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## Developing and Validating a Questionnaire to Measure Spirituality: A Psychometric Process

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### Abstract

The purpose of the paper is to describe the processes undertaken to evaluate the psychometric properties of a questionnaire developed to measure spirituality and examine the relationship between spirituality and coping in young adults with diabetes.

The specific validation processes used were: content and face validity, construct validity using factor analysis, reliability and internal consistency using test-retest reliability and Cronbach's alpha correlation coefficient.

The exploratory factor analysis revealed four factors: self-awareness, the importance of spiritual beliefs, spiritual practices, and spiritual needs. The items on the Spirituality Questionnaire (SQ) revealed factor loading  $\geq 0.5$ . Reliability processes indicated that the SQ is reliable: Cronbach's alpha 0.94 for the global SQ and between 0.80-0.91 for the four subscales. Test-retest statistic examination revealed stability of the responses at two time points 10 weeks apart.

The final questionnaire consists of 29 items and the psychometrics indicated that it is valid and reliable.

**Keywords:** Inner self, Spirituality, Reliability, Validity

### 1. Background

Spirituality is increasingly being recognised as an important aspect of the health and wellbeing of people with chronic health conditions. Spirituality gives meaning to people's lives and may be an important coping resource that enables people with chronic conditions to manage their condition (Cronbach & Shavelson 2004; Tse, Lloyd, Petchkovsky & Manaia 2005). In addition spirituality is central to finding meaning, comfort and inner peace, which helps people transcend their condition and incorporate it into their self-concept (transformation). However, several barriers prevent spirituality from being incorporated into health care. For example, there is no consensus definition of 'spirituality' (McSherry & Draper 1998). The difficulty in defining spirituality is partly due to the fact that it is complex, highly subjective, and difficult to measure (Coyle 2002).

Currently, most validated spirituality tools concentrate on religion or higher beings and may only apply to religious people or those whose spirituality encompasses religion (Tuck, McCain & Elswick 2001). While religion is an aspect of spirituality for many people, but it is not synonymous with spirituality. Rather spirituality involves humans' search for meaning in life while religion usually involves rituals and practices and a higher power or 'God' (Tanyi 2002).

The current paper reports the processes used to develop and validate a spirituality questionnaire that focuses on the concepts of inner-self, meaning in life and connectedness to be used by young people with type 1 diabetes, to test the hypothesis that there is a relationship between spirituality and coping in young adults with diabetes. For the purpose of the study spirituality was defined as a concept encompassing finding meaning in life, self-actualisation and connection with inner self and the universal whole.

## 2. Method

The methods used to validate the SQ included:

- Translational validity: content validity and face validity.
- Construct validity: factor analysis.
- Reliability tests: internal consistency (Cronbach's alpha) and test-retest.

A flow chart depicting the processes used to examine the validity of the SQ is presented in Figure 1.

The draft spirituality questionnaire (SQ) was derived from the relevant literature and four existing 'spirituality' tools:

- The Spirituality Scale: The internal consistency of subscales ranged from 0.59 to 0.97 (Delaney 2005).
- The Spiritual Meaning Scale (SMS): Cronbach's alphas of the subscales ranged from 0.60 to 0.62 (Mascaro, Rosen & Morey 2004).
- Daily Spiritual Experiences Scale: Cronbach's alpha correlation coefficient for the global scale was 0.90 (Underwood, Institute & Teresi 2002).
- A survey used in a national study in the Higher Education Research Institute by the University of California to explore students' search for meaning and purpose. The internal consistency of the subscales ranged between 0.75 and 0.97. All of these scales were valid but focused on religion or higher being as a measure of spirituality and did not fit the definition of spirituality developed for the current study. In addition, they may not be relevant to non-religious people.

The initial draft of the SQ contained 35 items in seven sections:

- Importance of spiritual beliefs.
- Self-awareness.
- Environmental awareness.
- Relationships.
- Spiritual needs.
- Spiritual experiences.
- Open-ended questions.

### 2.1 Translational validity

#### 2.1.1 Content validity

Content validity was undertaken to ascertain whether the content of the questionnaire was appropriate and relevant to the study purpose. Content validity indicates the content reflects a complete range of the attributes under study and is usually undertaken by seven or more experts (Pilot & Hunger 1999; DeVon et al. 2007). To estimate the content validity of the SQ, the researchers clearly defined the conceptual framework of spirituality by undertaking a thorough literature review and seeking expert opinion. Once the conceptual framework was established, eight purposely chosen experts in the areas of nursing, questionnaire design, and spirituality were asked to review the draft 35-item SQ to ensure it was consistent with the conceptual framework. Each reviewer independently rated the relevance of each item on the SQ to the conceptual framework using a 4-point Likert scale (1=not relevant, 2=somewhat relevant, 3=relevant, 4=very relevant). The Content Validity Index (CVI) was used to estimate the validity of the items (Lynn 1996).

#### 2.1.2 Face validity

Face validity indicates the questionnaire appears to be appropriate to the study purpose and content area. It is the easiest validation process to undertake but it is the weakest form of validity. It evaluates the appearance of the questionnaire in terms of feasibility, readability, consistency of style and formatting, and the clarity of the language used (Haladyna 1999; Trochim 2001; DeVon et al. 2007). Thus, face validity is a form of usability rather than reliability. To determine the face validity of the SQ, an evaluation form was developed to help respondents assess each question in terms of:

- 1) the clarity of the wording,
- 2) the likelihood the target audience would be able to answer the questions,
- 3) the layout and style.

Twenty five young adults with diabetes were randomly selected from two outpatient diabetes clinics and completed the face validity form on a Likert scale of 1-4, strongly disagree= 1, disagree= 2, agree= 3, and strongly agree= 4.

## 2.2 Construct validity

Construct validity refers to the degree to which the items on an instrument relate to the relevant theoretical construct (Kane 2001; DeVon et al. 2007). Construct validity is a quantitative value rather than a qualitative distinction between 'valid' and 'invalid'. It refers to the degree to which the intended independent variable (construct) relates to the proxy independent variable (indicator) (Hunter & Schmidt 1990). For example, in the SQ, self-awareness and meaning in life were used as proxy indicators of spirituality. When an indicator consists of multiple items, factor analysis is used to determine construct validity.

The sampling population for factor analysis was (n = 160) young adults from the general population in Melbourne. The sample was recruited using a snowball sampling technique.

### 2.2.1 Factor analysis

Factor Analysis is a statistical method commonly used during instrument development to cluster items into common factors, interpret each factor according to the items having a high loading on it, and summarise the items into a small number of factors (Bryman & Cramer 1999). Loading refers to the measure of association between an item and a factor (Bryman & Cramer 2005). A factor is a list of items that belong together. Related items define the part of the construct that can be grouped together. Unrelated items, those that do not belong together, do not define the construct and should be deleted (Munro 2005).

Exploratory Factor Analysis (EFA) is a particular factor analysis method used to examine the relationships among variables without determining a particular hypothetical model (Bryman & Cramer 2005). EFA helps researchers define the construct based on the theoretical framework, which indicates the direction of the measure (DeVon et al. 2007) and identifies the greatest variance in scores with the smallest number of factors (Delaney 2005; Munro 2005).

It is essential to have a sufficiently large sample to enable factor analysis to be undertaken reliably (Bryman & Cramer 2005). Although, the number of participants required undertaking factor analysis remains under debate, a minimum of five participants per variable is generally recommended (Munro 2005). However, to ensure an appropriate sample size was obtained for the current study to enable factor analysis to be undertaken two criteria were considered:

- 1) Kaiser-Meyer-Olkin (KMO) sampling adequacy
- 2) Factor loadings and the correlation between a variable and a factor (Hayes 2002).

Several types of extraction methods are used to undertake factor analysis. The two most common forms are Principal Component Analysis (PCA) and Principal Axis Factoring (PAF) (Bryman & Cramer 2005). In PCA, all the variance of a variable (total variance) is analysed, while PAF only analyses common variance (Bryman & Cramer 2005). Total variance consists of both specific and common variance. Common variance refers to the variance shared by the scores of subjects with the other variables, and specific variance describes the specific variation of a variable (Bryman & Cramer 2005). Therefore, PCA is assumed to be perfectly reliable and without error (Bryman & Cramer 2005) and used on the 32 items SQ.

According to Bryman and Cramer (2005, p 330) two main criteria used to determine how many factors should be retained:

- 1) The Kaiser criterion to select those factors that have an eigenvalue  $\geq 1$ . However, the general criterion of an eigenvalue  $\geq 1.00$  could misrepresent the most appropriate number of factors (Gorsuch 1983; Heppner, Lee, Wang & Park 2006).
- 2) A Scree Plot to depict the descending variances that account for the factors extracted in graph form. The factors that lie before the point at which eigenvalues begin to drop can be retained.

Varimax, the most commonly used orthogonal rotation was undertaken to rotate the factors to maximise the loading on each variable and minimise the loading on other factors (Field 2005; Bryman & Cramer 2005).

## 2.3 Reliability

Once the validity procedures were completed, the final version of the SQ was examined to assess its reliability. Reliability refers to the ability of a questionnaire to consistently measure an attribute and how well the items fit together, conceptually (Haladyna 1999; DeVon et al. 2007). Although reliability is necessary, is not sufficient to validate an instrument, because an instrument may be reliable but not valid (Beanland et al. 1999; Pilot & Hunger 1999, DeVon et al. 2007). Cronbach & Shavelson (2004) suggested researchers should consider the following issues when determining reliability:

- Standard error of the instrument, which is the most important reliability information to report.
- Independence of sampling.
- Heterogeneity of content.
- How the instrument is used.

Two estimators of reliability are commonly used: internal consistency reliability and test-retest reliability: both were used to examine the reliability of the SQ.

### 2.3.1 Internal Consistency Reliability

Internal consistency examines the inter-item correlations within an instrument and indicates how well the items fit together conceptually (Nunnally & Bernstein 1994; DeVon et al. 2007). In addition, a total score of all the items is computed to estimate the consistency of the whole questionnaire. Internal consistency is measured in two ways: Split-Half reliability and Cronbach's alpha correlation coefficient (Trochim 2001). In Split-Half reliability, all items that measure the same construct are divided into two sets and the correlation between the two sets is computed. Cronbach's alpha is equivalent to the average of the all possible split-half estimates and is the most frequently used reliability statistic to establish internal consistency reliability (Trochim 2001; DeVon et al. 2007).

Cronbach's alpha was computed to examine the internal consistency of the SQ. If an instrument contains two or more subscales, Cronbach's alpha should be computed for each subscale as well as the entire scale (Nunnally & Bernstein 1994; DeVon et al. 2007). Therefore, Cronbach's alpha was computed for each subscale.

### 2.3.2 Test-retest Reliability

Test-retest reliability is estimated by administering the same tool to the same sample on two different occasions on the assumption there will be no substantial change in the construct under study between the two sampling time points (Trochim 2001; DeVon et al. 2007). A high correlation between the scores at the two time points indicates the instrument is stable over time (Haladyna 1999; DeVon et al. 2007). The duration of time between the two tests is critical. The shorter the interval, the higher the correlation between the two tests, the longer the interval, the lower the correlation (Trochim 2001). However, very long test intervals can affect the results because of changes in participants or their environment (Linn & Gronlund 2000; DeVon et al. 2007). Currently, there is no definite evidence about the best time interval to allow between the test and the retest. Researchers need to consider factors such as the effects of time on health status such as deterioration or improvement in health and what the results will be used for, to make an appropriate decision about the time interval between tests (Concidine, Botti & Thomas 2005).

Test-Retest reliability of the SQ was undertaken by administering the questionnaire to 25 young adults with diabetes aged 18-28, randomly selected from a diabetes outpatient clinic of a teaching hospital in an inner city area. They completed the SQ on two different occasions; at baseline and eight weeks later. Because ordinal data were obtained from the questionnaire using a four point Likert scale rated from strongly disagree to strongly agree; and the scale was not continuous, non-parametric statistical tests were deemed to be more appropriate than Pearson Correlation Coefficient (Hilton 1996; Wittkowski 2003; Jakobsson 2004). Therefore, the analysis of responses between the test and the retest was conducted using Wilcoxon Non-parametric Statistical Test to determine whether there were any significant differences between the responses at each time point.

## 3. Results

### 3.1 Translational validity

#### 3.1.1 Content validity

According to the CVI index, a rating of three or four indicates the content is valid and consistent with the conceptual framework (Lynn 1996). For example, if five of eight content experts rate an item as relevant (3 or 4) the CVI would be  $5/8=0.62$ , which does not meet the 0.87 (7/8) level required, and indicates the item should be dropped (Devon et al. 2007).

Therefore, three items on the draft SQ were deemed to be invalid because they yielded CVIs of  $5/8=0.62$  to  $6/8=0.75$  and were removed from the questionnaire. Those items were:

- 'I feel a strong connection to all people', which reviewers considered it to be similar to another item 'I have a strong emotional connection with the people around me' (CVI =  $6/8=0.75$ )
- 'I respect all living creatures' (CVI= $5/8=0.62$ ).
- 'I accept others when they do things I think are wrong' (CVI= $6/8=0.75$ ).

All the remaining items were valid with CVIs ranging from 0.87 (7/8) to 1.00 (8/8) and were retained.

#### 3.1.2 Face validity

All respondents rated each parameter at three or four on a Likert scale of 1-4. Ninety five percent indicated they understood the questions and found them easy to answer, and 90% indicated the appearance and layout would be acceptable to the intended target audience.

### 3.2 Factor analysis

To ensure having an appropriate sample size to undertake the factor analysis the KMO sampling adequacy on the SQ was 0.9. The KMO statistic varies between 0 and 1. A value of 0 indicates that the sum of partial correlations is large in

comparison to the sum of correlations, which indicates diffusion in the pattern of correlation, and that factor analysis is inappropriate. A value close to one indicates factor analysis will yield distinct and reliable factors (Field 2005). Kaiser (1974) recommended accepting values  $\geq 0.5$  and described values between 0.5 and 0.7 as mediocre; 0.7 and 0.8 as good, 0.8 and 0.9 as great, and  $> 0.9$  as superb. Therefore, using Kaiser's scale, the sampling adequacy value of 0.9 for the SQ was superb. Likewise, Steven (2002) suggested that a factor is reliable if it has 10 or more variables with loadings of 0.4 and  $\geq 150$  participants. Given that the KMO of the first analysis of the draft SQ was 0.9 and all variables had loadings  $\geq 0.4$ , the sample size of 160 was considered to be adequate to enable factor analysis to be undertaken.

On the first run PCA, the total variance of the draft SQ factors was 66.14%; which means at least 50% of the variance could be explained by common factors and is considered to be reasonable (Field 2005). The communalities of the items on the SQ were  $> 0.5$ . When Kaiser's criterion was applied to the draft SQ, six factors had eigenvalues  $\geq 1.00$  in the first run PCA. A scree plot was compiled on the first PCA and indicated there were two to five factors. That is, the two tests suggested retaining a different number of factors. According to Steven (2002) and Field (2005), the scree plot and eigenvalues are accurate to determine how many factors should be retained when the sample is  $\geq 250$  and communalities (variance of the variables) are  $\geq 0.6$ , or when the questionnaire has more than 30 variables and communalities are  $\geq 0.7$ .

Therefore, among two to six factor solutions examined, a four factor solution with Varimax rotation was deemed to be the most statistically and conceptually appropriate to the SQ. To undertake the most appropriate interpretation, the loading values were carefully examined using Hair, Anderson, Tatham & Black's (1998) guideline for practical significance, which indicates a factor loading of  $\pm 0.3$  means the item is of minimal significance,  $\pm 0.4$  indicates it is more important, and  $\pm 0.5$  indicates the factor is significant.

On the basis of these tests, items were eliminated from the factor pattern matrix of the SQ when the factor loading was  $\leq \pm 0.5$ . The decision to eliminate such items was confirmed using Steven's (2002) Guideline of Statistical Significance for Interpreting Factor Loadings. Steven's Guideline is based on sample size and suggests that the statistically acceptable loading for 50 participants is 0.72, for 100 participants 0.51, and for 200-300 participants 0.29-0.38. The sample size used in the SQ validation process was 160: as a result, three items with a loading  $< 0.5$  were deleted. The remaining items with a loading  $\geq 0.5$  were accepted. One remaining item had a loading of 0.47, but was accepted because it was important to the relevant factor. The final PCA of the four-factor solution with 29 items accounted for 62.17% of the total variance. The factor loadings of the final PCA and their factorial weights are shown in Table 1.

### 3.3 Internal Consistency Reliability

Cronbach's alpha was computed for the revised SQ after construct validation was computed and was 0.94, which indicates a high correlation between the items and the questionnaire is consistently reliable. Opinions differ about the ideal alpha value. Some experts recommend the alpha should be at least 0.90 for instruments used in clinical settings (Nunnally & Bernstein 1994). Others suggest an alpha of 0.70 is acceptable for a new instrument (DeVellis 1991; DeVon et al. 2007). The alpha computed for each of the four subscales also exceeded the minimum value for a new tool: all subscales were  $\geq 0.70$ , see Table 1.

### 3.4 Test-retest

Twenty young adults with diabetes completed the SQ in test and retest in eight weeks and Wilcoxon Non-parametric Statistical Test showed no significant differences between the two tests, see Table 2.

## 4. The final Spirituality Questionnaire

The final Spirituality Questionnaire includes five subscales:

- 1) Subscale one: "Self-awareness", which accounted for 37.11% of the total variance. This factor includes ten items and reflects information about how people view themselves. The highest loading items were: "I am satisfied with who I am" (factor loading of 0.84), "I have a number of good qualities" (loading of 0.83) and "I have a positive attitude towards myself" (loading of 0.81).
- 2) Subscale 2: "The importance of spiritual beliefs in life" accounted for 13.03% of variance and includes four items with very high factor loadings ranging from 0.79 to 0.82. These items refer to people's opinions about the importance of spiritual beliefs to their life.
- 3) Subscale 3: "Spiritual practices" accounted for 6.316% of the variance and includes six items. It focuses on people's spiritual experiences. The item "I become involved in programs to care for the environment" had the highest loading, 0.761, followed by "reading spiritual books" with a loading of 0.673, and "meditation" (0.65).
- 4) Subscale 4: "spiritual needs" accounted for 5.71% of the variance and includes nine items. Four items explore the search for purpose and meaning in life: "I try to find answers to the mysteries of life", "I am searching for a purpose in life", "my life is a process of becoming", "I am developing a meaningful philosophy of life", with factor loadings of 0.50 to 0.74. One item in factor 4 specifically refers to inner peace and had a loading of 0.572.



5) Two open-ended questions ask about spirituality definition and the impact of spirituality on health and wellbeing.

The items were rated on a likert scale of 1-4 where one represents strongly disagree=1, disagree=2, agree=3, and strongly agree=4.

