

## CHAPTER IV



### RESULTS OF THE STUDY

This study analyzes the determinants of average charge per 1 relative weight of DRGs to adjust reimbursement rate of Diagnosis Related Groups (DRGs) of public hospitals in Thailand. In previous chapter the average cost/charge function were constructed in order to test hypothesis of the determinants. Results of the relationship between charges of in-patient services and determinants affecting charge in public hospitals are present in this chapter in two parts.

1. Descriptive analysis of the variables
2. Analysis of the estimated regression model

#### 4.1 Descriptive analysis of the variables

The data in the results of this study are secondary data collected from the public hospitals in the Ministry of Public Health, National Statistical Office and National Economic and Social Development Board in the Office of the Prime Minister and Ministry of Commerce. This study proposes for data collection from the target population samples of 813 public hospitals under the Ministry of Public Health in fiscal year 2001. The results are obtained by the methods as mentioned in chapter 3, but due to some limit in availability of data of the dependent variable, this study can obtain complete data set of from only 178 hospitals. The numbers and levels of population samples are shown below in Table 4.1.

**Table 4.1: Hospitals in this study classified by levels**

<b>Levels of Hospital</b>	<b>Number of Hospitals in this study</b>	<b>Target hospitals</b>	<b>% of Hospitals in this study</b>
Regional hospital with teaching status	4	12	33.3
Regional hospital without teaching status	5	13	38.5
General hospital	18	67	26.8
Community hospital	151	721	20.9
<b>Total</b>	<b>178</b>	<b>813</b>	<b>21.9</b>

Source: Ministry of Public Health, September 2001

In this study the levels of hospitals are classified into 4 groups, which consists of 4 regional hospitals with teaching status, 5 regional hospitals without teaching status, 18 general hospitals and 151 community hospitals. This study collects data of charges for treatment of inpatients services in the hospitals, which were submitted to the Health Insurance Office, Ministry of Public Health for reimbursement of high cost inpatients care. The population samples of hospitals that submitted complete data in this study are about 21.9% from the target population. The hospitals that submitted complete DRGs inpatient data classified by levels of hospitals are 33.3% of the regional hospitals with teaching status, 38.5% of regional hospitals without teaching status, 26.8% of general hospitals and 20.9% of hospitals.

**Table 4.2: Hospitals in this study classified by regions**

<b>Regions</b>	<b>Regional Hospitals with teaching status</b>	<b>Regional Hospitals without teaching status</b>	<b>General Hospitals</b>	<b>Community Hospitals</b>	<b>Total</b>
North	2	1	3	56	62
Northeast	1	1	3	66	71
Central	1	1	7	15	24
Bangkok Metropolitan	0	0	3	3	6
South	0	2	2	11	15
<b>Total</b>	<b>4</b>	<b>5</b>	<b>18</b>	<b>151</b>	<b>178</b>

Source: Ministry of Public Health, September 2001

From Table 4.2, the hospitals in this study are from every region in Thailand. The region that has the most complete data is the northeastern region of 71 hospitals follows by the northern region of 62 hospitals. In each level of hospitals, the distribution of the samples are in every regions also except for regional hospitals with training center that does not have the data from the southern region and also Bangkok metropolitans does not have regional hospital with or without training center.

**Table 4.3: Comparison of beds of this study and Unresponsive population**

<b>Beds</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std.</b>
Study samples	178	10	948	109.12	168.73
Unresponsive samples	635	10	1134	83.39	139.55

The number of beds in the hospitals in this study varies from 10 beds up to 948 beds, while the number of beds of hospitals that were exclude from this study varies from 10 beds up to 1134 which is nearly the same.

**Table 4.4: Comparison of average relative weight of the hospitals in this study and Unresponsive population**

<b>Average RW per case</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std.</b>
Study samples	178	0.45	1.25	0.68	0.12
Unresponsive samples	343	0.46	1.00	0.64	0.10

Average relative weights of hospitals in this study is 0.68, which is similar to the average relative weights of 343 hospitals that were exclude from this study of 0.64. This study should be a good representative of the average relative weights of the total target population of hospitals.

