CHAPTER IV

DATA AND RESULTS

This chapter outlines some background information on PhilHealth coverage and its accredited health care providers as of December 2003 and how it has changed during the first quarter of the year 2004. It also presents the results of the different analyses on the three measures of utilization which include the frequencies, descriptive statistics and variation assessment. The outcome of the multiple regression analyses that identifies the different factors affecting the variation in the two measures of health care utilization used in the study are likewise reported.

1. PhilHealth coverage and accredited providers

1.1. PhilHealth coverage

About 55% of the Philippine population was enrolled in the social health insurance program as of December 2003 (Table 4.1). Of this 55%, only about 34% of the indigent population was covered. Among the different regions, NCR had the highest percentage covered with 84%, while Region VIII had lowest with 33%. With regard to the coverage of the indigent population (sponsored program or SP), Region X had an impressive 83% coverage while Region XII had the least of 13% (Figure 4.1). The ratio of dependents to members for the whole country was roughly 3 to 1. In the regional level,

NCR had the least dependency ratio of about 2 to 1 while Region X had the greatest of about 5 to1 (Table 4.1).

Table 4. 1. Socio-economics in the different regions, average values and coverage data

Regions	Indicator, year							
	Population, 2000	Annual population growth	% population covered by NHIP, 2003	Dependency ratio[1]	%Urban	Per capita poverty threshold[2] (PhP)	Poverty incidence[3] 2000 (population)	% indigent population covered by NHIP, 2003 (# of people)
Philippines	**76,504,077**	**2.34**	**55.45**	**3.25**	**23.83**	**11,605**	**34.0**	**33.6 (8,741,380)**
NCR	11,639,778	2.42	83.95	1.87	98.35	15,600	7.6	32.5 (336,955)
CAR	1,365,220	1.76	59.32	4.01	18.94	13,176	39.7	53.8 (291,750)
Region I	4,216,945	1.41	43.96	4.01	24.86	13,024	34.7	40.4 (591,070)
Region II	2,796,692	2.06	41.19	3.95	12.10	10,920	28.7	55.3 (443,000)
Region III	8,204,742	2.06	54.51	3.91	42.24	13,211	20.5	48.1 (809,625)
Region IV-A	5,708,063	3.90	83.6	5.16	41.32	13,646	20.3	43.1 (498,790)
Region IV-B	4,204,577	2.42	51.55	4.76	24.60	12,804	42.0	35.8 (631,275)
Region V	4,674,855	1.80	35.45	4.25	15.90	11,524	56.2	19.4 (634,030)
Region VI	6,208,733	1.42	42.92	4.58	16.58	11,533	45.8	23.6 (672,890)
Region VII	5,701,064	2.18	58.31	4.00	21.45	9,791	36.6	17.9 (374,155)
Region VIII	3,610,355	1.68	32.49	4.00	11.89	9,623	45.9	22.5 (372,860)
Region IX	4,033,193	2.78	34.92	4.32	10.31	10,554	49.2	22.6 (449,050)
Region X	4,305,870	2.37	69.26	5.06	15.26	11,165	45.6	83.1 (1,631,960)
Region XI	3,676,163	2.13	49.57	3.87	13.47	10,203	33.3	32.5 (397,170)
Region XII	4,023,271	3.10	34.29	4.63	17.55	11,142	55.2	13.0 (288,380)
CARAGA	2,095,367	1.73	47.3	4.48	11.93	10,605	50.4	30.2 (318,420)

[1] Dependency ratio= # of dependents/ # of members

[2] Poverty threshold = the minimum income required to meet the food requirements and other non food basic needs (1997 Philippine Poverty Statistics, NSCB)

[3] Poverty incidence = the proportion of families (or population)with per capita income less than the per capita poverty threshold to the total number of families (population) (2000 Philippine Poverty Statistics, NSCB)

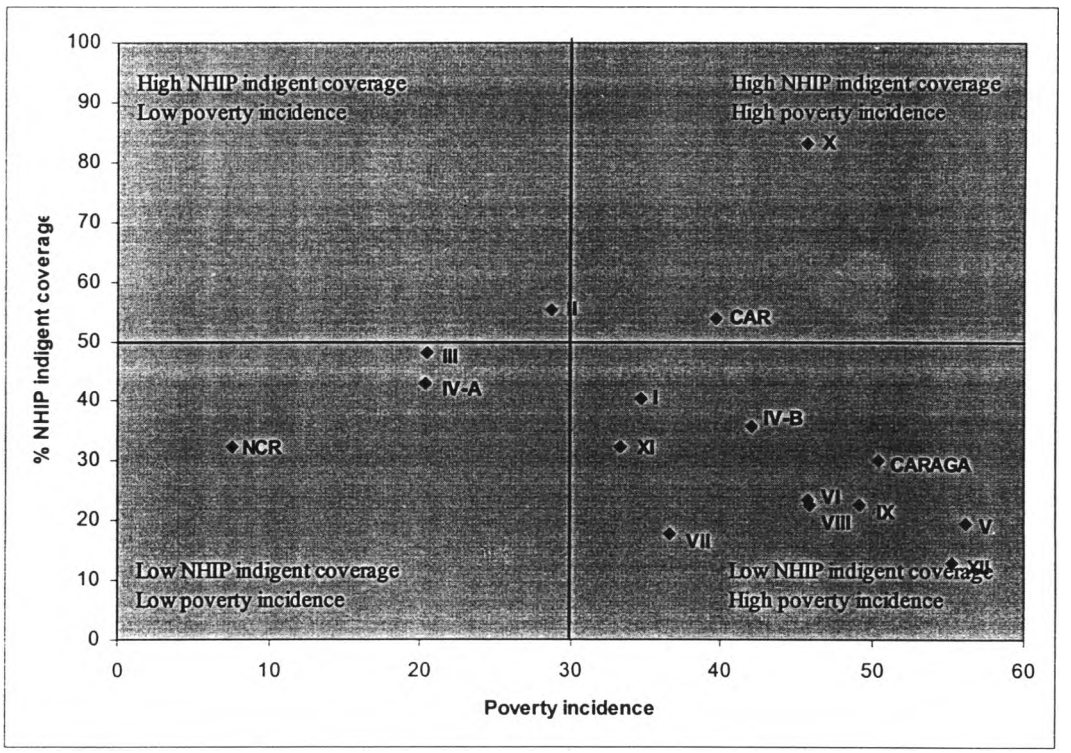

Figure 4. 1. NHIP indigent coverage as of December 2003 vs. poverty incidence

Majority of the paying members, about 76%, belong to the formal sector while a minimal 6% are the informal sector or the individually paying (IPP). The remaining 18% of the membership base belong to the sponsored program (~17%) and the non-paying program (~1%).

These figures however, radically changed in May of 2004. In an interview with Ms. Gilda Diaz, Project Evaluation Officer of the Corporate Planning Department of PhilHealth, on the 21st of May 2004, she reported that NHIP coverage grew to a 77% owing to the enrolment of the indigent 4.1 million families through the Plan 5/25 program

[2]. This massive enrolment of the poor population was in accordance to Executive Order 276 dated January 24, 2004 mandating Phil Health to cover 5 million heads of poor families to be identified by the Department of Interior and Local Government (DILG), through the barangay officials (Go, 2004). The sponsored program now covers about 47% of the membership base from a low 17% (Figure 4.2). This also concluded the attainment of the "universal coverage", which was pegged by the (Phil Health) Board of Directors at 75%. The arbitrary assignment of 75% was made since the Board claimed that a portion of the population would opt not to get social insurance such as the elite people who are capable of paying for private insurances and those people who do not have access to providers.

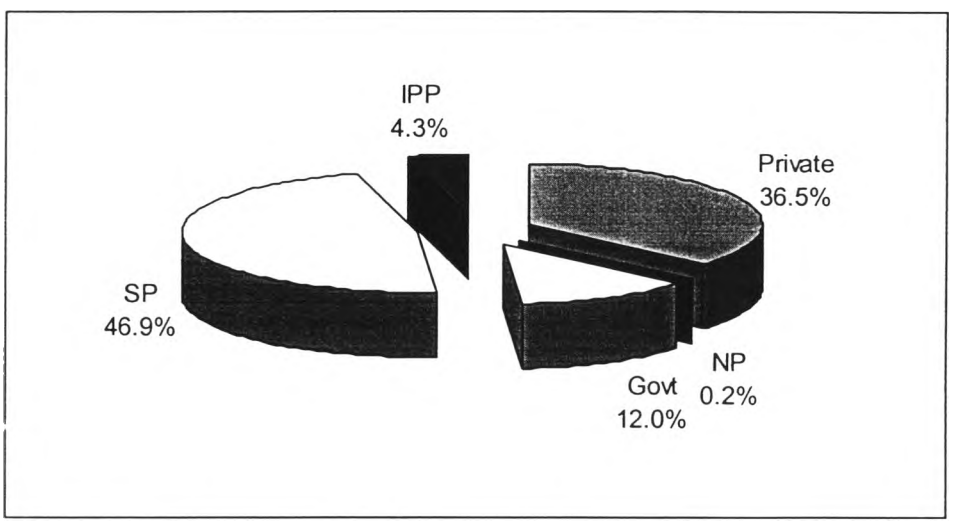

Figure 4. 2. Phil Health membership base as of May 2004

It should be emphasized however that in the course of the analysis, the data as of December 2003 were used.

[2] The Plan 5/25 program means that every head of the family who becomes a member may enlist four beneficiaries thus since the government aims to cover 5 million families, this would effectively enlist 25 million indigents. Premiums are paid by the national government and the Philippine Charity Sweepstakes Office (for the LGU share).

1.2. Accredited health care providers

There were 1,494 hospitals, 66,542 hospital beds and 19,741 health professionals (doctors and dentists) accredited by Phil Health in the country as of August 2003. About 38% of the accredited hospitals are government owned. Based on 2002 data of NSO, these accredited health resources account for 86% and 78%, respectively, of the total hospitals and hospital beds in the country. Figure 4.3 and Table 4.2 show the regional distribution of these health resources across the different regions of the country. Health care resources across the country varied. NCR was consistently observed to have the highest number of hospitals, hospital beds and health professionals accredited. Primary hospitals are especially numerous in Regions XI, V and X, secondary hospitals abound in Region III while tertiary hospitals are concentrated in the NCR.

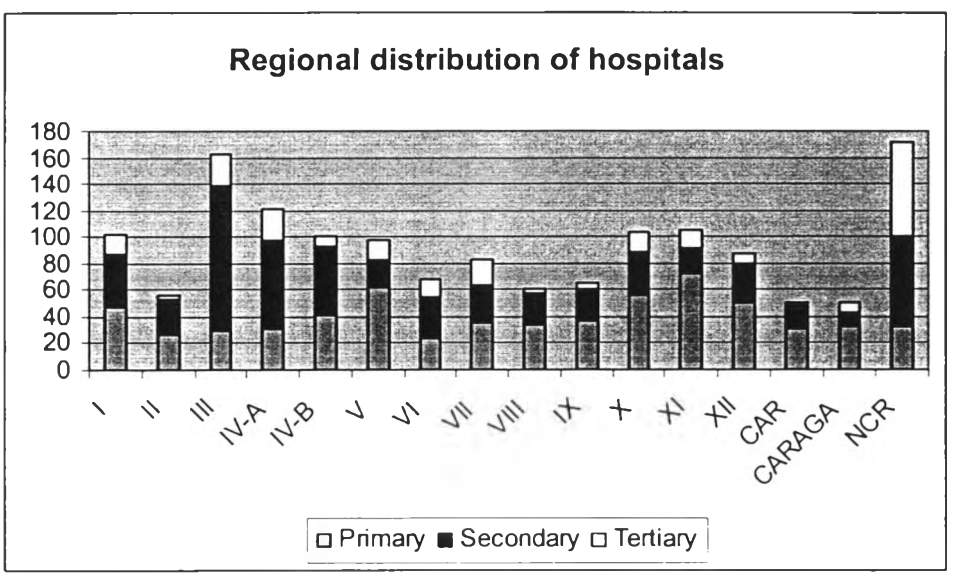

Figure 4. 3. Regional distribution of hospitals classified according to category

Table 4. 2. Regional distribution of health resources

Regions	Government hospitals	Private hospitals	Hospital beds	Health Professionals	Hospital beds/1000 population	Health Professionals/1000 population
Philippines	**564**	**919**	**66,542**	**19,741**	**1.57**	0.47
NCR	47	124	20,922	7721	2.14	0.79
CAR	32	18	1,637	491	2.02	0.61
Region I	36	66	3,301	884	1.78	0.48
Region II	26	30	1,680	451	1.46	0.39
Region III	50	112	6,141	1702	1.37	0.38
Region IVA	40	81	4,446	1173	0.93	0.25
Region IVB	43	58	2,776	692	1.28	0.32
Region V	35	62	2,464	577	1.49	0.35
Region VI	49	19	4,076	1256	1.53	0.47
Region VII	42	41	5,133	1251	1.54	0.38
Region VIII	42	19	1,970	497	1.68	0.42
Region IX	25	40	1,668	416	1.18	0.30
Region X	33	71	3,486	901	1.17	0.30
Region XI	15	90	3,376	937	1.85	0.51
Region XII	20	67	2,319	509	1.68	0.37
CARAGA	29	21	1,147	283	1.16	0.29

Source: Phil Health (August 2003)

Concentration curves were constructed and concentration indices were computed for the different health care resources in order to further illustrate variation across regions and identify how they are distributed across socioeconomic groups (Figure 4.4). Poverty incidence was used as a measure of socioeconomic status of the region. Concentration curves for hospital beds and health care professionals lie below the diagonal line while concentration indices were shown positive. These results indicate that for these two resources, they tend to concentrate in regions with low poverty incidence. For hospitals however, although the concentration curve lies above the equality line and the corresponding concentration index is negative, the value is very minimal. This probably suggests that there is fairly enough number of hospitals across the regions regardless of its poverty incidence rate.

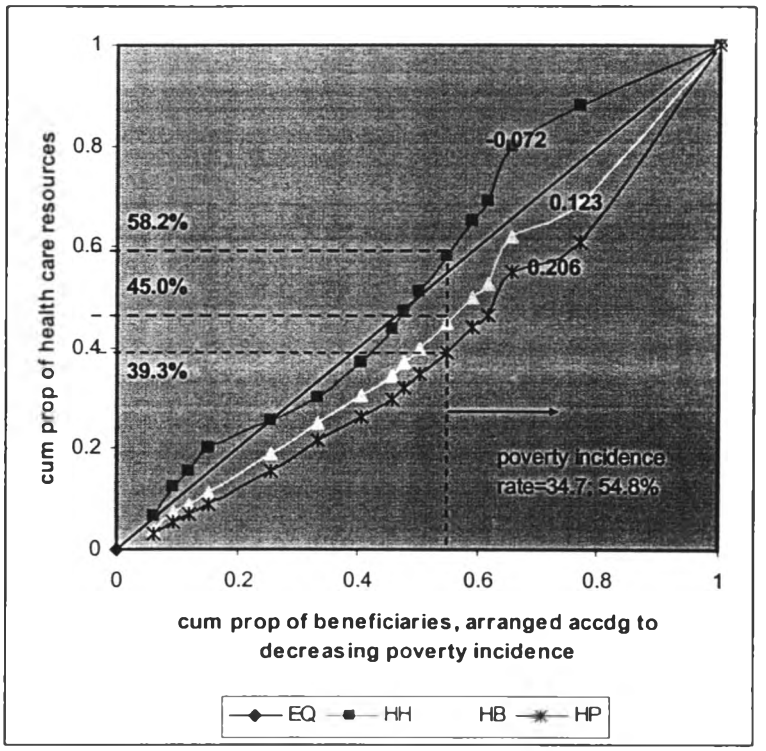

Figure 4. 4. Concentration curves for hospitals (HH), hospital beds (HB) and health care professionals (HP) and the corresponding concentration indices

2. Utilization

2.1. Admission rate

There were three sets of admission rates computed. First was the overall admission rate which included all medical and surgical cases, second was the admission rate for pneumonia and the third was for other medical cases (delivery by cesarean section and end stage renal failure). The overall admission rate gives a general estimate of hospital utilization across regions, however since it is a known fact that the pattern of disease is a likely factor for variation, pneumonia cases were chosen for further analysis in order to control for this factor. The admission rates of other medical cases were

computed in order to illustrate some health seeking pattern among the beneficiaries specifically the in- and out migration (or border crossing) among the beneficiaries in seeking health care.

