CHAPTER VII

ANALYSIS

This chapter will deal with summarization of data and planning of statistical strategies for testing the hypothesis stated in the earlier chapter. As previously classification of outcome into three types; dependent variables, independent variables, and baseline data; summarization, comparison of outcome, and analysis of association will be described. Process of reporting the data will also be stated for enhancing unambiguous understanding

Summarization of Data.

One type of data is usually obtained from multiple sources, (e.g. personal qualities obtained from 1989 and new graduates and supervisors). It is the hard work for describing summary of the data to each source repeatedly whenever it is the same conclusion. So without regard of data sources, the summarization will be made in term of type of data, data issues, items or statements.

1. <u>Dependent</u> <u>variables</u> <u>(graduates' professional</u>
<u>competence)</u>.

Since the professional competence are measured in ordinal, continuous type of data, they can be summarized as mean and standard deviation (SD). In one competence area, there are many items or statements which each represents as one component of that competence area. So the data will be summarized in two step; (1) each professional competence score in one competence item will be summed up and summarized into mean and SD, so called item mean and item SD, (2) sum of all professional competence scores from all competence item in one competence area will be done and summarized as average mean and SD.

The summarization will be done as the average professional competence of overall graduates and on the different graduates according to the school. The first case will describe the professional competence of all physical therapist in Thailand, but the second one on different school.

These outcome can be summarized in gross vision by using performance profile method and tabulated for showing the specific value as shown in table 7.1, 7.2, 7.3, 7.4. The performance profile will show a pattern of performance across different aspects of the job, and for different subject, without recourse to total scores (Katz

and Snow, 1980). In this case the competence will be placed on the vertical axe, the 7 points continuous rating scale on the horizontal axe. The mean scores will be recorded on the scale for each competence item. The line will be drawn to show the connection of each professional competence and their relative values.

Table 7.1 Data summary of the professional competence of all graduates in each competence item

Competence Items	*Competence level high <----------> low							MEAN	S.D.
	7	6	5	4	3	2	1		

1. Interpersonal
   relations and
   communication skills

1.1
   .
   .

9. Clinical problem
   solving skills

   9.1
   .
   .

*the competence level of skill categories will be used as five points of 1 to 5

Table 7.2 Data summary of the professional competence of
          all graduates in each competence category.

Competence Items	*Competence level high <----------> low							MEAN	S.D.
	7	6	5	4	3	2	1		
1. Interpersonal relations and communication skills									
2. Professional ethics and attitudes									
3. . . .									
9. Clinical problem solving skills									

*the competence level of skill categories will be used
as   five points of 1 to 5

Table 7.3 Data summary of the professional competence of
different graduates in each competence item

Competence Items	*M.U.		K.K.U.		C.M.U.	
	MEAN	S.E. MEAN	MEAN	S.E. MEAN	MEAN	S.E. MEAN
1. Interpersonal relations and communication skills						
1.1 . .						
9. Clinical problem solving skills						
9.1 . .						

Note: The following lines represent the professional
competence of different graduates
* M.U.=Mahidol University; K.K.U.=Khon Kaen University;
C.M.U.=Chiangmai University.

Table 7.4 Data summary of the professional competence of
different graduate in each competence category

Competence Items	*M.U.		K.K.U.		C.M.U.	
	MEAN	S.E. MEAN	MEAN	S.E. MEAN	MEAN	S.E. MEAN
1. Interpersonal relations and communication skills						
2. Professional ethics and attitudes						
3. . .						
9. Clinical problem solving skills						

Note: The following lines represent the professional
competence of different graduates
* M.U.=Mahidol University; K.K.U.=Khon Kaen University;
C.M.U.=Chiangmai University.

The professional competence level will be concluded by interpretation of the professional competence mean according to the following criteria.

6.50 - 7.00   very high level of professional competence

5.50 - 6.49   high level of professional competence

4.50 - 5.49   fairly high level of professional competence

3.50 - 4.49   medium level of professional competence

2.50 - 3.49   fairly low level of professional competence

1.50 - 2.49   low level of professional competence

1.00 - 1.49   very low level of professional competence

The above criteria will be used for the categories measured by 7-point scale. The following criteria will be used for the 5-point scale (skill categories).