The unresponsive sample was only 343 hospitals was because of the other hospitals did not submitted in-patient data record to the Health Insurance Office may be due to these hospitals did not have patients with relative weights 2.5 or higher for reimbursement. The hospitals that submit the data are usually hospitals that ask for reimbursement for high cost care

**Table 4.5: Comparison of percentage of physicians per bed in this study and Unresponsive population**

Percentage of physicians per bed	N	Minimum	Maximum	Mean	Std.
Study samples	176	2.22	50.00	9.60	4.99
Unresponsive samples	636	1.67	55.56	10.37	5.72

Percentage of physicians per bed of hospitals in this study is 9.60, which is similar to the unresponsive samples of 636 hospitals that were exclude from this study of 10.37. The minimum and maximum percentage were also similar which means that this study should be a good representative of the percentage of physicians per bed of the total target population of hospitals.

**Table 4.6: Comparison of percentage of labor cost relative to total expenditures in this study and Unresponsive population**

Percentage of Labor Cost/Total expenditure	N	Minimum	Maximum	Mean	Std.
Study samples	176	39.00	81.00	56.92	8.07
Unresponsive samples	624	18.68	83.64	57.24	9.9

Percentage of labor cost relative to the total expenditures of hospitals in this study is 56.92, which is similar to the unresponsive sample of 624 hospitals that were exclude from this study of 57.24. The maximum percentage is also similar so this study should be a good representative of the percentage of labor cost relative to the total expenditure of the target population of hospitals.

**Table 4.7: Comparison of percentage of admission rate in this study and Unresponsive population**

<b>Percentage of Admission Rate</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std.</b>
Study samples	178	2.20	15.89	7.06	2.54
Unresponsive samples	634	1.18	51.02	6.71	3.34

Percentage of admission rate of hospitals in this study is 7.06, which is similar to the unresponsive sample of 634 hospitals that were exclude from this study of 6.71. This study should be a good representative of the percentage of admission rate for the total target population of hospitals.

**Table 4.8: Comparison of inverse case flow rate in this study and Unresponsive population**

<b>Inverse Case flow rate (percentage of beds/output)</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std.</b>
Study samples	178	0.49	2.57	1.07	0.38
Unresponsive samples	346	0.15	15.38	1.18	0.96

The inverse case flow rate (percentage of beds/output) of hospitals in this study is 1.07, which is similar to the unresponsive sample of 346 hospitals that were exclude from this study of 1.18. This study should be a good representative of the percentage of admission rate for the total target population of hospitals.

**Table 4.9 : Descriptive statistic of the variables in this study**

<b>Variables</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std.</b>
GPP per capita (Baht)	178	16,719.00	419,741.00	49,120.17	54,966.69
CPI	178	131.40	135.40	133.97	1.74
Beds	178	10.00	948.00	109.12	168.73
Average charge per RW (Baht)	178	241.27	13155.53	3303.30	2416.26
Percentage of Physicians per bed	178	2.22	50.00	9.60	4.99
Average RW per case	178	0.45	1.25	0.68	0.12
Percentage of Board Certified Physicians	107	0.00	100.00	29.70	39.66
Percentage of Labor Cost/Total Expenditures	176	39.00	81.00	56.92	8.07
Percentage of Admission Rate	178	2.20	15.89	7.06	2.54
Percentage of Referral Rate	176	0.84	97.92	48.40	24.13
Inventory Turnover Ratio	176	0.90	581.18	18.83	56.71
Case Flow Rate (Outputs/bed)	178	38.9	206.00	104.83	36.28

Table 4.9 shows the average value of each variable in this study, both dependent and independent. The average charge per one relative weight of DRGs, which is the dependent variable, is 3,303.30 baht. The hospital that charge per one relative weight of DRG lowest was 241.27 baht which was a community hospital

and the highest charge was 13,155.53 baht in the regional hospital with teaching status.