Pneumonia cases were chosen in demonstrating variation because it was the most common reason for hospitalization for the study period (Table 4.3). The two other medical cases chosen, delivery by cesarean section and end stage renal failure, were also among the top ten medical cases commonly reimbursed. Delivery by elective cesarean while not included among the top ten medical cases (actually the 11th in the list) with the most number of claims entailed the highest in monetary terms expended for reimbursement.

Table 4. 3. Top 10 medical cases with most number of claims and highest amount paid

Medical case	# of admissions	Average reimbursement/ case (PhP)	Medical case	Total amount reimbursed (PhP)
Pneumonia	53,732	3,976	Delivery by elective cesarean	330,816,901
Urinary tract infection (UTI), site not specified	31,087	2,187	Pneumonia	213,637,365
Bronchopneumonia	30,589	3,569	Single spontaneous delivery, unspecified	134,473,406
End stage renal disease	29,926	1,948	Acute appendicitis	118,324,412
Asthma, unspecified	29,630	3,079	Bronchopneumonia	109,161,402
Diarrhea and gastroenteritis (A090)	29,441	2,419	Typhoid fever	101,331,762
Single spontaneous delivery, unspecified	28,588	4,704	Asthma	91,233,607
Diarrhea and gastroenteritis (A099)	26,321	2,400	Urinary tract infection, site not specified	87,570,162
Typhoid fever	24,511	4,134	Spontaneous vertex delivery	87,054,881
Acute bronchitis	22,534	2,794	Acute appendicitis with generalized peritonitis	81,730,054

It is interesting to note that among the top medical cases, other than pneumonia (which will be discussed later on), and with the exception of end stage renal failure and cesarean delivery, majority of the hospitalizations were actually classified as ordinary reaching as high as 99% for UTI, diarrhea and gastroenteritis and acute bronchitis. Another point of considerable interest is the proportion or the ratio of cesarean deliveries to normal deliveries[3]. Delivery by elective cesarean is almost 10% higher than normal deliveries or a ratio of 11 is to 10—for every 11 elective cesarean cases, there are 10 normal deliveries.

2.1.1. All medical and surgical cases

The total number of claims for the period September 2002 to September 2003 for the whole country was 1,742,667. Most of these claims were for the dependents, female, in private and tertiary hospitals, the private sector and for ordinary cases (Table 4.4).

Table 4. 4. Summary of frequencies for the categorical variables (all cases)

Variable	Category	Percentage
Patient	Dependent	60.8
	Member	39.2
Sex	Female	55.5
	Male	44.5
Hospital Type	Government	23.5
	Private	76.4
Hospital Category	Primary	11.9
	Secondary	30.3
	Tertiary	57.8
Worker Type	Government	30.6
	Indigent	9.4
	Non-paying	10.1
	Private	49.9
Medical Case	Catastrophic	10.9
	Intensive	21.2
	Ordinary	67.9

[3] In the International Classification of Diseases and Related Health Problems (ICD-10) of WHO, normal deliveries and cesarean deliveries are classified into four and five (respectively) categories. In this particular study however, only spontaneous vertex delivery (O80.0) and delivery by elective cesarean (O82.0) were compared.

Among the 16 regions, NCR had the most number of claims with about 380,000 while Region II had the least with about 32,000 (Table 4.5).

The admission rates per region showed Region XII with the highest admission rate of 87.0, while Region II with the least of 27.9 (Table 4.5). The national average rate was 41.1. Most of the regions had rates below the national average rate (Figure 4.5). Four regions had rates one standard deviation lower and seven had one-half standard deviation lower than the mean. Only three regions had slightly higher rates than the mean (one-half standard deviation) and the remaining two regions had rates twice as much as the national average. The computed admission rates, however, may have been over or under-estimated since aggregation was according to where the medical care was sought instead of the residence of the patient.

Table 4. 5. Total number of claims and admission rate (all cases)

Region	Number of claims	AR (per 1,000 beneficiaries)	AR Government sector	AR Sponsored Program	AR Private sector
Philippines	**1,742,667**	**41.1**	**69.97**	**18.72**	**37.56**
NCR	380,862	38.98	104.63	12.30	31.91
CAR	36,594	45.18	62.59	23.84	50.57
I	71,758	38.71	51.93	22.76	36.66
II	32,170	27.93	46.83	9.74	28.17
III	125,614	28.09	39.46	11.36	26.95
IV-A	137,820	28.88	53.93	12.29	24.66
IV-B	82,907	38.25	51.19	17.91	43.17
V	73,051	44.09	66.83	20.90	47.65
VI	116,494	43.72	64.76	13.35	47.62
VII	125,208	37.67	69.49	15.18	31.96
VIII	34,701	29.58	48.31	8.19	30.56
IX	56,225	39.92	67.87	18.98	40.56
X	153,489	51.47	106.06	26.81	73.81
XI	158,097	86.75	113.91	22.94	100.02
XII	120,040	87.02	131.44	39.71	84.61
CARAGA	37,637	37.98	55.80	13.72	58.73

Per sector, admission rates were observed least for the sponsored program with 18.72 per 1000. This low admission rate among the indigents was actually fairly consistent across regions (Table 4.5). Government sector had an admission rate of 69.97 while the private sector had 37.56 (Table 4.5). Rates for the individually paying and the non-paying programs cannot be assessed accurately because they cannot be properly identified in the database.

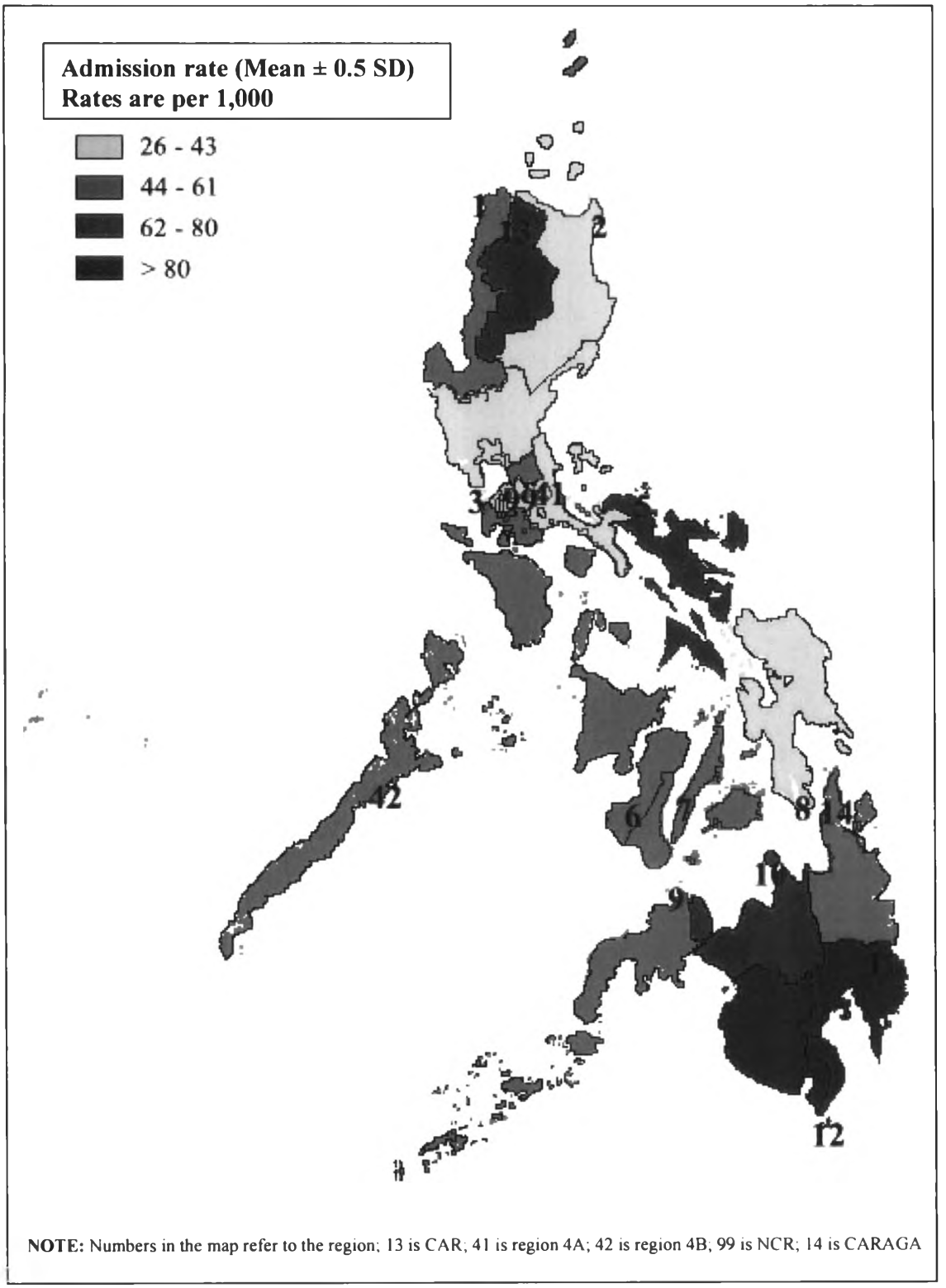

Figure 4. 5. Overall admission rates aggregated in the regional level

2.1.2. Pneumonia cases

Pneumonia cases comprised about 3.1% of the total claims for the study period. Most of the admissions were that of the dependents, males, in private and tertiary hospitals, the private sector and for ordinary cases (Table 4.6). It was also observed that most of the admissions (about 50%) were for children aged 1-13.

Table 4. 6. Summary of frequencies and descriptive statistics for categorical variables (pneumonia cases)

Variable	Category	Percent distribution
Patient	Dependent	78.8
	Member	21.2
Sex	Female	48.0
	Male	52.0
Hospital Type	Government	24.4
	Private	75.5
Hospital Category	Primary	21.3
	Secondary	38.4
	Tertiary	40.3
Worker Type	Government	30.8
	Indigent	14.3
	Non-paying	8.3
	Private	46.5
Medical case	Ordinary	77.6
	Intensive	21.9
	Catastrophic	0.5

Admission rates per region were computed in two ways according to how the admissions were grouped or aggregated—according to the region where patient resides and according to the region where medical care was sought, both of which are presented in Table 4.7. Regardless of the way they were aggregated, Region III was shown with the least rate while Region XI had the highest rate although differences in the rates between them were observed (indicating movement or migration among the beneficiaries in seeking medical care). The national admission rate was 126.72 per 100,000. The rates aggregated according to the regional residence of the patient are presented in a choropleth

map (Figure 4.6). Region III, the one with the least rate was uniquely classified in having 1.5 standard deviations lower than the mean. Four regions had rates one standard deviation lower and six regions had rates half standard deviation lower than the mean. On the other hand, three regions had rates half standard deviation higher than the mean. Two regions had extremely high rates of as much as 2.5 standard deviations higher than the average rate.

Table 4. 7. Admission rates for pneumonia

Region	Admission rate (per 100,000 beneficiaries)		"Border crossing" or in and out migration for health care
	Aggregated according to patient residence* (A)	Aggregated according to hospital provider (B)	Difference between B and A**
Philippines	**126.72**	**126.72**	
NCR	66.14	67.24	+
CAR	152.24	150.39	-
I	106.48	110.10	+
II	70.93	72.32	+
III	55.63	52.90	-
IVA	76.49	67.82	-
IVB	115.94	120.46	+
V	167.83	169.64	+
VI	110.14	113.25	+
VII	157.13	160.31	+
VIII	155.83	156.68	+
IX	191.40	191.69	+
X	171.89	172.02	+
XI	399.81	405.35	+
XII	371.83	371.32	-
CARAGA	154.49	153.58	-

*59 cases cannot be classified properly

**(+) import or in-migration; (-) export or out-migration of patients

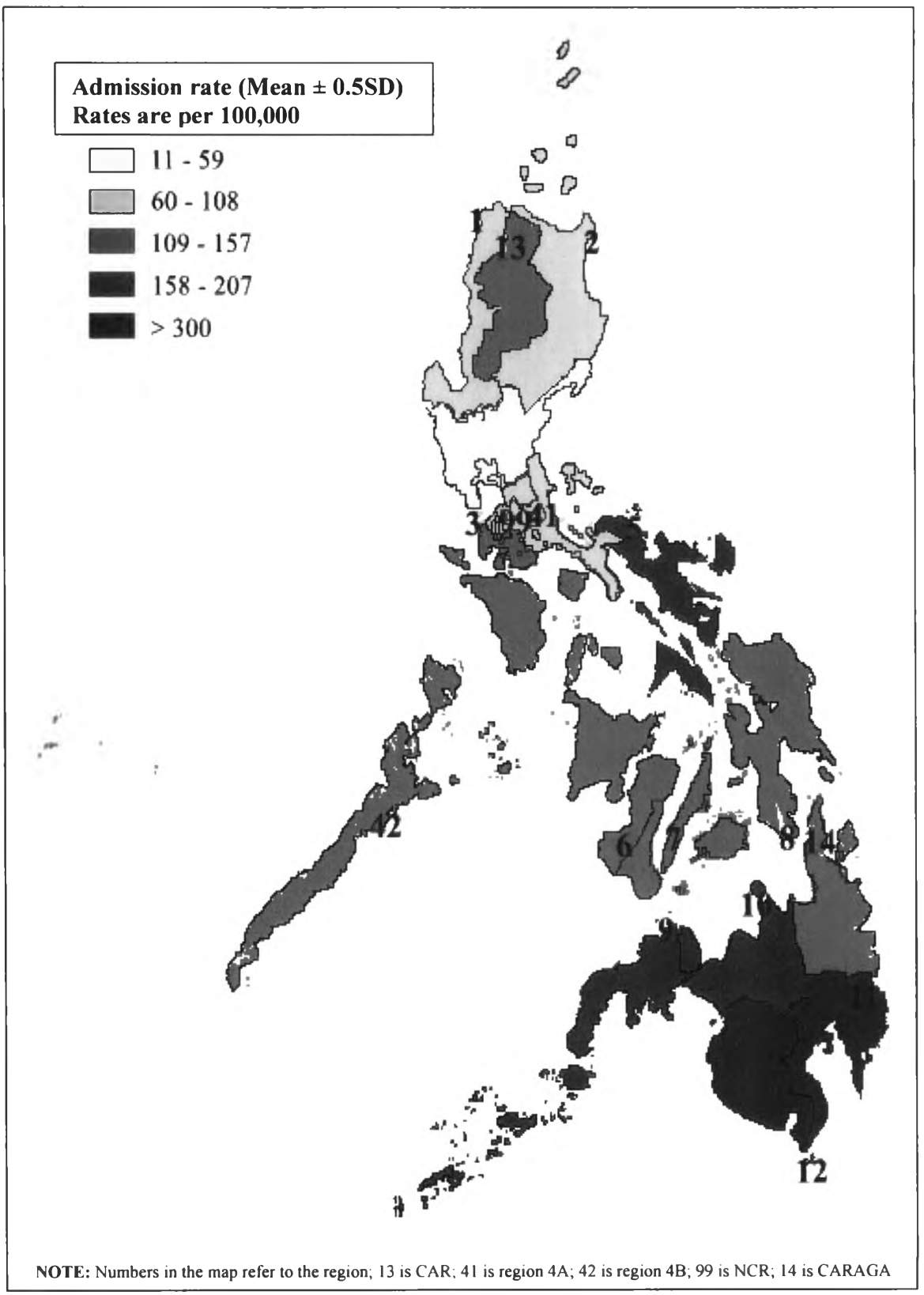

Figure 4. 6. Admission rate for pneumonia aggregated in the regional level

The extremal ratio for admission rates in the pneumonia cases was 7.66. The chi-square test, on the other hand, gave a χ^2 of 31,910 suggesting that the differences in the rates were significant at 0.05 level, where the critical value at this level is 22.31 (Table 4.8).

