident.

PWO<sub>i</sub> = Total waiting time cost of outpatient in first year after patient's accident for each patient forgone = income of patient before accident per hour x waiting time patient spend in a hospital each visit (hour) x number of outpatient's visit to hospital (return trip).

Where :

Income of patient before accident per hour =  $\frac{\text{income/month before accident}}{154}$

154 is from in 1 month average of patient work 7 hours x 22 day

Waiting time patient spend in a hospital each visit (hour) is waiting time that patient spend for waiting to received the treatment or see the doctor in hospital as outpatient. (can get data from questionnaire )

Number of outpatient's visit to hospital (return trip).

For out patient, number of follow up can be more than 1 return trip due to need to visit hospital for waiting for receiving a treatment 1 round trip as inpatient (1 way at the first of admittance and 1 way at the date of leaving hospitalization = 1 round trip) , and another following for purchasing medicine or see doctor in first year of accident due to disability.

So,

For outpatient ; Number of patient's following to hospital (return trip) =  
1 (no, of following as IP = 1 round trip) + number of following as OP

$CPI_i$  = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

$n$  = Number of observations = 95

For patient who didn't have an income or unemployed. patient who is inpatient for all of 1<sup>st</sup> year after accident or patient who didn't visit hospital during they was outpatient in 1<sup>st</sup> year after patient accident, Total waiting time cost of outpatient in first year after patient's accident of that patient is equal to zero (PWO = 0).

According to total waiting time cost of inpatient .it's very difficult to define the cost because of on the date that patient have an accident and was an inpatient .It's difficult to get the data that how long the patient wait for received emergency or acute care on that first day admittance. Therefore, the inpatient's waiting time spend is assumed equal to zero and not included total waiting time cost of inpatient in this study because of the limitation.



### 1.2.1.3 Loss of income due to illness during treatment in hospital for inpatient

Definition: Loss of income due to illness during treatment in hospital for inpatient (P10) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident. That can be the income foregone of patient who have salary due to admit as inpatient in hospital in 1<sup>st</sup> year after patient accident. It means that patients who have income will loss their income because they loss their workday and cannot work due to illness from disability and need to admit in hospital.

Loss of income due to illness during treatment in hospital for inpatient (P10) = The summary of loss of income due to illness during treatment in hospital for inpatient in first year after patient's accident for each patient (PLI) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$P10 = \frac{\sum_{i=1}^n (PLI_i \times CPI_i)}{95}$$

Where;

P10 = Loss of income due to illness during treatment in hospital for inpatient = average loss of income due to illness during treatment in hospital for inpatient forgone per 1 person in first year after patient's accident.

PLI<sub>i</sub> = Loss of income due to illness during treatment in hospital for inpatient in first year after patient's accident for each patient forgone = income of patient before accident per day x number of workday lost in 1<sup>st</sup> year after patient accident

Where :

Income of patient before accident per day =  $\frac{\text{income/month before accident}}{22}$

22 is from suppose workday in 1 month = 22 days

Therefore, number of workday all year = 22 x 12 = 264 days

Number of workday lost of inpatient in 1<sup>st</sup> year after patient accident is calculated from;

$$\begin{aligned}
 & \text{Number of workday lost of inpatient in 1}^{\text{st}} \text{ year} \\
 & = \frac{\text{number of workday all year} \times \text{no.of IP admit day in 1}^{\text{st}} \text{ year}}{365} \\
 & = \frac{22 \times 12 \times \text{no. of IP admit day in 1}^{\text{st}} \text{ year}}{365} \\
 & = 264 \times \frac{\text{no. of IP admit day in 1}^{\text{st}} \text{ year}}{365}
 \end{aligned}$$

$CPI_i$  = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100

(Please look at CPI table in appendix B, page 163)

$n$  = Number of observations = 95

For patient who didn't have an income or unemployed or be outpatient, Loss of income due to illness during treatment in hospital for inpatient in first year after patient's accident of that patient is equal to zero (PLI = 0).