For the independent variables, since the hospitals in this study are from various levels and beds ranging from 10 beds to 948 beds. There are representative from each regions of the country in every level of hospitals in which CPI by region of the country is a proxy of both cost of living and regions of the hospitals. There are variations in Gross Provincial Product per capita (GPP per capita) or income per capita among different provinces and different regions. The province with highest GPP per capita was 419,741 baht in Bangkok metropolitan area and the lowest was 16,719 baht in the northeastern part of Thailand, while the average GPP per capita was 49,120,17 baht. These two variables are proxy of input prices in the hospital's cost function.

The average relative weights per case in each hospital are 0.68 varying from 0.28 to 1.25 RW. The percentage of physicians per bed is 9.60, while the average percentage of board certified physicians in comparison with the total physicians in the hospital is 29.70. Some community hospitals do not have any board certified physicians, while in some general and regional hospitals the physicians are all board certified physicians. The average percentage of labor cost compare to the total expenditure of the hospital is 56.92.

The other proxies of hospital's output are percentage of admission rate, which has the average of 7.06 cases per 100 cases that came to the hospital. While the percentage of refer-in (accept refer) cases rate from total referral rate, both accept and refer out is, 48.40 cases from total of 100 referral cases. The average case flow rate, which is the percentage of cases or output per bed in the fiscal year, is 104.83 cases per beds. Average inventory turnover rate of each hospital in this study is 18.83.



From the average value of each variable, if we classified each hospital into regional hospitals with teaching status, regional hospitals without teaching status, general hospitals and community hospitals the average value of each level will be different. The table below (Table 4.10) shows the average value of charges per 1 relative weight (RW) in baths of each level of hospitals.

**Table 4.10 : Comparison of average charge per relative weight in different level hospitals (unit: Baht)**

Hospitals	Average charge per RW
Regional hospitals with teaching status	10,025.40
Regional hospitals without teaching status	8,082.52
General hospitals	6,775.93
Community hospitals	2,553.02

The average charge per 1 relative weight differs in different level of hospitals. Regional hospitals with teaching status charge the highest of 10,025.40 bahts per unit of relative weight that may refer to that the hospital incurs the highest cost of providing service due to tendency of hospitals to charge at the rate to covers it own input costs. While regional hospitals without teaching status charge the second highest of 8,082.52 bahts, about 2,000 bahts lower than regional hospitals with teaching status follow by general hospitals of 6,775.93 bahts. Community hospitals charge the lowest in the group of 2,553.02 bahts per unit of relative weight; about 7,500 bahts lower than regional hospitals with teaching status and 4,000 bahts lower than general hospitals.

**Table 4.11 : Comparison of average relative weights per case in different level hospitals**

<b>Hospitals</b>	<b>Average RW per case</b>
Regional hospitals with teaching status	1.02
Regional hospitals without teaching status	0.97
General hospitals	0.79
Community hospitals	0.65

The average relative weight differs in different levels of hospitals. Regional hospitals with teaching status have the highest average relative weight of 1.02 RW per case, which indicates the high complexity of the cases treated in the hospital. While regional hospitals without teaching status has the second highest average relative weight of 0.97 RW per case follow by general hospitals of 0.79 RW. Community hospitals have the lowest average RW in the group of 0.65 per case.

**Table 4.12 : Comparison of percentage of physicians per bed in different level hospitals**

<b>Hospitals</b>	<b>Percentage of Physicians per bed</b>
Regional hospitals with teaching status	13.59
Regional hospitals without teaching status	14.42
General hospitals	9.25
Community hospitals	9.22

From Table 4.12 the percentage of physician per bed differs between two groups of hospitals. Regional hospitals with teaching status and regional hospitals without teaching status have the similar percentage of physician per bed at about 13.59 and 14.42. While general hospitals and community hospitals have the have the similar percentage of physician per bed at about 9.25 and 9.22.