#### 4. Discussion

The integrity of any research depends on the accuracy of the measures used, especially when exploring complex phenomena such as spirituality. The results of the validity testing on the SQ indicated it is an accurate measure of spirituality. The processes used to validate the SQ were rigorous and appropriate. While face validity is the lowest form of validity, it was useful in that provided important information about the operationalisation of the questionnaire by young adults with diabetes. Content validity helped assess whether the content was relevant to the concept of spirituality defined for the study. Factor analysis assessed the theoretical construct of the SQ. The internal reliability (alpha) reached the recommended level for clinical use; and test-retest indicated stability of the responses to the items on the SQ over time. Therefore, the SQ could be used in routine diabetes education and management, for example, clinicians could use it confidently in usual clinical practice to incorporate spirituality into the care of their clients.

While spirituality has been recently recognised as an important aspect of health care, health care providers find it difficult to measure when they assess and care of their patients; largely because spirituality is highly subjective and often confused with religion. This paper reported the psychometric validation of the SQ to measure spirituality according to a specific definition and context: finding meaning in life, self-actualisation, and connections with the inner-self, other people and the universal whole; which are applicable to both religious and non-religious people.

However, to strengthen the rigor of the questionnaire for further research, the researchers recommend undertaking convergent and discriminant validity to examine the similarity and differences of the SQ with other spirituality tools. It is also recommended that structured equation modelling (SEM) and confirmatory factor analysis be undertaken in a larger sample with diverse healthy people as well as people with chronic illnesses to support the generalisability of the questionnaire.

#### 5. Conclusion

The SQ is a valid and reliable research tool which can be generalised to a wider population of young people with or without diabetes.

#### References

- Astin, A.W., Astin, H.S., Lindholm, J.A., Bryant, A.N., Szelenyi, K., Calderone, S. (2004). *The Spiritual Life of College Student, A National Study of College Students' Search for Meaning and Purpose*. Los Angeles: Higher Education Research Institute at University of California, Los Angeles.
- Beanland C., Schneider Z., LoBiondo-Wood G. and Haber, J. (1999). *Nursing Research: methods, critical appraisal and utilisation*. Sydney: Mosby.
- Bryman, A., Cramer, D. (1999). *Quantitative Data Analysis with SPSS Release 8 for Windows. A Guide for Social Scientists*. London: Routledge.
- Bryman, A., Cramer, D. (2005). *Quantitative Data Analysis with SPSS12 and 13. A Guide for Social Scientists*. East Sussex Routledge.
- Concidine, J., Botti, M., Thomas, S. (2005). Design, format, validity and reliability of multiple choice questions for use in nursing research and education. *Collegian*, 12 (1), 19-24.
- Coyle, J. (2002). Spirituality and health: toward a framework for exploring the relationship between spirituality and health. *Journal of Advanced Nursing*, 37 (6), 589-597.
- Cronbach, L.J., Shavelson, R.J. (2004). My Current Thoughts on Coefficient Alpha and Successor Procedures *Educational and Psychological Measurement*, 64 (3), 391-418.
- Delaney, C. (2005). The Spirituality Scale, Development and Psychometric Testing of a Holistic Instrument to Assess the Human Spiritual Dimension. *Journal of Holistic Nursing*, 23 (2), 145-167.
- DeVellis, R.F. (1991). *Scale Development: theory and applications* (Applied Social Research Methods Series, Vol. 26). Newbury Park: Sage.
- DeVon, H. A., Block, M. E., Moyle-Wright, P., Ernst, D. M., Hayden, S. J., Lazzara, D. J. et al. (2007). A psychometric Toolbox for testing Validity and Reliability. *Journal of Nursing scholarship*, 39 (2), 155-164.
- Field, A. P. (2005). *Discovering Statistics using SPSS*. London: Sage.
- Gorsuch, R. L. (1983). *Factor Analysis*. Hillsdale: NJ: Erlbaum.

- Hair, J.F.; Anderson, R.E.; Tatham, R. L.; Black, W.C. (1998). *Multivariate Data Analysis*, Fifth Edition, Prentice-Hall: Upper Saddle River.
- Haladyna, T. (1999). *Developing and Validating multiple-choice test items*. New Jersey: Lawrence Erlbaum.
- Hayes, S.C. (2002). Acceptance, Mindfulness, and Science. *American Psychological Association*, D12, 101-105.
- Heppner, P.P., Heppner, M. J., Lee, D., Wang, Y., Park, H., & W. L. (2006). Development and validation of a Collectivist Coping Style Inventory. *Journal of Counselling Psychology*, 53(1), 107-125.
- Hunter, J.E., Schmidt, F. L. (1990). *Methods of meta-analysis: Correcting errors and bias in research findings*. Newsbury Park: Sage Publications.
- Kaiser, H. (1974). An index of factorial simplicity *Psychometrika*, 39 (1), 31-36.
- Kane, M. (2001). Current concerns in validity theory. *Journal of Educational Measurement*, 38, 319-342.
- Linn, R., Gronlund, N. (2000). *Measurement and assessment in teaching*. New Jersey: Prentice Hall.
- Lynn, M.R. (1996). Determination and quantification of content validity. *Nursing Research*, 35, 382-385.
- Mascaro, N., Rosen, D.H., Morey, L.C. (2004). The development, construct validity, and clinical utility of the Spiritual Meaning Scale. *Personality and Individual Differences*, 37, 845-860.
- McSherry, W., Draper, P. (1998). The spiritual dimension: why the absence within nursing curricula. *Nurses Education Today*, 16, 38-43.
- Munro, B.H. (2005). *Statistical methods for health care research*. Philadelphia: Lippincott, Williams & Wilkins.
- Nunnally, J.C., Bernstein, I.H. (1994). *Psychometric theory*. New York: McGraw-Hill.
- Pilot, D., & Hunger, B. (1999). *Nursing research: principals and methods*. Philadelphia: Lippincott Williams & Wilkins.
- Stevens, J. (2002). *Applied Multivariate Statistics for the Social Sciences (4th Edition)*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Tanyi, R. A. (2002). Towards clarification of the meaning of spirituality. *Advanced Nursing*, 39 (5), 500-509.
- Trochim, W.M.K. (2001). *The Research Methods Knowledge Base*. Cincinnati: Atomic Dog.
- Tse, S. et al. (2005). Exploration of Australian and New Zealand indigenous people's spirituality and mental health. *Australian Occupational Therapy Journal*, 52 (3), 181-187.
- Tuck, I., Wallace, D., & Pullen, L. (2001). Spirituality and Spiritual Care Provided by Parish Nurses. *Western Journal of Nursing Research*, 23 (5), 441-453.
- Underwood, L.G., Institute, F., Teresi, J.A. (2002). The daily Spiritual Experience Scale: Development, theoretical description, Reliability, Exploratory factor analysis, and Preliminary Construct Validity Using Health-Related Data. *Annals of behavioural medicine*, 24 (1), 22-33.

Table 1. The results of the final four factor solution of the SQ according to the Principal Component Analysis with Varimax rotation and the internal consistency of each factor

Items	Factor 1	Factor 2	Factor 3	Factor 4
<i>Self-Awareness (<math>\alpha=0.91</math>)</i>		<i>Loadings</i>		
I am satisfied with who I am.	0.84			
I have good qualities.	0.83			
I have positive attitude towards myself.	0.81			
I am a worthy person.	0.80			
I am generally self-confident.	0.69			
My life is meaningful to me.	0.64			
I believe I am equal to other people.	0.62			
I am a compassionate person.	0.61			
I find meaning in difficult situations.	0.58			
I think about positive things.	0.55			
<i>Importance of spiritual beliefs in life (<math>\alpha=0.91</math>)</i>		<i>Loadings</i>		
My spirituality helps me define my goals.	0.82			
My spirituality helps me decide who I am.	0.82			
My spirituality is part of my whole approach to life.	0.81			
My spirituality is integrated into my life.	0.80			
<i>Spiritual practices (<math>\alpha=0.80</math>)</i>		<i>Loadings</i>		
I become involved in environmental programs.		0.77		
I read books about spirituality.		0.67		
I meditate to achieve inner peace.		0.65		
I try to live in harmony with nature.		0.57		
I try to find any opportunity to enhance spirituality.		0.55		
I use silence to get in touch with myself.		0.47		
<i>Spiritual needs (<math>\alpha=0.89</math>)</i>		<i>Loadings</i>		
I search for a purpose in life.			0.74	
I enjoy listening to music.			0.69	
I need to find answers to the life mysteries.			0.66	
Maintaining relationships is important to me.			0.64	
I need to attain inner peace.			0.57	
I seek beauty in my life.			0.55	
I need to have strong connections with people.			0.55	
My life is evolving.			0.55	
I need to develop a meaningful life.			0.50	

Table 2. Test-Retest results of the SQ using Wilcoxon's non-parametric test. As the table indicates, there were no significant differences in the P values at the level of 0.05 in the responses to the items between the two tests.

<b>Items</b>	<b>Asymp. Sig. (P value)</b>
I am satisfied with who I am.	0.157
I have good qualities.	0.480
I have positive attitude towards myself.	0.083
I am a worthy person.	0.705
I am generally self-confident.	0.655
My life is meaningful to me.	0.180
I believe I am equal to other people.	0.705
I am a compassionate person.	0.180
I find meaning in difficult situations.	0.157
I think about positive things.	1.000
My spirituality helps me define my goals.	0.414
My spirituality helps me decide who I am.	1.000
My spirituality is part of my whole approach to life.	0.317
My spirituality is integrated into my life.	0.180
I become involved in environmental programs.	0.234
I read books about spirituality.	0.655
I meditate to achieve inner peace.	0.655
I try to live in harmony with nature.	0.317
I try to find any opportunity to enhance spirituality.	0.096
I use silence to get in touch with myself.	0.157
I search for a purpose in life.	0.763
I enjoy listening to music.	0.157
I need to find answers to the life mysteries.	0.564
Maintaining relationships is important to me.	0.564
I need to attain inner peace.	0.564
I seek beauty in my life.	0.157
I need to have strong connections with people.	1.000
My life is evolving.	0.783
I need to develop a meaningful life.	0.180

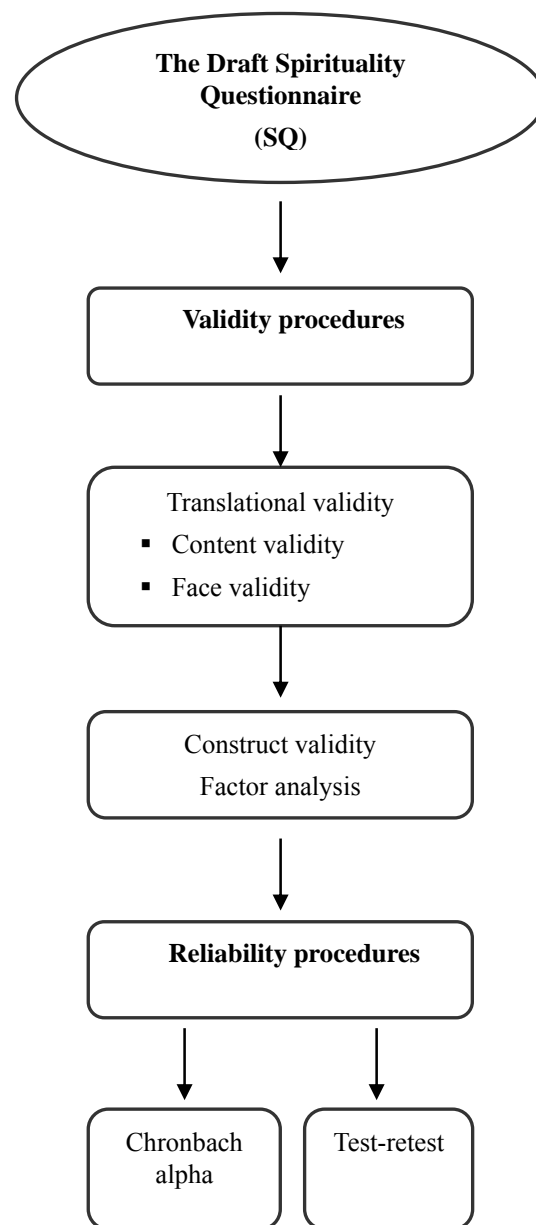


Figure 1. A flow chart depicting the process used to validate the Spirituality Questionnaire (SQ).



## Barriers to Utilisation of Sexual Health Services by Female Sex Workers in Nepal

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### Abstract

Sexual health services are relatively rare in Nepal. Female sex workers (FSWs) do not use health services as often as would be desirable. A study was conducted to identify the barriers of access to sexual health services by FSWs in Nepal. A mixed-method approach consisting of a 425 questionnaire-based survey and 15 in-depth interviews was conducted in 2007.

One fifth of the FSWs had never visited health facilities. FSWs turned to private clinics, followed by clinics belonging to non-governmental organisations and pharmacies for treatment. A combination of personal and service-related factors acted as critical barriers in accessing health services. Lack of confidentiality, discrimination and negative attitudes held by health care providers, poor communication between service providers and fear of exposure to the public as a sex worker were the major barriers in seeking sexual health services. These barriers should be taken into account while planning for sexual health services.

**Keywords:** Service usage, Prostitution, Stigma, Women, Nepal

### 1. Introduction

Nepal is one of the least developed countries. There are many marginalised people in both rural to urban areas and the country experiences considerable seasonal labour migration (Puri & Cleland 2006), mostly to India (MOH, 2002). Labour migrants seeking work in India constitute one of the “bridging populations” in the transmission of sexually transmitted infections (STI’s) and the human immunodeficiency virus (HIV) (Sharma 2003).

Generally, Nepal has a low HIV prevalence among its adult population (below 0.5%), but it is higher amongst Female Sex Workers (FSWs), whose national prevalence rate is 4% (The World Bank 2007). Around the capital, in Kathmandu valley, HIV prevalence in FSWs is reported to be 17% according to the National Centre for AIDS and STD Control (SCATS, 2001; NCASC, 2004).

The first case of HIV was reported in Nepal in 1988 and in two decades nearly 70,000 people have become infected (UNAID 2008). This increase is attributable to an active sex trade, an increasing number of injecting drug users and substantial male labour migration (FHI, 2004). Government records show that young people (aged 14–19) comprise one-sixth (13%) of all known HIV-infected cases. Teenage girls represent about one-third of all women living with HIV (NSASC/MOH 2004). It is estimated that (UNDP, 2007), in the absence of effective public health interventions in Nepal, AIDS could become the leading cause of death among the 15 – 49 age group over the coming decade.

FSWs have limited access to appropriate information and sexual and reproductive health services. They are a highly marginalised subgroup (Day & Ward 1997) and their social stigma is a barrier for the use of health care and treatment (Faugier et al. 1992; Romans 2001). Health services are generally not accessible to underprivileged women (Wolffers

1999), and sexual health service usage is generally low. Rather than using a victim-blaming approach, i.e. blaming FSWs for not using routine health services appropriately, we addressed questions such as: What is the nature of FSWs' health service contact? And what are their barriers to accessing health care? This information is needed if use of current services by FSWs is to be improved (USAID 2004).

Health policy makers should reinforce the need to overcome the substantial barriers to access that exist for the poorest (Sachs 2001). The focus of much health policy intervention has been on reducing structural or services provider barriers.

## **2. Methods**

### *2.1 Study sample and methods*

Our study focused on FSWs aged 15-45 years who had been involved in the sex trade; in exchanging sex for money or equivalent, for at least six months prior to the survey. We combined a mixed-methods approach in two phases; a questionnaire study followed by in-depth interviews. Phase I purposively selected FSWs from a range of castes, ethnic backgrounds, work settings and exposure levels for a semi-structured questionnaire survey. In the second phase a sub-sample of volunteers from the first phase were invited for a further in-depth interview.

FSWs constitute a hard-to-reach population (Vandepitte 2006). We employed a snowball-sampling technique based on a convenience sampling method (Kruse et al. 2003). The samples was purposively identified through frontline organizations and community key informants; from international NGOs and local key informants working on issues related to sex workers and who were familiar with sex workers' activities.

Mix-method or multi-method research holds the potential for rigorous and methodologically sound studies in public health (Tashakkori 1998). The two main approaches used in this study were: (a) a semi-structured questionnaire and (b) in-depth face-to-face interviews.

An instrument was developed through the modification of questionnaires used by the World Health Organization (Cleland et al. n.d.) and FHI/Nepal (WHO 2000). The questionnaire was firstly developed in English and then translated into Nepali language. As existing instruments were modified, conducting a pilot study was important (van Teijlingen & Hundley, 2005). The questionnaire was piloted in areas similar to the study area in other parts of Nepal to avoid contamination. Necessary modifications were made in consultation with Nepalese research experts. For the qualitative information, 15 life histories were conducted. This sample size reflects the point where the information collected reached theoretical saturation (Barcellos Fontanella & Turato 2005). Respondents who were working as sex workers in different settings with high-risk behaviours or experienced signs and symptoms of STIs in the survey were purposively selected. Efforts were made to select a diverse range of respondents in terms of age, marital status, ethnicity, and socioeconomic status to obtain a wide range of opinions and experiences.

A topic guideline was prepared to collect missing information from the quantitative survey. The guidelines included the main topics to be discussed, core questions, and some probing questions. This was firstly developed in English and translated into Nepali. Topics covered included knowledge and use of condoms, sexual activities and protective behaviour, potential partners, sexual harassment, characteristic of paying and non-paying partners, risk of sexual behaviour and reason for utilization and non-utilisation of sexual and reproductive health services. Interviewing is appropriate in situations where sensitive issues are addressed (Mason 2006). Conducting semi-structured interviews allowed the researcher to hold some element of control over the line of questioning (van Teijlingen & Forrest 2004: 171), whilst still leaving scope for respondents to cover issues not directly addressed in the interview schedule.

Eight interviewers (six female and two male) were trained to conduct the phase I interviews. All were university graduates with health, sociology and/or education degrees who were experienced in conducting research on sensitive topics, and were similar to the respondents in terms of culture and age. Interviews were conducted at a convenient location chosen by the respondent, usually in a public area due to fear of disclosure of their occupation. Questionnaire completion took between 45 minutes to two hours. The in-depth interviews completed by the first author lasted between two to five hours and several visits were made to complete one case history due to emotional expression and harassment of sex workers by the police.

### *2.2 Ethical considerations*

Ethical approval was obtained from the Nepal Health Research Council (ERB). Participants' full verbal and written informed consent was obtained (van Teijlingen & Cheyne 2004) using consent forms written in Nepali and expressed in simple terms. It described the objectives, nature of the participant's involvement, risks and benefits and confidentiality of data. Participants could participate immediately or defer the interview until a later date. It was also made clear that they could refuse to answer any question and terminate the interview at any time. Those respondents who requested additional information were referred to the nearest health institutions. Confidentiality of information was maintained by removing personal identifiers, names of hotels and massage centres where FSWs operate.

### 2.3 Data processing and analysis

All completed questionnaires were entered into a SPSS (version 15) database. Open-ended questions were coded separately. Data entry and validity checks were performed for all questionnaires. Qualitative data was analyzed using NVivo version 7 and by reading and re-reading the transcripts

## 3. Results

### 3.1 Characteristics of the FSWs

We surveyed 425 FSWs by using semi-structured questionnaire from three cities in Kathmandu Valley. Half of the respondents were street-based sex workers (50.3%), while the remainder (49.7%) worked within establishments such as cabins and restaurants, massage centre and hotels. In addition, we conducted 15 in-depth interviews with FSWs, four with street-based FSWs and 11 with establishment-based FSWs. Of the 15 interviewees, four were single. The age of the FSWs varied from 19 to 35 years. Four FSWs were illiterate, nine of them could simply read and write only, and two of them had studied for 10 years.