Table 4. 8. Calculation of chi-square statistic

Region	Actual number of admissions (Y_i)	Total beneficiaries (nj)	Expected number of admissions ($n_i m$)	Chi- square χ^2
I	1,974.00	1,853,827.00	2346.63	95.11
II	817.00	1,151,876.00	1458.08	72.50
III	2,488.00	4,472,532.00	5661.46	1665.21
IV-A	3,650.00	4,771,692.00	6040.15	2079.47
IV-B	2,513.00	2,167,561.00	2743.76	25.36
V	2,781.00	1,657,023.00	2097.51	138.31
VI	2,935.00	2,664,848.00	3373.24	45.59
VII	5,223.00	3,324,092.00	4207.74	693.26
VIII	1,828.00	1,173,100.00	1484.95	65.92
IX	2,696.00	1,408,543.00	1782.98	220.55
X	5,126.00	2,982,199.00	3774.96	790.28
XI	7,286.00	1,822,360.00	2306.80	14180.81
XII	5,129.00	1,379,407.00	1746.09	11148.75
CAR	1,233.00	809,893.00	1025.19	34.38
CARAGA	1,531.00	991,023.00	1254.47	6.17[a]
NCR	6,463.00	9,771,455.00	12369.00	649.05
Total	**53,673.00**	**42,401,431.00**	**53673.00**	**31910.73**

Where m is the overall rate for all regions, 0.0012658 or 126.58 per 100,000 beneficiaries
[a]Not significant at $\alpha = 0.05$

Per sector, admission rate among the government sector was 217.09, 107 among the private sector and 88.18 per 100,000 among the sponsored program or the indigents. This observation was similar to the admission rates earlier presented when all cases were considered in that the indigents were observed to have quite consistent low admission rates across regions. Admission rates for the non- paying and the individually paying programs cannot be accurately assessed for the same reason stated earlier (Table 4.9).

Table 4. 9. Admission rates per sector (pneumonia cases)

Region	Government sector*	Indigent (Sponsored Program)*	Private sector*
Philippines	**217.09**	**88.18**	**107.96**
NCR	129.36	20.48	64.01
CAR	188.03	168.98	98.28
I	149.05	86.12	100.10
II	120.89	37.02	61.19
III	64.75	25.94	56.50
IVA	122.23	45.91	58.48
IVB	164.68	49.90	147.77
V	274.83	93.37	145.39
VI	171.24	73.27	104.84
VII	258.51	125.88	131.48
VIII	256.29	65.71	139.70
IX	322.24	89.97	210.24
X	273.04	124.76	217.40
XI	549.74	152.58	456.63
XII	602.55	206.32	334.79
CARAGA	232.44	86.99	204.62

*Rates are admissions per 100,000 beneficiaries

2.1.3. Other medical cases

Admission rates per region for the two other medical cases, end stage renal disease and delivery by cesarean section, were similarly aggregated according to where patient resides and where medical care was sought. Table 4.10 summarizes the results.

Table 4. 10. Admission rates for end stage renal disease and delivery by cesarean section

Region	Delivery by Cesarean Section*			End Stage Renal Disease*		
	Aggregated accdg to patient residence (A)	Aggregated accdg to hospital provider (B)	Difference between B and A	Aggregated accdg to patient residence (A)	Aggregated accdg to hospital provider (B)	Difference between B and A
NCR	74.77	82.74	+	131.83	174.24	++
CAR	31.73	30.25	-	173.60	119.03	--
I	24.38	23.95	-	160.16	175.91	+
II	24.66	24.74	+	76.57	75.01	-
III	70.29	37.91	--	50.66	14.06	---
IVA	116.77	104.68	-	44.85	4.63	----
IVB	47.60	71.26	++	170.51	160.46	-
V	15.51	14.18	-	3.14	1.51	--
VI	25.22	25.44	+	2.51	0.41	---
VII	14.23	13.39	-	25.33	29.81	+
VIII	22.85	22.59	-	8.87	0.94	----
IX	31.66	31.59	-	83.35	64.96	+
X	5.23	4.73	-	19.82	25.28	+
XI	38.41	40.39	+	5.49	1.10	---
XII	48.93	42.55	-	52.41	54.52	+
CARAGA	16.95	16.35	-	1.61	0.40	---

*Rates are expressed per 100,000 beneficiaries
**(+) import or in-migration; (-) export or out-migration of patients

Differences in the rates across regions between the two methods of aggregation were likewise evident (as is the case for the pneumonia admission rates) and to a varying extent. For delivery by cesarean section, regardless of how the data was aggregated, Region IV-A had the highest rate and Region X had the lowest but differences between them are quite apparent. The admission rates were over or underestimated by as much as 85% when aggregation of the admissions was according to the hospital (Table 4.10). The differences between the patient address and hospital aggregation were particularly high among the regions in Luzon. Region III was underestimated by approximately 85% when aggregation of admissions was according to hospital while Region IV-B was overestimated by 33%. The differences among the 5 regions in Mindanao were as much as 14% while for the 3 regions in the Visayas, it was not more than 6%. Majority of the

cases were intensive (~99%) and majority of the admissions were in secondary (35.2%) and tertiary hospitals (64.5%). Primary hospitals had a minimal 0.3% admission.

For end stage renal disease, when aggregation is according to patient residence, CAR had the highest rate while CARAGA had the lowest while when aggregation is according to where medical care was sought, Region I had the highest rate and CARAGA had the least. The discrepancies of the admission rates (Table 4.10) between the patient address and hospital aggregation were as much as 90% regardless of where the region might be situated (Regions I, II, IV-B, VII and XII differences however were not more than 20%). About 99% of the cases were catastrophic and a high proportion of the cases were in the tertiary hospitals (~94%).

These results only indicate that patients do move around or go to other regions to seek medical care especially for the more serious cases. The (+) or (-) sign designated in each region as shown in Table 4.10 signifies whether one region experiences an influx or an effluence of the patients.

Illness concentration curves were constructed and concentration indices were computed in the same manner as that of the health care resources, for each of the three medical cases (Figure 4.7). Illness concentration curves of both end stage renal failure and delivery by cesarean section lie below the equality line and the corresponding concentration indices are positive thereby indicating these medical cases concentrate on the regions with lower poverty incidence while the converse is true for pneumonia. The

higher concentration index for end stage renal failure suggests greater variation when compared to the other two medical cases.

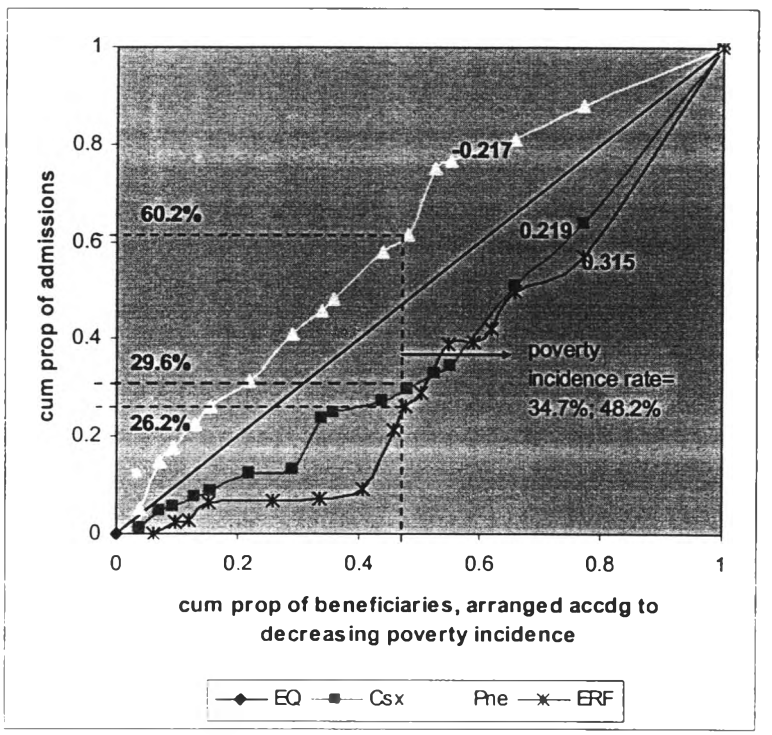

Figure 4. 7. Concentration curves and corresponding concentration indices of the three medical cases (Csx- Delivery by cesarean section; Pne- pneumonia and ERF- end stage renal failure)

2.2. Reimbursement and length of stay

There were two sets of average reimbursement and length of stay determined—that of all medical cases and pneumonia cases. Only those of pneumonia cases were assessed for variation.

2.2.1. All medical and surgical cases

The two regions with the most and least number of claims, NCR and Region II, respectively, also had the highest and lowest figures with 3 billion pesos[4] and 154 million pesos, in terms of reimbursed amount (Table 4.11). The total amount spent for the reimbursement of claims was about 10.2 billion pesos (in contrast with total actual hospital charges of 21.8 billion). Hence, when all these cases are considered, support value[5] was about 47% on the average. For length of stay, NCR had the highest average while Region IV-B had the least. The national average length of stay was 3.37.

Table 4. 11. Average reimbursement and length of stay per region (all cases)

Region	Mean (SD) Amounts are in PhP	Total Reimbursement	Average length of stay Mean (SD)	Average reimbursement per day
Philippines	**5,887 (6,548)**	**10,259,528,103**	**3.45 (4.84)**	**1,706**
NCR	8,006 (8,406)	3,049,212,969	4.05 (7.71)	1,977
CAR	4,797 (4,797)	175,550,642	3.74 (3.76)	1,398
I	5,365 (5,600)	385,014,879	3.24 (3.31)	1,656
II	4,812 (5,228)	154,795,595	3.47 (3.60)	1,387
III	6,812 (6,301)	855,658,497	3.35 (3.57)	2,033
IV-A	5,521 (5,307)	760,877,077	3.03 (2.95)	1,822
IV-B	5,311 (5,407)	440,352,488	2.84 (2.87)	1,870
V	4,627 (5,468)	337,987,689	3.33 (3.36)	1,389
VI	6,932 (7,313)	807,590,296	3.93 (4.85)	1,764
VII	6,202 (6,912)	776,487,299	3.60 (5.21)	1,723
VIII	5,272 (5,891)	182,946,543	3.73 (3.80)	1,413
IX	4,054 (4,463)	227,940,734	3.33 (3.97)	1,217
X	4,466 (5,071)	685,517,484	3.27 (3.36)	1,366
XI	4,719 (5,709)	745,981,063	3.07 (3.17)	1,537
XII	4,244 (4,379)	509,466,238	2.88 (2.54)	1,474
CARAGA	4,361 (4,771)	164,148,309	3.12 (2.35)	1,398

[4] The average exchange rate for the year 2003 is about 55PhP for 1 US$

[5] Support value was obtained by dividing the total reimbursement by the actual charge multiplied by 100. The results however are only estimates and as such should be interpreted with caution, since actual (hospital) charges may not have been reflected in the database as exemplified by some entries having more than a 100% computed support value.

Of the different benefit items, drugs took the largest share of 31%, followed by professional fees at 24% (Figure 4.8). Support value was likewise highest for drugs of approximately 64% and least for operation expenses at 15%. The average reimbursement or average value per claim (AVPC) for the whole country was about PhP5,887. NCR had the highest AVPC of about PhP8,000 while Region IX had the least AVPC of about PhP4,000 (Table 4.11). Majority of the average reimbursements per region fell below the national average reimbursement (Figure 4.9). Two regions were classified under the first data interval (2 standard deviations lower than the mean). A majority, eight regions, had reimbursements one standard deviation lower than the mean, while the remaining regions were categorized one (3 regions) or two (2 regions) standard deviations higher than the mean. NCR's reimbursement was about 3 standard deviations higher than the mean and was therefore grouped separately.

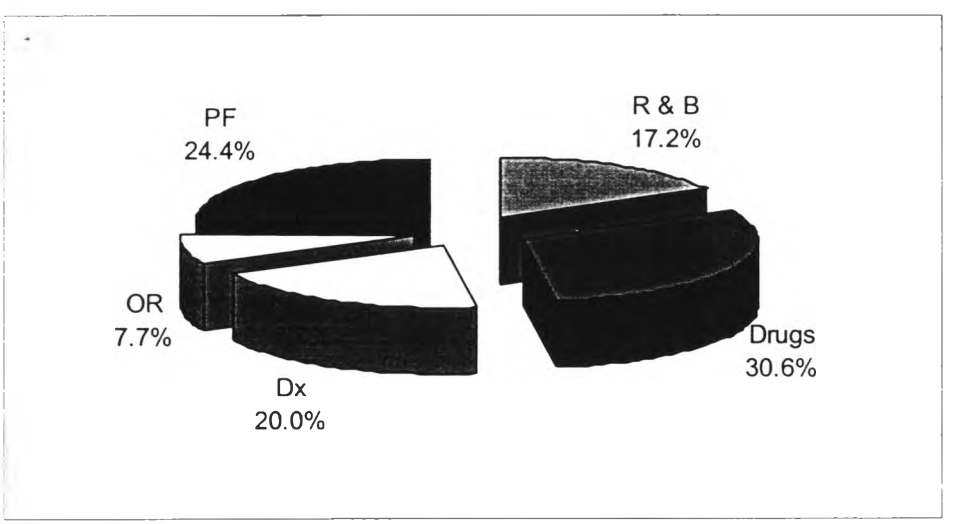

Figure 4. 8. Distribution of total amount reimbursed according to benefit items (all cases)

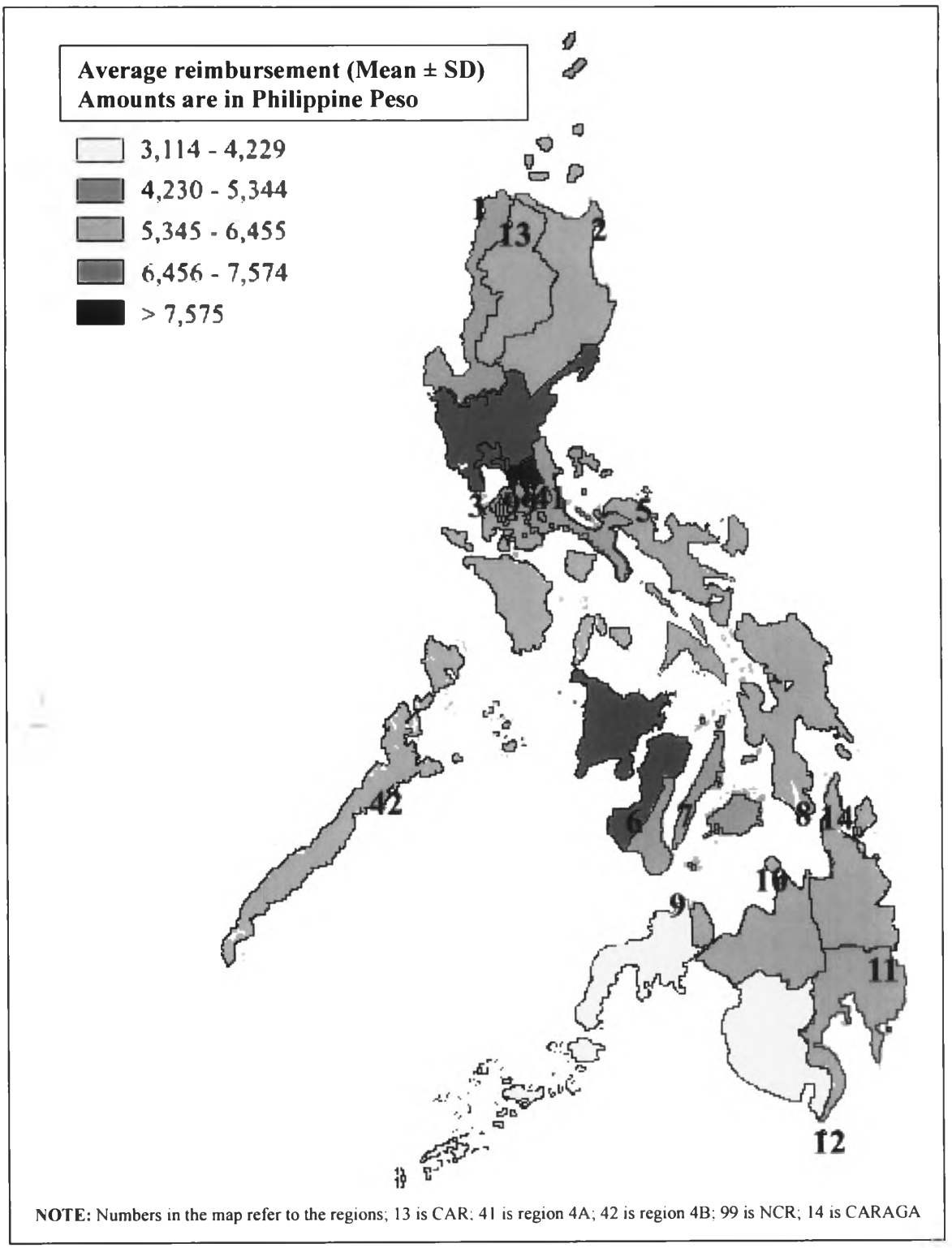

Figure 4. 9. Average expenditure aggregated in the regional level (all cases)

In terms of support value, CARAGA was highest with almost 73% of the actual hospital charges paid by Phil Health while NCR had the least with only about 33% of the actual charges being reimbursed (Figure 4.10).