**Table 4.13 : Comparison of percentage of board certified physicians in different level hospitals**

<b>Hospitals</b>	<b>Percentage of Board Certified Physicians</b>
Regional hospitals with teaching status	92.11
Regional hospitals without teaching status	91.62
General hospitals	88.36
Community hospitals	9.51

The percentage of board certified physicians differs between two groups of hospitals. Regional hospitals with teaching status, regional hospitals without teaching status, and general hospitals have similar high percentage of board certified physicians about 92.11, 91.62 and 88.36 respectively; and low percentage of general practitioners. While community hospitals have the lowest percentage of board certified physicians of 9.51, which indicates that community hospital's physicians are mostly general practitioner.

**Table 4.14: Comparison of percentage of labor cost in different level hospitals**

<b>Hospitals</b>	<b>Percentage of Labor Cost</b>
Regional hospitals with teaching status	49.25
Regional hospitals without teaching status	49.00
General hospitals	56.61
Community hospitals	57.43

The percentages of labor cost relative to the total expenditures of the hospital are nearly similar in different groups of hospital. Regional hospitals with teaching status and without teaching status have similar percentages of labor cost about 49.25 and 49.00 which is about half of the total expenditure. While general hospitals and community hospitals have similar percentages of labor cost higher than the former group of about 56.61 and 57.43, which may indicate that more than half of the expenditure of these hospitals are from the labor cost.

**Table 4.15: Comparison of percentage of admission rate in different level hospitals**

<b>Hospitals</b>	<b>Percentage of Admission Rate</b>
Regional hospitals with teaching status	10.33
Regional hospitals without teaching status	9.71
General hospitals	10.15
Community hospitals	6.51

The percentage of admission rate of the hospital differs in different levels of hospital. Regional hospitals with teaching status and general hospitals have similar percentages of admission rate about 10.33 and 10.15. Regional hospital without teaching status has percentage of admission rate is 9.71, slightly lower than the former two groups. While community hospitals have percentages of admission rate the lowest of 6.51, which may indicate that the proportion of patients in community hospital are mostly outpatients.

**Table 4.16: Comparison of percentage of referral rate in different level hospitals**

Hospitals	Percentage of Referral Rate
Regional hospitals with teaching status	86.3
Regional hospitals without teaching status	92.20
General hospitals	75.27
Community hospitals	42.67

The percentage of accepting referral cases relative to the total referral in and out cases of the hospital differs in different levels of hospital. From 100 referral cases, regional hospitals with teaching status accept about 86.3 cases and refer out 13.7 cases, while regional hospitals without teaching status accept about 92.20 cases. General hospitals accept about 75.27 from 100 referral cases or about  $\frac{3}{4}$  of the cases. Community hospitals have percentages of accepting referral cases lowest of 42.67, which may indicate that the proportion of referral cases in community hospitals are usually referring patients out to a higher level of hospital for more complex care. The capability of treating complex cases in community

hospitals are lower than general and regional hospitals due to the results from table 4.13 that indicates the higher percentage of board certified physicians in the latter.

**Table 4.17: Comparison of inventory turnover ratio in different level hospitals**

<b>Hospitals</b>	<b>Inventory Turnover ratio</b>
Regional hospitals with teaching status	12.07
Regional hospitals without teaching status	10.56
General hospitals	12.84
Community hospitals	20.01

The percentages of inventory turnover ratio of the hospital are different in different levels of hospital. Regional hospitals with training center and without teaching status have percentages of inventory turnover ratio of 12.07 and 10.56 respectively. While general hospitals has slightly higher inventory ratio of 12.84 and community hospitals percentage is 20.01. Community hospitals have higher turnover rate of financial cash flow than larger hospitals.