#### 1.2.1.4 Loss of income due to illness of outpatient

Definition: Loss of income due to illness for outpatient (P11) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident. That can be the income foregone of patient who have salary due to admit as outpatient in hospital in 1<sup>st</sup> year after patient accident. It means that patient who has income will loss their income because they lose their workday and cannot go to work as normal due to illness from disability.

Loss of income due to illness of outpatient (P11) = The summary of loss of income due to illness of outpatient in first year after patient's accident for each patient (PLO) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95).

The formula for calculation is :

$$P11 = \frac{\sum_{i=1}^n (PLO_i \times CPI_i)}{95}$$

Where;

P11 = Loss of income due to illness of outpatient = average of income due to illness of outpatient forgone per 1 person in first year after patient's accident.

$PLO_i$  = Loss of income due to illness of outpatient in first year after patient's accident for each patient forgone = income of patient before accident per day  
x number of workday lost in 1<sup>st</sup> year after patient accident

Where :

Income of patient before accident per day  
=  $\frac{\text{income/month before accident}}{22}$

22 is from suppose workday in 1 month = 22 days

Therefore, number of workday all year = 22 x 12 = 264 days

Number of workday lost of outpatient in 1<sup>st</sup> year after patient accident is calculated from;

$$\begin{aligned}
 & \text{Number of workday lost of outpatient in 1}^{\text{st}} \text{ year after patient accident} \\
 & = \frac{\text{number of workday all year} \times \text{no. of day as OP in 1}^{\text{st}} \text{ year after patient accident}}{365} \\
 & = \frac{22 \times 12 \times \text{no. of day as OP in 1}^{\text{st}} \text{ year after patient accident}}{365} \\
 & = 264 \times \frac{\text{no. of day as OP in 1}^{\text{st}} \text{ year after patient accident}}{365}
 \end{aligned}$$

$CPI_i$  = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

$n$  = Number of observations = 95

For patient who didn't have an income or unemployed or be inpatient, Loss of income due to illness during treatment in hospital for outpatient in first year after patient's accident of that patient is equal to zero (PLO = 0).

### 1.3 Other costs of patient

Definition: Other costs of patient or (P12) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay for other costs of patient. That can be the other cost that patient pay for anything which's not include in other cost components for example the alternative or traditional medical treatment that patient pay for themselves.

Other costs of patient or (P12) = The summary of total Other costs of patient in first year after patient's accident for each patient pay for (POT) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95).

The formula for calculation is :

$$P12 = \frac{\sum_{i=1}^n (POT_i \times CPI_i)}{95}$$

Where;

P12 = Other costs of patient = average other costs of patient that patient pay per 1 person in first year after patient's accident.

POT<sub>i</sub> = Total Other costs of patient in first year after patient's accident for each patient.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For any patient who didn't have other costs. Total other costs of patient in first year after patient's accident of that patient pay for is equal to zero (POT = 0).



## 2. Patient's relative costs

### 2.1 Direct cost

#### 2.1.1 Medical

##### 2.1.1.1 Medical equipments cost(Relative pay for patient)

Definition: Medical equipment cost (Relative pay for patient) or (R1) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay for medical equipments. That can be the cost of wheel chair, wheel chair electricity, cushion, gel cushion, staff, tri-staff, walker, crutch, airbed, hospital bed, pampers, toilet chair, urine set, alcohol set, etc.

Medical equipment cost (Relative pay for patient) or (R1) = The summary of total medical equipments in first year after patient's accident for each patient's relative pay for (RME) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$R1 = \frac{\sum_{i=1}^n (RME_i \times CPI_i)}{95}$$

Where;

R1 = Medical equipment cost (Relative pay for patient) = average medical equipment cost that patient's relative pay for patient per 1 person in first year after patient's accident.

RME<sub>i</sub> = Total medical equipments in first year after patient's accident for each patient's relative pay for.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008, base year 2007 = 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient's relative who didn't pay for this cost (patient pay for it already), Total medical equipments in first year after patient's accident of that patient's relative pay for is equal to zero (RME = 0).