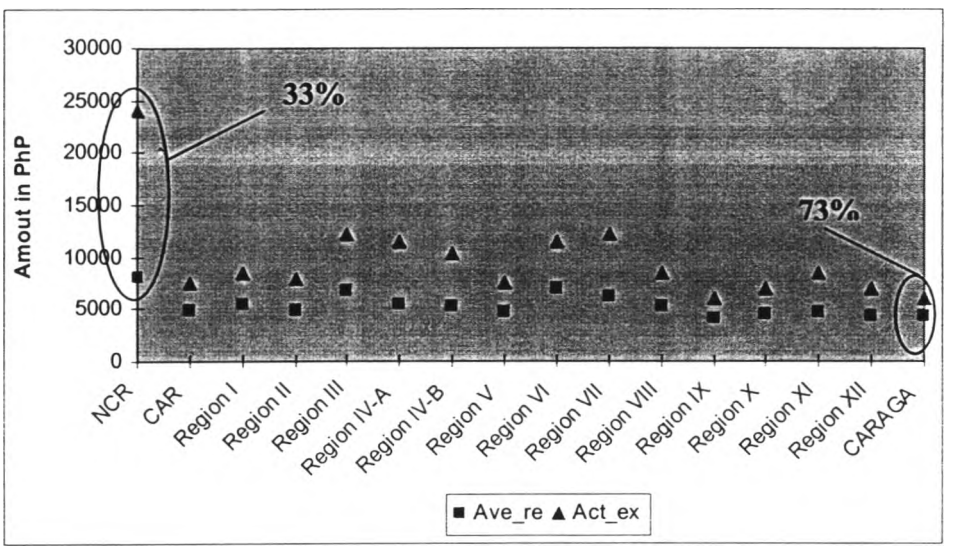

Figure 4. 10. Average reimbursements and actual charges per region (all cases)

Per sector, average reimbursement was highest in the private sector and least in the sponsored program (Figure 4.11). Support values, however were least for the private sector and greatest for the sponsored program. The same trend was observed across regions.

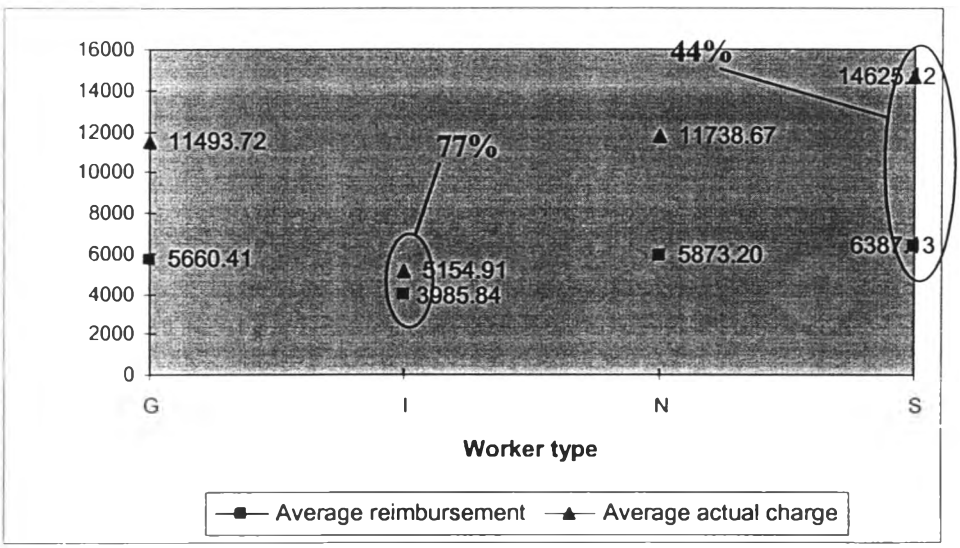

Figure 4. 11. Average reimbursements and actual charges per sector (all cases)

2.2.2. Pneumonia cases

The average reimbursement was PhP3,976. NCR was again observed to have the highest average reimbursement of about PhP6,000 while Region V had the least of about PhP3,000 (Table 4.12). The average length of stay, on the other hand, was 3.47. CAR was revealed to have the highest mean LOS while Region XII had the least (Table 4.12). ANOVA tests revealed the differences across regions to be statistically significant at the 0.003 level[6] (Table 4.13). The complete descriptive statistics can be found in Appendix D.

[6] A Bonferroni adjustment was made in the alpha (α) to reduce errors in the analysis because 16 pairs of means were compared.

Table 4. 12. Average reimbursement and length of stay per region (pneumonia cases)

Region	Mean* (SD) Amounts are in PhP	Total amount reimbursed	Average length of stay Mean (SD)	Average reimbursement per day
Philippines	**3,976 (2,583)**	**213,637,365**	**3.47 (2.22)**	**1,146**
NCR	5,700 (3,409)	37,452,130	4.20 (3.28)	1,357
CAR	3,060 (1,614)	3,727,593	4.31 (2.13)	710
I	4,031 (2,715)	8,227,102	3.52 (2.26)	1,145
II	3,378 (2,052)	2,814,061	3.52 (2.61)	960
III	3,948 (1,950)	9,341,341	3.74 (2.59)	1,056
IVA	4,207 (2,265)	13,613,503	3.38 (2.09)	1,245
IVB	4,251 (2,340)	11,099,520	3.12 (1.96)	1,363
V	2,957 (1,559)	8,310,884	3.01 (1.52)	982
VI	5,058 (3,560)	15,266,903	4.03 (2.49)	1,255
VII	4,103 (2,771)	21,863,730	3.47 (2.16)	1,182
VIII	4,053 (2,983)	7,449,639	3.56 (2.07)	1,138
IX	3,791 (2,680)	10,236,259	3.65 (2.69)	1,039
X	3,419 (2,047)	17,540,335	3.26 (1.75)	1,049
XI	3,290 (1,794)	24,301,357	3.15 (1.46)	1,044
XII	3,448 (1,622)	17,661,123	2.92 (1.49)	1,181
CARAGA	3,109 (1,762)	4,731,887	3.32 (1.64)	936

Table 4. 13. Results of analysis of variance

		Sum of Squares	df	Mean Square	F	Sig.
Average reimbursement	Between Groups	35523162647.972	15	2368210843.198	393.717	.000
	Within Groups	323102340784.009	53716	6015011.184		
	Total	358625503431.981	53731			
LOS	Between Groups	9041.807	15	602.787	126.055	.000
	Within Groups	256866.415	53716	4.782		
	Total	265908.222	53731			

Since the Levene's test for equality of variance was rejected indicating that there were unequal variances among the groups, the post hoc analysis tests employed were Tamhane's T2 and Dunnett's T3, both of which allow unequal variances. Both tests showed almost similar results which are shown in Tables 4.14 and 4.15.

Table 4. 14. Post hoc analysis (average reimbursement)

Regions	I	II	III	IV-A	IV-B	V	VI	VII	VIII	IX	X	XI	XII	CAR	CA-RAGA	NCR
I		*				*	*				*	*	*	*	*	*
II	*		*	*	*	*	*	*	*	*						*
III		*		*	*	*	*				*	*	*	*	*	*
IV- A		*	*			*	*			*	*	*	*	*	*	*
IV- B		*	*			*	*	*		*	*	*	*	*	*	*
V	*	*	*	*	*		*	*	*	*	*	*	*			*
VI	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*
VII		*				*	*			*	*	*	*	*	*	*
VIII		*				*	*				*	*	*	*	*	*
IX		*		*	*	*	*	*			*	*	*	*	*	*
X	*		*	*	*	*	*	*	*	*				*	*	*
XI	*		*	*	*	*	*	*	*	*			*	*		*
XII	*		*	*	*	*	*	*	*	*		*		*	*	*
CAR	*		*	*	*		*	*	*	*	*	*	*			*
CARAGA	*		*	*	*		*	*	*	*	*		*			*
NCR	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

*Significant at 0.003 for both Tamhane and Dunnett's T3 tests

Across these different comparisons of the regions in the average reimbursements some share similar profiles as to which regions they are significantly different with. For average reimbursement they are: Region V, CAR and CARAGA; X, XI and XII (with II quite similar to X); I and VIII which are also quite similar to III and VII; IV-A and IV-B; VI and NCR were both significantly different to all of the regions. These results were comparable with what is demonstrated in the choropleth map in Figure 4.12, where the average reimbursements were grouped according to deviation from the mean. Eight of the regions fell below the national average reimbursement rate—three (CAR,V,CARAGA) with 2 standard deviations lower and 5 (II,IX,X,XI AND XII) had one standard deviation lower than the mean. Six regions (I,III,IV-A,IV-B,VII AND VIII) had rates classified under one standard deviation from the mean and another one region (VI) under two standard deviations higher than the mean. NCR, which had the highest average

reimbursement, was classified separately falling under three standard deviations higher than the mean interval.

Table 4. 15. Post hoc analysis (average length of stay)

Regions	I	II	III	IV-A	IV-B	V	VI	VII	VIII	IX	X	XI	XII	CAR	CARAGA	NCR
I					*	*	*				*	*	*	*		*
II						*	*						*	*		*
III				*	*	*	*	*			*	*	*	*	*	*
IV-A			*		*	*	*					*	*	*		*
IV-B	*		*	*			*	*	*	*			*	*		*
V	*	*	*	*			*	*	*	*	*	*		*	*	*
VI	*	*	*	*	*	*		*	*	*	*	*	*		*	
VII			*		*	*	*				*	*	*	*		*
VIII					*	*	*				*	*	*	*		*
IX					*	*	*				*	*	*	*	*	*
X	*		*			*	*	*	*	*			*	*		*
XI	*		*	*		*	*	*	*	*			*	*		*
XII	*	*	*	*	*		*	*	*	*	*	*		*	*	*
CAR	*	*	*	*	*	**		*	*	*	*	*	*		*	
CARAGA			*			**	*			*			*	*		*
NCR	*	*	*	*	*	*		*	*	*	*	*	*		*	

* Significant at p = 0.003 for both Tamhane and Dunnett's T3 tests
**Significant at p = 0.003 for Dunnett's T3 but not Tamhane test

Across the comparisons in the length of stay the following regions share similar profile: I, III, IV-A, VII, VIII and IX; VI, CAR and NCR; IV-B, X and XI; V and XII; Regions II and CARAGA have entirely different profiles with the other regions, that is they are statistically different with all the other regions.

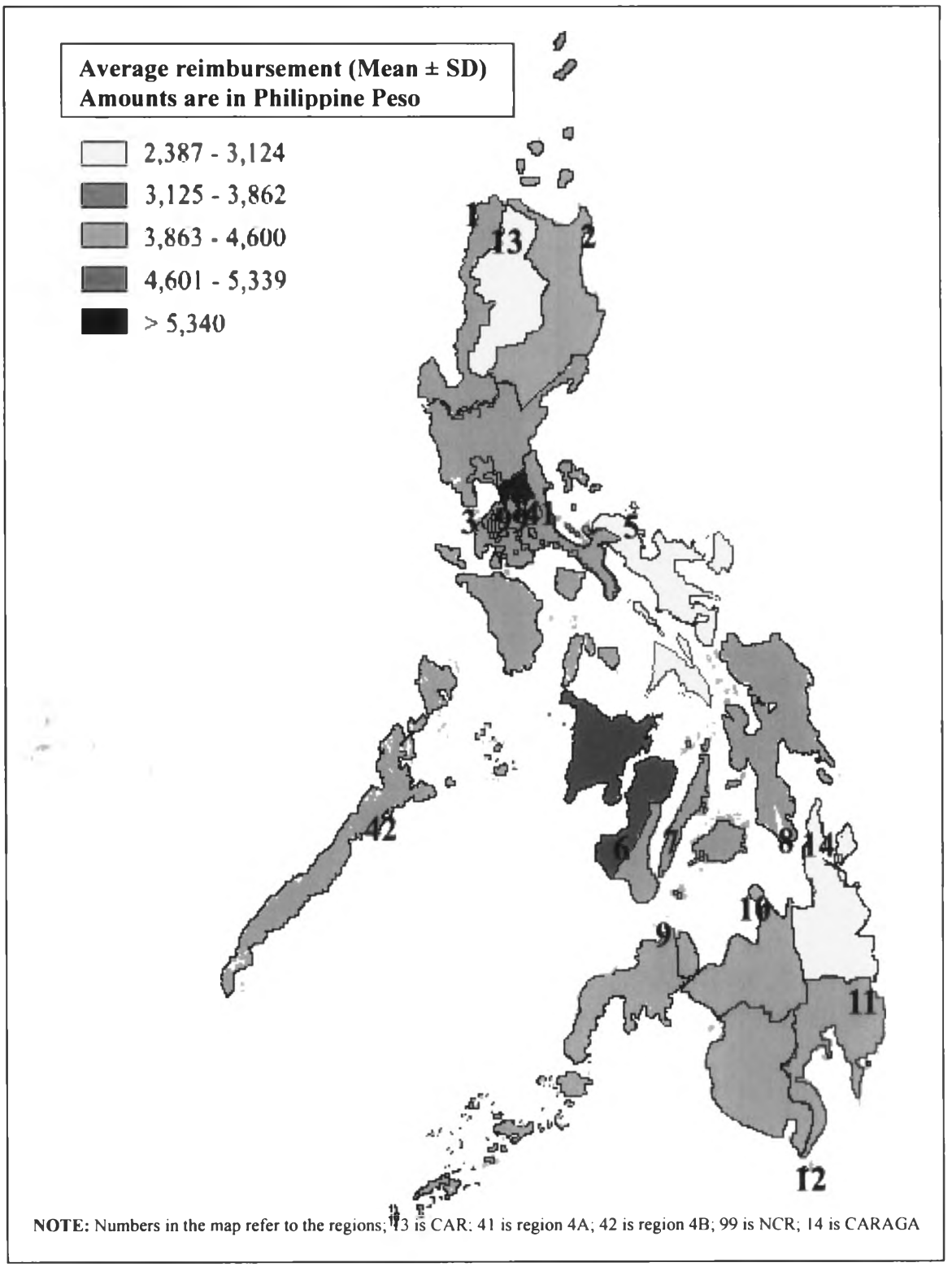

Figure 4. 12. Average reimbursements aggregated in the regional level (pneumonia cases)

Of the different benefit items, drugs took the largest share followed by the room and board (Figure 4. 13). Drugs also had the highest support value of 61% while professional fees had the least of about 39%.

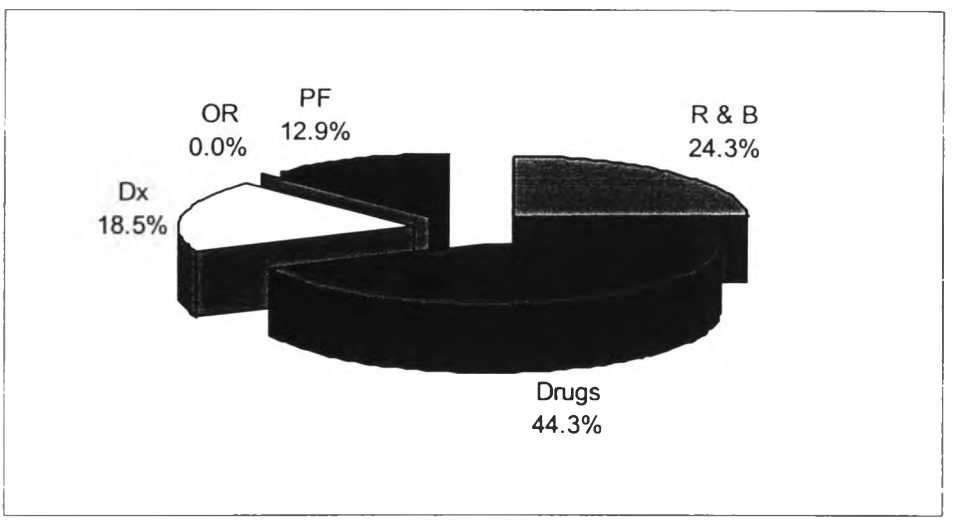

Figure 4. 13. Distribution of amount reimbursed according to benefit items (pneumonia cases)

Support value, on the other hand, was highest for CARAGA with approximately 83% and lowest for NCR with about 38% (Figure 4.14). Concentration curves were also constructed for the actual hospital charges and the PhilHealth reimbursements which are shown in Figure 4.15. Results showed that while reimbursements seem to be almost equal across regions as demonstrated by the low concentration index and the curve being very close to the equality line, charges are not. Charges are shown higher in regions with lower poverty incidence rates.