**Table 4.18: Comparison of case flow rate in different level hospitals**

<b>Hospitals</b>	<b>Case flow rate (outputs/bed)</b>
Regional hospitals with teaching status	63.45
Regional hospitals without teaching status	66.52
General hospitals	70.47
Community hospitals	111.29

**Table 4.19: Comparison of inverse case flow rate in different level hospitals**

<b>Hospitals</b>	<b>Inverse Case flow rate (percent of beds/output)</b>
Regional hospitals with teaching status	1.60
Regional hospitals without teaching status	1.57
General hospitals	1.45
Community hospitals	0.98

The case flow rate of the hospitals differs in different levels of hospital. Regional hospitals with teaching status, regional hospitals without teaching status and general hospitals have similar percentages of case flow rate of 63.45, 66.52 and 70.47 respectively. While community hospitals have higher case flow rate of 111.29, which indicates that utilization capacity is higher or resources are more fully used in community hospitals than larger hospitals. In this study we use the inverse of case flow rate as explanatory variable because of hypothesis that if the hospital have higher case flow rate, the fixed cost should be distribute more and then will lower the average cost per output.

## 4.2 Analysis of the estimated regression model

This section presents the estimated results of linear regression model for the characteristics of hospital, hospital's output, input prices and management efficiency regarding charge of in-patient services. Multiple regression analysis is used to estimate the relationship between average charge per 1 relative weight of DRGs in public hospitals and the explanatory variables. The estimated regression is expected to be use as criteria that can reflect the relationship between existing factors and charge.

The model of the characteristics of hospital mention above as proximate to inpatient charge is estimated by hypothesis of average charge function is a function of output, input prices and management efficiency of the hospital stated below.

$$\begin{aligned}
 ACRW = & \beta_0 + \beta_1 AVRW_i + \beta_2 BEDS_i + \beta_3 LEV 1_i + \beta_4 LEV 2_i + \beta_5 LEV 3_i + \\
 & \beta_6 LEV 4_i + \beta_7 INVCFR_i + \beta_8 LCI_i + \beta_9 PHY_i + \beta_{10} BDPHY_i + \\
 & \beta_{11} ADM_i + \beta_{12} RF_i + \beta_{13} TR_i + \beta_{14} GPP_i + \beta_{15} CPI_i + \varepsilon
 \end{aligned}$$

### 4.2.1 Result from regression model I

The results of regression analysis from SPSS version 10.0 program to determine which following explanatory variables have relation and to what degree with the average charge per 1 relative weight of DRGs in fiscal year 2001 is showed in Table 4.20. The independent variables are average relative weights, number of hospital beds, level of hospital, inverse of case flow rate, percentage of labor cost, percentage of physicians per bed, percentage of board certified physicians, admission rate, referral rate, inventory turnover ratio, Gross Provincial Product per capita and consumer price index. From correlation analysis and multicollinearity diagnostic test, some variables were exclude from the average



charge function due to these variables have high correlation and multicollinearity with the other explanatory variables. These variables are number of beds in hospital, percentage of board certified physicians, average relative weights of hospital and percentage of admission rate. Consumer price index does not have linear relationship with average charge per relative weight and have collinearity with other variables. Factors that are significantly related to average charge per 1 relative weight are level of hospitals and inverse of case flow rate.

**Table 4.20: Estimated regression model I of determinant factors for average charge per 1 relative weight of DRGs**

Variable	Coefficients	Std. Error	t-statistic
(Constant)	1799.540	962.880	1.869
phy	19.353	26.356	.734
gpp	3.156E-03	.002	1.342
lc	-14.334	16.453	-.871
tr	1.557	2.140	.728
invcfr	877.281	431.316	2.034*
rf	7.516	6.272	1.198
lev1	6414.507	919.739	6.974**
lev2	4485.558	861.508	5.207**
lev3	3538.291	485.156	7.293**

N= 173

\* = significant level of 5%

\*\* = significant level of 1%

Adjusted R-square = 0.583

Standard error of regression = 1576.4720

F-statistic = 27.837 Prob (F-statistic) = 0.000

### Levels of hospital

From Table 4.20, levels of hospital are significantly related with average charge per 1 relative weight of DRGs in public hospitals and have positive relationship at 99% level of confidence. The levels of hospital are dummy variables and classified into 4 levels, regional hospitals with teaching status (lev1), regional hospitals without teaching status (lev2), general hospitals (lev3) and community hospitals (lev4).