### 2.1.1.2 Supplement food cost(Relative pay for patient)

Definition: Supplement food cost(Relative pay for patient) or (R2) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay for supplement food cost. That can be the cost of any herbs, vitamins or other supplement food.

Supplement food cost (R2) = The summary of total supplement food cost in first year after patient's accident for each patient's relative pay for (RSF) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$R2 = \frac{\sum_{i=1}^n (RSF_i \times CPI_i)}{95}$$

Where;

R2 = supplement food cost (relative pay for patient) = average supplement food cost that patient pay themselves per 1 person in first year after patient's accident.

RSF<sub>i</sub> = Total supplement food cost in first year after patient's accident for each Patient's relative pay for.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient's relative who didn't pay for this cost (only pay by patient), Total supplement food cost in first year after patient's accident of that patient is equal to zero (RSF = 0).

### 2.1.1.3 Home nursing cost (Relative pay for patient)

Definition: Home nursing cost (Relative pay for patient) or (R3) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay for home nursing cost. That can be the cost of hiring nurse or any person to take care patient because they're disability or relative's not available to take care patient all day due to have to working.

Home nursing cost (Relative pay for patient) or (R3) = The summary of total home nursing cost in first year after patient's accident for each patient's relative pay for (RHN) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations(n = 95).

The formula for calculation is :

$$R3 = \frac{\sum_{i=1}^n (RHN_i \times CPI_i)}{95}$$

Where;

R3 = Home nursing cost= average home nursing cost that patient's relative pay for patient per 1 person in first year after patient's accident.

RHN<sub>i</sub> = Total home nursing cost in first year after patient's accident for each patient's relative pay for.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient's relative who didn't pay home nursing cost by themselves (patient pay for it already), Total home nursing cost in first year after patient's accident of that patient's relative pay for is equal to zero (RHN = 0).

#### 2.1.1.4 Doctor cost and drug cost (Relative pay for patient)

Definition: Doctor cost and drug cost (Relative pay for patient) or (R4) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay for doctor cost and drug cost of patient . That can be the cost that patient's relative pay for doctor cost and drug cost due to disability from drunk driving only in private hospital, public hospital or any medical clinic.

Doctor cost and drug cost (Relative pay for patient) or (R4) = The summary of total doctor cost and drug cost in first year after patient's accident for each patient's relative pay for (RDD) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$R4 = \frac{\sum_{i=1}^n (RDD_i \times CPI_i)}{95}$$

Where;

R4 = Doctor cost and drug cost = average doctor cost and drug cost that patient's relative pay for patient per 1 person in first year after patient's accident.

RDD<sub>i</sub> = Total doctor cost and drug cost in first year after patient's accident for each Patient's relative pay for.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient's relative who didn't pay cost and drug cost by themselves (patient pay for it already), Total doctor cost and drug cost in first year after patient's accident of that patient's relative pay for is equal to zero (RDD = 0).

### 2.1.2 Non Medical

#### 2.1.2.1 Travelling Cost (relative pay for patient)

Definition: Travelling Cost (pay for transportation) of patient's relatives (R5) refers to the average travelling cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay amount of money spent on each visit (return trip) due to patient need to receive treatment both of inpatient and outpatient in hospital.

Travelling Cost (pay for transportation) or (R5) = The summary of total travelling Cost (pay for transportation) in first year after patient's accident for each patient's relative pay for (RTC) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95).

Due to year of patient's accident are different as same as money value.the travelling cost must be multiplied by CPI Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100 (Please look at CPI table in appendix B, page 163)

The formula for calculation is :

$$R5 = \frac{\sum_{i=1}^n (RTC_i \times CPI_i)}{95}$$

Where;

R5 = Travelling Cost (Relative pay for patient) for patients = average travelling cost (relative pay for patient) for patient that patient 's relative pay for per 1 person in first year after patient's accident.