(Table 1)

### 3.2 Living arrangement

Nearly two third of the FSWs (62.6%) had been living in their current residence for two to five years. One out of ten FSWs had stayed in their current place for six to ten years, whilst one in 20 FSWs had lived there for less than a year. Table 2 shows that more than half of the FSWs lived with a partner or husband and whether or not they had any children:

(Table 2)

### 3.3 Sex work involvement

(Table 3)

### 3.4 Health service seeking behaviours and barriers

(Table 4)

#### 3.4.1 Stigma and discrimination

Powerlessness and poverty of FSWs were frequently reported as the reasons behind their low use of health services. The FSWs mentioned discrimination and stigma attached to commercial sex work. One 24-year-old FSW highlighted the double standards in Nepalese society: “many men enjoy our services but hate to us when they go out in the society.”

Almost all FSWs had experienced stigma and discrimination from family, from the community and at health facilities, an example of the latter included:

Doctors should not discriminate in our treatment because of our status as some prestigious clients also visit us for our services (*i.e. sex*) but they have high status in the society and nobody blames them. We have no good status and we are discriminated always (FSW 2, 19 years)

FSWs reported that stigma and discrimination were barriers that may prevent them from seeking treatment for STIs and HIV from the health institutions. Most FSWs reported that health service providers in private clinics as well as doctors in the government hospital ask personal questions, particularly about their work and sexual history. This was one de-motivating factor in the pursuit of services from health facilities.

The doctor asked me about my work, when and how I got the disease? When I told him this, he looked at me differently. (FSW 2, 19 years, single)

Similarly, another FSW had visited one of the better-known hospitals in Kathmandu for treatment did not like it:

They (the Health Care Providers) ask very personal questions about me, which I do not like to answer. I am afraid of being exposed as sex worker. (FSW 3, 24 years)

An older FSW who works in restaurant spoke in a similar way:

I work in restaurant where I serve many clients. I think at least one person is enough to recognise me as sex worker while I am waiting in the queue in XX hospital. (FSW 4, 39 years)

Another FSW described her fear of recognition:

Health workers judge and recognise us as a sex worker. They might tell this to my friends and neighbours; it will be bad for me and my future life. (FSW 9, 30 years, street-based)

FSWs also reported indifference by the doctors and other health services providers as a reason for the non-use of government health services. As one FSW remarked about staff:



They are not friendly to me. They even did not listen to my problems at first. When I told them my problems they started writing down the names of medicines without doing a proper examination. Once they knew nature of my work, they scolded me in front of other people. They act like God; no one talks about what they are doing. Are they (the doctors and nurses) God? (FSW 8, 25 years).

While one FSW specifically mentioned that Health Care workers try to charge more as they assume that FSWs have money:

We are not very comfortable with the health workers because they charge more money if they recognise us as sex workers (FSW 7, 42 years)

#### 3.4.2 Male doctors and feelings of embarrassment

Three participants felt that they could not consult with male staff about their sexual health problems. They preferred female doctors in the examination room. Some FSWs were uncomfortable with discussing their genital parts with male staff, for example:

I won't tell all my problems to male doctor as I am a sex worker and ....sore in private areas...I fear scolding by doctor, ...when I was visiting XX clinic with an ulcer in the vulva, I did not ask him for an examination and ...he did not ask me my problems either, ...if female doctor was available I could have shared more with her... (FSW 11, 30 years)

Another FSW commented that the examination of her genitalia by male doctors was a reason for not visiting the hospital:

A male doctor asked me to show my private organ (Vagina) but I could not show it to him. How could I do this in such a place? So I would not like to go there again. (FSW 4, 39 years).

#### 3.4.3 Harassment

Some FSWs recollected their experiences of sexual harassment by a male doctor:

The doctor asked me many questions and looked at me differently. He asked me to lie down on the examination table in a room. I did as he said. He caught my hand and pressed my body. I was scared and called my mum, who was waiting for me outside. Then I left the hospital without a check up. I do not want to go there again. (FSW 3, 34 years)

FSWs wanted harassment by police and others to stop and wished to change societal perceptions and attitudes towards sex workers. FSWs had divided opinions regarding the legalization of commercial sex. More than half of the FSWs thought that sex work needed to be legalised while the rest were in favour of working secretly, not because of their interest but because of the societal stigma attached to sex work in Nepal. One FSW, who was a member of an activist women organisation, expressed her view in this way:

Sex work should be legalised, this job is very demanding of a person. Is it only the women who are to blame? I am involved in this profession and am a member of a women's right group. So, I am fighting for other women; to improve their rights and economic conditions and to secure their own and their children's futures. It takes time but one day they will realize this and legalize sex work (FSW 12, 24 years).

#### 3.4.4 Exploitation

FSWs also criticized the private clinics as they charged them higher fees than they normally charge for services, as one person explained:

We are not very comfortable with the health workers because they charge more money if they recognise us as sex workers. (FSW 7, 42 years)

The younger and better-educated FSWs were in favour of the legalisation of sex work as this would result in greater provisions of Governmental security and increased economic opportunities.

One older FSW was mostly concerned about her social status. She highlighted that the agency from which FSW's would normally seek help from exploited them. She then stated that the Police also exploit them:

We need security from the Police. The Police do not provide security, but are stealing our money and threatening us. I had to give part of my earnings to the Police ... (FSW 7, 42 years)

Another FSW expressed this more generally:

We need security without any discrimination. We should be treated as human beings and treated like ordinary women in society (FSW 3, 24 years).

#### 3.4.5 Fear of recognition

It was common among FSWs to seek health care treatment from distant health facilities and unfamiliar providers because of fear of recognition and subsequent stigma, for example:

As we need to tell all our problems and nature of work to the doctor, they will certainly know us. In this situation consulting a Doctor in the nearby location is not an alternative for us. It is better to go far away so that no one, neither the Doctor nor the patients, have chance to see and recognise us again. (FSW 13, 22 years).

Several FSWs had used self-medication, because of the stigma associated within the sex work, for example, some went directly to the community pharmacist:

Getting treatment for our problems is very difficult. Many of us do not go for treatment, even if we are in need of it. We resort to going to the pharmacy to ask for medicines. Shopkeepers hand out medicine easily. (FSW 4, 39 years)

I am worried on how to tell him (doctor) these problems (STI) ? If he asks me about my work, what will I answer to him? How would I show him my face next time?' (FSW 15, 30 years)

#### 3.4.6 Lack of privacy and confidentiality

According to the FSWs there was a lack of trained staff for consultation on STI's and treatment of marginalised people like sex workers. As they reported, health care staff did not appear to be fully confident in dealing with FSWs and there was a shortage of drugs for the treatment of STIs in the hospitals and clinics. Similarly, the FSW also reported that blood testing facilities within the health institutions were lacking:

I went to a famous hospital for my health check up but doctor was in a hurry and behaved in an aggressive manner while taking my sexual health history. He asked to me to visit his private clinic for a blood test. So, how could I know whether he could take blood safely in his clinic? ...I am not sure either he has proper blood instrument in his clinic! (FSW 4, 39 years)

Another FSW described her feelings about lack of confidentiality on part of the Doctors as follows:

I don't like to tell them all my personal details ....and I don't trust that they (the staff and local people) maintain confidentiality...my neighbour asked me about my work after my visit to the health institution ...she knew about my work...she overheard while the Doctor was taking my history ...So I moved from that place.' (FSW 3, 24 years)

One of the FSW commented on hospital rules and regulation in following way:

In the hospital there are many people queuing up for the treatment. I fear that someone could recognise me easily. My client also could be in attendance.... (FSW 1, 28 years)

#### 3.5 FSW's satisfaction with health services and providers

Only three out of fifteen FSWs - one who had her consultation in a private clinic and two who visited hospital - were satisfied. The reason for perceived satisfaction of treatment at the private clinic was that the Doctor listened to the FSW's problem and called her for a follow up visit. But interestingly, the same FSW subsequently went to another clinic because she did not want to be recognised by the doctor. Another 30-year-old FSW who frequently suffered from STIs expressed satisfaction because she was cured from it. Few FSWs expressed neutral responses to the services they received during their last visit. One of the three FSWs was asked to attend for a follow-up visit, but the course of medicine she was prescribed was not explained to her. Another FSW was happy with the Doctor but did not feel comfortable sharing her problems and private history. Another FSW, who used to go for a routine HIV/STI test every trimester reported that she was given advice and a date for follow up visit. However, she was equally unhappy about informing the doctor about her personal history. She reported:

I can't say whether I am satisfied or not. I could not tell them my real condition. I said that I had suspicions about my husband having had sexual relationships with other women and as I result, I felt I had to undergo HIV test. I did not feel comfortable to let them know what work I do. (FSW 3, 24 years).

Many FSWs ultimately expressed their dissatisfaction of the health care services. One of the main reasons for this dissatisfaction that was mentioned was that Doctors and/or nurses, particularly from government hospitals, asked them personal questions relating to their sexual history. This is reflected in the following response of a FSW:

The doctor asks every detail of my work in a loud voice, just like if a deaf person was talking to me. In a threatening manner he told me to stop my work. He prescribed me some medicine in a sheet of paper but did not advise me about the dose or timing of the medicine. So, I decided that I would not go back to that hospital every again. (FSW 1, 28 years)

Other FSWs were not satisfied because of the long queue in the waiting room, aggressiveness of the Doctor, higher costs of treatment and fear of being stigmatised on the basis of their work.

One FSW criticised the lack of medication for HIV. She said:

My husband had a very expensive blood test. Even if it is diagnosed, they do not give out medicine. No one will care. So it's better not to have the test. (FSW 8, 30 years)

FSWs expressed dissatisfaction at the poor communication and judgemental behaviour of the service providers. They reported that they wanted the doctors to hear their problems in detail but were equally suspicious regarding whether or not they would maintain patient privacy and confidentiality. One FSW who had visited a government hospital said:

I had been to XX hospital for a check-up on my sore vulva. I had to queue for about three hours. Finally, I was taken to the examination room. The doctor asked about my problems and started to prescribe medicines before I had finished telling my history (problems). .... He did not examine my sore vulva, but just prescribed medicine for me to buy from elsewhere (FSW 3, 24 years).

FSWs who had visited a private clinic for medication did not like it, because of the higher cost for the services provided. They reported that they had to spend Nepalese Rs: 500-2000 (UK£5-20) for their check-up. One FSW commented:

The charge for their service (STIs check) is very high. I paid RS: 2000 to see the Doctor and to receive medication and a blood test. He asked me to visit him again after a week. How can I go there, as he will charge same amount for me again? I am sure that I will not go there again. (FSW 10, 26 years)

#### 4. Discussion

Sex work means high vulnerability due to FSWs' low social status and self-esteem, lack of education and skills, poverty, family responsibility, poor health, negative societal attitudes, illegal nature and legal restrictions (Cohen et al. 2000; Wong et al. 2003). This vulnerability may result in difficulties accessing health services and treatments, a lack of safe sex practices, increased abortion rates, and low negotiation power in condom use (Mardh 1999; UNAID Geneva 2002). More specifically, in Nepal, one study has documented FSWs' low access to STI services (FPAN 2006, UNAIDS/WHO 2006), and generally women with STIs are low users of health services (Tandukar, 2003). Previous studies of FSWs were largely quantitative and no study has adopted a mixed-method approach. This study offers personal accounts from 425 FSWs and case histories of 15 FSWs from diverse age groups, education, sex work involvement, work settings and living arrangements. Women who participated in the first phase and who were willing to participate in in-depth interviews, were later re-interviewed with a focus on specific questions and topics that were not covered in the questionnaire. Because of this methodology the results provide an understanding of how FSWs see, interpret and respond to health services, and what factors influence their decisions to choose sexual health services

Our findings suggest two broad categories of factors that influence FSWs' access and use of sexual health services. These factors, internal and external influences, seem in consonance with a previous classificatory system. The internal factors are individual problems and experiences while the external factors are related to more structural influences (Shannon et al. 2008).

Rushing et al. (2005) identified several internal barriers to service use including FSWs' poor hygiene, mental instability and fear of public exposure leading to damage of social status, shame and embarrassment. This study found similar barriers. It also found that age, education level, duration of exposure to commercial sex work, feelings of insecurity due to fears of identification, low living status and livelihood problems are internal factors (see also Ensor & Cooper 2004), as were the ability to pay for health services. By contrast, the level of self-confidence and empowerment in younger and more educated FSWs was reflected in their negotiations with their clients and in their pursuit of sexual health services. Nevertheless, as sex work is still an illegal act, fear of recognition by the police and consequently possible harassment and/or bribery was a big concern for FSWs.

Our study also confirms certain health service related or structural barriers (Kurtz et al. 2005), including: inappropriate clinic or hospital opening times, perceived low quality of the service providers, poor communication between the client and the providers; judgemental and disrespectful attitudes of the service providers and inadequate training in sexual health provision. Most Nepalese FSWs also felt a lack of privacy and confidentiality in the government hospital because of the crowd of patients and the behaviour of the health care workers. In their opinion it made them feel further stigmatised (Nepal ICDP 1998). This attitude was also found in Cape Town, Africa (Simbayi et al. 2007). Lengthy waiting times and the interpersonal behaviour of the service providers, including sexual harassment, judgemental attitudes and poor communication, were also cited as constraints to seeking health care services. Rushing et al. (2005) also identified long distance and higher travel cost, behaviours of the service providers, lack of privacy and confidentiality, consultation with multiple and substandard service providers and difficulties in accessing and negotiating the health care system as external or structural barriers. Our study confirms Rushing et al's findings.

Previous studies were undertaken examining young people's views concluded similar findings regarding sexual health services (Mackay, 2006; Langille & Rigby 2006; McNulty et al. 2004; Nwokolo et al. 2002 and Reid et al. 2005). Hospital rules often result in women having to queue for long periods of time, and having to disclose personal information and disease history to the doctor whilst undergoing a check-up in a place without privacy. The FSWs perceived that sexual health services in the government hospital were cheaper, but the opening hours were less appropriate. Their rating of the quality of Doctors was higher in the government hospital but they had reservations over

the privacy and confidentiality issues. Moreover, they reported that the available services were not comprehensive to them.

Some FSWs reported harassment by Doctors during check-ups. Lack of gender compatibility between the service providers and the FSWs appeared as the next service-related barrier as most of them wanted to be examined by female doctors. They felt uncomfortable referring to their private parts with male health care staff.

The private clinics and hospitals were criticised for charging higher fees, even though the doctors and nurses were perceived as being poorly trained and less experienced, a finding similar to that found in Abidjan (Vuylsteke 2004).

Satisfaction levels towards the sexual health services were mixed. The majority were dissatisfied with the poor and/or low levels of communication with the service providers, the exhaustive history taking through questions perceived to be judgemental and too personal, especially in government hospitals. Expensive medical fees, long waiting hours and inappropriate opening hours also contributed to levels of dissatisfaction. Good quality medical advice (where staff avoided asking too many personal questions) in the private clinic and clear communication regarding follow-up visits appeared to increase FSW's satisfaction levels.

## 5. Conclusion

Several conclusions could be drawn from our study in view of current health service provision for issues pertaining to STIs and HIV/AIDS among FSWs in Nepal. Information dissemination and behaviour change interventions for FSWs should focus on strengthening knowledge of STIs. To promote health-seeking behaviour, mobilizing the resources available with the involvement of establishment owners, using peer-referral approaches could greatly increase these women's utilization of health care services.

Interventions that focus on FSWs appear to be either focused on awareness rising or full prioritisation of generalised health service delivery. Therefore a two-pronged approach comprising education and service activities focusing on strengthening the health sector's STI diagnosis and treatment capabilities for both FSWs and their clients should expedite together.

FSWs are more willing to communicate with and seek health care provision from physicians/health workers who assure privacy and confidentiality. Further investigation is needed to identify a confidentiality assurance statement that explains the legal and ethical limitations of confidentiality without decreasing FSWs' likelihood of seeking future health care for routine and non-reportable sensitive health concerns. It is high time to address common discriminatory attitudes among health workers especially towards FSWs. So, training for service providers in all types of health care institutions in different levels of health care facilities need to be provided in order to promote non-judgmental specific sexual health services and appropriate counselling skills.

Integrated health services should be made available within the entire health care system as FSWs seem reluctant to use health service follow-up care provisions due to fear of being labelled as sex workers.

It is important to link the livelihood of FSW's with their empowerment, including education and improvement of their social status. It is imperative to revisit the income generating programmes implemented by the governmental and non-governmental sectors. Also, it is equally important to collaborate with the private sectors for increasing the input for quality and access to the STI and other health care services for FSWs. Health service provision for FSWs should be viewed in relation to broader socio-political perspectives rather than perceived as a mere problem pertaining to the delivery of sexual health services. Provision of a quality service that ensures the rights of FSWs should be prioritised.