Regional hospitals with teaching status (lev1) are significantly related with average charge per relative weight in positive direction. If the hospital is a regional hospital with teaching status the average charge will increase 6414.507 baht. If the hospital is regional hospital without teaching status the average charge will increase 4485.558 baht, while general hospital's average charge increases 3538.291 baht.

### Inverse of case flow rate

Inverse of case flow rate is significantly related with average charge of 1 relative weight of DRG in public hospital and have positive relationship at confidence level 95%. From table 4.18, level of hospitals that have the highest case flow rate is, community hospitals of 111.29 cases per bed in one year while the higher level of hospitals has lower outputs per bed. When considering about unit cost analysis, fixed cost will be spread over more when the output increases which will lead to lower cost per case. From the assumption mention earlier in Chapter III that charges reflect the cost of the services provided, increase in case flow rate should lower the charges. In other words, lower case flow rate or the higher inverse of case flow rate will increase the charge per 1 relative weight.

In this study we use the inverse of case flow rate or inverse of the occupancy rate as a proxy for fixed capacity or utilization capacity of the hospital.

Assuming that fixed cost are positively related to capacity, average fixed cost will depend positively on the inverse of the occupancy rate. From the result in Table 4.20 if the percentage of inverse case flow rate increase by one, the average charge will increase 948.724 baht.

The other variables in this model that are proxy of input prices and management efficiency such as percentage labor cost relative to total expenditures, percentage of physicians/beds, referral rates, gross provincial product per capita, and inventory turnover ratio are not significantly related to average charge per 1 relative weight of the hospitals. Adjusted R-square of this model is 0.583, which indicates that this model can explain the relationship between explanatory variables and average charge per 1 relative weight of DRGs about 58%.

#### 4.2.2 Result from regression model II

From the result of the earlier model, the significant factors related to average charge are levels of hospital and inverse of case flow rate but the other variables are insignificant. The results of correlation and multicollinearity diagnosis indicates that levels of hospital have significant relation with average relative weights, number of beds, board certified physicians and some other variables. However, level of hospital could be represent by some other variable such as average relative weights and referral rate, which have the same positive direction relative to average charge per relative weight. To exclude multicollinearity between explanatory variables, level of hospitals were represent by average relative weights and referral rate. Results of which explanatory variables have relation and to what degree with the average charge per 1 relative weight of DRGs are showed in Table 4.21. From correlation analysis and multicollinearity diagnostic test, number of beds in hospital, percentage of board certified physicians, percentage of admission rate and consumer price index were

exclude from the average charge function due to these variables have high correlation and multicollinearity with the other independent variables. The independent variables in this model are average relative weights, inverse of case flow rate, percentage of labor cost, percentage of physicians per bed, percentage of referral rate, inventory turnover ratio, GPP per capita and variable indicate teaching status (lev1). From the results, factors that are significantly related to average charge per 1 relative weight are physicians per bed, average relative weights, GPP per capita, percentage of labor cost, inverse of case flow rate, percentage of referral rate and level 1.

**Table 4.21: Estimated regression model II of determinant factors for average charge per 1 relative weight of DRGs**

Variable	Coefficients	Std. Error	t-statistic
(Constant)	-710.418	1358.722	-.523
phy	51.315	29.514	1.739*
avrw	3085.307	1420.974	2.171**
gpp	5.173E-03	.003	1.921*
lc	-42.013	18.275	-2.299**
tr	1.476	2.469	.598
invcfr	2104.059	460.890	4.565***
rf	24.743	6.851	3.612***
lev1	3132.761	1034.179	3.029***