RTC<sub>i</sub> = Average travelling cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay amount of money spent on each visit (return trip) to the hospital by patient's relatives

RTC = Taxi fare per 1 return trip x ( number of follow up as inpatient + number of follow up as outpatient)

For Inpatient's relative. it can have number of follow up = 1 return trip to hospital (first on the date of admittance, and on the final day of hospitalization.)

For Outpatient's relative ,number of follow up can be more than 1 return trip due to need to visit hospital for receiving treatment, purchasing medicine or see doctor in first year of accident due to disability.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100

(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95



Note:

All calculation for Travelling Cost (pay for transportation) of patient's relatives (R5) is similar to Travelling Cost (pay for transportation) of patients (P5), but the different is only person who pay for this travelling cost.

If relative's pay for this cost it means patient didn't pay due to there're travelling together as same as if patient's pay for this cost it means patient's relative didn't pay too.

So, to avoid duplicate cost calculation .For any patient's relative who didn't pay for Travelling Cost (pay for transportation) (patient pay already), Travelling Cost (pay for transportation) of patient in first year after patient's accident of that patient's relative pay for is equal to zero ( $RTC = 0$ ).

### 2.1.2.2 Travelling cost of relative pay for transportation visit IP

Definition: Travelling cost of relative pay for transportation visit IP (R6) refers to the average travelling cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay amount of money spent on each visit (return trip) due to travelling to assist inpatient in hospital for all inpatient admittance in 1<sup>st</sup> year after patient accident for themselves.

Travelling cost of relative pay for transportation visit IP or (R6) = The summary of total travelling cost of relative pay for transportation visit IP in first year after patient's accident for each patient's relative pay for (RTI) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95).

Due to year of patient's accident are different as same as money value. the travelling cost must be multiplied by CPI Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100 (Please look at CPI table in appendix B, page 163)

The formula for calculation is :

$$R6 = \frac{\sum_{i=1}^n (RTI_i \times CPI_i)}{95}$$

Where;

R6 = Travelling cost of relative pay for transportation visit inpatient= average travelling cost for patient that patient pay themselves per 1 person in first year after patient's accident.

RTI<sub>i</sub> = Average travelling cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay amount of money spent on each visit (return trip) to the hospital for visiting inpatient during their hospital admittance by themselves.

RTI = Taxi fare per 1 return trip x ( number of return trip to hospital of inpatient's relative during inpatient admittance.)

For travelling cost of relative pay for transportation visit IP . It's not include the number of follow up on the first date of patient admittance, and on the final day of hospitalization( 1 return trip), to avoid duplicate calculation with travelling cost (Relative pay for patient) .so, this cost mention only cost that relative pay for their transportation to visit inpatient during patient admittance in a hospital only.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

Note:

All calculation for Travelling cost of relative pay for transportation visit IP (R6) is similar to travelling cost (Relative pay for patient) or (R5), but the different is Taxi fare per 1 return trip need to be multiplied by number of return trip to hospital of inpatient's relative during inpatient admittance.

In case that patient's no relative take care or patient's relative didn't go to assist inpatient during patient admit day, Travelling cost of relative pay for transportation visit IP of patient in first year after patient's accident of that patient's relative pay for is equal to zero (RTI= 0).

### 2.1.2.3 Electricity and water cost (Relative pay for patient)

Definition: Electricity and water cost (Relative pay for patient) or (R7) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay for electricity and water cost . That can be the cost that patient's relative pay for electricity and water cost in 1<sup>st</sup> year after patient accident.

Electricity and water cost (R7) = The summary of total electricity and water cost in first year after patient's accident for each patient's relative pay for (REW) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95).

$$R7 = \frac{\sum_{i=1}^n (REW_i \times CPI_i)}{95}$$

Where;

R7 = Electricity and water cost = average electricity and water cost that patient's relative pay for patient per 1 person in first year after patient's accident.