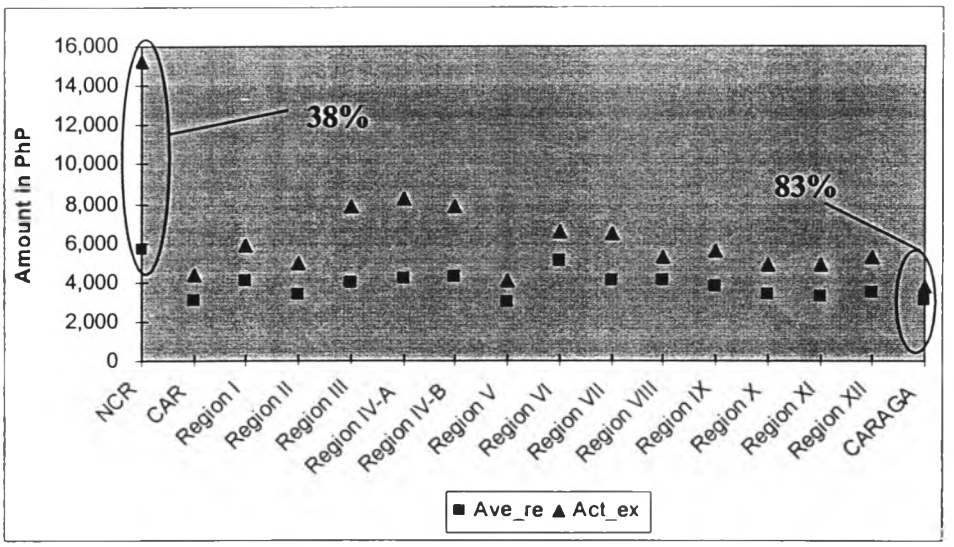

Figure 4. 14. Average reimbursements and actual charges per region (pneumonia cases)

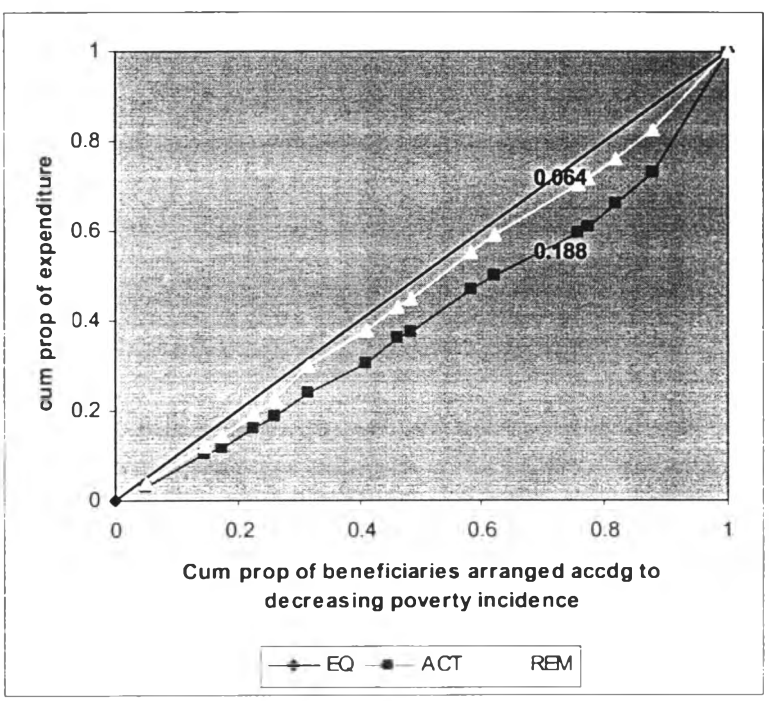

Figure 4. 15. Concentration curves and corresponding concentration indices for actual charges and reimbursements for pneumonia cases

Per sector, average reimbursement was least in the sponsored program but support value was a high 84% and greatest in the private sector but also the least support value of 52% (Figure 4.16). The same trend was observed across regions.

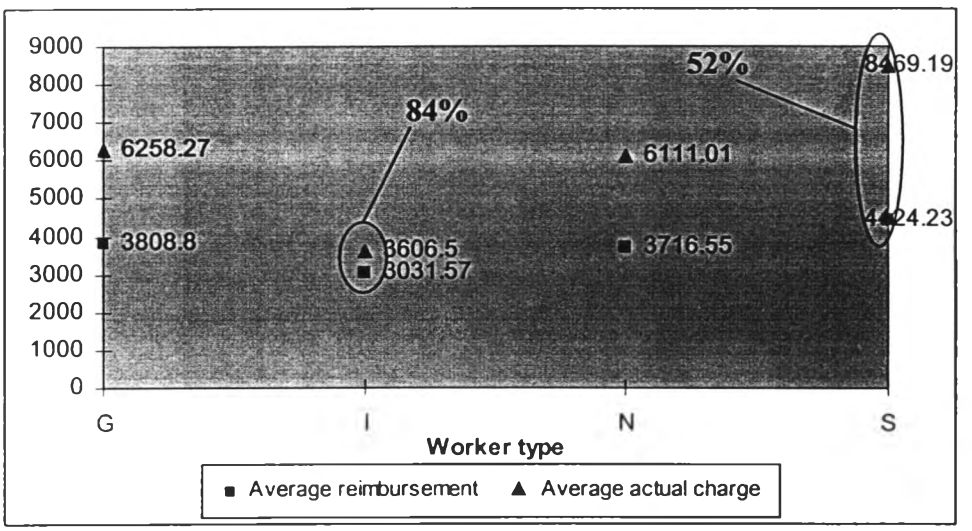

Figure 4. 16. Average reimbursements and actual charges per sector (pneumonia cases)

2.2.3. Cost of treatment analysis

Cost of treatment analysis was performed in order to approximate the actual expense involved in treating pneumonia following the method by Liu *et al.* (2003) where the medical case is controlled for by considering only the ordinary cases. It must be stressed out that the cost of treatment here is the hospital perspective—that is the cost to the hospital since charges as reflected in the claims database were used.

A total of 37,245 claims were included in the analysis which amounted to about 342 million pesos. Only about 181 million (~53%) was reimbursed by Phil Health, the remaining 47% was paid for by the patient. Drugs were the principal expenditure (41.82%) which also had the highest reimbursement of 44.45% followed by room and

board which accounted to 23.02% of the total hospital charge and 23.70% of the reimbursement. Laboratory examinations amounted to 19.02% of the total expenditure and 19.14% of the reimbursement while doctors' fees comprised 16.02% of the total expenditure and 12.67% of the reimbursement. Operation expenses had the least contribution of 0.12% of the total expenditure and 0.04% of the reimbursement. In terms of support values, drugs also had the highest of 56.39% next was room and board of 54.63%, laboratory examinations of 53.38%, doctor fees of 41.96% and operation expenses of 15.02%.

The costs of treatment classified according to type and category of hospital are shown in Table 4.16. Discrepancy indices between private and government hospitals classified according to primary, secondary and tertiary were computed and likewise presented in the same table. Government hospitals charged lower (thereby higher support values) compared to private hospitals but involved longer confinement period. However, while differences in length of stay between them are only as high as 30%, the private hospitals charge as much as 150% per day more than the government hospitals. Discrepancy indices for drug charges and laboratory and other diagnostic (Dx) exam charges are also particularly high. Tertiary hospitals were observed to have longer confinement periods than primary or secondary hospitals. This pattern was consistently observed across the different regions of the country (Appendix E).

Drugs usually comprised the largest expenditure followed by room and board, doctor fees, laboratory examinations and operation expenses. Reimbursements also

follow a similar trend. In terms of support values, government hospitals were reimbursed more than private hospitals, the value decreases as the level of care increases. With regard to the benefit items, regardless of the category of hospital, government hospitals were reimbursed more for room and board while private hospitals were reimbursed less for room and board but more for drugs as the level of care increases.

Table 4. 16. Charges profile for government and private hospitals

	Government hospitals			Private hospitals			Discrepancy index***		
	Prim	**Sec**	**Tert**	**Prim**	**Sec**	**Tert**	**Prim**	**Sec**	**Tert**
Number of hospitals	150	178	74	307	348	166			
Number of claims	1,461	2,081	1,594	8,165	11,906	12,038			
Room & Board Charge	553 (358)	989 (670)	1,710 (1,530)	565 (394)	1,096 (884)	2,653 (2,320)	-2.19	-10.91	-55.17
Room &Board Reimbursed	516 (288)	934 (512)	1,471 (907)	445 (178)	684 (317)	1,221 (595)	13.85	26.76	17.05
Drugs Charge	868 (692)	1,315 (1,584)	1,604 (2,670)	1,967 (1, 667)	2,409 (2,198)	4,115 (6,517)	- 126.56	-83.17	- 156.58
Drugs Reimbursed	716 (496)	894 (600)	1,130 (1,023)	1,194 (398)	1,331 (483)	2,140 (959)	-66.85	-48.90	-89.33
Dx Charge	273 (213)	435 (368)	802 (1,635)	385 (331)	886 (670)	2,215 (3,200)	-40.99	- 103.53	- 176.32
Dx Reimbursed	203 (124)	364 (219)	544 (435)	261 (108)	627 (219)	1,068 (478)	-28.43	-72.25	-96.39
PF Charge	492 (283)	607 (504)	896 (954)	555 (394)	921 (898)	1,706 (1,445)	-12.78	-51.72	-90.42
PF Reimbursed	420 (168)	457 (200)	604 (285)	429 (142)	402 (209)	556 (303)	-2.15	11.92	7.92
Total Reimbursement*	1,855 (768)	2,649 (1,167)	3,751 (1,918)	2,329 (575)	3,045 (876)	4,985 (1,636)	-25.53	-14.94	-32.90
Total Charge*	2,188 (1,128)	3,348 (2,332)	5,016 (5,454)	3,474 (2,122)	5,314 (3,573)	10,692 (9,906)	-58.76	-58.73	- 113.14
LOS*	3.40 (2.09)	3.96 (2.85)	4.16 (3.09)	2.89 (1.05)	2.72 (1.25)	3.39 (1.88)	15.00	31.31	18.51
Average charge/day	644	845	1,206	1,202	1,954	3,154	-86.78	- 131.09	- 161.56

*Significant at 0.01

**All amounts are in PhP—average charges (SD)

***Discrepancy indices are computed as follows: Prim = (Government primary hospital average charge – Private primary hospital average charge) divided by the Government primary hospital average charge multiplied by 100

NOTE: for the secondary and tertiary hospitals discrepancy indices, the same formula was used

3. Factors affecting variation in utilization

In order to determine the factors influencing variation, multiple regression analysis was employed but although there were three measures of utilization used in the study, only two of these measures—reimbursement and length of stay, were employed as dependent variables in the analysis. For the admission rate, the rates were instead compared with the different socio-economic variables of the regions in order to approximate possible factors that can somehow explain for the observed variation.

3.1. Admission rate

Admission rates were compared with the different socio-economic variables such as poverty incidence, % urban, average annual income, geographic location as well as the morbidity rates (both for year 2000 and 2002) and the different health care providers (poverty incidence and % urban are given in Table 4.1; the different health care providers are in Table 4.2 or refer to Appendix F for a complete list of all these variables).

In general, admission rates were observed to be higher in the regions found in Mindanao. The regions in Luzon had lower admission rates with the exception of Region V which incidentally also had lower poverty incidence rates again with the exception of Region V which had a high incidence rate of 56%. In fact, it may be broadly described that admission rates were higher in regions with higher poverty incidences which was supported by the concentration curve created and index computed (Figure 4.7). Admission rates were also observed higher in the more rural areas. There is however no

clear pattern between admission rates and average annual income although the regions with high admission rates were the relatively low income regions. Using the 2002 incidence rates of pneumonia, it seems that a high morbidity does not necessarily follow a high admission rate. Of course the validity of such comparison will always come into question. Admission rates also do not seem to be related with the availability of health resources (hospitals, hospital beds or health care professionals).

3.2. Reimbursement and length of stay

As explained in the methodology section, there were four levels of aggregation (or four units of analysis) starting from the individual record to provincial aggregation level and results are presented here according to the level of aggregation. The same set of independent variables was used for the two dependent variables and the same conceptual framework was applied in each level of aggregation. Table 3.3 in the Methodology section lists all the independent variables classified as predisposing, enabling, need and health care system factors.

The use of four different units of analysis provides varying information on utilization. The individual record level (or patient) describes utilization of a single individual. It can disclose information on the patient's preferences of care, demographic characteristics that are particularly distinctive for a particular patient and how the patient was cared for. The membership number describes utilization of a group of individuals, which can be a family, sharing the same membership. It shows the intensity that a particular group uses insurance and who among them uses more. The hospital, even when

basically this is the utilization of a group of individuals who sought care in the same hospital, will provide information on its efficiency in managing the disease—how well did a particular hospital treat its patients and how much. And finally the province describes the utilization of a group of individuals who sought medical care in the hospitals found in a particular province. This most appropriately characterize utilization of a particular geographic area.

Collinearity diagnostic tests were performed on the different regression models across the different levels of aggregation. In all levels, no serious collinearity problems were detected. Residual plots for each model were also performed to check if the dependent variables exhibited constant variance across the range of the predictor variables (see Appendix G for the scatter plots). For total (or average) reimbursement, in the first three levels of aggregation, the plots revealed substantial heteroscedasticity (increasing variance) which is in contrast with the plots for length of stay that appeared homoscedastic in all levels of aggregation. Despite the observed heteroscedasticity when reimbursement was used as dependent variable, multiple regression analysis was still employed as the appropriate statistical tool for analysis. This was considering that the sample size is very large making the data very robust.

3.2.1. Individual record level

A total of 16 variables were entered in the analysis. The mean reimbursement was PhP3,974 and the mean length of stay was 3.46 (Table 4.17). Pearson correlations are given in Tables 4.18 and 4.19 for the two dependent variables.