N= 173

\* = significant level of 10%

\*\* = significant level of 5%

\*\*\* = significant level of 1%

Adjusted R-square = 0.445

Standard error of regression = 1817.7234

F-statistic = 18.350 Prob (F-statistic) = 0.000

The results in Tables 4.21 show that 7 from 8 explanatory variables have significant relationship to average charge per relative weight. These variables are from all 3 categories in the component of the hospital cost function classified in chapter III. Average relative weights, percentage of referral rate, inverse of case flow rate and teaching status are representative of outputs of hospital. Percentage of labor cost and Gross Provincial Product per capita are proxy of input prices

while percentage of physicians per bed represents the management efficiency. Adjusted R-square of this model is 0.445, which indicates that this model can explain the relationship between explanatory variables and average charge per 1 relative weight of DRGs about 44.5%.

Average relative weights are significantly related with average charge of 1 relative weight of DRGs in public hospital at 95% level of confidence. This variable is use to represent levels of hospital and from Table 4.11 regional hospitals with teaching status have highest average relative weights of 1.02 RW while community hospitals is lowest of 0.65 RW. Indicates that larger hospitals have higher complexities of care. Results show that complexities of care have positive relationship with average charge; higher relative weights leads to higher charge.

Percentage of referral rate is significantly related with average charge of 1 relative weight of DRGs in public hospital at 99% level of confidence. If the hospital has increases in accepting referral cases 1 percent, the average charge will increase 24.743 baht. Hospitals with higher accept in referral case tends to charge higher. This refers to larger hospital since high referral rate about 86-92% are in regional hospitals with and without teaching status. Community hospitals has the lowest referral rate about 42%, the average charge will increase less than general and regional hospitals.

Inverse of case flow rate is significantly related with average charge of 1 relative weight of DRGs in public hospitals and have positive relationship at 99% level of confidence. Hospitals with higher inverse of case flow rate will charge higher.

Teaching status is significantly related with average charge of 1 relative weight of DRGs in public hospital and has positive relationship at 99% level of confidence. If the hospital has teaching status the average charge will increase 3,132.761 baht.

Percentage of labor cost is significantly related with average charge of 1 relative weight of DRGs in public hospital and has negative relationship at 95% level of confidence. If the hospital increases proportion of labor cost relative to total expenditure 1 percent, the average charge will decrease 42.013 baht.

Gross Provincial Product per capita is significantly related with average charge of 1 relative weight of DRGs in public hospital and has positive relationship at 90% level of confidence. If the Gross Provincial Product per capita of the province, which the hospital is located increases 1,000 baht, the average charge will increase 5.173 baht.

Percentage of physicians per bed is significantly related with average charge of 1 relative weight of DRGs in public hospitals and has positive relationship at 90% level of confidence. If the percentage of physicians per bed increases 1percent, the average charge will increase 51.315 baht.

From both of the regression model if we use these models to estimate the average per relative weight in each level of hospital compare to the real charge per relative weight of DRGs collected from the hospital in-patient records, the results is shown below.

**Table 4.22: Comparison of average charge in regional hospitals with teaching status**

	<b>Actual Charge</b>	<b>Model I</b>	<b>Model II</b>
Mean	10,025.3559	9,479.6945	10,025.2180
N	4	4	4
Std. Deviation	2,211.7834	183.1044	465.4556
Minimum	7,984.81	9,229.78	9,370.22
Maximum	13,155.53	9,670.08	10,463.02

In regional hospitals with teaching status the estimated average charge in the first model is about 600 baht lower than actual charge while in the second model the average charge is similar to actual charge. Range of standard deviations in both models is narrower than actual. The minimum average charges of both models are similar and higher than actual charge; on the other hand the maximum average charge of both models are lower than actual charge.

**Table 4.23: Comparison of average charge in regional hospitals without teaching status**

	<b>Actual Charge</b>	<b>Model I</b>	<b>Model II</b>
Mean	8,082.5241	7,448.1146	6,781.8251
N	5	5	5
Std. Deviation	2,849.9494	306.2773	506.4630
Minimum	3,723.96	7,182.72	6,313.91
Maximum	10,597.95	7,943.29	7,582.81

For regional hospitals without teaching status, average charge in both models is lower than actual charge while in model II the charge is about 1,300 baht lower. Range of standard deviations in both models is narrower than actual. The minimum charges in both models are higher but for maximum charge, results in both models are lower than the actual charge.