4.50 - 5.00   perform safety and always accurate
              ($\geq$ 80% accuracy)

3.50 - 4.49   perform safety and frequently accurate
              (60-79% accuracy)

2.50 - 3.49   perform safety and often accurate
              (40-59% accuracy)

1.50 - 2.49   perform safety and sometimes accurate
              (20-39% accuracy)

1.00 - 1.49   can not perform or perform with little
              accuracy (less than 20%) and not safety

2. Independent variable.

There are many data of independent variable. They are almost summarized in the form of table. So it is the hard work to present the form or pattern of the table needed here. In order to make an

overview of summarization in easy way, the conclusion of the summary method of independent variables outcome are showed in the table 7.5.

Table 7.5   Independent variables and their data summary method [summarized form (tabulation, graph), data description (frequency, mean)]

VARIABLES	SUMMARIZED FORM	DATA DESCRIPTION
1. Curriculum		
1.1 Course content		
- Degree of applicability of each group of major subjects	table	mean, S.E. Mean
1.2 Clinical experiences		
- Clinical experience in school (by doing observing)	table	percentage in each type
2. Quality of teacher		
2.1 Quality of faculty		
(a) Ability in teaching	table	opinion profile, mean, S.E. Mean
(b) Ability in clinical instruction	table	opinion profile, mean, S.E. Mean
(c) Ability in profession	table	opinion profile, mean, S.E. Mean
(d) Actual teacher's characteristics and personalities	table	opinion profile, mean, S.E. Mean

Table 7.5 (continued)

VARIABLES	SUMMARIZED FORM	DATA DESCRIPTION
2.2 Quality of clinical instructors (outside university)		
(a) Ability in clinical instruction	table	opinion profile, mean, S.E. Mean
(b) Ability in profession	table	opinion profile, mean, S.E. Mean
(c) Actual teacher's characteristics and personalities	table	opinion profile, mean, S.E. Mean
3. Teaching - learning		
3.1 Learning style		
- Actual learning style in major subjects	table	proportion in each style
4. Student's activities		
4.1 Benefit and risk	table	opinion profile, mean, S.E. Mean
4.2 Level of involvement	table	proportion
5. Student counselling		
5.1 Academic counselling		
(a) Benefit	table	opinion profile, mean, S.E. Mean
(b) Frequency	table	opinion profile, mean, S.E. Mean
5.2 Personal counselling		
(a) Benefit	table	opinion profile, mean, S.E. Mean

Table 7.5 (continued)

VARIABLES	SUMMARIZED FORM	DATA DESCRIPTION
(b) Frequency	table	opinion profile, mean, S.E. Mean
6. Facilities		
6.1 Clinical practice center and classroom (adequacy)	table	opinion profile, mean, S.E. Mean
6.2 Laboratory and equipment (adequacy, good quality)	table	opinion profile, mean, S.E. Mean
6.3 Library service (convenience)	table	opinion profile, mean, S.E. Mean
6.4 Textbook (adequacy, modern)	table	opinion profile, mean, S.E. Mean
6.5 Self-stduying aids (adequacy)	table	opinion profile, mean, S.E. Mean
7. Academic achievement		
7.1 Total GPA	table	number and proportion
7.2 All clinical practice GPA	table	number and proportion

Opinion profile is one kind of reporting the opinion, attitude of the subject. Liked performance profile, which show the responses across the different aspects of observed educational events with or without

concern for different subjects (Anant Srisopha, 1982).

For interpretation of the opinions or attitude which measured by 7 points rating scale, the following criteria will be used;

6.50 - 7.00   Strongly agreed, very necessary, excellence, very important, very satisfactory etc.

5.50 - 6.45   Agreed, necessary, good, important, satisfactory etc.

4.50 - 5.49   Partial agreed, fairly necessary, fair, fairly important, fairly satisfactory etc.

3.50 - 4.49   Neutral

2.50 - 3.49   Partial disagreed, fairly unnecessary, poor, fairly unimportant, fairly unsatis-factory etc.

1.50 - 2.49   Disagreed, unnecessary, trace, unimportant, unsatisfactory etc.

1.00 - 1.49   Strongly disagreed, very unnecessary, ill, very unimportant, very unsatisfactory etc.

3. Baseline data.

The baseline outcome from any subjects are the number of subjects and proportion. The result will be summarized as number and percentage and tabulated. The table of data summary for baseline measures for each subject category will not be presented here.

Comparison of Outcome.

The objectives of this study are to answer and test the hypothesis, the statistical strategies for comparison of outcome stated in hypothesis will be described first. The other comparison will be done on the independent variable and baseline data within each subject to show different subcategories of outcome.