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## References

- Agency for International Development. (USAID 2004). Nepal's Country Profile HIV AIDS Kathmandu.
- Barcellos Fontanella, B.J. & Turato E.R. (2005). Spontaneous harm reduction: A barrier for substance-dependent individuals seeking treatment? *Rev Bras Psiquiatria*, 27: 272-77.
- Cleland, J. Ingham, R. Stone, N.( n.d.). Asking young people about sexual and reproductive behaviours UNDP/UNFPA/WHO/World Bank special programme of research development and research training in human reproduction. Online Available: [http://www.who.int/reproductive-health/adolescent/docs/questionnaire\\_intro.pdf](http://www.who.int/reproductive-health/adolescent/docs/questionnaire_intro.pdf)

- Cohen, M. Deamnt, C.Barken, S. Richardson, M. Young, S.Holman, S. Anastos, K. Cohen, J and Melnick, S. (2000). Domestic violence and childhood sexual abuse in HIV-infected women and women at risk for HIV. *Am J Public Health* 90: 560-65.
- Day, S. & Ward, H. (1997). Sex workers and the control of sexually transmitted disease. *Genitourinary Med* 73:161-68.
- Ensor, T. & Cooper, S. (2004). Overcoming barriers to health service access: influencing the demand side. *Health Pol Planning* 192: 69-79.
- Family Health International (2001). Nepal Programme Overview, FHI, Kathmandu, Nepal
- Faugier, J. Hayes, C. Butterworth, C. (1992). Drug-using prostitutes, their health care needs, and their clients. Manchester: University of Manchester
- Hopkin, A. Gabby, J. Neuberger, J. (1994). Role of users of health care in achieving a quality service. *Qual Health Care* 3: 203-9.
- Kruse, N. Behets, FM.T.F. Vaovola, G. et al. (2003). Participatory mapping of sex trade and enumeration of sex workers using capture-recapture methodology in Diego-Suarez, Madagascar. *Sex Transm Dis*, 30:664-70.
- Kurtz, SP. Surratt, HL. Kiley, MC. Inciardi, JA. (2005). Barriers to Health and Social Services for Street-Based Sex Workers. *J Health Care Poor Underserved*, 16: 345-61.
- Langille, DB. & Rigby, JA. (2006). Factors associated with PAP testing in adolescents in northern Nova Scotia. *Can J Public Health* 97: 183-86.
- Mardh, P.A., Shoubnikova, M., Champlinkas, S., Unzeitig, V. (1999). Health care of female sex workers. *Eur J Contraceptive Report Health Care* 4: 165-80.
- Mason, J. (2006). Mixing methods in a qualitatively driven way. *Qualitative Res* 6: 9-25.
- McKay, A. (2006). Chlamydia screening programs: a review of the literature. Part 1: Issues in the promotion of Chlamydia testing of youth by primary care physicians. *Can J Human Sexuality* 15: 1-15. .
- McNulty, C.A., Freeman, E., Bowen, J., Shefras J, Fenton KA (2004). Barriers to opportunistic chlamydia testing in primary care. *Brit J Gen Pract* 54: 508-14.
- Ministry of Population and Environment Nepal Country Report (2002). Presented at the Fifth Asian Pacific Population Conference in Bangkok Kathmandu, Nepal.
- National Centre for AIDS and STD Control (2004). HIV counselling in Nepal. Available on [www.unaids.org.np/HIV/AIDS in Nepal](http://www.unaids.org.np/HIV/AIDS%20in%20Nepal).
- Nepal: ICPD spurs changes in policies (1998) *CIRDAP development digest* 74: 33.
- Nwokolo, N. MC., Owan, A., Hennebry, G., Chislett L., Mandalia, S. (2002). Young people's views on provision of sexual health services. *Sex Transm Infect* 78: 342-45.
- Paudel, K.C., Okumura, J. & Sherchand, J.B. Jimba, M., Murakami, I., Wakai, S. (2003). Mumbai disease in far western Nepal HIV infection and syphilis among male migrant-returnees and non-migrants. *Trop Med Int Health* 8: 933-39.
- Puri, M. & Cleland, J. (2006). Sexual behaviour and perceived risk of HIV/AIDS among young migrant factory workers in Nepal. *J Adolescent Health* 38: 237-46.
- Reid, R. J, Scholes, D., Grothaus, L., Truelove, Y., Fishman, P., McClure, J. Grafton, J., Thompson R.S. (2005). Is provider continuity associated with chlamydia screening for adolescent and young adult women? *Prev Med* 41: 865-72.
- Romans, S.E., Potter, K., Martin, J. Horbison, P. (2001). The mental and physical health of female sex workers: A comparative study. *Aus New Zealand J Psychiatry* 35: 75-80.
- Rushing, R., Watts, C., Rushing, S. (2005). Seeking serenity living with HIV/AIDS in rural Western Canada. *J Midwifery Women's Health* 50: 41-44.
- Sachs, J. (2001). Macroeconomics and health: Investing in health for economic development. WHO report of the commission on macroeconomics and health.
- STD/AIDS counselling and training services (SCATS) (2001). female sex workers sero- prevalence study in Kathmandu, Nepal.
- Shannon, K., Rusch, M., Shoveller, J., Alexson, D., Gibson, K., Tyndall, M.W., (2008). Mapping violence and policing as an environmental-structural barrier to health service and syringe availability among substance-using women in street-level sex work. *Int J Drug Pol* 19:140-47.
- Sharma, N. (2002). HIV/AIDS awareness for migrant communities in the rural hills of Nepal. Amsterdam, Netherlands.

- Simbayi, L.C., Kalichman, S., Strebel, A., Cloete, A., Henda, N., Mqueketo, A. (2007). Internalized Stigma and Discrimination and depression among men and women living with HIV/AIDS in Cape Town. *S Afr J Soc Sci Med* 64: 1823-31.
- Tandukar, K. & Poudel, K. (2003). Factors influencing women's health services for sexually transmitted infections in eastern Nepal. [Online] Available: [www.aushealthreview.com.au/publications/articles/issues/ahr/\\_26\\_1](http://www.aushealthreview.com.au/publications/articles/issues/ahr/_26_1)
- Tashakkori, A. (1998). Mixed methodology: combining qualitative and quantitative approaches, *Sage, Thousand Oaks, Calif.*
- Teijlingen, van E. & Cheyne, H.L. (2004). Ethics in research. *RCM Midwives J* 7: 208-10.
- Teijlingen, van E., & Forrest, K. (2004). Range of qualitative research methods in family planning & reproductive health care. *J Fam Plann Reprod Health Care* 30: 171-73.
- The World Bank, HIV/AIDS South Asia, (2007) <http://www.web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/EX> Accessed: 05/06/2007...
- UNAIDS, (2008) HIV/AIDS estimate [Homepage of unaids], [Online] Available: [www.unaids.org/en/CountryResponses/Countries/nepal.asp](http://www.unaids.org/en/CountryResponses/Countries/nepal.asp) 2008/11/12
- UNAID, (2008) HIV/AIDS estimate [Online] available: <http://www.unaids.org/en/CountryResponses/Countries/nepal.asp>. Accessed: 12/11/2008
- UNDP, (2007) Nepal at a glance, <http://www.youndis.org/asia> transmitted disease, *Genitourinary Med* 73: 161-68.
- UNDP, (2007). Management Support to the National Programme on HIV/AIDS – MSNP [Online] Available: <http://www.undp.org.np/hiv/projects/msnp/index.php?ProgramID=41>. Accessed 10/11/08
- USAID Washington DC, Cohen, M., Deamant, C., Barken, S. et al. (2000). Domestic violence and childhood sexual abuse in HIV-infected women and women at risk for HIV. *Am J Public Health* 90: 560-65.
- Vandepitte, J., Lyaera, R., Dallabetta, G., Crabbé, F., Alary, M., Buvé, A., (2006). Estimates of the number of female sex workers in different regions of the world. *Sex Transm Infect* 82 (Supplement 3):iii18-iii25; doi:10.1136/sti.
- Vuylsteke, B., Traore, M., Mah-Bi G, Konan, Y., Ghy, P., Diarra, J., Laga, M., (2004). Quality of sexually transmitted infections services for female sex workers in Abidjan Côte d'Ivoire. *Trop Med Int Health* 9: 638-43.
- Wolffers, I. (1999). Appropriate health services for sex workers. *Research for Sex Work* 2: 1-3 [Online] Available: <http://www.nswp.org/pdf/R4SW-02.PDF> Accessed 7-11-08.
- Wong, M.L., Lubek, I. Dy. BC., Pen, S., Chhit, M. (2003). Social and behavioural factors associated with condom use among direct sex workers in Siem Reap. Cambodia. *Sex Transm Infect* 79: 163-65.

Table 1. Characteristics of FSWs who completed semi-structured questionnaire

<b>Age group (Year)</b>	<b>Number*</b>	<b>Percentage</b>
• 15-19	43	10.1
• 20-24	145	34.1
• 25-29	124	29.2
• 30-34	60	14.1
• 35 and over	53	12.5
<b>Year of education completed</b>	<b>Number</b>	<b>Percentage</b>
• None	275	64.7
• One or less than one year	35	8.2
• 2-5 years	41	9.6
• 6-10 years	63	14.8
• More than ten years	11	2.6
Total	425	100%

One in ten FSWs was adolescents ( $\leq 19$  years), while about two-thirds were aged between 20 and 29. Just one in eight was older than 35. The median age of FSWs was 26 years. The majority was between 22 to 30, and had married aged 15 to 17 years. While those interviewed in-depth, their ages varied from 19 to 39 years; seven were married, four single and four separated.

Nearly two thirds of the FSWs were illiterate (64.7 %), 14.8% had completed six to ten years of education and only 2.6% more than 10 years.

Table 2. Living arrangements of the FSWs

<b>Currently living with</b>	<b>Number</b>	<b>Percentage</b>
• Husband/partner without children	159	37.4
• Boyfriend with children	54	12.7
• Family	53	12.5
• Friends	116	27.3
• Alone	32	7.5
• Children	7	1.6
• Pimps	2	.5
• No response	2	.5
Total	425	100.0

Above table 2 shows more than half of the FSWs lived with a partner or husband either with or without children. More than one quarter of the FSWs lived with a partner, who also had a co-wife or girlfriend. More than two-thirds (68.7%) of the interviewed FSWs had dependants currently living with them.

Table 3. Duration of exchanging sex by age

<b>Duration exchanging sex for money or other things</b>	<b>≤ 19 yrs N=43</b>	<b>20-24 N=145</b>	<b>25-29 N=124</b>	<b>30+ yrs N=113</b>	<b>Total N=425</b>
• Less than a year	-	3.4	-	-	1.2
• 1-3 years	72.1	61.4	40.3	32.7	48.7
• 4-5 years	18.6	24.8	33.1	26.5	27.1
• 6-10 years	9.3	9.0	25.8	32.7	20.2
• More than 10 years	-	1.4	0.8	8.0	2.8
Total	100.0	100.0	100.0	100.0	100.0

About three-quarters of the FSWs had been involved in sex work for one to five years. Nearly one-half were doing sex work for one to three years.

The proportion of FSWs who had been doing sex work for a longer time gradually declined as the age gets higher and very few (<3%) reported doing sex work for more than 10 years. Most FSWs were in their 20s and the proportion still active in sex work gradually starts to decline age 30

Table 4. Health service consultations for STI symptoms (N=282)

<b>Treatment places</b>	<b>Number*</b>	<b>Percentage</b>
• Private clinic	188	66.6
• NGO's clinic target visiting FSWs	160	56.7
• Pharmacy	66	23.4
• Government health facility	47	16.6
• Did not take any medicine	21	7.4
• Friends or relatives	17	6.0
• Taken home-based treatment	13	4.6
• Traditional healer	7	2.4

\* Percentage total exceeds 100 due to multiple responses

Table 4 shows the health service outlets visited by the FSWs for the treatment when they thought they had STI symptoms. On the whole, 282 out of 425 FSWs (66.3%) had visited sexual health clinic. Out of them, two-third of the FSWs consulted private clinics followed by NGO clinics (56.7%) and pharmacies (23.4). A much smaller proportion of FSWs (16.6%) had turned to government facilities when they experienced STIs systems.





## Clinical Study on *Dahuang Lingxian* Decoction against Postoperative Recurrence of Cholelithiasis

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### Abstract

**Objective:** To observe the clinical effect of *Dahuang Lingxian* Decoction in preventing postoperative recurrence of cholelithiasis. **Methods:** 105 patients of cholelithiasis were randomly divided into 3 groups, receiving clinical treatment and 12 months observation. Respectively, 36 cases in the group of *Dahuang Lingxian* Decoction were treated with modified *Dahuang Lingxian* Decoction. 33 cases in blank group did not take any medicine of relieving gallbladder and discharging stone except the routine therapy in preoperational period; 36 cases in *Xiaoyan Lidan* group administered tablets of *Xiaoyan Lidan*. **Results:** After 3 treatment courses, it showed a total effective rate of 97.22% in *Dahuang Lingxian* Decoction group, 81.8% in blank group, and 83.3% in *Xiaoyan Lidan* group. Analyzed by statistics, the curative effects between 3 groups had obvious differences ( $P < 0.05$ ), and *Dahuang Lingxian* Decoction group was significantly superior to blank group and *Xiaoyan Lidan* group ( $P < 0.05$ ). **Conclusions:** *Dahuang Lingxian* Decoction had preferable efficacy on Cholelithiasis and it is worthy of further promotion in clinical application.

**Keywords:** Dahuang lingxian decoction, Postoperative recurrence of cholelithiasis, Clinical research

Cholelithiasis is one of the common and frequently-occurring surgical diseases of bile duct (Huang, Zhiqiang, 1998). Treatment of cholelithiasis is very thorny and postoperative recurrence is baffling question in surgical treatment. Reducing recurrence has been always an important project of clinical research.

Having the functions of smoothing liver and relieving gallbladder and discharging stone, the decoction is an effective prescription developed from experiences. Through previous clinical researches and animal experiment, it indicated that it could significantly reduce postoperative recurrence and residual stone rate of cholelithiasis and prevent from suffering pigment stone. In order to study it further, we selected cholelithiasis patients as the research objects and administrate red them modified decoction after surgery. The decoction was properly adjusted according to patients' TCM differentiation.

Then we observed the postoperative recurrent rate. The study is summarized as follow.

## 1. Clinical Data

### 1.1 General Information

From December 2006 to November 2007, the research group formed from hepatobiliary departments of 3 hospitals of third grade and A level selected 105 cholelithiasis patients that all met the diagnostic criteria. They were randomly divided into 3 groups. *Dahuang Lingxian* decoction group (taken modified decoction according to TCM differentiation) had 36 cases, including 15 males and 21 females of between 65 and 31 years old. The average age was 44.2. The blank control group (accepted routine therapy in preoperational period but not to take any medicine of relieving gallbladder and discharge gallstone) had 33 cases, including 18 males and 15 females of between 67 and 31 years old. The average age was 43.2. The *Xiaoyan Lidan* group (taken tablet of *Xiaoyan Lidan*) had 36 cases, including 16 males and 20 females of between 65 and 32 years old. The average age was 43.8. Analyzed by statistics, the data had no obvious difference between 3 groups ( $P>0.05$ )

In the 105 cases, there were 27 patients of choledocholithiasis, 26 cases of hepatolithiasis, 31 patients of calculus of intra-extra hepatic duct and 21 patients of multiple calculi in different parts. They were all diagnosed on the history, symptoms, physical signs, biochemical tests, type-B ultrasound or CT examination, and finally proved through operation.

### 1.2 Criteria for Patients Selection

Inclusive Criteria: cholelithiasis patients who already had operation of cholecystectomy, choledocholithotomy, or exploratory of bile duct, who were set the T-tube of drainage so that we could observe, and who were between 31 and 67 years old without severe complications and agreed to accept the decoction and clinical observation.

Exclusive Criteria: a. unqualified cases to the inclusive criteria; b. difficulty in evaluating safety and excluding influential factors due to inadequacy of clinical information; c. incompleteness of treatment course because of unsatisfactory effect and side effects; d. application or supplement of the other related medication or therapy because of society factors.

### 1.3 Project Design

Inter-comparison of groups and principal of complete random were adopted in research. Patients were randomly divided into *Dahuang Lingxian* group (testing group), blank control group and *Xiaoyan Lidan* group. The testing group took herbs of *Dahuang Lingxian* Decoction. Ingredients of the decoction: *fresh Dahuang* 12g, *Weilingxian* 30g, *Mangxiao* 15g, *Jinqiancao* 30g, *Zhike* 12g, *Jineijin* 6g (pulverizing and infusing separately), *Zelan* 10g, *Caihu* 12g, *Yujin* 12g, *Cishi* 15g, *Huangqi* 12g, *Gancao* 5g. Usage: boiled in water, twice per day, and 200ml each time. Add *Chuanlianzi* 12g and *Chuanxiong* 10g for syndrome of liver qi stagnation, *Yinchen* 15g and *Zhizi* 10g for syndrome of damp heat, and *Goujizi* 15g, *Beishashen* 15g and *Shihu* 15g for syndrome of deficiency of liver yin. Prune *Mangxiao* and *Caihu*, and reduce the dosage of *Dahuang* to 6g or change to dried preparation so as not to eliminate too much. 3 months treatment was a course and 3 courses regarded as a completed treatment. Patients in control group took tablet of *Xiaoyan Lidan* (produced by Guangzhou Baiyunshan Enterprise Group Co. Ltd Grant Number: ZZ-4007 approval of Cantonese Health and Pharmacy (1996) No.132068). Usage: 3 times per day, 6 tablets per time, and 3 months treatment was a course and 3 courses regarded as a completed treatment.

### 1.4 Statistical Approach

PEMS3.1 statistics software was adopted to analyze serial samples, to adopt T test to compare between groups, and to use the type- $\chi^2$  to compare the groups' rate. Result of  $P<0.05$  means having statistical senses.

## 2. Criterion of therapeutic Effect and Result

The standard was made by referring to the *Chinese Medicine Standard for Diagnose and Efficacy of Clinical Disease and Syndrome*. (Wang, Jingjing, 1993) Curative: clinical symptoms and signs were eliminated and no residual stone was found through ultrasound and CT examination; Marked Effective: clinical symptoms and signs were relieved mostly and a small amount of residual stone was found through ultrasound and CT examination; Effective: clinical symptoms and signs were partly eased, but a big amount of residual stone was found through ultrasound and CT examination; Ineffective: there were no improvement in clinical symptoms, signs and quantity of stone after treatment. Summary Results of Therapeutic Effect of the 3 groups (Table 1).

After 3 treatment courses, there were significant differences between the 3 groups ( $p<0.05$ ). It showed effective rate of 97.22% in *Dahuang Lingxian* group, of 81.8% in blank group, of 83.3% in *Xiaoyan Lidan* group. Obviously, *Dahuang Lingxian* group had superiority over blank group and *Xiaoyan Lidan* group.

No severe complications occurred in all 105 cases after surgery. Drainage through T tube was fluent and clear. The T tube was removed away from 15 to 17 days, and 17 days on average. Meanwhile, cut healed well. As surgery succeeded

in a rate of 100%, there were no differences between the 3 groups ( $P > 0.05$ ). Before removing the T tube, contrast examination along it was carried out after 2~3 weeks of surgery. Ultrasound reexamination was done after 3 months. Results showed in Table. 2

The results suggested that effectiveness of *Dahuang Lingxian* group was superior to blank group and *Xiaoyan Lidan* group and recurrence rate and residual stone rate was lower than the later 2 groups after 3 months of surgery. It also indicated that the decoction might enhance the curative effect of operation of cholelithiasis and reduces the possibility of residual stone and recurrence. Not only might the decoction help patient escape from repetitious surgery, but also it might resolve to some extent this big issue of surgery.

### 3. Discussions

As cholelithiasis has a long disease process without any apparent symptoms at the early stage, sufferer would not come to hospital until clinical manifestations presented, such as abdominal pain, cholecystalgia, fever, jaundice, hyperleukocytosis, hepatic dysfunction, etc. Although there's a decline incidence of cholelithiasis in recent years, it still accounts for 16.1% of these kind conditions.<sup>[4]</sup> Currently, surgery is the main management for it, but there is a high rate of residual stone and recurrence. (Lai, Jiaming, 2002) We conducted our research program by observing and comparing the *Dahuang Lingxian* decoction modified to TCM syndrome, and *Xiaoyan Lidan* group and blank group.