REW<sub>i</sub> = Total electricity and water cost in first year after patient's accident for each patient's relative pay for = Total electricity and water cost per month of first year after patient's accident x 12.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient's relative who didn't pay electricity and water cost (patient pay for it already), Total electricity and water cost in first year after patient's accident of that patient's relative pay for is equal to zero (REW = 0).

## 2.1.2.4 Accommodation (Relative pay for patient)

Definition: Accommodation (Relative pay for patient) or (R8) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay for Accommodation (Relative pay for patient). That can be the costs that patient's relative pay for accommodation such as costs due to renovate ,construction, build the house changing the accommodation and its facilities, toilet for disability patient or slope for wheelchair or any house renovation for necessary to patient's living.

Accommodation cost (R8) = The summary of total Accommodation (Relative pay for patient)in first year after patient's accident for each patient's relative pay (RAC) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95).

$$R8 = \frac{\sum_{i=1}^n (RAC_i \times CPI_i)}{95}$$

Where;

R8 = Accommodation cost = average accommodation cost that patient's relative pay per 1 person in first year after patient's accident.

RAC<sub>i</sub> = Total Accommodation cost (Relative pay for patient)in first year after patient's accident for each patient's relative pay for

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient's relative who didn't pay accommodation cost (patient pay for it already), Total electricity and water cost in first year after patient's accident of that patient's relative pay for is equal to zero (RAC = 0).



## 2.2 Indirect cost

### 2.2.1 Non Medical

#### 2.2.1.1 Total travelling time cost of outpatient's relatives

Definition: Total travelling time cost of outpatient's relatives (R9) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay for Total travelling time cost of outpatient's relatives. That can be the income foregone of patient's relative who have salary due to travelling and spend time to hospital 1<sup>st</sup> year after patient accident as the assistance. it means that patient's relative who have income will loss their income if they assist patient travel to hospital.

Total travelling time cost of outpatient's relatives (R9) = The summary of Total Travelling time cost of outpatient's relatives in first year after patient's accident for each patient 's relative pay for (RTTO) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$R9 = \frac{\sum_{i=1}^n (RTTO_i \times CPI_i)}{95}$$

Where;

R9 = Total Travelling time cost of outpatient's relatives = average total travelling time cost of outpatients that patient's relative pay for per 1 person in first year after patient's accident.

RTTO<sub>i</sub> = Total Travelling time cost of outpatient's relatives in first year after patient's accident for each patient's relative pay for = income of patient's relative before accident per minute x travelling time patient's relative spend (minute) x number of patient's relative following to hospital (return trip).

Where :

Income of patient's relative before accident per minute =

$$\frac{\text{Income /hr before accident}}{60} = \frac{\text{income/month before accident}}{60 \times 154}$$

154 is from in 1 month patient work 7 hours x 22 day

And 60 is from in 1 hour has 60 minutes.

Travelling time patient's relative spend (minute) calculate from;

Travelling time was calculated by distance divided by average speed as in the equation

$$t = \frac{S}{v}$$

Where ;

S = Distance(Km)

v = Average speed of vehicle in Bangkok traffic road (v) is 20Km/hour by the Land Traffic Department surveys

t = travelling time spend hour for transportation (hour)

Number of patient's relative following to hospital (return trip)

For outpatient's relative ,number of follow up can be more than 1 return trip due to need to assist patient to hospital for receiving treatment. for example 1 round trip as inpatient's relative , and another are number of follow up as the outpatient's relative.

So,

For outpatient ; Number of patient's relative following to hospital (return trip) =  
1 (number of following as IP's relative ) + number of following as  
OP's relative

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient who didn't have relative, relatives are unemployed ,Total travelling time cost of outpatient's relatives in first year after patient's accident of that patient is equal to zero (RTTO = 0).

### 2.2.1.2 Total Travelling time cost of inpatient's relatives

Definition: Total travelling time cost of inpatient's relatives (R10) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient pay for total travelling time cost of inpatient's relatives . That can be the income foregone of inpatient's relative who have salary due to travelling and spend time to hospital 1<sup>st</sup> year after patient accident. it means that patient who have income will loss their income if they travel to hospital on the date of admittance and date that patient's leave hospital.