1. Hypothesis testing.

There are two hypotheses which will be tested for different including hypothesis no. 2 and 5. The assumption of the parametric statistics is based on normal distribution, equal variance and sample (n). Since they are allowed for some robust, the assumption can not be vigorously violated (Klienbaum, Kupper, and Muller; 1988). In this study the sample in some groups are so small and are differed so much (inequal sample). So the nonparametric statistics will be used. However, in some instance, the parametric can be used. The statistical analysis used are showed in the table 7.6.

Another comparison between the professional competence of the new graduates (also 1989 graduates) rated by themself and their supervisors' will be done as overall graduates and as graduates of individual program. The paired t-test or the Wilcoxon signed-ranks test will be used according to the sample size. The p-value= 0.05

of significant level will be used.

Table 7.6 Outcome measure, data summary, type of compa-

rison and statistical strategy to test each

hypothesis.

HYPO-THESIS NO.	OUTCOME	DATA SUMMARY	TYPE OF COMPARISON	STATISTICAL STRATEGY
2(a)	Professional competence of new graduates by self-appraisal	Rank ordered	Three independent groups (three programs)	Kruskal-Wallis ANOVA (if necessary multiple
2(b)	Professional competence of new graduates by supervisors' opinion	Rank ordered	Three independent groups (three programs)	comparison by Mann-Whitney U test)
5(a)	Professional competence of all graduates by self-appraisal	Mean or Rank ordered	Two independent groups (1989 and new graduates)	Unpaired t-test or Mann-Whitney U
5(b)	Professional competence of all graduates by supervisors' opinion	same as 5(a)	same as 5(a)	same as 5(a)
5(c)	Professional competence of graduates of individual program by self-appraisal	same as 5(a)	same as 5(a)	same as 5(a)
5(d)	Professional competence of graduates of individual program by supervisors' opinion	same as 5(a)	same as 5(a)	same as 5(a)

2. **Comparison within group of subject.**

This is the analysis of comparison of

outcome in each group of subject as graduate, faculty etc.

2.1 <u>Graduates.</u> Comparison of baseline measures between the graduates from different school and between 1989 and new graduates (as overall and as individual program graduates). The comparison will be done only by tabulation and description of outcome.

2.2 <u>Supervisors.</u> Comparison of the professional competence of graduate (overall) rated by supervisors between different type of occupation and level of highest education acquired will be done by using Kruskal-Wallis ANOVA or Mann-Whitney U with a significant level of $p=0.05$, according to the numbers of groups. Multiple comparison will be done further if necessary.

<u>Test for Association (Regression)</u>

1. <u>Hypothesis testing.</u>

The 3rd and 4th hypothesis needed test for prediction of independent variables (educational factors) to dependent variables (graduates' professional competence). In this study, there are more than one independent variable to be considered, so the multiple regression analysis will be used. There are many types of multiple regression can be applicable: i) standard, ii) stepwise, iii) hierarchical. The stepwise method is used when the best correlational model or prediction

equation which include only the statistical significant independent variables is needed. The hierarchical method is different from the stepwise that; in the former method the researcher controls entry of variables based on logical or theoretical consideration, while in the stepwise the sample data controls order of entry based on statistical consideration (Suchart Prasith-rathsint, and Laddawan Rodmanee; 1985)

The objective of this study is to find the best equation of the relationships among variables, so the stepwise type will be used.

Usage of multiple regression should be considered on the following assumption; existence, independence, homoscedasticity, and Gaussian distribution (normality) (HEIL GAUSS mnemonic recommended by the author; Klienbaum, et al; 1988). The problem of small population size in some group in this study makes difficulty in holding the above assumption and in justification of using multiple regression.

Tabachnick and Fidell (1983) suggested that a minimum requirement was to have at least 4 to 5 times more cases than independent variables. But there is no firmly agreed on how many of cases or case-to-variable ratio be appropriate.

However the multiple regression analysis has a stability property called robustness. This provides merely stable reliability and accuracy even if the assumption of normality can not be reached. However, it should not apply when the normality assumption is badly violated (Klienbaum et al, 1988).

This study will analyze the prediction of educational factors and academic achievement to the new graduates'professional competence in each competence categories. So the only average score from all competence items in one category is concluded as professional competence score of each graduate in that area.

All predictors will not be included into analysis with each competence area. The reason is to decrease the independent variables which result in increasing the confidence of the conclusion, by prioritizing the logical and theoretical ones. The prediction of the clinical experience in school to the professional competence will be analysed separatedly by using stepwise multiple regression. The competence areas which will be included in analysis are; evaluative skills, treatment skills, and planning and treatment of common diseases.