It's believed in TCM that gallbladder is attached to liver and liver regulates free movement of qi, which includes fluent excretion of bile. Symptom and cause, reducing and reinforcing, deficiency and excess must be contemporaneously considered according to the characteristics of cholelithiasis. Unblocking or purging is the general principle among various methods, for unblocking leads to painless. Specifically, *Yue Meizhong*, the modern famous physician, summarized 4 steps of *transforming, removing, flushing, and discharging*. The writer adopted a main principal of smoothing liver and relieving gallbladder, assisting with clearing damp-heat, invigorating spleen and harmonizing stomach, resolving stasis to eliminate pain, etc., and nourishing spleen to replenish qi and yin. The decoction adopted according this theory and modified according to patients' TCM syndrome heals the condition by discharging stones and returns it to a silent period. Syndrome identification and treatment formulation make full use of the advantages of TCM. The mechanism may be that *Jinqiancao Weilingxian* and *Dahuang*, etc., act to significantly increase the bile acid and decrease bilirubin and affect the formation of the Bilirubin stones (Tang, Qianli, 2002). Those herbs, with function of resistance to cholecystitis, promoting of biliation and resolving congestion of bile, has good effects on cholelithiasis, especially on the postoperative recurrence of cholelithiasis. Huang Mingwei, etc., found that *Dahuang Lingxian* decoction had the effect of prevention of pigment stones, which may relate to the multi-functions of protecting the liver cell and gallbladder tissue, normalizing the metabolism of bile, and inhibiting the growth of bacteria and so on. Although bacterial infection could not be an original and inducing factor of cholelithiasis among the condition of chronic liver injury, it can increase the possibility of stone formation.

Complex prescription of Chinese herbs, with advantages of contraindication less, safe, and effective, has fewer side effects and intends to be accepted by patient. It has showed perceived benefits to dissolve and discharge stone and achieved significant clinical effects. In recent years, Uchiyama K has decreased rate of residual stone to 2.4~10.0% by using choledochoscope and percutaneous transhepatic cholangioscopy. (Huang, Zhiqiang, 2000) Combination of medication and fibercholedochoscope plays an important role in enhancing the surgical effect of hepatolith. (Uchiyama K, 2002) By combining the herbs with new technology of endoscope or choledochoscope, percutaneous transhepatic cholangioscopy and interventional treatment of western medicine, herbs could act directly on nidus and make full use of the functions of dissolving and discharging stone to enhance curative effect and reduce the recurrence of cholelithiasis. Combination of Chinese herbs and new technology has great prospects in the treatment of cholelithiasis. Up to present, Chinese scientists have found many new treatment targets of cholelithiasis. We should explore new fields in cholelithiasis for Chinese complex prescription by connecting Chinese medicine research to these new subjects (Zuo, yutong, 2005).

Postoperative residual stone in bile duct is a long-standing surgical issue for cholelithiasis. It still has great practical significance. Under the developing of high technologies, it might get resolved. Considering the unbalanced development of technology in different area in our country, it's worthwhile playing more emphasis on traditional technologies and effective experiences, and it's more valuable to research and promote them.

### References

- Huang, Zhiqiang, (1998). *Modern Surgery of Biliary Tract* M, the 1st publication: Shanghai:Shanghai Science and technology literature Publishing House, 386-398.
- Tang, Qianli., Liu, Zujun and Wu, Songhe,etc. (2002). A Clinical Observation of *Dahuang Lingxian* Capsule for Decreasing Residual Stone Rate and Recurrence Rate of Cholelithiasis After Operation J. *New Journal of Traditional Chinese Medicine*, 34 (6):17-19.

Huang, Mingwei, Tang, Qianli and Wu, Songhe, etc. (2005). Mechanism of Dahuang Lingxian Decoction on Preventing Formation of Pigmental Stones J. *CHINESE JOURNAL OF INTEGRATED TRADITIONAL AND WESTERN MEDICINE ON DIGESTION*, 13 (4): 248- 250.

Wang, Jingjing and Long, Junjie. (1993). The China Criteria for Diagnosis and Curative Effect of Clinical Disease S. Changsha: Hunan Science and Technology Publishing House, 266.

Lai, Jiaming and Liang, Lijian. (2002). Emphasis on Liver Lobectomy for Intrahepatic Calculus J. *NEW JOURNAL OF TRADITIONAL CHINESE MEDICINE*, 10 (1): 4-5.

Yu, Yuan., Tang, Qianli and He, Jun., etc. (2007). To Build the Cholelithiasis Model in Rabbits with CCl<sub>4</sub> and Research the Pathogenesis of Cholelithiasis J. *CHINA MEDICAL HERALD*, 4 (12): 106- 108.

Huang, Zhiqiang. (2000). The History, Actualities and Strategy to the Postoperative Residual Stone of Bile Duct J. *CHINESE JOURNAL OF PRACTICAL SURGERY*, 20 (9):515-516.

Uchiyama K, OnishiH, TaniM, et al. (2002). Indication and Procedure of Treatment of Hepatolithiasis J. *Arch Surg*, 137 (2):149-153.

Zuo, yutong., Gao, Wenyuan., Jia, wei., Duan, Hongquan and Xiao, Peigen. (2005). Prevention and Treatment for Cholelithiasis by Chinese Medicine J. *China Journal of Chinese Materia Medica*, 29 (9): 832~ 834.

Table 1. Therapeutic Effect in the 3 Groups

group	n	Curative	Marked effective	Effective	Ineffective
<b>Dahuang Lingxian</b> group	36	20	10	5	1
Blank control group	33	14	10	3	6
<b>Xiaoyan Lidan</b> group	36	17	10	3	6

**Notice:** comparison between *Dahuang Lingxian* group and blank group,  $P=0.035 < 0.05$ ; Comparison between *Dahuang Lingxian* group and *Xiaoyan Lidan* group,  $P=0.047 < 0.05$

Table 2. Summary of Residual Stones after Surgery

Group	n	extrahepatic	intrahepatic	Miscibility	The number of case found residual stone in 3 months after surgery
<b>Dahuang Lingxian</b> group	36	25	5	6	1
Blank control group	33	22	4	7	6
<b>Xiaoyan lidan</b> group	36	24	10	2	6

**Notice:** comparison between *Dahuang Lingxian* group and blank group,  $P=0.034 < 0.05$ ; Comparison between *Dahuang Lingxian* group and *Xiaoyan Lidan* group,  $P=0.048 < 0.05$



## Methods for Analyzing Hospital Length of Stay with Application to Inpatients Dying in Southern Thailand

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### Abstract

This study investigated length of stay (LOS) for patients who died in hospital in Southern Thailand from 2000 to 2003 with respect to principal diagnosis and demographic, geographic and hospital size factors. The computerized data of 40,498 mortality cases were obtained from the Ministry of Public Health from 167 hospitals in 14 provinces of Southern Thailand between October 2000 and September 2003 with information on age, gender, principal diagnosis, province and hospital size. Logistic and linear regression with log-transformed LOS was used to analyze the data. Patients with injuries as principal diagnosis had shortest LOS, whereas cancer patients had the longest LOS. Older patients, particularly females, had higher LOS for all diagnoses. LOS increased with hospital size except in the North and North West. Small hospitals in the South West region had the lowest LOS whereas large hospitals in the North West had the highest. The highest proportion of bed days (11.2%) occurred in males aged less than 60 diagnosed with infectious diseases. Males aged less than 60 diagnosed with injuries and digestive diseases, and aged at least 60 diagnosed with COPD, and aged less than 60 diagnosed with infectious diseases, accounted for more than double those for female patients in the same disease groups. Both logistic regressions with LOS at least 1 week as the outcome and linear regression on appropriately log transformed LOS gave consistent results. Providing suitable palliative care or allowing patients to select the place for spending their final time of life, especially for patients with chronic diseases, which can reduce hospital resource utilization.

**Keywords:** Spending time in hospital, Hospital mortality, Number of bed days, Analysis of length of hospital stay

### 1. Introduction

Length of hospital stay (LOS) is a common parameter used to indicate health resource utilization, health care cost and severity of disease (Li, 1999; Wang et al., 2002; Lee et al., 2003). Based on a literature review Martin and Smith (1996) concluded that patient demographics and hospital characteristics were the two major factors that determine patient LOS. Among demographic characteristics, studies have reported that LOS varied according to age and disease group (Goldfarb et al., 1983; McMullan et al., 2004), whereas among hospital characteristics, LOS has been reported to vary by region, hospital size, and health care service (Health Technology Case Study 24, 1983; Xiao, 1997; Clarke, 2002).

LOS can be terminated by cure, transfer or death discharge. Many studies have been concerned only with LOS for patients with cured discharge (see, for example, Cabre et al., 2004). However, hospital stay terminated by death is also an important outcome event. Patient care in hospital is the most expensive way of providing palliative care (Huang et al., 2002). Longer stays are more likely to indicate physicians' decisions or administrative inefficiencies than patients' need (Brownell & Roos, 1995). Reducing LOS is health policy in many countries (Clarke & Rosen, 2001). Setting up a

proper palliative care or providing opportunity for patients to decide where they want to stay during the last stages of their life can reduce unnecessary hospital LOS. For inpatients spending their final days in hospital in developed countries such as Canada, England and Belgium, LOS has been studied by Huang et al. (2002), Dixon et al. (2004) and van den Block et al. (2007), but similar studies for developing countries are limited.

The development of LOS models for patients dying in hospital will be useful for hospital management, particularly for prioritizing health care policies and improving health services, including the most appropriate allocation of health resources according to differences in LOS with respect to patients' health conditions and demographic and geographic factors.

It is also important to develop appropriate methods for the statistical analysis of LOS data. Generally, LOS has a highly positive skewed distribution (Liu et al., 2001; Lee et al., 2003) and some patients stay in hospital for a very long time. Using linear regression to predict LOS is likely to seriously violate the assumptions of the model (Li, 1999). Various methods have been suggested to handle outliers. For caesarean delivery LOS Lee et al. (2003) used median regression. Marazzi et al. (1998) examined the adequacy of models based on lognormal, Weibull and gamma distributions and found that the lognormal model was most appropriate but cases with LOS less than one day were omitted from their analysis because of computational problems when the LOS is zero.

In this study, two methods were used to handle skewness in the LOS distribution: (a) logistic regression with LOS 7 days or more taken as the outcome, and (b) linear regression on the natural logarithm of LOS after adding an appropriate constant to cope with LOS equal to zero. We thus examined the variation in LOS with respect to principal diagnosis, demographic, and geographic and hospital size factors for patients dying in hospital in Southern Thailand over the 4-year period from 2000 to 2003. This analytical framework provides a straightforward methodology for modeling positively skewed outcomes with a high proportion of zero occurrences.

## 2. Material and methods

### 2.1 Data source and variables

The data for this study comprised 41,134 cases of mortality records routinely reported to the National Health Security Office (NHSO) of the Ministry of Public Health from hospitals in 14 provinces of Southern Thailand according to date of discharge during the 4 fiscal years from October 2000 to September 2003. We excluded 636 cases with no information on patient demographics or principal diagnosis. As gender and age by themselves are known to be insufficient to adequately model LOS (National Center for Health Statistics, 1973), we also used principal diagnosis group and hospital location and size. Two nominal explanatory factors were defined: (1) the combination of diagnosis, gender and age group (54 categories), and (2) the combination of region and hospital size (19 categories). Age and gender were grouped into six categories by dividing age into three groups: 0-59 years, 60-74 years and 75 and over. Principal diagnosis using ICD 10 was regrouped into nine broad classes: injuries, digestive diseases (DD), unspecified septicemia (ICD-10 code A41.9), other infectious diseases (ID), chronic obstructive pulmonary diseases (COPD), respiratory infection (RI), cardiovascular diseases (CVD), cancer, and other diseases. The 14 provinces were reduced to seven regions as follows: Chumphon and Ranong (N), Surat Thani (ST), Phangnga, Phuket and Krabi (NW), Nakhon Si Thammarat (NST), Satun and Trang (SW), Songkhla and Phattalung (CS) and Pattani, Yala and Narathiwat (SE). These seven regions were then combined with hospital size (60 or fewer beds, 61-499 beds, 500 beds or more) to give the second factor as shown in Table 1.

### 2.2 Statistical methods

Two statistical models were used to examine the influences of the two factors on length of stay for patients who died in hospital.

In the first model LOS was treated as a binary variable with patients staying in hospital at least 7 days as the outcome of interest. Logistic regression (Hosmer & Lemeshow, 2000; Kleinbaum & Klein, 2002) was then used to estimate the proportion  $p_{ij}$  of these outcomes in diagnosis-demographic group  $i$  and region-hospital size group  $j$  using the model

$$\ln \frac{p_{ij}}{1 - p_{ij}} = \mu + \alpha_i + \beta_j. \quad (1)$$

To avoid over-specification of the parameters, for each factor the category having the largest group size was taken as the referent with corresponding parameter 0. To calculate the adjusted prevalence  $p_{i\bullet}$  for category  $i$  of the first factor, the term  $\beta_j$  in equation (1) was replaced by a constant  $\beta_0$ , chosen to make the sum of the expected number of outcomes equal to the sum of the observed number, that is,

$$\sum_{i=1}^m p_{i\bullet} n_i = \sum_{i=1}^m p_i n_i, \quad (2)$$

$n_i$  being the sample size in category  $i$ . The constant  $\beta_0$  was computed using an iterative procedure. Similarly, to calculate the adjusted prevalence  $p_{\bullet j}$  for category  $j$  of the second factor, the term  $\alpha_i$  in equation (1) was replaced by a constant  $\alpha_0$ , again chosen to ensure that the sum of the expected number of outcomes equaled the total observed.

In the second model LOS was treated as a continuous outcome, by taking its natural logarithm after adding a constant  $d$  to handle zero days stay, giving the transformed outcome  $y$ . The linear regression model is thus similar to equation (1), namely

$$y_{ij} = \mu + \alpha_i + \beta_j. \quad (3)$$

Estimates of LOS for different levels of the first factor after adjusting for the second factor were calculated by replacing  $\beta_j$  in equation (1) by a constant  $\beta_0$  to give fitted values  $y_{i\bullet}$  and then reversing the transformation to give  $\exp(y_{i\bullet}) - d$ , with  $\beta_0$  chosen to match the overall fitted mean LOS with the overall observed mean.

Confidence intervals for these parameters were obtained by using the standard errors obtained through fitting each model.

All statistical analysis was carried out using the R program (R Development Core Team, 2007).

### 3. Results

Median LOS and proportions staying seven days or more are given in Tables 2 and 3 for each determinant. The largest number of patients (8,461) occurred in the cardiovascular disease group. There were 6,261 and 5,698 patients in the other infectious disease and injuries groups, respectively. The number of male patients in the digestive disease, COPD and respiratory infectious disease groups were close to double the number of female patients in the same groups. The shortest median LOS were found in the injuries group among males aged less than 75 and females aged less than 60 where 56 percent had LOS less than 7 days. The highest median LOS was found in the cancer group among females aged 75 and over. More than half of the patients with cancer had LOS at least 7 days. The North West region had the highest proportion of patients staying 7 days or more, followed by Nakhon Si Thammarat and the Central South. The highest median LOS occurred in the North West region with more than one third of LOS at least one week.

Figure 1 shows a histogram of the overall distribution of LOS after transforming the data by adding  $d = 0.4$  and taking natural logarithms. The fit to this log-normal distribution is good for LOS greater than 1 day (apart from three high outliers at 1,179, 1,830 and 2,741 days). However, the lognormal distribution, being a continuous curve, cannot accurately accommodate data where LOS takes discrete values 0 or 1, although if these shorter lengths of stay were coded in hours rather than days they might well be accommodated in the model curve. Note that if the model is to be used to provide estimates of hospital costs, it is more important to accurately model longer stays.

The data were grouped by principal diagnosis, age, gender, region and hospital size from 40,498 individual cases into 1,026 records. Figure 2 shows a scatter plot of these observed counts and fitted values of LOS at least one week in the left panel and a residual plot in the right panel. The model predicts the proportions in the 1026 cells quite well, as shown in the residuals plot. However, the model could not be expected to accurately predict individual LOS.

Figure 3 shows the fitted prevalence of LOS of at least 1 week based on the logistic regression model. The dotted horizontal line on each graph gives the overall prevalence of patients having LOS at least 7 days, (30.9 percent). The top panel shows the prevalence of LOS at least 1 week by diagnosis-demographic groups after adjusting for the geographic-hospital size factor. Males aged less than 60 years admitted to hospital from injury comprised the referent group. The increasing trend of LOS at least one week in older age groups occurred in all disease groups except females diagnosed with digestive disease. The lowest LOS occurred among males aged less than 60 diagnosed with injuries while the highest LOS occurred among females diagnosed with cancer aged 75 and over.

The graph in the lower panel of Figure 3 shows the prevalence of LOS at least 1 week by the geographic-hospital size factor after adjusting for the diagnosis-demographic factor. The large hospital in Nakhon Si Thammarat was taken as the referent group. Patients from all hospital sizes in the North, Surat Thani, South East, and from small and medium sized hospitals in Nakhon Si Thammarat and small hospitals in the Central South were less likely to have LOS at least 1 week. Patients from large hospitals in the Northwest were more likely to have LOS at least 1 week. The increasing trends of LOS with hospital size appeared in all regions except for the North and the North West.

The second method involved fitting a linear model to the log-transformed outcome  $\ln(0.4+LOS)$ . Figure 4 shows a normal quartile plot for the standardized residuals from this model, and indicates that the normality assumption is reasonable for LOS greater than zero. However, the model gave an r-squared of only 7.8%, confirming that individual LOS cannot be accurately predicted. The components of this r-squared were 1.7% for age and gender alone and 6.6% for age-gender and principal diagnosis combined.

Figure 5 shows estimates of LOS from the model. The dotted line on each graph gives the overall mean of LOS (8.9

days). The top graph shows LOS by the diagnosis-demographic factor after adjusting for the geographic-hospital size factor. It shows a similar pattern of increasing trend of LOS by disease group, gender and age group as Figure 3. Patients with injuries had the lowest LOS while patients with cancer had the highest LOS.

The graph in the lower panel of Figure 5 shows mean LOS for the geographic-hospital size factor after adjusting for the demographic-diagnosis factor. Again the patterns are similar to those given by the logistic model.

Table 4 shows numbers of patients and corresponding expected proportions of bed days given by the model for each category of the diagnosis-demographic factor, thus giving a breakdown of expected contributions to the costs associated with patients dying in hospital in southern Thailand. Among patients aged less than 60, the highest proportion (11.2%) occurred in males diagnosed with infectious diseases while patients aged 60 to 74, males diagnosed with cancer, patients diagnosed with the CVD, and males diagnosed with COPD, respectively, had the highest proportions. The highest proportions for patients aged more than 74 years were found in the CVD group. Males diagnosed with injuries accounted for over 4% of all bed days. Males aged less than 60 diagnosed with injuries and digestive diseases, and aged at least 60 diagnosed with COPD, and aged less than 60 diagnosed with infectious diseases accounted for more than double those for female patients in the same disease groups.

#### 4. Discussion

This study analysed LOS using logistic and linear regression. The first model was used for predicting the factors associated with LOS at least 1 week. This method provided reasonable and explainable results and the patterns of LOS across diagnosis-demographic and region-hospital size were clearly illustrated from the plot of the prevalence (Figure 3). The linear model with log transforming LOS provided results consistent with the logistic model (Figure 5). We used the log-linear model to calculate average LOS and total number of bed days as they cannot be calculated from the logistic model.