Total travelling time cost of Inpatient's relatives (R10) = The summary of Total travelling time cost of inpatient's relatives in first year after patient's accident for each inpatient 's relative pay for (RTTI) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$R10 = \frac{\sum_{i=1}^n (RTTI_i \times CPI_i)}{95}$$

Where;

R10 = Total Travelling time cost of inpatient's relatives = average total travelling time cost of inpatient that patient's relative pay for per 1 person in first year after patient's accident.

RTTI<sub>i</sub> = Total Travelling time cost of inpatient's relatives in first year after patient's accident for each patient's relative pay for = income of patient's relative before accident per minute x travelling time patient's relative spend (minute) x number of patient's relative following to hospital (return trip).

Where :

Income of patient's relative before accident per minute =

$$\frac{\text{Income /hr before accident}}{60} = \frac{\text{income/month before accident}}{60 \times 154}$$

154 is from in 1 month patient work 7 hours x 22 day

And 60 is from in 1 hour has 60 minutes.

Travelling time patient's relative spend (minute) calculate from;

Travelling time was calculated by distance divided by average speed as in the equation below.

$$t = \frac{S}{v}$$

Where ;

S = Distance(Km)

v = Average speed of vehicle in Bangkok traffic road (v) is 20Km/hour by the Land Traffic Department surveys

t = travelling time spend hour for transportation (hour)

Number of patient's relative following to hospital (return trip)

For inpatient's relative. it can have number of follow up = 1 return trip to hospital (first on the date of admittance, and on the final day of hospitalization.) + number of following up to assist patient when they're inpatient (round trip)

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100

(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient who didn't have relative, relative are unemployed, Total travelling time cost of inpatient's relatives in first year after patient's accident of that patient is equal to zero (RTTI = 0).

### 2.2.1.3 Total waiting time cost of outpatient's relative

Definition: Total waiting time cost of outpatient's relative (R11) is the average cost of outpatient's relative forgone their income due to assist outpatient during their waiting for receiving medical treatment in a hospital per 1 person in 1<sup>st</sup> year after patient's accident. That can be the income foregone of patient's relative who have salary due to waiting and spend time in hospital. Also it means that patient's relative who have income will loss their income if they assist outpatient for receiving medical treatment or wait to see the doctor at hospital.

Total waiting time cost of outpatient's relative (R11) = The summary of total waiting time cost of outpatient's relative in first year after patient's accident for each patient's relative pay for (RWO) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95)

The formula for calculation is :

$$R11 = \frac{\sum_{i=1}^n (RWO_i \times CPI_i)}{95}$$

Where;

R11 = Total waiting time cost of outpatient's relative = average total waiting time cost of outpatient's relative that patient's relative forgone per 1 person in first year after patient's accident.

$RWO_i$  = Total waiting time cost of outpatient's relative in first year after patient's accident for each patient's relative forgone = income of patient's relative before accident per hour x waiting time patient's relative spend in a hospital each visit (hour) x number of outpatient's relative's visit to hospital (return trip).

Where :

Income of patient's relative before accident per hour  
 $= \frac{\text{income/month before accident}}{154}$

154 is from in 1 month average of patient's relative work 7 hours x 22 day

Waiting time patient's relative spend in a hospital each visit (hour) is waiting time that patient's relative spend for waiting with patient to received the treatment or see the doctor in hospital as outpatient (can get data from questionnaire).



Number of outpatient's relative's visit to hospital (return trip).

For outpatient's relative, number of follow up can be more than 1 return trip due to need to assist patient to hospital for receiving treatment. For example 1 round trip as inpatient's relative , and another are number of follow up as the outpatient's relative. (Can get data from questionnaire).