Table 4. 17. Descriptive statistics (Unit of analysis: individual entry)

Variable	Mean	Std. Deviation
Total reimbursement	3974.2175	2581.61688
Length of stay	3.4628	2.22316
Patient age	25.0017	28.02728
Dummy variable for type of hospital (reference category → government)	.7555	.42978
Dummy variable for dependent (reference category → member)	.7877	.40897
Dummy variable for sex (reference category → female)	.5204	.49959
Dummy variable for category of hospital (Secondary; reference category → primary)	.3847	.48653
Dummy variable for category of hospital (Tertiary; reference category → primary)	.3992	.48974
Dummy variable for medical case (Intensive; reference category → ordinary)	.2169	.41212
Dummy variable for medical case (Catasrophic; reference category → ordinary)	.0051	.07141
Dummy variable for worker type or membership type (Private sector; refrence category → indigent)	.4624	.49859
Dummy variable for worker type or membership type (Government sector; refrence category → indigent)	.3085	.46186
Dummy variable for worker type or membership type (Non-paying; refrence category → indigent)	.0838	.27702
Use or not use of specialist services	.3059	.46596
Dummy variable for poverty incidence	.3154	.46469
Dummy variable for poverty incidence	.2971	.45697
Dummy variable for poverty incidence	.1169	.32134
Dummy variable for poverty incidence	.1206	.32567

Table 4. 18. Pearson correlation of all key variables (Unit of analysis: individual entry; DV: total reimbursement)

	tot_ amnt	patage	dum_ dd	dum_ m	dum_ p	dum_ sec	dum_ tert	dum_ int	dum_ cat	dum_ spri	dum_ gov	dum_ npay	SP_ TOT	rank_ pov2	rank_ pov3	rank_ pov4	rank_ pov5
tot_amnt	1.000																
patage	0.052	1.000															
dum_dd	0.051	-0.419	1.000														
dum_m	0.002	-0.093	-0.056	1.000													
dum_p	0.114	-0.043	-0.050	-0.017	1.000												
dum_sec	-0.227	0.078	-0.028	-0.003	-0.095	1.000											
dum_tert	0.511	-0.190	0.131	0.027	0.072	-0.644	1.000										
dum_int	0.370	0.116	0.067	0.005	-0.153	-0.020	0.154	1.000									
dum_cat	0.175	0.092	-0.010	0.004	-0.049	0.007	0.025	-0.038	1.000								
dum_spri	0.163	-0.127	0.026	0.041	0.202	-0.094	0.243	0.030	0.002	1.000							
dum_gov	-0.044	0.151	-0.023	-0.040	-0.070	0.049	-0.100	0.023	0.008	-0.619	1.000						
dum_npay	-0.030	-0.015	-0.003	-0.010	0.080	0.015	-0.041	-0.057	-0.007	-0.280	-0.202	1.000					
SP_TOT	0.344	-0.161	0.117	0.016	0.110	-0.239	0.481	0.128	0.013	0.201	-0.074	-0.028	1.000				
rank_pov2	-0.006	0.009	0.033	-0.001	-0.165	0.049	-0.019	0.125	0.018	-0.147	0.074	-0.057	-0.101	1.000			
rank_pov3	-0.088	0.029	-0.055	0.005	0.056	-0.029	-0.080	-0.097	-0.008	0.024	-0.048	0.070	-0.004	-0.441	1.000		
rank_pov4	0.007	-0.034	0.051	0.003	-0.044	0.050	0.023	-0.039	0.002	0.065	-0.035	0.006	0.016	-0.247	-0.236	1.000	
rank_pov5	0.252	-0.112	0.073	0.012	0.094	-0.144	0.289	0.155	-0.001	0.244	-0.118	-0.062	0.255	-0.251	-0.241	-0.135	1.000

Significant at 0.05 | Significant at 0.01

tot_amnt	Total amount reimbursed
patage	Patient age
dum_dd	Dummy variable for dependent (reference category → member)
dum_m	Dummy variable for sex (reference category → female)
dum_p	Dummy variable for type of hospital (reference category → government)
dum_sec	Dummy variable for category of hospital (Secondary; reference category → primary)
dum_tert	Dummy variable for category of hospital (Tertiary; reference category → primary)
dum_int	Dummy variable for medical case (Intensive; reference category → ordinary)
dum_cat	Dummy variable for medical case (Catasrophic; reference category → ordinary)
dum_spri	Dummy variable for worker type or membership type (Private sector; refrence category → indigent)
dum_gov	Dummy variable for worker type or membership type (Government sector; refrence category → indigent)
dum_npay	Dummy variable for worker type or membership type (Non-paying; refrence category → indigent)
SP_TOT	Use or not use of specialist services
rank_pov2	Dummy variable for poverty incidence
rank_pov3	Dummy variable for poverty incidence
rank_pov4	Dummy variable for poverty incidence
rank_pov5	Dummy variable for poverty incidence

Table 4. 19. Pearson correlation of all key variables (Unit of analysis: individual entry; DV: length of stay)

	LOS	patage	dum_dd	dum_m	dum_p	dum_sec	dum_tert	dum_int	dum_cat	dum_spri	dum_npay	dum_gov	SP_TOT	rank_pov2	rank_pov3	rank_pov4	rank_pov5
LOS	1.000																
patage	0.031	1.000															
dum_dd	0.040	-0.419	1.000														
dum_m	0.013	-0.093	-0.056	1.000													
dum_p	-0.188	-0.043	-0.050	-0.017	1.000												
dum_sec	-0.079	0.078	-0.028	-0.003	-0.095	1.000											
dum_tert	0.159	-0.190	0.131	0.027	0.072	-0.644	1.000										
dum_int	0.242	0.116	0.067	0.005	-0.153	-0.020	0.154	1.000									
dum_cat	0.073	0.092	-0.010	0.004	-0.049	0.007	0.025	-0.038	1.000								
dum_spri	0.032	-0.127	0.026	0.041	0.202	-0.094	0.243	0.030	0.002	1.000							
dum_npay	-0.039	-0.015	-0.003	-0.010	0.080	0.015	-0.041	-0.057	-0.007	-0.280	1.000						
dum_gov	-0.021	0.151	-0.023	-0.040	-0.070	0.049	-0.100	0.023	0.008	-0.619	-0.202	1.000					
SP_TOT	0.096	-0.161	0.117	0.016	0.110	-0.239	0.481	0.128	0.013	0.201	-0.028	-0.074	1.000				
rank_pov2	0.002	0.009	0.033	-0.001	-0.165	0.049	-0.019	0.125	0.018	-0.147	-0.057	0.074	-0.101	1.000			
rank_pov3	-0.024	0.029	-0.055	0.005	0.056	-0.029	-0.080	-0.097	-0.008	0.024	0.070	-0.048	-0.004	-0.441	1.000		
rank_pov4	0.012	-0.034	0.051	0.003	-0.044	0.050	0.023	-0.039	0.002	0.065	0.006	-0.035	0.016	-0.247	-0.236	1.000	
rank_pov5	0.124	-0.112	0.073	0.012	0.094	-0.144	0.289	0.155	-0.001	0.244	-0.062	-0.118	0.255	-0.251	-0.241	-0.135	1.000

Significant at 0.05 | Significant at 0.01

LOS	Length of stay
patage	Patient age
dum_dd	Dummy variable for dependent (reference category → member)
dum_m	Dummy variable for sex (reference category → female)
dum_p	Dummy variable for type of hospital (reference category → government)
dum_sec	Dummy variable for category of hospital (Secondary; reference category → primary)
dum_tert	Dummy variable for category of hospital (Tertiary; reference category → primary)
dum_int	Dummy variable for medical case (Intensive; reference category → ordinary)
dum_cat	Dummy variable for medical case (Catasrophic; reference category → ordinary)
dum_spri	Dummy variable for worker type or membership type (Private sector; refrence category → indigent)
dum_gov	Dummy variable for worker type or membership type (Government sector; refrence category → indigent)
dum_npay	Dummy variable for worker type or membership type (Non-paying; refrence category → indigent)
SP_TOT	Use or not use of specialist services
rank_pov2	Dummy variable for poverty incidence
rank_pov3	Dummy variable for poverty incidence
rank_pov4	Dummy variable for poverty incidence
rank_pov5	Dummy variable for poverty incidence

There were thirteen variables that were significantly correlated with average reimbursement in which, the dummy variable for an admission in a tertiary hospital afforded the highest correlation of 0.511 (Table 4.18). In the regression model, there were only ten variables of these thirteen that can significantly explain about 43% of the variation in the dependent variable in which the strongest predictor was the dummy variable for an admission in a tertiary hospital (Table 4.20). Overall, the category of the hospital and the type of medical case were the factors that influence the variation to a large extent contributing R^2 of 0.279 and 0.109, respectively. This should not be surprising because Phil Health reimbursements are two-tiered in that they depend on these two factors. Tertiary hospitals and catastrophic cases have higher reimbursement rates. The type of hospital was also significant in explaining variation. Private hospitals had higher reimbursement rates compared with government hospitals. Membership type was not significant which is true to the fact that there is a unified benefit mechanism—all members may get the same benefits regardless of the type of membership they are in. Age and sex, are two demographic factors which are well investigated and documented factors accounting for variation. Sex, as the results showed, was not significant in contrast with age. The higher the age the higher is the reimbursement. Use of specialist services also contributed to a higher reimbursement. In addition, poverty incidence specifically, those regions categorized in the fourth and fifth group (lower poverty incidence) had significantly higher rates than the first group, which had the highest poverty incidence although, the coefficients of which were rather weak, nevertheless significant. All the regions belonging to these two groups are from Luzon and with the exception of Region II (which belong to group 4), the three are with the highest number

of hospitals, especially tertiary hospitals. So it might be that the high reimbursements that resulted are due to the admission in the tertiary hospitals in these areas. Of course the price or the cost of services in these areas (regardless of the category of hospital where patient was admitted) could be another reason.

Table 4. 20. Multiple regression model (Unit of analysis: individual entry)

Variables	B	SE	β	t	Sig	Collinearity Stastitics	
						Tolerance	VIF
(Constant)	1051.394	44.141		23.819	0.000		
Patient age	11.239	0.355	0.122	31.654	0.000	0.733	1.364
Patient type (Dependent)	90.920	23.430	0.014	3.881	0.000	0.791	1.265
Male	-3.702	17.252	-0.001	-0.215	0.830	0.977	1.023
Admission in private hospital	811.453	21.451	0.135	37.828	0.000	0.854	1.171
Admission in secondary hospital	696.679	23.592	0.131	29.531	0.000	0.551	1.815
Admission in tertiary hospital	2639.733	27.006	0.501	97.748	0.000	0.415	2.410
Intensive case	1794.295	22.292	0.286	80.489	0.000	0.860	1.163
Catastrophic case	6033.308	120.566	0.167	50.042	0.000	0.979	1.021
Private sector	1.793	28.174	0.000	0.064	0.949	0.368	2.718
Non-paying	28.573	38.208	0.003	0.748	0.455	0.648	1.543
Government sector	-12.588	27.940	-0.002	-0.451	0.652	0.436	2.294
Use or not use of specialist services	458.717	21.465	0.083	21.371	0.000	0.726	1.378
Poverty incidence (2)	30.291	27.698	0.005	1.094	0.274	0.438	2.282
Poverty incidence (3)	-23.723	27.399	-0.004	-0.866	0.387	0.463	2.160
Poverty incidence (4)	128.532	34.132	0.016	3.766	0.000	0.604	1.655
Poverty incidence (5)	496.860	36.019	0.063	13.794	0.000	0.528	1.896
R^2 = 0.429; Adjusted R^2 = 0.428; SE = 1951.827 **F = 2459.827; 16 and 52461 df; n = 52478** **Dependent variable: total reimbursement**							

On the other hand, with length of stay as the dependent variable, almost all the entered variables were found significantly correlated (only one dummy variable for poverty incidence was not significant) where the dummy variable for intensive case had the highest correlation (Table 4.19). In the regression analysis, 12 of these variables were shown to significantly explain 11.5% of the variation in the dependent variable (Table 4.21). It was the dummy variable for intensive case which had the highest predictive or

explanatory power. In general it was the type of medical case which greatly contributed to explaining the observed variation (~5%). Intensive case had a longer length of stay when compared to ordinary case, which was the reference category, in that the former is a more severe case than the latter. Admission in a tertiary hospital had a longer length of stay when compared to an admission in a primary hospital. Increasing age also entailed longer length of stay and being a dependent as compared to a member. This probably means that the dependents are the elderly and as such had longer length of stay. The use of specialist services, although weak association, also involved longer length of stay as well as those people admitted in regions belonging to lower poverty incidence as compared to those with high poverty incidence. Admission in a private hospital was negatively associated—meaning a shorter length of stay when compared to an admission in a government hospital. Likewise, all the different sectors or member types (private, non-paying and government) had shorter length of stay when compared with the indigent sector.

Table 4. 21. Multiple regression model (Unit of analysis: individual entry)

Variables	B	SE	β	t	Sig	Collinearity Stastitics	
						Tolerance	VIF
(Constant)	3.437	0.047		72.648	0.000		
Patient age	0.003	0.000	0.040	8.339	0.000	0.733	1.364
Patient type (Dependent)	0.078	0.025	0.014	3.096	0.002	0.791	1.265
Male	0.036	0.018	0.008	1.939	0.052	0.977	1.023
Admission in private hospital	-0.890	0.023	-0.172	-38.698	0.000	0.854	1.171
Admission in secondary hospital	-0.030	0.025	-0.006	-1.171	0.242	0.551	1.815
Admission in tertiary hospital	0.500	0.029	0.110	17.286	0.000	0.415	2.410
Intensive case	0.990	0.024	0.184	41.435	0.000	0.860	1.163
Catastrophic case	2.031	0.129	0.065	15.713	0.000	0.979	1.021
Private sector	-0.051	0.030	-0.011	-1.683	0.092	0.368	2.718
Non-paying	-0.116	0.041	-0.014	-2.827	0.005	0.648	1.543
Government sector	-0.127	0.030	-0.026	-4.238	0.000	0.436	2.294
Use or not use of specialist services	0.081	0.023	0.017	3.515	0.000	0.726	1.378
Poverty incidence (2)	0.017	0.030	0.004	0.572	0.567	0.438	2.282
Poverty incidence (3)	0.214	0.029	0.044	7.279	0.000	0.463	2.160
Poverty incidence (4)	0.231	0.037	0.033	6.307	0.000	0.604	1.655
Poverty incidence (5)	0.635	0.039	0.093	16.449	0.000	0.528	1.896
R^2 = 0.115; Adjusted R^2 = 0.114 = 2.092 **F = 424.816; 16 and 52461 df; n = 52478** **Dependent variable: total length of stay**							

Removal of outliers (standardized residual exceeding ± 3) in both sets of data, which were about 1.8% and 1.1% of the total n, from the analysis afforded almost the same set of significant variables and increased the R^2 to 0.465 and 0.149 for total reimbursement and length of stay, respectively. It also improved the homoscedasticity of the former (Appendix G).

3.2.2. Membership number

A total of 14 variables were entered into the analysis. The average reimbursement was PhP 4,034 and the average length of stay was 3.49 (Table 4.22).

Table 4. 22. Descriptive statistics (Unit of analysis: membership number)

Variable	Mean	Std. Deviation
Average reimbursement	4033.877	2604.4703
Average length of stay	3.492	2.2563
Number of admissions	1.08	.356
Proportion of dependents	.7727	.40620
Proportion of female	.4806	.49339
Proportion in tertiary hospitals	.4167	.49230
Proportion of ordinary cases	.7699	.41823
Proportion in government hospitals	.2507	.43284
Membership class* **D1** (government)	.3066	.46111
Membership class* **D2** (non-paying)	.0805	.27204
Membership class* **D3** (private)	.4692	.49906
Total use of specialist services	.3317	.50871
Poverty incidence (2)	.3194	.46625
Poverty incidence (3)	.2861	.45192
Poverty incidence (4)	.1260	.33184
Poverty incidence (5)	.1281	.33416

There were eleven of the fourteen variables significantly associated with average reimbursement in which the variable, proportion of admissions in tertiary hospitals, had the highest correlation (Table 4.23). In the regression model, ten variables were demonstrated to significantly explain 35.8% of the variations in the dependent variable (though not exactly the same significant variables as that in Pearson correlation test). Similarly, proportion of admissions in tertiary hospitals had highest explanatory power followed by proportion of ordinary cases (Table 4.24). These variables explained a majority of the observed R^2 with, R^2 contributions of 0.226 and 0.108, respectively.