Spending the remaining time to death in the hospital increases hospital cost (Sashamani & Gray, 2004). In this study, LOS increased with age. Similar results were reported by Himsworth and Goldacre (1999), Brownell and Roos (1995) and McMullan (2004). The simple explanation is that older patients tend to take longer to recover from disease, and most have chronic disease whereas younger patients tend to have acute disease with shorter duration. However, our result contrasts with the finding by Dixon et al. (2004) that average LOS did not increase with age. The longest LOS was found in females aged at least 75 diagnosed with cancer. Patients with injuries as principal diagnosis had shortest average LOS. Reducing LOS is a policy for many health care systems (Clarke & Rosen, 2001). Brownell and Roos (1995) indicated that longer stays in hospital were more likely to reflect physicians' decisions or administrative inefficiencies than patient needs, and LOS among patients dying from injuries could not be managed due to the short stay and uncertainty of the discharge status. However, hospital LOS among cancer patients can be reduced by providing palliative care or providing the opportunity for patients to decide where they want to stay during their last stage of life.

LOS variation by region and hospital size has been reported in many studies (List et al., 1983; Xiao, 1997; Clarke, 2002). In our setting, small hospitals in the South West region had the lowest average LOS whereas large hospitals in the North West had the highest average LOS.

Beside average LOS, total numbers of bed days provide useful information on the financial cost of patients who die in hospital. Thus the use of health care services and resources can be identified by considering this aspect, allowing health planning and budget allocations to be fairly distributed to the most suitable groups. In the United States, hospital inpatient stays accounted for nearly one-third of total health care expenses (Machlin & Carper, 2004). Our results show that males aged less than 60 diagnosed with infectious diseases accounted for 11.2% of the total, whereas females in the same group accounted for only 5.4% of the total. The higher proportion in males is possibly due to excess deaths for males from HIV/AIDS (Lim & Choonpradub, 2007). Excess male mortality from other diseases related to HIV/AIDS such as tuberculosis and pneumonia were also reported by Rumakom et al. (2002). Males who died from injuries aged less than 60 accounted for 4% of total bed days, possibly due to traffic accidents with higher mortality in males than females (Bureau of Policy and Strategy, 2002).

A strength of this study is that data were taken for 4 years and from every hospital size in every province in Southern Thailand. Gustafson (1968) mentioned that the poor performance of linear regression analysis for LOS due to the small sample size. In our study, the sample size was large enough for accurate analysis with each statistical method. Extremely positive skewed data and zero days stay were not omitted from the analysis. Outliers can give vital information for health services management in several aspects such as resources allocation or assessment of health intervention (Marazzi, 1998). While information concerning physician characteristics for data used in this study was limited, this may not have unduly biased the results of our study. Westert et al. (1993) noted that the difference in LOS between treating physicians within the same hospital was much less than the difference between hospitals.

In conclusion, providing suitable palliative care or allowing patients to select the place for spending their final time of life, especially for patients with chronic diseases, which can reduce hospital resource utilization.



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## References

- Brownell, M.D. & Roos, N.P. (1995). Variation in length of stay as a measure of efficiency in Manitoba hospitals. *Canadian Medical Association Journal*, 152, 675-682.
- Bureau of Policy and Strategy. (2002). Thailand Health Profile 1999-2000. Ministry of Public Health: Express Transportation Organization. pp. 189-247.
- Cabre, M., Bolivar, I., Pera, G. & Pallares, R. (2004). Factors influencing length of hospital stay in community-acquired pneumonia: a study in 27 community hospitals. *Epidemiology and Infection*, 132, 821-829.
- Clarke, A. & Rosen, R. (2001). Length of stay, how short should hospital care be ?. *European Journal of Public Health*, 11, 166-170.
- Clarke, A. (2002). Length of in-hospital stay and its relationship to quality of care. *Quality Safety Health Care*, 11, 209-210.
- Dixon, T., Shaw, M., Frankel, S. & Ebrahim, S. (2004). Hospital admissions, age, and death: retrospective cohort study. *British Medical Journal*, 328, 1288-1290.
- Goldfarb, M.G., Hornbrook, M.C. & Higgins, C.S. (1983). Determinants of hospital use: A cross-diagnostic analysis. *Medical Care*, 211, 48-66.
- Gustafson, D.H. (1968). Length of stay: prediction and explanation. *Health Services Research*, 3, 12-34.
- Health Technology case study 24. (1983). Variations in Hospital Length of Stay: Their relationship to health outcomes. Washington D.C.: U.S. Government Printing Office. pp 9-22.
- Himsworth, R.L. & Goldacre, M.J. (1999). Does time spent in hospital in the final 15 years of life increase with age at death? A population based study. *British Medical Journal*, 319, 1338-1339.
- Hosmer, D.W. & Lemeshow, S. (2000). *Applied logistic regression* (2nd ed). New York: John Wiley & Sons, (Chapter 1).
- Huang, J., Boyd, C., Tyldesley, S., Zhang-Salomons, J., Groome, P.A. & Mackillop, W.J. (2002). Time spent in hospital in the last six months of life in patients who died of cancer in Ontario. *Journal of Clinical Oncology*, 20, 1584-1592.
- Kleinbaum, D.G. & Klein, M. (2002). *Logistic regression: a self-learning text*. (2nd ed.). New York: Springer-Verlag, (Chapter 1).
- Lee, A.H., Fung, W.K. & Fu, B. (2003). Analyzing hospital length of stay: mean or median regression? *Medical Care*, 41, 681-686.
- Li, J. (1999). An application of lifetime models in estimation of expected length of stay of patients in hospital with complexity and age adjustment. *Statistics in Medicine*, 18, 3337-3344.
- Lim, A. & Choonpradub, C. (2007). A statistical method for forecasting demographic time series counts, with application to HIV/AIDS and other infectious disease mortality in southern Thailand. *Southeast Asian Journal of Tropical Medicine Public Health*, 38, 1029-1039.
- List, N.D., Fronczak, N.E., Gottlieb, S.H. & Baker, R.E. (1983). A cross-national study of differences in length of stay of patients with cardiac diagnoses. *Medical Care*, 21, 519-530.
- Liu, Y., Phillips, M. & Codde, J. (2001). Factors influencing patients' length of stay. *Australian Health Review*, 24, 63-70.
- Machlin, S.R. & Carper, K. (2004). Expenses for Inpatient Hospital Stays. Statistical Brief #164, March 2007. Agency for Healthcare Research and Quality, Rockville. [Online] Available: [http://www.meps.ahrq.gov/mepsweb/data\\_files/publications/st164/stat164.pdf](http://www.meps.ahrq.gov/mepsweb/data_files/publications/st164/stat164.pdf) (July 26, 2008).
- Marazzi, A., Paccaud, F., Ruffieux, C. & Beguin, C. (1998). Fitting the distributions of length of stay by parametric models. *Medical Care*, 36, 915-927.
- Martin, S. & Smith, P. (1996). Explaining variations in inpatient length of stay in the National Health Service. *Journal of Health Economics*, 15, 279-304.
- McMullan, R., Silke, B., Bennett, K. & Callachand, S. (2004). Resource utilisation, length of hospital stay, and pattern

of investigation during acute medical hospital admission. *Postgraduate Medical Journal*, 80, 23-26.

National Center for Health Statistics. (1973). Average length of Stay in Short-Stay Hospitals: Demographic Factors, United States-1968. Vital and Health Statistics, Series 13-No 13. Washington D.C.: U.S. Government Printing Office. pp. 1-40.

R Development Core Team. (2007). R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing.

Rumakom, P., Prasartkul, P. & Punpuing, S. (2002). Change to the epidemiological transition in Thailand due to HIV/AIDS: Implications for population and health policies. The 2002 IUSSP Regional Population Conference, Bangkok, 10-12 June 2002. Institute for Population and Social Research, Nakhon Pathom: Mahidol University. pp. 1-12.

Sashamani, M. & Gray, A. (2004). Time to death and health expenditure: an improved model for the impact of demographic change on health care costs. *Age and Ageing*, 33, 556-561.

Van den Block, L., Deschepper, R., Drieskens, K., Bauwens, S., Bilsen, J., Bossuyt, N. & Deliens, L. (2007). Hospitalisations at the end of life: using a sentinel surveillance network to study hospital use and associated patient, disease and healthcare factors. *BMC Health Services Research*, 7, 69.

Wang, K., Yau, K.K.W. & Lee, A.H. (2002). A hierarchical Poisson mixture regression model to analyse maternity length of hospital stay. *Statistics Medicine*, 21, 3639-3654.

Westert, G.P., Nieboer, A.P. & Groenewegen, P.P. (1993). Variation in duration of hospital stay between hospitals and between doctors within hospitals. *Social Science & Medicine*, 37, 833-839.

Xiao, J., Douglas, D., Lee, A.H. & Vemuri, S.R. (1997). A delphi evaluation of the factors influencing length of stay in Australian hospitals. *International Journal Health Planning Management*, 12, 207-218.

Table 1. Classification of hospitals by region and size in southern Thailand

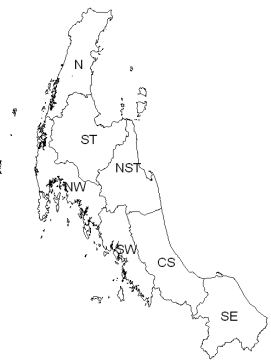
	Region	Number of beds			Total
		≤ 60	61 - 499	≥ 500	
	North (N)	14	2	1	17
	Surat Thani (ST)	17	5	2	24
	North West (NW)	16	4	1	21
	Nakhon Si Thammarat (NST)	14	5	1	20
	South West (SW)	16	2	-	18
	Central South (CS)	26	5	2	33
	South East (SE)	27	7	-	34
	Total	130	30	7	167

Table 2. LOS summary for patients dying in hospital by disease group, gender and age group

<i>Disease group</i>	<i>Gender</i>	<i>Total</i>	<i>Median LOS</i>			<i>Number of LOS <math>\geq 7</math> days (%)</i>		
			<i>Age group</i>			<i>Age group</i>		
			0-59	60-74	75+	0-59	60-74	75+
Injuries	Male	4,130	1	1	3	476 (13.9)	120 (25.5)	79 (32.4)
	Female	1,568	1	2	3	170 (15.5)	65 (25.6)	75 (34.1)
CVD	Male	4,581	1	2	3	283 (16.7)	434 (24.8)	316 (27.8)
	Female	3,880	2	2	3	234 (21.8)	356 (25.2)	427 (30.7)
Septicemia	Male	1,485	2	2	3	149 (19.6)	125 (30.1)	101 (32.6)
	Female	1,545	2	3	3.5	122 (19.1)	131 (27.1)	139 (32.9)
Other ID	Male	4,339	3	4	4	1,274 (33.0)	117 (37.5)	59 (35.5)
	Female	1,922	4	4	5	555 (33.8)	61 (36.1)	43 (39.4)
DD	Male	1,482	2	3	4	197 (23.8)	137 (34.7)	98 (37.5)
	Female	704	4	5	4	102 (38.8)	99 (41.1)	76 (38.0)
COPD	Male	1,886	2	5	5	125 (26.3)	332 (43.2)	275 (42.8)
	Female	835	2	4	5	82 (27.2)	111 (40.5)	111 (42.7)
RI	Male	1,408	2	4	7.5	161 (29.4)	168 (41.1)	232 (51.3)
	Female	967	3	5	6	123 (34.3)	109 (46.4)	182 (48.8)
Cancer	Male	1,917	5	7	7	358 (44.3)	397 (51.5)	174 (51.6)
	Female	1,246	7	7	9	322 (52.5)	228 (54.9)	139 (63.8)
Other	Male	3,393	2	5	5	709 (28.8)	243 (42.3)	161 (45.1)
	Female	3,210	2	5	7	663 (30.3)	247 (43.0)	236 (52.6)

Table 3. LOS summary for patients dying in hospital by region and hospital size group

<i>Region</i>	<i>Total</i>	<i>Median LOS</i>			<i>Number of LOS <math>\geq 7</math> days (%)</i>		
		<i>Number of beds</i>			<i>Number of beds</i>		
		$\leq 60$	61-499	500+	$\leq 60$	61-499	500+
North	4,051	3	3	3	29 (23.8)	321 (31.2)	881 (30.4)
Surat Thani	5,512	2	2	3	101 (26.0)	108 (20.8)	1,323 (28.7)
North West	5,591	4	3	4	79 (41.8)	956 (36.1)	1,054 (38.2)
Nakhon Si Thammarat	7,151	3	3	3	125 (27.6)	249 (31.8)	1,933 (32.7)
South West	4,636	2	2	-	55 (18.1)	1,040 (27.6)	-
Central South	6,868	3	3	3	148 (26.4)	1,134 (32.5)	899 (31.8)
South East	7,249	2	3	-	130 (19.7)	1,943 (29.5)	-

Table 4. Number of patients and bed days by disease group, gender and age group

<i>Disease group</i>	<i>Gender</i>	Number of patients			Percent of bed days		
		<i>Age group</i>			<i>Age group</i>		
		0-59	60-74	75+	0-59	60-74	75+
Injuries	Male	3,415	471	244	4.1	0.7	0.5
	Female	1,094	254	220	1.4	0.5	0.5
CVD	Male	1,692	1,753	1,136	2.3	3.2	2.4
	Female	1,073	1,414	1,393	1.8	2.8	3.3
Septicemia	Male	760	415	310	1.2	0.9	0.7
	Female	640	483	422	1.0	1.0	1.1
Other ID	Male	3,861	312	166	10.0	0.9	0.5
	Female	1,644	169	109	4.4	0.5	0.3
DD	Male	826	395	261	1.5	1.0	0.8
	Female	263	241	200	0.7	0.8	0.7
COPD	Male	475	768	643	0.9	2.7	2.4
	Female	301	274	260	0.6	0.9	1.0
RI	Male	547	409	452	1.2	1.3	2.1
	Female	359	235	373	0.9	1.0	1.7
Cancer	Male	809	771	337	3.0	3.6	1.7
	Female	613	415	218	2.9	2.2	1.4
Other	Male	2,462	574	357	5.1	2.1	1.3
	Female	2,187	574	449	4.5	2.1	2.1

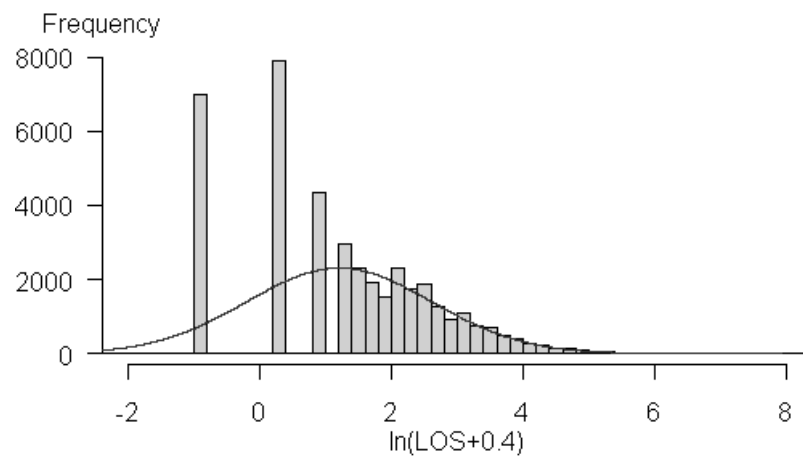


Figure 1. Distribution of  $\ln(\text{LOS}+0.4)$  for in-hospital deaths in southern Thailand 2000-2003

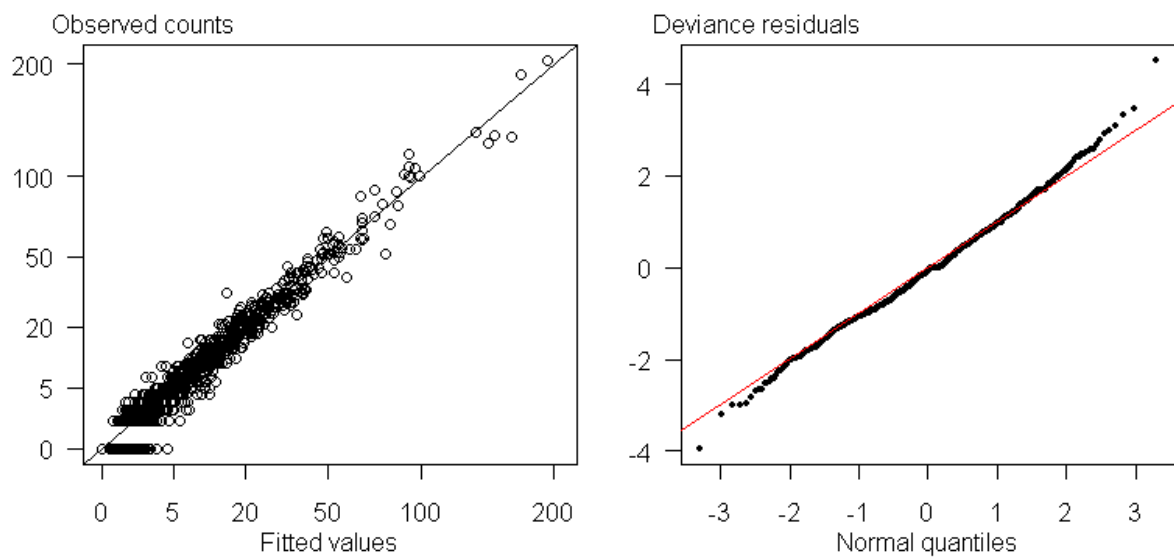


Figure 2. Scatter plot of observed counts and fitted values and residuals plot

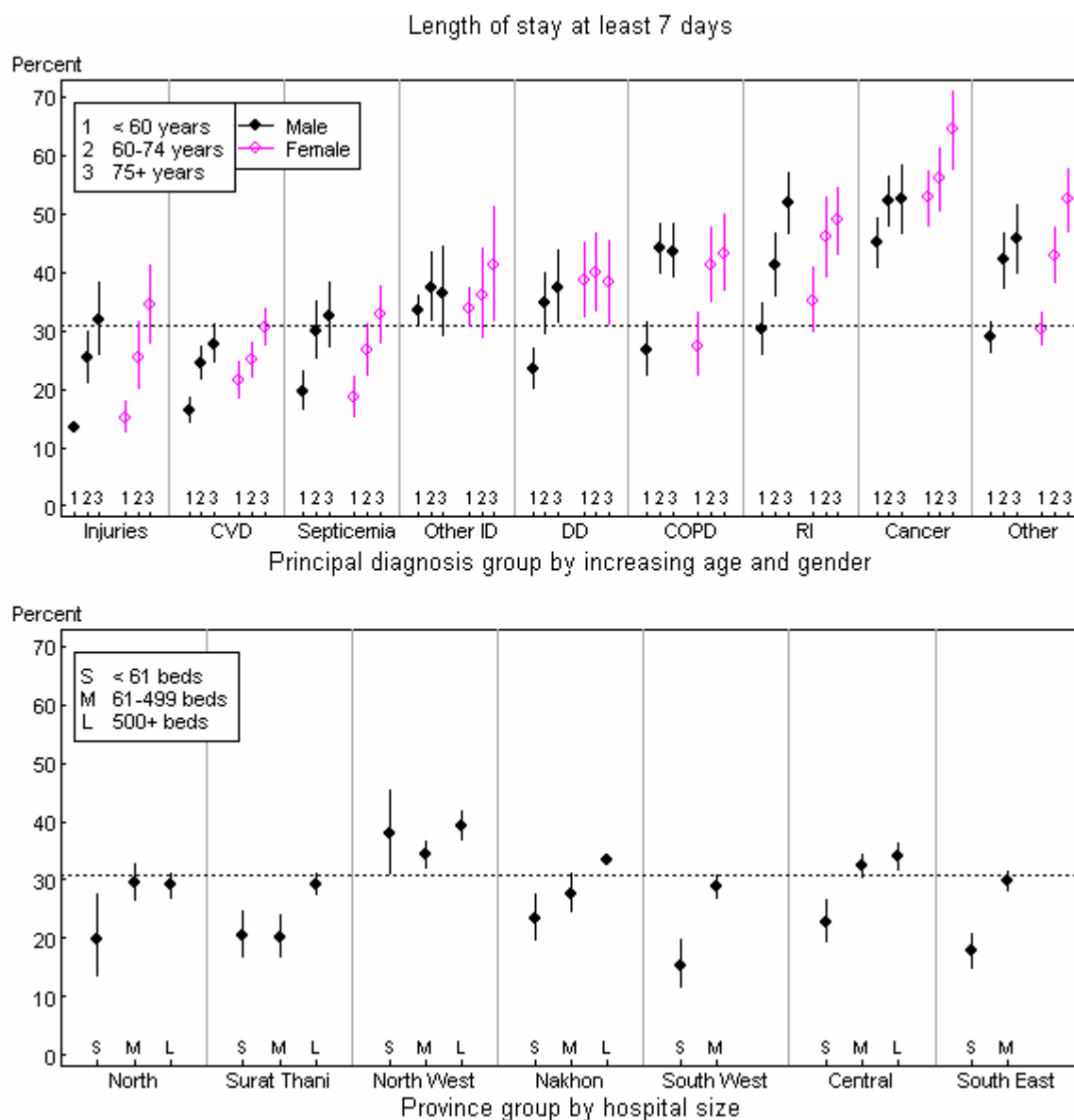


Figure 3. Prevalence of LOS at least 7 days adjusted by demographic and geographic factors.