So, For outpatient's relative ;

Number of patient's relative following to hospital (return trip) =

1 (number of following as IP's relative) + number of following as OP's relative

$CPI_i$  = Consumer Price Index adjusted value from year of accident of each patient's relative to year 2008 , base year 2007= 100

(Please look at CPI table in appendix B, page 163)

$n$  = Number of observations = 95

For patient who didn't have patient's relative, patient's relative who didn't have an income or unemployed. patient's relative who is inpatient's relative ,patient's relative who didn't visit hospital during they were outpatient's relative in 1<sup>st</sup> year after patient accident, Total waiting time cost of outpatient's relative in first year after patient's accident of that patient's relative pay for is equal to zero (RWO = 0).

For Total waiting time cost of inpatient's relative .it's very difficult to define the cost because of on the date that patient have an accident and was an inpatient .It's difficult to get the data that how long the patient's relative wait for emergency or acute care on that first day admittance of patient. Therefore, the inpatient's relative's waiting time spend is assumed equal to zero and not included total waiting time cost of inpatient's relative in this study because of the limitation.

#### 2.2.1.4 Loss of relative's income due to leaving the job to Take care the patient

Definition: Loss of relative's income due to leaving the job to take care the patient (R12) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident .That can be the income foregone of patient's relative who have salary but need to leave the job to take care patient who's disability victim in 1<sup>st</sup> year after patient accident.

Loss of relative's income due to leaving the job to take care the patient (R12)  
= The summary of Loss of income due to leaving the job to take care the patient  
of patient's relative in first year after patient's accident (RLL) x CPI (adjusted value  
to year 2008 use base year 2007 = 100) divided by the number of all observations  
(n = 95)

The formula for calculation is :

$$R12 = \frac{\sum_{i=1}^n (RLL_i \times CPI_i)}{95}$$

Where;

R12 = Loss of relative's income due to leaving the job to take care the patient =  
average of loss of relative's income due to leaving the job to take care the  
patient that patient's relative forgone per 1 person in first year after  
patient's accident.

RLL<sub>i</sub> = Loss of relative's income due to leaving the job to take care the patient in  
first year after patient's accident for each patient's relative forgone =  
total income of patient's relative before patient's accident per year (for  
relative who leave job to take care patient only, for other relative who didn't  
leave job to take care ,value of RLL = 0)

Where :

Income of patient's relative before patient's accident per year.(for relative who leave  
job to take care patient only,

= income before patient's accident per month of patient's relative who  
leave the job to take care patient x 12 months

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to  
year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For patient's relative who didn't leave job or unemployed. Loss of relative's  
income due to leaving the job to take care the patient in first year after patient's  
accident of that patient's relative is equal to zero (RLL = 0).

### 2.3 Other costs of patient's relative

Definition: Other costs of patient's relative or (R13) is the average cost per 1 person in 1<sup>st</sup> year after patient's accident that patient's relative pay for other costs of patient's relative. That can be the other cost that patient's relative pay for anything which's not include in other cost components for example the alternative or traditional medical treatment for patient that relative pay for.

Other costs of patient's relative or (R13) = The summary of total other costs of patient's relative in first year after patient's accident for each patient's relative pay for (ROT) x CPI (adjusted value to year 2008 use base year 2007 = 100) divided by the number of all observations (n = 95).

The formula for calculation is :

$$R13 = \frac{\sum_{i=1}^n (ROT_i \times CPI_i)}{95}$$

Where;

R13 = Other costs of patient's relative= average other costs of patient's relative that patient's relative pay for patient per 1 person in first year after patient's accident.

ROT<sub>i</sub> = Total other costs of patient's relative in first year after patient's accident for each patient's relative pay for.

CPI<sub>i</sub> = Consumer Price Index adjusted value from year of accident of each patient to year 2008 , base year 2007= 100  
(Please look at CPI table in appendix B, page 163)

n = Number of observations = 95

For any patient's relative who didn't have other costs of patient's relative. Total other costs of patient's relative in first year after patient's accident of that patient's relative pay for is equal to zero (ROT = 0).