**Table 4.24: Comparison of average charge in general hospitals**

	<b>Actual Charge</b>	<b>Model I</b>	<b>Model II</b>
Mean	6,775.9287	6,396.1157	5,109.2327
N	18	18	18
Std. Deviation	2,259.2662	245.7550	881.1977
Minimum	2,663.04	5,953.79	2,713.47
Maximum	10,183.44	6,857.87	6,466.06

The result in general hospitals is similar to the result of regional hospitals without teaching status.

**Table 4.25: Comparison of average charge in community hospitals**

	<b>Actual Charge</b>	<b>Model I</b>	<b>Model II</b>
Mean	2,553.0205	2,636.1334	2,774.3410
N	151	148	147
Std. Deviation	1,419.9283	403.8669	940.2927
Minimum	241.27	1,846.40	745.99
Maximum	9,374.60	4,992.30	5,958.48

In community hospitals, both of the estimated models average charge are similar to the actual charge of the hospitals eventhough model I is little higher and model II is little lower.

From the results above, the average overall regional hospitals with teaching status will gain revenue from the both of the estimated model while regional hospitals without teaching status and general hospitals will lose some revenue.

Community hospitals will gain revenue but in less proportion than regional hospitals with teaching status.

Reimbursements of the hospital are based on the total relative weights of the hospital and the base rate, which is currently 4,000 baht for public hospitals under the Ministry of Public Health. The tables below shows the total revenues of the hospitals in different level from both of the estimated models compare to the current rate of 4,000 baht. The positive sign indicates the gain of revenues and negative sign indicates the loss of revenues from the estimated model.

**Table 4.26: Revenue in regional hospitals with teaching status compare with actual revenues**

	<b>Model I</b>	<b>Model II</b>
Mean	+ 121,177,944.1650	+ 139,046,749.7750
N	4	4
Std. Deviation	77,322,967.8590	94,394,746.2532
Minimum	+ 25,543,652.56	+ 24,865,224.47
Maximum	+ 190,002,819.20	+ 219,432,489.70

**Table 4.27: Revenue in regional hospitals without teaching status compare with actual revenues**

	<b>Model I</b>	<b>Model II</b>
Mean	+ 72,573,982.6720	+ 58,387,231.4660
N	5	5
Std. Deviation	13,501,745.9797	12,672,328.2820
Minimum	+ 57,502,029.26	+ 40,376,577.74
Maximum	+ 91,723,701.02	+ 73,894,857.03

**Table 4.29: Revenue in general hospitals compare with actual revenues**

	<b>Model I</b>	<b>Model II</b>
Mean	+ 24,734,095.2849	+ 12,677,717.8467
N	18	18
Std. Deviation	15,331,527.7439	12,614,857.6144
Minimum	+ 1,904,674.29	-5,808,575.15
Maximum	+ 56,437,448.36	+ 51,122,437.93

**Table 4.30: Revenue in community hospitals compare with actual revenues**

	<b>Model I</b>	<b>Model II</b>
Mean	-2,671,627.8538	-2,259,160.6484
N	148	147
Std. Deviation	2,131,740.5780	2,941,087.9192
Minimum	-10,510,581.92	-11,317,245.85
Maximum	2,086,171.54	10,925,413.09

Regional hospitals with and without teaching status will all gain revenue from both of the estimated models. Model two estimated higher revenues gain for regional hospitals with teaching status while model one estimated higher revenues gain for regional hospitals without teaching status. For general hospitals, model one estimated higher revenues gain while for model two some hospitals will incur loss of revenues. On the other hand, most of the community hospitals incur loss of revenue about 2 million baht with only few hospitals gain. However, this study analyze in the framework of no budgets constraint, results in no upper boundary for reimbursement budgets.