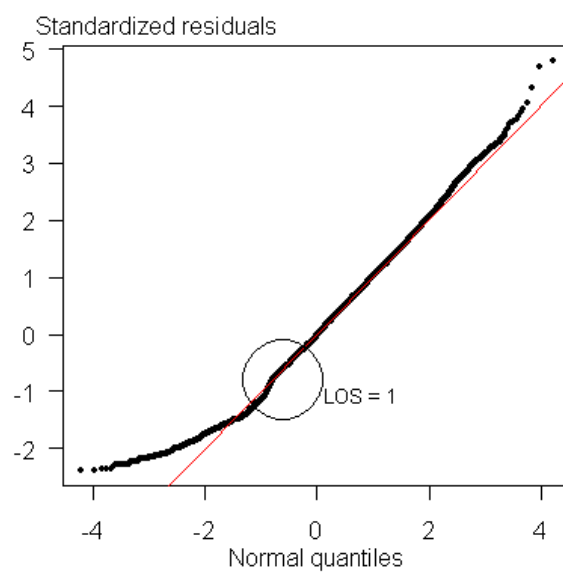


Figure 4. Standardized residuals against normal quantiles plot

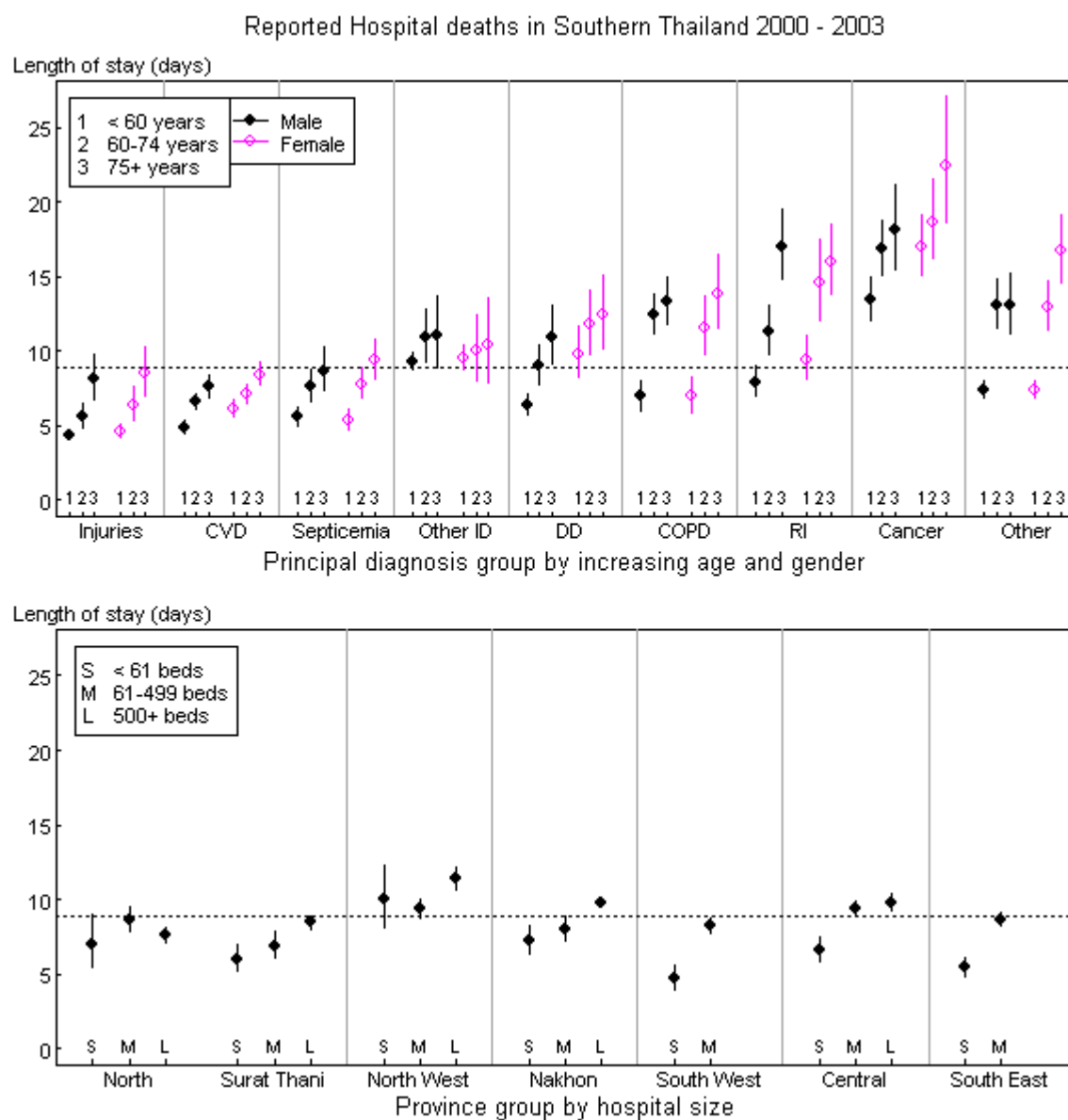


Figure 5. Confidence interval plots for LOS as continuous variable for patient who died in hospital adjusted for demographic and geographic factors.





## Investigation on the Effectiveness of Treatments for Overcoming Emotional, Mental and Physical Health Problems

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### Abstract

This study is aimed at investigating the effectiveness of various treatments to overcome emotional, mental and physical (EMP) health problems among medical students in Pakistan. The EMP health is assessed using two questionnaires. The effectiveness of treatments to overcome EMP health problems was evaluated using statistical paired t-test on 113 medical students. 'Soothing the body and the mind' and 'Collarbone breathing exercise' are found to be most effective methods of treatment for emotional health problem. All treatments for EMP health problems are found to be effective if the respondents performed the treatments regularly.

**Keywords:** Emotional, Mental, Physical health, Treatment effectiveness, Paired-t Test

### 1. Introduction

Health is viewed holistically as an interacting system of the mental, emotional and physical mechanisms of the body. It is the ability to suitably determine difficulties and control emotions that is the source of preserving and articulating positive self-concept and physical and mental well-being. Thus, it is very important to look at health as a multidimensional phenomenon, with emotional, mental and social perspectives that are inseparable from one another. Today, emotional, mental, and physical health problems are serious problems in both developed and developing countries. This is evident from the increasing number of tragic and fatal incidents that happened in schools, colleges, and universities in the West as well as in the East. These include the tragic killing of 32 people by Cho Seung-Hui, a South Korean student, at Virginia Tech (Hopkins & Zengerle, 2008; Thomson Reuters, 2008). In another incident, Sajjad Abbasi committed suicide out of frustration and due to the continuous reprimand by his parents for not getting prominent position in the SSC examination (PakTribune, 2008). Also, another incident happened in Malaysia, where a 12-year old girl committed suicide at her home for not obtaining the results

that she had expected in the Primary School Assessment Examination results (AsiaOne News, 2007). These sad incidents reflect that students who suffer from EMP health problems are shy or hesitant to seek advice or seek treatment from psychiatrists. According to Dr. Mohamad Hussain Habil, Head of the Department of Psychological Medicine, University of Malaya, people who have anxiety problems, and are suffering from depression or any psychiatric disorders, should see a psychiatrist without hesitation (Dass, 2007).

Needless to say, the emotional, mental and physical health problems of people in educational institutions can have serious consequences both for the individuals and for society. Health status can affect student performance, class attendance, motivation and morale, grades and rate of drop-outs (Arthur, 1998; Haines, Norris & Kashy, 1996). Such problems affect not only individuals, but also the entire community through the direct costs of welfare services and treatment, and loss of income as a result of incapacity. Thus, researches are still going on to find a good integrated EMP health assessment technique that can also recommend effective treatments to help overcome EMP health problems.

In Pakistan, medical universities/colleges are often regarded as tense environments that can have negative impacts on the emotional, mental, physical, and psychological well-being of the students. In a study, Inam, Saqib, and Alam (2003) of Ziauddin Medical University, Karachi, Pakistan, found that 60.0% of the medical students have anxiety problem and they suffer from depression. This finding is consistent with the results of similar studies done in the West.

Thus, this research is aimed at investigating and establishing an integrated EMP health assessment technique that not only can analyse the EMP health status of the medical students but also recommend treatments to overcome EMP health problems. The following sections discuss the methods used in this study, and the investigation carried out to evaluate the effectiveness of various treatments for overcoming EMP health problems.

## 2. Research methods

In this research, a thorough literature review was first conducted on EMP assessment techniques. Four EMP health assessment techniques were reviewed and compared. These include the Emotional Freedom Technique (EFT) (Quantum Flow, 2007); Zensight Energy Healing Technique (Zensight Energy Healing, 2005); Thought Field Therapy (TFT) technique (South West Clear Mind, n.d.); and Vera Peiffer's technique published in her bestselling book (Peiffer, 2002), *Inner Happiness: Positive Steps to Feeling Complete*. Vera Peiffer's technique was selected as it is the most comprehensive and adopts an integrated approach. It analyses EMP health conditions and suggests treatments to overcome the health problems detected. The technique is deemed to be reliable and effective as Vera Peiffer is a qualified analyst/hypnotherapist and health kinesiologist (Peiffer, 2002).

To assess the EMP health status of the medical students (respondents), two questionnaires were formulated using questions recommended by Vera Peiffer. The first questionnaire (a pre-test questionnaire) aims to assess the preliminary EMP health status. The second questionnaire aims to assess the severity level of the EMP health problems of the respondents. The second questionnaire is used "before and after treatments" so that the results of the two assessments can be compared to determine whether there has been improvement in the EMP health status after treatment.

The surveys, using the questionnaires, were carried out to investigate the preliminary EMP health condition of the respondents (pre-test) and the severity level of those respondents who suffer from EMP health problems (before-treatment test) (Peiffer, 2002). The respondents who suffer from EMP health problems were recommended appropriate treatments. Re-assessment on the EMP health of the respondents was conducted after the treatment periods (after-treatment test). An assessment of the effectiveness of the EMP health treatments was made using the statistical paired-t test.

The medical students involved in this research are from three different medical institutions in Pakistan – Baqai Medical University, Dow University of Health Sciences, and Sindh Medical College.

## 3. Questionnaire survey

The survey method was used to collect the personal health status pertaining to emotional, mental and physical health of the medical students. The data collected was used to analyse the respondents' health status, and appropriate treatments were recommended to those respondents who have EMP health problems. Before the actual survey was carried out, a pilot test was conducted by inviting 30 medical students to answer the questionnaires in order to solicit feedback on the survey questionnaire. The feedback revealed mistakes that have been overlooked and other issues that have not been considered. After the pilot study, corrections were made to the two original questionnaires to make the questionnaires easy to understand and answer.

In order to manage the research study effectively, a Web-based system, EMPHA Health Analyser, was developed. The EMPHA Health Analyser allows the medical students (respondents) to keep track of the treatments/exercises performed by them. To study the effectiveness of treatments, respondents must perform the treatments assigned to them for at least six months. Hence, in this research, a Web-based questionnaire survey using the EMPHA system was carried out for six months, from August 2006 to January 2007.

### 3.1 Questionnaire Design

As mentioned above, two questionnaires were used to collect data from the respondents. In the first questionnaire (pre-test), respondents are only required to choose either a 'Yes' or 'No' option for all the assessment statements (Appendix I). In the second questionnaire (before and after treatment tests), a 6-point Likert scale was used for the response to all the assessment statements (Appendix II). The respondents answer this questionnaire before and after treatments.

The two questionnaires were incorporated into the EMPHA Health Analyser. Thus, the system is able to make an assessment of EMP health status, recommend treatments based on the assessment results, monitor treatments performed, and compare EMP health status accurately and efficiently. The assessment of EMP health status pertains to emotional, mental and physical health, respectively. As most of the assessment statements (questions) are simple and self-explanatory, each respondent should take not more than 30 minutes to complete a questionnaire. The preliminary assessment was conducted using printed questionnaires. When the EMPHA system was fully developed, data collected using the manual questionnaire survey, were entered into the system for analysis.

### 3.2 Administration of the Questionnaire

By using the EMPHA system, assessment results are generated immediately after the respondents have submitted their questionnaires online. Also, appropriate treatments are recommended by the EMPHA system depending on the result obtained after answering the second questionnaire. Respondents can record the treatments performed and answer the second questionnaire to know the latest EMP health status after performing treatments for the required duration. If respondents forget to perform and/or record the treatments performed, a reminder email will be sent to them.

## 4. Results

The analyses discuss in this section include the respondents' profiles, the EMP health status of the respondents and investigation on the effectiveness of the treatments recommended for the EMP health problems.

### 4.1 Respondents' Profiles

In this research, a total of 151 medical students, selected randomly from three medical universities in Pakistan, were invited to participate in the study. Of these, 113 (74.8%) students visited the website, registered themselves and answered the emotional, mental and physical health questionnaires. They will be referred to as respondents. As shown in Table 1, of the 113 respondents, only 96 (85.0%) respondents were required to follow the treatments on regular basis. It is obvious that the majority of the respondents fall under the emotional category followed by physical; and emotional, mental and physical health problems.

Of the 113 respondents, 49 (43.4%) respondents are male and 64 (56.6%) respondents are female. As shown in Figure 1, there are 60 (53.1%) female and 44 (38.9%) male respondents, 4 (3.5%) female and 5 (4.4%) male respondents from the age groups of 22-24 years and 25-28 years, respectively.

Figure 2 shows that a majority of the female respondents (58, 90.6%) have EMP health problems as compared to the male respondents (38, 77.6%). This trend could possibly be due to more female (64) than male (49) respondents involved in this study. However, the outcome could also reflect the actual EMP health status of the female medical students as there are only 6 female medical students compared to 11 male medical students who do not have EMP health problems.

Based on Table 1 and Figure 3, a total of 96 respondents who have one or more of the EMP health problems need to undergo treatments. Table 2 shows the types of treatments that these respondents need to perform according to the severity level of the EMP health problems. The number and percentage of respondents who are assigned the specific types of treatments are shown in Figure 3.

### 4.2 Reliability Analysis on the Measurement Scale

The EMP health assessment questionnaires have three sections, namely, emotional, mental and physical sections, with 19, 9 and 11 questions, respectively. To determine the reliability of the data, a statistical analysis known as alpha coefficient, was performed. Alpha (Cronbach) is a model of internal consistency, based on the average inter-item correlation (SPSS Base 14.0 User's Guide, 2005). Inter-item correlation checks the correlation among the questions in each category. In this study, inter-item correlations were determined for each category for both before-treatment and after-treatment cases. Using the reliability analysis, it can be determined as to what extent the items in the questionnaire are related to each other. This is done by ranking the responses using the Likert scale. The lowest scale is 0 and the highest scale is 5. For each of the three EMP health problem categories, the alpha coefficients were calculated, and tabulated in Table 3.

Based on the results shown in Table 3, all treatments investigated have alpha coefficients close to 0.7. The Cronbach's alpha coefficient of below 0.5 suggests that the items are not reliable (SPSS Base 14.0 User's Guide, 2005). Hence,

these results suggest that there is a high level of internal consistency among the items in each EMP health assessment category, before and after treatment(s).

#### 4.3 Testing for Normality of Data Distributions

A critical stage in any data analysis is the test of significance of factors affecting the variables of interest. One-sample Kolmogorov-Smirnov Test compares the observed cumulative distribution function for a variable with a specified theoretical distribution, which may be normal, uniform, exponential, or Poisson. The one-sample Kolmogorov-Smirnov test can be used to prove that a variable is normally distributed, and large significance values ( $> 0.05$ ) indicate that the observed distribution corresponds to the theoretical distribution (SPSS Base 14.0 User's Guide, 2005). Hence, the normality distribution of each of the variables, i.e. emotional, mental and physical health problems, was performed using this test.

The results of the tests, presented in Table 4, show that all the corresponding  $p$ -value is greater than 0.05. If all variables being investigated have  $p$ -values greater than 0.05, they reflect that the data follow normal distribution.

#### 4.4 Effectiveness of the Treatments Applied

There are two treatments for the emotional category, namely, *Soothing the body and the mind* (T1), and *Collarbone breathing exercise* (T2). *Soothing the body and the mind* (T1) treatment was prescribed for 3 respondents, only. The *Collarbone breathing exercise* (T2) was prescribed for 70 respondents.

Similarly, there are four treatments for the mental category, namely, *Soothing the body and the mind* (T1), *Psoas exercise* (T3), *Meridian tap exercise* (T4), and *What thoughts are ruling your life* (T5). In this study, only one treatment, the *Psoas exercise* (T3), was prescribed for the respondents as they suffer from minor mental problems, and none of them is severe. This treatment was prescribed for 26 respondents.

There are three treatments for the physical category. Only two treatments, namely, *Thymus tap exercise* (T7) and *Zip-up exercise* (T6) were prescribed for the respondents. No respondent has severe physical problems that would make it necessary to prescribe the *Cross Crawl exercise* (T8). The treatment, *Thymus tap exercise* (T7), was prescribed for 25 respondents. The treatment *Zip-up exercise* (T6) was prescribed for 26 respondents.