Table 4. 23. Pearson correlation of all key variables (Unit of analysis: membership number; DV: average reimbursement)

	TOTAMNT_AVE	freq	Prop_dd	Prop_fe	prop_tert	prop_ord	prop_gov	dum_gov	dum_nopay	dum_spri	SP_TOT	rank_pov2	rank_pov3	rank_pov4	rank_pov5
TOTAMNT_AVE	1.000														
freq	-0.065	1.000													
prop_dd	0.048	0.027	1.000												
prop_fe	-0.001	0.000	0.047	1.000											
prop_tert	0.476	-0.076	0.124	-0.023	1.000										
prop_ord	-0.393	0.049	-0.039	0.002	-0.142	1.000									
prop_gov	-0.127	-0.045	0.034	-0.017	-0.107	-0.156	1.000								
dum_gov	-0.043	0.018	-0.033	0.040	-0.100	-0.026	0.073	1.000							
dum_nopay	-0.022	0.035	0.001	0.007	-0.028	0.054	-0.076	-0.197	1.000						
dum_spri	0.159	-0.032	0.034	-0.039	0.240	-0.026	-0.209	-0.625	-0.278	1.000					
SP_TOT	-0.007	0.010	-0.097	0.010	-0.008	0.010	-0.031	-0.035	-0.058	0.072	1.000				
rank_pov2	-0.018	-0.040	0.054	0.001	-0.043	-0.120	0.161	0.082	-0.053	-0.157	-0.008	1.000			
rank_pov3	-0.076	0.067	-0.110	0.007	-0.060	0.093	-0.045	-0.042	0.064	0.018	0.024	-0.434	1.000		
rank_pov4	-0.003	-0.045	0.067	-0.003	0.013	0.046	0.033	-0.036	0.009	0.067	-0.058	-0.260	-0.240	1.000	
rank_pov5	0.246	-0.049	0.087	-0.012	0.281	-0.154	-0.103	-0.123	-0.059	0.248	-0.002	-0.263	-0.243	-0.146	1.000

Significant at 0.05 | Significant at 0.01

TOTAMNT_AVE	Average amount reimbursed
freq	Patient age
prop_dd	Proportion of dependents
prop_fe	Proportion female
prop_tert	Proportion of admissions in tertiary hospitals
prop_ord	Proportion of ordinary cases
prop_gov	Proportion of admissions in government hospitals
dum_spri	Dummy variable for worker type or membership type (Private sector; refrence category → indigent)
dum_gov	Dummy variable for worker type or membership type (Government sector; refrence category → indigent)
dum_npay	Dummy variable for worker type or membership type (Non-paying; refrence category → indigent)
SP_TOT	Use or not use of specialist services
rank_pov2	Dummy variable for poverty incidence
rank_pov3	Dummy variable for poverty incidence
rank_pov4	Dummy variable for poverty incidence
rank_pov5	Dummy variable for poverty incidence

Table 4. 24. Multiple regression model (Unit of analysis: membership number)

Variable	B	SE	β	t	Sig	Collinearity Statistics	
						Tolerance	VIF
(Constant)	4981.624	56.063		88.858	0.000		
Number of admissions	-136.433	26.905	-0.019	-5.071	0.000	0.980	1.020
Proportion of dependents	-113.529	23.950	-0.018	-4.740	0.000	0.951	1.052
Proportion of female	44.950	19.280	0.009	2.331	0.020	0.994	1.006
Proportion in tertiary hospitals	2053.269	20.920	0.388	98.147	0.000	0.848	1.179
Proportion of ordinary cases	-2150.444	23.808	-0.345	-90.325	0.000	0.907	1.102
Proportion in government hospitals	-765.096	23.632	-0.127	-32.376	0.000	0.860	1.163
Membership class* **D1** (government)	183.840	31.045	0.033	5.922	0.000	0.439	2.278
Membership class* **D2** (non-paying)	189.716	43.119	0.020	4.400	0.000	0.654	1.529
Membership class* **D3** (private)	203.412	31.264	0.039	6.506	0.000	0.370	2.706
Total use of specialist services	-25.913	18.847	-0.005	-1.375	0.169	0.979	1.022
Poverty incidence (2)	32.773	31.373	0.006	1.045	0.296	0.420	2.378
Poverty incidence (3)	-12.467	31.296	-0.002	-0.398	0.690	0.450	2.223
Poverty incidence (4)	172.891	37.750	0.022	4.580	0.000	0.573	1.744
Poverty incidence (5)	552.852	39.687	0.071	13.930	0.000	0.512	1.955
R^2 = 0.358; Adjusted R^2 = 0.358; SE = 2086.375 **F = 1930.523; 14 and 48370 df; n = 48385** **Dependent variable: average reimbursement**							

In general then, results suggest that the category of hospital and the medical case were the major predictors of average reimbursement at this level (Table 4.23). The higher the proportion of admissions in tertiary hospitals the higher the reimbursements, while the higher the proportion of ordinary cases the lower the reimbursements. Next was the proportion of admissions in government hospitals. The higher this proportion the lower the reimbursement. Other variables which showed weak but significant associations with average reimbursement were membership class, poverty incidence, frequency of use (or number of admissions), proportion of dependents and proportion female. Membership class while showing a non significant association with reimbursement at the individual

record level, showed a significant association in this level of aggregation. It can be that even while Phil Health offer the same benefit payments to all its members, the indigents avail of hospital services less than those belonging to the government, private or the non-paying sector thus the average reimbursement for the three latter sectors are significantly higher when compared to the former. The frequency of use had an inverse relationship with average reimbursement which was similar for proportion of dependents. Phil Health had set a maximum number of days (of hospitalization) in a year for its members and another maximum number of days that must be shared by all the member's dependents. The more frequent the usage of these services then both of the members and the dependents (altogether) would decrease the amount reimbursable.

When average length of stay was the dependent variable, twelve variables afforded significant correlations (Table 4.25). Proportion of ordinary cases had the highest (negative) correlation of -0.247. Regression analysis identified eight variables significantly explaining the variation in length of stay (Table 4.26). Proportion of ordinary cases had the greatest predictive power and explanatory power contributing R^2 of 0.053. Overall, the entered variables explained 10.5% in the observed variation in the dependent variable.

At the membership number level, the type of medical case and type of hospital are the major factors affecting length of stay. More ordinary cases will have shorter average length of stay while more admissions in government hospital have longer average length of stay. The category of hospital was also a fairly strong predictor in that the higher the admissions in tertiary hospital the higher the average length of stay. Government and

non-paying sectors have higher length of stay when compared to the indigent. Poverty incidence had a similar effect at this level compared to the individual record or patient level.

Table 4. 25. Pearson correlation of all key variables (Unit of analysis: membership number; DV: average length of stay)

	Los_ave	freq	Prop_dd	Prop_fe	prop_tert	prop_ord	prop_gov	dum_gov	dum_nopay	dum_spri	SP_TOT	rank_pov2	rank_pov3	rank_pov4	rank_pov5
Los_ave	1.000														
freq	-0.028	1.000													
prop_dd	0.037	0.027	1.000												
prop_fe	-0.013	0.000	0.047	1.000											
prop_tert	0.140	-0.076	0.124	-0.023	1.000										
prop_ord	-0.247	0.049	-0.039	0.002	-0.142	1.000									
prop_gov	0.180	-0.045	0.034	-0.017	-0.107	-0.156	1.000								
dum_gov	-0.019	0.018	-0.033	0.040	-0.100	-0.026	0.073	1.000							
dum_nopay	-0.036	0.035	0.001	0.007	-0.028	0.054	-0.076	-0.197	1.000						
dum_spri	0.028	-0.032	0.034	-0.039	0.240	-0.026	-0.209	-0.625	-0.278	1.000					
SP_TOT	-0.014	0.010	-0.097	-0.010	-0.008	0.010	-0.031	-0.035	-0.058	0.072	1.000				
rank_pov2	-0.004	-0.040	0.054	0.001	-0.043	-0.120	0.161	0.082	-0.053	-0.157	-0.008	1.000			
rank_pov3	-0.018	0.067	-0.110	-0.007	-0.060	0.093	-0.045	-0.042	0.064	0.018	0.024	-0.434	1.000		
rank_pov4	0.005	-0.045	0.067	-0.003	0.013	0.046	0.033	-0.036	0.009	0.067	-0.058	-0.260	-0.240	1.000	
rank_pov5	0.119	-0.049	0.087	-0.012	0.281	-0.154	-0.103	-0.123	-0.059	0.248	-0.002	-0.263	-0.243	-0.146	1.000

Significant at 0.05 | Significant at 0.01

Los_ave	Average length of stay
freq	Patient age
prop_dd	Proportion of dependents
prop_fe	Proportion female
prop_tert	Proportion of admissions in tertiary hospitals
prop_ord	Proportion of ordinary cases
prop_gov	Proportion of admissions in government hospitals
dum_spri	Dummy variable for worker type or membership type (Private sector; refrence category → indigent)
dum_gov	Dummy variable for worker type or membership type (Government sector; refrence category → indigent)
dum_npay	Dummy variable for worker type or membership type (Non-paying; refrence category → indigent)
SP_TOT	Use or not use of specialist services
rank_pov2	Dummy variable for poverty incidence
rank_pov3	Dummy variable for poverty incidence
rank_pov4	Dummy variable for poverty incidence
rank_pov5	Dummy variable for poverty incidence

Table 4. 26. Multiple regression model (Unit of analysis: membership number)

Variable	B	SE	β	t	Sig	Collinearity Statistics	
						Tolerance	VIF
(Constant)	3.780	0.057		65.890	0.000		
Number of admissions	0.003	0.028	0.000	0.105	0.916	0.980	1.020
Proportion of dependents	0.031	0.025	0.005	1.246	0.213	0.951	1.052
Proportion of female	-0.027	0.020	-0.006	-1.346	0.178	0.994	1.006
Proportion in tertiary hospitals	0.487	0.021	0.106	22.763	0.000	0.848	1.179
Proportion of ordinary cases	-1.063	0.024	-0.197	-43.651	0.000	0.907	1.102
Proportion in government hospitals	0.884	0.024	0.170	36.572	0.000	0.860	1.163
Membership class* **D1** (government)	-0.097	0.032	-0.020	-3.048	0.002	0.439	2.278
Membership class* **D2** (non-paying)	-0.115	0.044	-0.014	-2.604	0.009	0.654	1.529
Membership class* **D3** (private)	-0.038	0.032	-0.008	-1.201	0.230	0.370	2.706
Total use of specialist services	-0.023	0.019	-0.005	-1.168	0.243	0.979	1.022
Poverty incidence (2)	-0.014	0.032	-0.003	-0.422	0.673	0.420	2.378
Poverty incidence (3)	0.211	0.032	0.042	6.573	0.000	0.450	2.223
Poverty incidence (4)	0.193	0.039	0.028	4.997	0.000	0.573	1.744
Poverty incidence (5)	0.594	0.041	0.088	14.619	0.000	0.512	1.955
R^2 = 0.105; Adjusted R^2 = 0.105; SE = 2.135 **F = 405.092; 14 and 48370 df; n = 48385** **Dependent variable: average length of stay**							

Similarly, when outliers were removed from the analysis in both sets of data that comprised about 1.6% and 1.1% for average reimbursement and average length of stay, R^2 was increased to 0.389 and 0.139. Residual plots also revealed an improvement in homoscedasticity (Appendix G).

3.2.3. Hospital aggregation

A total of 15 variables were entered into the analysis. The average reimbursement and length of stay were PhP 3,264 and 3.56, respectively (Table 4. 27).

Table 4. 27. Descriptive statistics (Unit of analysis: hospital)

Dependent variable: average reimbursement			Dependent variable: average length of stay		
	Mean	Std. Deviation		Mean	Std. Deviation
Average reimbursement	3264.2107	1506.90585	Average length of stay	3.5621	1.74255
Hospital beds	48.87	87.223	Hospital beds	48.89	87.252
Number of admissions	40.53	67.922	Number of admissions	40.55	67.940
Proportion of dependents	.7662	.21849	Proportion of dependents	.7663	.21855
Proportion female	.4872	.20921	Proportion female	.4876	.20886
Proportion of indigent patients	.1568	.22950	Proportion of indigent patients	.1569	.22955
Proportion of ordinary cases	.7603	.27426	Proportion of ordinary cases	.7604	.27435
Proportion of patients who used specialist services	.1867	.29840	Proportion of patients who used specialist services	.1869	.29847
Category of hospital* **D1** (secondary)	.4257	.49464	Category of hospital* **D1** (secondary)	.4253	.49458
Category of hospital* **D2** (tertiary)	.1843	.38789	Category of hospital* **D2** (tertiary)	.1845	.38800
Type of hospital (private)	.6276	.48364	Type of hospital (private)	.6273	.48371
Poverty incidence (2)	.3001	.45847	Poverty incidence (2)	.3003	.45857
Poverty incidence (3)	.2300	.42100	Poverty incidence (3)	.2302	.42111
Poverty incidence (4)	.2262	.41853	Poverty incidence (4)	.2264	.41864
Poverty incidence (5)	.1196	.32459	Poverty incidence (5)	.1189	.32380

Pearson correlation test indicated twelve variables to be significantly associated with average reimbursement (Table 4.28). Dummy variable for tertiary hospital had the highest correlation. In the regression analysis, only eight variables were demonstrated to significantly explain the variation in the dependent variable where the dummy variable for tertiary hospital had the greatest predictive power (Table 4.29). Overall these factors explained 68.7% of the observed variation in length of stay with the category of hospital explaining the variation to a large extent (56.9%).

Table IV. 28. Pearson correlation of all key variables (Unit of analysis: hospital; DV: average reimbursement)

	TOT_ AMNT_ ave	h_ beds	freq	prop_ dd	prop_ fe	prop_ ind	prop_ ord	prop _sp	dum_ sec	dum_ tert	dum_ hpri	rank_ pov2	rank_ pov3	rank_ pov4	rank_ pov5
TOT_AMNT_ave	1.000														
h_beds	0.510	1.000													
freq	0.282	0.291	1.000												
prop_dd	0.107	0.081	0.055	1.000											
prop_fe	-0.011	-0.050	-0.019	0.015	1.000										
prop_ind	-0.245	-0.120	-0.032	-0.004	0.041	1.000									
prop_ord	-0.374	-0.190	0.026	-0.132	0.004	0.023	1.000								
prop_sp	0.497	0.449	0.232	0.176	-0.044	-0.231	-0.130	1.000							
dum_sec	0.004	-0.139	-0.050	0.091	-0.015	-0.066	-0.052	-0.059	1.000						
dum_tert	0.686	0.586	0.337	0.126	-0.040	-0.163	-0.142	0.516	-0.409	1.000					
dum_hpri	0.172	-0.110	0.157	-0.055	0.044	-0.299	0.233	0.159	-0.019	0.045	1.000				
rank_pov2	-0.103	-0.086	0.015	-0.029	0.009	0.194	-0.095	-0.140	-0.009	-0.084	-0.142	1.000			
rank_pov3	-0.059	-0.043	0.095	-0.100	0.034	0.051	0.003	-0.027	-0.105	-0.036	0.006	-0.358	1.000		
rank_pov4	0.040	-0.057	-0.151	0.111	-0.048	-0.127	0.133	0.023	0.193	-0.018	0.025	-0.354	-0.296	1.000	
rank_pov5	0.301	0.341	0.006	0.117	-0.023	-0.217	-0.262	0.278	-0.009	0.236	0.080	-0.241	-0.201	-0.199	1.000
Significant at 0.05									Significant at 0.01						

TOT_AMNT_ave	Average reimbursement
h_beds	Accredited bed capacity
freq	Number of admissions
prop_dd	Proportion of dependents
prop_fe	Proportion female
prop_ind	Proportion indigents
prop_ord	Proportion of ordinary cases
prop_sp	Proportion of specialist services
dum_sec	Dummy variable for category of hospital (Secondary; reference category → primary)
dum_tert	Dummy variable for category of hospital (Tertiary; reference category → primary)
dum_hpri	Dummy variable for type of hospital (reference category → government)
rank_pov2	Dummy variable for poverty incidence
rank_pov3	Dummy variable for poverty incidence
rank_pov4	Dummy variable for poverty incidence
rank_pov5	Dummy variable for poverty incidence

Table 4. 29. Multiple regression model (Unit of analysis: hospital)

Variable	B	SE		t	Sig	Collinearity Statistics	
						Tolerance	VIF
(Constant)	3285.002	154.138		21.312	0.000		
Hospital beds	1.737	0.364	0.101	4.767	0.000	0.542	1.845
Number of admissions	0.393	0.392	0.018	1.004	0.315	0.774	1.292
Proportion of dependents	-381.004	112.222	-0.055	-3.395	0.001	0.911	1.098
Proportion female	171.440	112.533	0.024	1.523	0.128	0.988	1.012
Proportion of indigent patients	-117.959	113.175	-0.018	-1.042	0.297	0.812	1.232
Proportion of ordinary cases	-1630.045	95.592	-0.297	-17.052	0.000	0.797	1.255
Proportion of patients who used specialist services	279.850	98.925	0.055	2.829	0.005	0.629	1.591
Category of hospital* **D1** (secondary)	835.697	56.202	0.274	14.870	0.000	0.709	1.411
Category of hospital* **D2** (tertiary)	2545.204	92.379	0.655	27.552	0.000	0.427	2.344
Type of hospital (private)	635.946	55.510	0.204	11.456	0.000	0.760	1.316
Poverty incidence (2)	6.807	81.413	0.002	0.084	0.933	0.393	2.544
Poverty incidence (3)	45.029	83.724	0.013	0.538	0.591	0.441	2.268
Poverty incidence (4)	194.521	86.515	0.054	2.248	0.025	0.418	2.394
Poverty incidence (5)	100.021	106.681	0.022	0.938	0.349	0.457	2.189
R^2 = 0.687; Adjusted R^2 = 0.684; SE = 847.712 **F = 203.415; 14 and 1298 df; p = 0.000; n = 1313** **Dependent variable: average reimbursement**							

At the hospital level, again the primary determinant factors were the category of the hospital and the medical case (proportion of ordinary cases)—tertiary hospitals had higher average reimbursements when compared to the primary hospitals while a higher proportion of ordinary cases involved lower reimbursements [Table 4.29]. The type of hospital was also significant, private hospital had higher reimbursement than government hospital. Hospital bed was also a factor that showed a significant relationship with average reimbursement—higher hospital beds had higher reimbursement. This is probably not really due to the higher number of beds per se but because higher hospital beds are found in tertiary hospitals which is also demonstrated by the relatively high Pearson correlation of these two variables (0.586) [Table 4.28]. Proportion of dependents

and a hospital found in a region belonging to the 4th group of poverty incidence also showed weak but nonetheless significant associations with average reimbursement.

With average length of stay as the dependent variable, Pearson correlation test gave eight significant variables where dummy variable for private hospital had the strongest correlation (Table 4.30). Regression analysis, on one hand, demonstrated five variables to significantly explain the variation in length of stay where dummy variable for private hospital also had the strongest predictive power which was able to explain about 11% of the observed variation (Table 4.31). Overall, the variables entered explained 22.5%. These results indicated that admission in a private hospital had a shorter length of stay when compared to an admission in a government hospital. A higher number of hospital beds also entailed a longer length of stay. A higher proportion of ordinary cases, dependents and female patients had shorter length of stay.

Table 4. 30. Pearson correlation of all key variables (Unit of analysis: hospital; DV: average length of stay)

	Los_ave	h_ beds	freq	prop_ dd	prop_ fe	prop_ ind	prop_ ord	prop _sp	dum_ sec	dum_ tert	dum_ hpri	rank_ pov2	rank_ pov3	rank_ pov4	rank_ pov5
los_ave	1.000														
h_beds	0.280	1.000													
freq	-0.032	0.291	1.000												
prop_dd	-0.124	0.081	0.055	1.000											
prop_fe	-0.111	-0.051	-0.020	0.014	1.000										
prop_ind	-0.014	-0.120	-0.032	-0.005	0.040	1.000									
prop_ord	-0.231	-0.190	0.026	-0.132	0.003	0.023	1.000								
prop_sp	0.063	0.449	0.231	0.176	-0.045	-0.231	-0.130	1.000							
dum_sec	-0.004	-0.139	-0.050	0.092	-0.012	-0.065	-0.052	-0.058	1.000						
dum_tert	0.137	0.586	0.337	0.126	-0.041	-0.163	-0.142	0.516	-0.409	1.000					
dum_hpri	-0.332	-0.110	0.157	-0.055	0.045	-0.298	0.233	0.160	-0.019	0.046	1.000				
rank_pov2	-0.024	-0.087	0.015	-0.029	0.007	0.194	-0.095	-0.140	-0.009	-0.084	-0.142	1.000			
rank_pov3	0.005	-0.043	0.094	-0.100	0.033	0.050	0.003	-0.027	-0.104	-0.036	0.006	-0.358	1.000		
rank_pov4	-0.017	-0.057	-0.152	0.110	-0.049	-0.128	0.133	0.022	0.194	-0.018	0.025	-0.354	-0.296	1.000	
rank_pov5	0.118	0.343	0.007	0.118	-0.018	-0.216	-0.262	0.280	-0.011	0.238	0.079	-0.241	-0.201	-0.199	1.000
	Significant at 0.05								Significant at 0.01						

Los_ave	Average length of stay
h_beds	Accredited bed capacity
freq	Number of admissions
prop_dd	Proportion of dependents
prop_fe	Proportion female
prop_ind	Proportion indigents
prop_ord	Proportion of ordinary cases
prop_sp	Proportion of specialist services
dum_sec	Dummy variable for category of hospital (Secondary; reference category → primary)
dum_tert	Dummy variable for category of hospital (Tertiary; reference category → primary)
dum_hpri	Dummy variable for type of hospital (reference category → government)
rank_pov2	Dummy variable for poverty incidence
rank_pov3	Dummy variable for poverty incidence
rank_pov4	Dummy variable for poverty incidence
rank_pov5	Dummy variable for poverty incidence

Table 4. 31. Multiple regression model (Unit of analysis: hospital)

Variable	B	SE	β	t	Sig	Collinearity Statistics	
						Tolerance	VIF
(Constant)	6.140	0.279		22.007	0.000		
Hospital beds	0.004	0.001	0.209	6.320	0.000	0.542	1.845
Number of admissions	-0.001	0.001	-0.046	-1.660	0.097	0.774	1.291
Proportion of dependents	-1.471	0.203	-0.185	-7.245	0.000	0.911	1.098
Proportion female	-0.661	0.204	-0.079	-3.238	0.001	0.988	1.012
Proportion of indigent patients	-0.392	0.205	-0.052	-1.913	0.056	0.812	1.231
Proportion of ordinary cases	-0.837	0.173	-0.132	-4.836	0.000	0.797	1.255
Proportion of patients who used specialist services	-0.043	0.179	-0.007	-0.241	0.809	0.628	1.592
Category of hospital* **D1** (secondary)	0.140	0.102	0.040	1.377	0.169	0.709	1.411
Category of hospital* **D2** (tertiary)	0.208	0.167	0.046	1.247	0.213	0.427	2.344
Type of hospital (private)	-1.087	0.100	-0.302	-10.816	0.000	0.760	1.316
Poverty incidence (2)	-0.133	0.147	-0.035	-0.906	0.365	0.393	2.543
Poverty incidence (3)	0.046	0.152	0.011	0.306	0.760	0.441	2.268
Poverty incidence (4)	0.056	0.157	0.014	0.360	0.719	0.418	2.393
Poverty incidence (5)	0.178	0.193	0.033	0.922	0.357	0.458	2.185
R^2 = 0.233; Adjusted R^2 = 0.225; SE = 1.534 **F = 28.195; 14 and 1297 df; p = 0.000; n = 1312** **Dependent variable: average length of stay**							

The removal of outliers from the analysis that were about 1.6% and 1.4% of the data improved the R^2 to 0.749 (Adjusted R^2 = 0.747) and 0.338 (Adjusted R^2 = 0.331), for average reimbursement and average length of stay, respectively, as well as improved homoscedasticity (Appendix G).

3.2.4. Provincial aggregation

A total of 12 variables were entered into the analysis. The average reimbursement and length of stay were PhP 3,466 and 3.57, respectively (Table 4.32).

Table 4. 32. Descriptive statistics (Unit of analysis: province)

Variable	Mean	Std. Deviation
Average reimbursement	3466.8311	941.83076
Average length of stay	3.5664	.53870
Proportion of admissions in government hospitals	48.332	34.3254
Proportion of admissions in tertiary hospitals	11.562	12.0536
Number of admissions	679.81	1027.265
Proportion of dependents	.7763	.10736
Proportion female	.4914	.04799
Proportion of ordinary cases	.7466	.23024
Proportion indigents	.1916	.15425
Proportion of specialist services	.2009	.18511
Dummy variable for poverty incidence	.4177	.49634
Dummy variable for poverty incidence	.2405	.43012
Dummy variable for poverty incidence	.1772	.38429
Dummy variable for poverty incidence	.0253	.15809

Seven of the twelve variables were shown to be significantly correlated with average reimbursement (Table 4.33). Among them, proportion of patients who used specialist services was most correlated with the dependent variable, closely followed by proportion of admissions in tertiary hospitals. It should be noted that these two variables had likewise high correlation (0.647) but since collinearity diagnostic tests indicated no multicollinearity problems among the entered variables, both were included in the analysis. In the regression analysis, the variable proportion of admissions in tertiary hospitals had the greatest predictive power followed by proportion of patients who used specialist services (Table 4.34). The entered variables explained 79.5% of the observed variation in average reimbursement.

Table 4. 33. Pearson correlation of all key variables (Unit of analysis: province; DV: average reimbursement)

	TOTPHIC_AVE	prop_gov	per_tert	admit	prop_dd	prop_fem	prop_ord	prop_ind	prop_sp	rank_pov2	rank_pov3	rank_pov4	rank_pov5
TOTPHIC_AVE	1.000												
prop_gov	-0.335	1.000											
per_tert	0.743	-0.403	1.000										
admit	0.363	-0.473	0.419	1.000									
prop_dd	0.181	0.187	0.165	0.057	1.000								
prop_fem	-0.165	0.147	-0.211	-0.155	-0.297	1.000							
prop_ord	-0.364	-0.224	-0.023	0.071	-0.144	-0.070	1.000						
prop_ind	-0.337	0.223	-0.368	-0.206	-0.170	0.116	0.054	1.000					
prop_sp	0.785	-0.297	0.647	0.373	0.162	-0.154	-0.212	-0.390	1.000				
rank_pov2	-0.002	0.166	-0.174	-0.141	-0.004	0.200	-0.343	0.090	-0.146	1.000			
rank_pov3	-0.042	0.032	-0.037	0.088	-0.023	-0.053	0.066	0.166	-0.011	-0.477	1.000		
rank_pov4	0.100	-0.035	0.122	-0.100	0.148	-0.177	0.168	-0.123	0.158	-0.393	-0.261	1.000	
rank_pov5	0.202	-0.152	0.204	0.411	0.130	-0.141	-0.105	-0.188	0.181	-0.137	-0.091	-0.075	1.000

Significant at 0.05 | Significant at 0.01

TOTPHIC_AVE	Average reimbursement
prop_gov	Proportion of admissions in government hospitals
per_tert	Proportion of admissions in tertiary hospitals
admit	Number of admissions
prop_dd	Proportion of dependents
prop_fem	Proportion female
prop_ord	Proportion of ordinary cases
prop_ind	Proportion indigents
prop_sp	Proportion of specialist services
rank_pov2	Dummy variable for poverty incidence
rank_pov3	Dummy variable for poverty incidence
rank_pov4	Dummy variable for poverty incidence
rank_pov5	Dummy variable for poverty incidence

At the provincial level, there were three variables significantly associated or explaining average reimbursement. The category of hospital and medical case as illustrated by proportion of admissions in tertiary hospitals and proportion of ordinary cases and the proportion of those who used specialist services (the greater this proportion, the higher the average reimbursement).

Table 4. 34. Multiple regression model (Unit of analysis: province)

Variable	B	SE	β	t	Sig	Collinearity Statistics	
						Tolerance	VIF
(Constant)	3380.858	875.688		3.861	0.000		
Proportion of admissions in government hospitals	-3.286	1.962	-0.120	-1.675	0.099	0.607	1.647
Proportion of admissions in tertiary hospitals	33.657	6.192	0.431	5.435	0.000	0.494	2.024
Number of admissions	0.000	0.068	0.000	-0.004	0.997	0.570	1.754
Proportion dependents	67.856	560.576	0.008	0.121	0.904	0.760	1.316
Proportion female	-237.551	1201.988	-0.012	-0.198	0.844	0.827	1.209
Proportion of ordinary cases	-1048.173	273.088	-0.256	-3.838	0.000	0.696	1.436
Proportion of indigent patients	101.724	388.671	0.017	0.262	0.794	0.766	1.306
Proportion of patients who used specialist services	2140.954	408.921	0.421	5.236	0.000	0.480	2.082
Poverty incidence (2)	327.053	177.737	0.172	1.840	0.070	0.354	2.828
Poverty incidence (3)	246.137	185.704	0.112	1.325	0.190	0.431	2.318
Poverty incidence (4)	289.990	195.263	0.118	1.485	0.142	0.489	2.046
Poverty incidence (5)	217.189	401.454	0.036	0.541	0.590	0.683	1.463
R^2 = 0.795; Adjusted R^2 = 0.758; SE = 463.338 **F = 21.357; 12 and 66 df; p = 0.000; n = 79** **Dependent variable: average reimbursement**							

Table 4. 35. Pearson correlation of all key variables (Unit of analysis: province; DV: average length of stay)

	TOTPHIC_AVE	prop_gov	per_tert	admit	prop_dd	prop_fem	prop_ord	prop_ind	prop_sp	rank_pov2	rank_pov3	rank_pov4	rank_pov5
TOTPHIC_AVE	1.000												
prop_gov	0.408	1.000											
per_tert	0.120	-0.403	1.000										
admit	-0.124	-0.473	0.419	1.000									
prop_dd	0.213	0.187	0.165	0.057	1.000								
prop_fem	-0.065	0.147	-0.211	-0.155	-0.297	1.000							
prop_ord	-0.420	-0.224	-0.023	0.071	-0.144	-0.070	1.000						
prop_ind	0.002	0.223	-0.368	-0.206	-0.170	0.116	0.054	1.000					
prop_sp	0.160	-0.297	0.647	0.373	0.162	-0.154	-0.212	-0.390	1.000				
rank_pov2	-0.013	0.166	-0.174	-0.141	-0.004	0.200	-0.343	0.090	-0.146	1.000			
rank_pov3	0.228	0.032	-0.037	0.088	-0.023	-0.053	0.066	0.166	-0.011	-0.477	1.000		
rank_pov4	-0.006	-0.035	0.122	-0.100	0.148	-0.177	0.168	-0.123	0.158	-0.393	-0.261	1.000	
rank_pov5	0.108	-0.152	0.204	0.411	0.130	-0.141	-0.105	-0.188	0.181	-0.137	-0.091	-0.075	1.000

Significant at 0.05 | Significant at 0.01

Los_ave	Average length of stay
prop_gov	Proportion of admissions in government hospitals
per_tert	Proportion of admissions in tertiary hospitals
admit	Number of admissions
prop_dd	Proportion of dependents
prop_fem	Proportion female
prop_ord	Proportion of ordinary cases
prop_ind	Proportion indigents
prop_sp	Proportion of specialist services
rank_pov2	Dummy variable for poverty incidence
rank_pov3	Dummy variable for poverty incidence
rank_pov4	Dummy variable for poverty incidence
rank_pov5	Dummy variable for poverty incidence

Table 4. 36. Multiple regression model (Unit of analysis: province)

Variable	B	SE	β	t	Sig	Collinearity Statistics	
						Tolerance	VIF
(Constant)	3.739	0.819		4.563	0.000		
Proportion of admissions in government hospitals	0.007	0.002	0.418	3.577	0.001	0.607	1.647
Proportion of admissions in tertiary hospitals	0.012	0.006	0.267	2.059	0.043	0.494	2.024
Number of admissions	0.000	0.000	-0.117	-0.971	0.335	0.570	1.754
Proportion dependents	-0.030	0.525	-0.006	-0.057	0.954	0.760	1.316
Proportion female	-0.629	1.125	-0.056	-0.560	0.578	0.827	1.209
Proportion of ordinary cases	-0.686	0.256	-0.293	-2.685	0.009	0.696	1.436
Proportion of indigent patients	0.023	0.364	0.007	0.064	0.949	0.766	1.306
Proportion of patients who used specialist services	0.156	0.383	0.054	0.408	0.684	0.480	2.082
Poverty incidence (2)	0.137	0.166	0.126	0.825	0.413	0.354	2.828
Poverty incidence (3)	0.460	0.174	0.368	2.650	0.010	0.431	2.318
Poverty incidence (4)	0.219	0.183	0.156	1.199	0.235	0.489	2.046
Poverty incidence (5)	0.617	0.376	0.181	1.642	0.105	0.683	1.463
R^2 = 0.452; Adjusted R^2 = 0.352; SE = 0.434 **F = 4.534; 12 and 66 df; p = 0.000; n = 79** **Dependent variable: average length of stay**							

With average length of stay as the dependent variable, four variables were found to be significantly correlated with proportion of ordinary cases having the highest (negative) correlation followed closely by proportion of admissions in government hospitals (Table 4. 35). A higher proportion of ordinary cases had a longer average length of stay while the reverse is true for the latter. Regression analysis indicated the proportion of admissions in government hospitals with highest predictive power explaining about 16% of the observed variation in average length of stay (Table 4.36). This was followed by the dummy variable for poverty incidence—in fact, poverty incidence as a whole explained about 11.5% of the observed variation. All entered variables afforded an R^2 of 0.452. Poverty incidence had a positive relationship. Regions which had the second

highest poverty incidence rate had higher average length of stay when compared to regions with the most poverty incidence rate.