To investigate the effectiveness of the treatments undergone by the respondents, a suitable statistical test can be used. As the data pertaining to the emotional, mental and physical health are normally distributed (Table 4), the paired t-test was chosen to test the hypothesis that there is no difference in the treatments. If the treatments had no effect, the average difference between the measurements is equal to 0, and the null hypothesis holds. On the other hand, if the treatments did have an effect, the average difference is not 0, and the null hypothesis is rejected. In this study, the level of significance, defined at 5%, is regarded as a normal acceptable level of significance in social science studies, and is often set at  $p = 0.01$  or  $p = 0.05$  (SPSS Base 14.0 User's Guide, 2005). To test the effectiveness of treatments, the following null and alternate hypotheses were established.

$H_0$ : Treatments for emotional, mental and physical health problems: T1, T2, T3, T6 and T7 are not effective.

$H_1$ : Treatments for emotional, mental and physical health problems: T1, T2, T3, T6 and T7 are effective.

In this study, respondents who suffer from EMP health problems are grouped into the emotional (E), mental (M) or physical (P) categories, respectively. These three groups of respondents were prescribed relevant treatments/exercises to alleviate their EMP health problems. One assumption made in this test of hypothesis is that all the respondents had undergone and recorded the treatments according to the instructions, and for the recommended duration honestly. This assumption might not be true as there are four possibilities that could happen in data collection:

- i. Respondents had undergone the treatments and recorded the treatments;
- ii. Respondents had undergone the treatments but did not record the treatments;
- iii. Respondents did not undergo the treatments but recorded the treatments;
- iv. Respondents did not undergo the treatments and did not record the treatments.

As the significance level has been determined at  $p = 0.05$ , the errors/bias resulting from cases ii and iii above, have been considered in the test of hypothesis and indicated clearly in the standard deviation and standard error columns of Tab. 5.

Table 5 shows the results of the paired t-test. The average difference (i.e. the mean column for before and after treatments) for emotional (T1 and T2), mental (T1 and T3), and physical (T6 and T7) health are 0.73756, 0.45299 and 0.64171, respectively. These values are greater than zero. In paired t-test, a non-zero average difference implies that the treatments performed by the respondents are effective (i.e. improvements in the health conditions). Also, since the significance value for the three EMP health conditions before-after treatments is less than 0.05 (i.e. 0.000 in the last column for all three EMP health problems), we can conclude that the treatments, T1, T2, T3, T6 and T7, are effective, and the improvements in the EMP health conditions of the respondents are not by chance. Hence, the null hypothesis is rejected and the alternate hypothesis is accepted.

## 5. Discussion

The outcomes of the study reveal that more female (58 out of 64, 90.6%) medical students suffer from EMP health problems as compared to the male (38 out of 49, 77.6%) medical students. Based on the statistical paired t-test results, the treatments for emotional health problem, *soothing the body and the mind* (T1) and *Collarbone breathing exercise* (T2); and the treatment for physical health problem, *soothing the body and the mind* (T1) and *Psoas exercise* (T3); are more effective than the treatments for mental health problems, *Zip-up exercise* (T6) and *Thymus tap exercise* (T7). This is reflected by the average difference (i.e. the Mean column in Table 5) of the emotional (0.73756), and physical (0.64171) health scores which are higher than the average difference of the mental health score (0.45299). These results imply that the treatments assigned to the respondents are found to be effective in improving their EMP health problems after performing and completing the recommended treatments regularly, within the specified treatment period.

Often, students who suffer from EMP health problems are afraid or shy to seek expert's help. They are unable to overcome the problems themselves, thus, resulting in tragic incidents such as killing and suicides. The outcomes of this research show that EMP health problems could be overcome by following appropriate exercises/treatments, regularly. Also, the development of the EMPHA system, which incorporates comprehensive EMP assessment techniques of Vera Peiffer, provides an alternative channel to help these students to analyse their EMP health conditions and recommend suitable treatments. Obviously, the research findings and the use of the EMPHA system can contribute to reducing and overcoming these serious health problems that students everywhere, irrespective of their socio-economic status, are facing today. There are definitely areas for further research and enhancement of the EMPHA system such as incorporation of other EMP health assessment techniques, and addition of more treatments into the system, and collection of data from other countries for analysis.

## APPENDIX I

**SELF ASSESSMENT  
EMOTIONAL, MENTAL AND PHYSICAL (EMP) HEALTH QUESTIONNAIRE**

DATE: \_\_\_\_\_

NAME: \_\_\_\_\_

**Instructions:** Please tick (✓) one box only or specify otherwise. \_\_\_\_\_1. GENDER: ☐ MALE ☐ FEMALE2. AGE GROUP: ☐ 21 ☐ 25 - 28 ☐ 29 - 323. FIELD OF STUDY: ☐ MEDICAL ☐ COMPUTER SCIENCE
☐ OTHERS, PLEASE SPECIFY:  
 \_\_\_\_\_

4. PHONE NUMBER: \_\_\_\_\_

5. E-MAIL: \_\_\_\_\_

6. INSTITUTION NAME: \_\_\_\_\_

**This questionnaire should not take more than 30 minutes to answer.****Preliminary Test (Pre-Test)**

All the information will be kept confidential. This information will be used for research purpose only.

**Instructions**

- Please read through each of the following statement and circle the relevant answer.

**Option Interpreter**

Y: This statement applies to me.

N: This statement does not apply to me.

Please circle either 'Y' or 'N' next to each of the statement. We will need it to measure your EMP health condition.

No.	Statement	Yes/No
1	I am often in a bad mood.	<input type="checkbox"/> Y <input type="checkbox"/> N
2	I find it difficult to control my anger.	<input type="checkbox"/> Y <input type="checkbox"/> N
3	I find it hard to say 'no,' even when someone makes unreasonable demands.	<input type="checkbox"/> Y <input type="checkbox"/> N
4	I am a jealous person.	<input type="checkbox"/> Y <input type="checkbox"/> N
5	I am easily hurt when I am criticised, even if the criticism is constructive.	<input type="checkbox"/> Y <input type="checkbox"/> N
6	It upsets me greatly when I fail at something, no matter how unimportant it is.	<input type="checkbox"/> Y <input type="checkbox"/> N
7	I feel I am losing control over my life.	<input type="checkbox"/> Y <input type="checkbox"/> N
8	I feel anxious and down a lot.	<input type="checkbox"/> Y <input type="checkbox"/> N
9	I can't let go of a past event.	<input type="checkbox"/> Y <input type="checkbox"/> N
10	I feel unhappy about lots of things in my life.	<input type="checkbox"/> Y <input type="checkbox"/> N
11	I am so emotional that I often find it hard to make rational decisions.	<input type="checkbox"/> Y <input type="checkbox"/> N
12	I constantly change my mind. I am a true ditherer. ( <i>dither means hesitant</i> )	<input type="checkbox"/> Y <input type="checkbox"/> N
13	In certain situations, I panic and am unable to think rationally.	<input type="checkbox"/> Y <input type="checkbox"/> N
14	I find it difficult to follow a train of thought when I need to take in new information.	<input type="checkbox"/> Y <input type="checkbox"/> N
15	I feel confused and disorientated.	<input type="checkbox"/> Y <input type="checkbox"/> N
16	I find it difficult to follow instructions. I simply cannot remember the order of things.	<input type="checkbox"/> Y <input type="checkbox"/> N
17	I feel constantly tired.	<input type="checkbox"/> Y <input type="checkbox"/> N
18	Whenever there is a bug going around, I will catch it.	<input type="checkbox"/> Y <input type="checkbox"/> N
19	I have been plagued by various health problems for a long time.	<input type="checkbox"/> Y <input type="checkbox"/> N
20	I have a chronic condition which doesn't get better.	<input type="checkbox"/> Y <input type="checkbox"/> N
21	I have a chronic condition which is getting worse.	<input type="checkbox"/> Y <input type="checkbox"/> N
22	I have annoying physical symptoms (ticks, twitches, shooting pains, and so on) that keep recurring.	<input type="checkbox"/> Y <input type="checkbox"/> N
23	The quality of my skin and/or hair has deteriorated.	<input type="checkbox"/> Y <input type="checkbox"/> N
24	My breathing feels different in an unpleasant way.	<input type="checkbox"/> Y <input type="checkbox"/> N
25	I feel unwell but can't say exactly how or why.	<input type="checkbox"/> Y <input type="checkbox"/> N
26	One or several of my body processes (for example, menstruation, bowel movements, digestion, etc.) has not been working properly for a while.	<input type="checkbox"/> Y <input type="checkbox"/> N

Thank you for your participation.

## APPENDIX II

## SELF-ASSESSMENT

## EMOTIONAL, MENTAL AND PHYSICAL (EMP) HEALTH QUESTIONNAIRE

DATE: \_\_\_\_\_

NAME: \_\_\_\_\_

**Instructions:** Please tick (✓) one box only or specify otherwise. \_\_\_\_\_1. GENDER: ☐ MALE ☐ FEMALE2. AGE GROUP: ☐ 21 ☐ 25 - 28 ☐ 29 - 323. FIELD OF STUDY: ☐ MEDICAL ☐ COMPUTER SCIENCE☐ OTHERS, PLEASE SPECIFY:  
\_\_\_\_\_

4. PHONE NUMBER: \_\_\_\_\_

5. E-MAIL: \_\_\_\_\_

6. INSTITUTION NAME: \_\_\_\_\_

**This questionnaire should not take more than 30 minutes to answer.****EMP Health Assessment (Before and After Treatments)**

All the information will be kept confidential. This information will be used for research purpose only.

**Instructions**

- Please read through each of the following statement and rate them according to how relevant they are to your situation using the rating scale given below.

**Rating Scale**

- A: This statement applies to me 100 per cent.  
 B: This statement reflects how I feel quite often.  
 C: I sometimes feel like this and it upsets me.  
 D: I sometimes feel like this but it does not bother me.  
 E: I rarely feel like this.  
 F: This statement does not apply to me.

**Please circle your rating next to each of the statement. We will need it to measure your EMP health status.**



No.	Statement	Rating
1	When someone else is in a bad mood, it affects my own mood in a negative way.	A B C D E F
2	I don't feel that I have control over my life.	A B C D E F
3	I doubt very much that I will ever excel at anything.	A B C D E F
4	When something goes wrong during the day, it depresses me for a long time after.	A B C D E F
5	My life is ruled by my sense of duty towards family, friends and employer.	A B C D E F
6	I am expecting my future to be as unsatisfactory as my past.	A B C D E F
7	I have developed thought patterns that make me unhappy.	A B C D E F
8	I have behavioural patterns that I dislike but cannot stop.	A B C D E F
9	My daily life is at the mercy of my feelings. My feelings are unpredictable.	A B C D E F
10	I seem to do all the right things but never get the results I want.	A B C D E F
11	I have habits that make me feel a failure.	A B C D E F
12	I am unable to say 'no,' even when others make demands that are clearly unreasonable.	A B C D E F
13	When certain situations occur in my life, they trigger great fear in me, even though other people don't seem to be bothered by the same situation.	A B C D E F
14	It is important to me to do everyday things always the same way.	A B C D E F
15	I hate conflict and will avoid it at all cost.	A B C D E F
16	I am fearful of most things in life.	A B C D E F
17	I feel that others are better than me.	A B C D E F
18	I suffer from a particular health problem that keeps recurring.	A B C D E F
19	There are things I could do to improve my life situation, but I am not doing them.	A B C D E F
20	I feel compelled to think about certain past events in my life, even though this upsets me.	A B C D E F
21	I am scared that I will go on having the same negative experiences that I had in the past.	A B C D E F
22	I have developed thought patterns that upset me.	A B C D E F
23	Although I hated the way I was treated by others in the past, I seem to be treating others in the same unacceptable way now.	A B C D E F
24	I have done something in the past that made me lose all self-respect.	A B C D E F
25	I have omitted to do something in the past that I should have done. This omission has blighted my life since.	

No.	Statement	Rating					
		A	B	C	D	E	F
26	I often have unexpected flashbacks about a past traumatic event.	A	B	C	D	E	F
27	I cannot remember anything before the age of ten.	A	B	C	D	E	F
28	I have a chronic illness and now I feel guilty because someone said that I have attracted the illness through negative thoughts.	A	B	C	D	E	F
29	I would rather be anyone else but myself.	A	B	C	D	E	F
30	I have brief moments where I see disturbing pictures in my mind which do not seem to relate to anything I have experienced in my life so far.	A	B	C	D	E	F
31	I have been trying to think positively over a long time, but somehow, it doesn't work for me.	A	B	C	D	E	F
32	When I look back over my life and think of where I am today, I am dissatisfied.	A	B	C	D	E	F
33	My thoughts are automatically negative most of the time.	A	B	C	D	E	F
34	I cannot see a future.	A	B	C	D	E	F
35	I don't think I can visualise. I just don't have any imagination.	A	B	C	D	E	F
36	I don't like who I have become.	A	B	C	D	E	F
37	I don't think others like me.	A	B	C	D	E	F
38	I dislike myself and I resent others.	A	B	C	D	E	F
39	I feel it is important to hide my inadequacies from others around me.	A	B	C	D	E	F

**Thank you for your participation.**

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## References

- Arthur, N. (1998). The effects of stress, depression, and anxiety on postsecondary students' coping strategies. *Journal of College Student Development*, 39 (1), 11-22.
- AsiaOne News. (2007). Malaysian year six pupil found hanged [Online] Available: <http://www.asiaone.com/News/Education/Story/A1Story20071119-37440.html>.
- Dass, F. (2007). A healthy mind in a healthy body [Online] Available: <http://www.psychiatry-malaysia.org/article.php?aid=711>.
- Haines, M.E., Norris, M.P., & Kashy, D.A. (1996). The effect of depressed mood on academic performance in college students. *Journal of College Student Development*, 37 (5), 519-526.
- Hopkins, A., & Zengerle, P. (2008). thestar online: South Korean student blamed for U.S. shooting rampage [Online] Available: [http://thestar.com.my/news/story.asp?file=/2007/4/17/worldupdates/2007-04-17T194000Z\\_01\\_NOOTR\\_RTRJONC\\_0\\_-294547-2&sec=Worldupdates](http://thestar.com.my/news/story.asp?file=/2007/4/17/worldupdates/2007-04-17T194000Z_01_NOOTR_RTRJONC_0_-294547-2&sec=Worldupdates).
- Inam, S.N., Saqib, A., & Alam, E. (2003). Prevalence of anxiety and depression among medical students of private university. *Journal of Pakistan Medical Association*, 53 (2), 44-47.
- PakTribune. (2008). Student commits suicide for not securing good marks in SSC exam [Online] Available: <http://www.paktribune.com/news/index.shtml?185829>.
- Peiffer V. (2002). *Inner Happiness: Positive Steps to Feeling Complete*. London: Judy Piatkus (Publishers) Limited.
- Quantum Flow. (2007). What is quantum flow bioenergetics [Online] Available: [http://www.quantumflow.com/index.php?option=com\\_content&task=view&id=5&Itemid=4](http://www.quantumflow.com/index.php?option=com_content&task=view&id=5&Itemid=4).
- South West Clear Mind. (n.d.). Thought Field Therapy [Online] Available: [http://www.southwestclearmind.co.uk/?page\\_id=4](http://www.southwestclearmind.co.uk/?page_id=4).
- SPSS Base 14.0 User's Guide. (2005). Chicago: SPSS Inc.
- Thomson Reuters. (2008). Student gunman blamed for U.S. campus shooting [Online] Available: <http://www.reuters.com/article/latestCrisis/idUSN17367451>.
- Zensight Energy Healing. (2005). [Online] Available: <http://www.zensightprocess.com/>.

Table 1. Cross-tabulation of Gender with EMP Health Problems

Health Problem	Gender		Total
	Female	Male	
None	6 (9.4%)	11 (22.4%)	17 (15.0%)
Emotional	25 (39.0%)	16 (32.7%)	41 (36.3%)
Physical	13 (20.3%)	9 (18.4%)	22 (19.5%)
Emotional and Mental	0 (0.0%)	4 (8.2%)	4 (3.5%)
Emotional and Physical	6 (9.4%)	1 (2.0%)	7 (6.2%)
Mental and Physical	0 (0.0%)	1 (2.0%)	1 (0.9%)
Emotional, Mental and Physical	14 (21.9%)	7 (14.3%)	21 (18.6%)
<b>Total</b>	64 (100.0%)	49 (100.0%)	113 (100.0%)

This table shows the distribution of the emotional, mental, and physical health problems of the respondents by gender.

Table 2. Types of Treatments According to Severity Level of EMP Health Problems

Treatment/Exercise	Health Problems									
	Emotional			Mental				Physical		
	L	M	H	L	M	H	VH	L	M	H
Soothing the body and the mind (T1)	✓		✓		✓					
Collarbone breathing exercise (T2)		✓	✓							
Psoas exercise (T3)				✓						
Meridian tap exercise (T4)						✓				
What thoughts are ruling your life (T5)							✓			
Zip-up exercise (T6)								✓		
Thymus tap exercise (T7)									✓	
Cross crawl exercise (T8)										✓

Keys: L - Low Severity, M - Medium Severity, H - High Severity, VH - Very High Severity

This table shows the different types of treatment/exercise for emotional, mental and physical health problems based on the severity level.

Table 3. Reliability Coefficients

Item	Number of Questions in Each Category	Alpha Coefficient
<b>1) Before treatment</b>		
Emotional	19	0.659
Mental	9	0.687
Physical	11	0.693
<b>2) After treatment</b>		
Emotional	19	0.692
Mental	9	0.686
Physical	11	0.679

This table shows the Alpha Coefficients for the emotional, mental and physical health before- and after-treatment. All the values are greater than 0.5, implying that all the items have a high level of consistency in each assessment category.

Table 4. Results of Kolmogorov-Smirnov Test

Variable	Test Statistics	<i>p</i> -value
<b>Before-Treatment</b>		
Emotional	0.993	0.278
Mental	0.950	0.327
Physical	1.123	0.160
<b>After-Treatment</b>		
Emotional	0.786	0.567
Mental	0.706	0.702
Physical	0.918	0.368

This table shows the values of the test statistics for emotional, mental and physical health conditions of the respondents before and after performing treatments using the Kolmogorov-Smirnov Test. The values of the test statistics of after-treatment are smaller than before-treatment, implying that the treatments/exercises for emotional, mental and physical health are effective.

Table 5. Results of Paired t-test (Emotional, Mental and Physical Health Problems)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Emotional [Before–Af ter]	.73756	.32827	.03842	.66097	.81415	19.197	72	.000
Pair 2	Mental [Before–Af ter]	.45299	.32949	.06462	.31991	.58608	7.010	25	.000
Pair 3	Physical [Before–Af ter]	.64171	.35741	.05005	.54119	.74223	12.822	50	.000

This table shows the mean difference of the emotional, mental and physical health conditions of the respondents before and after performing treatments. The results imply that their EMP health conditions have improved after performing treatments.

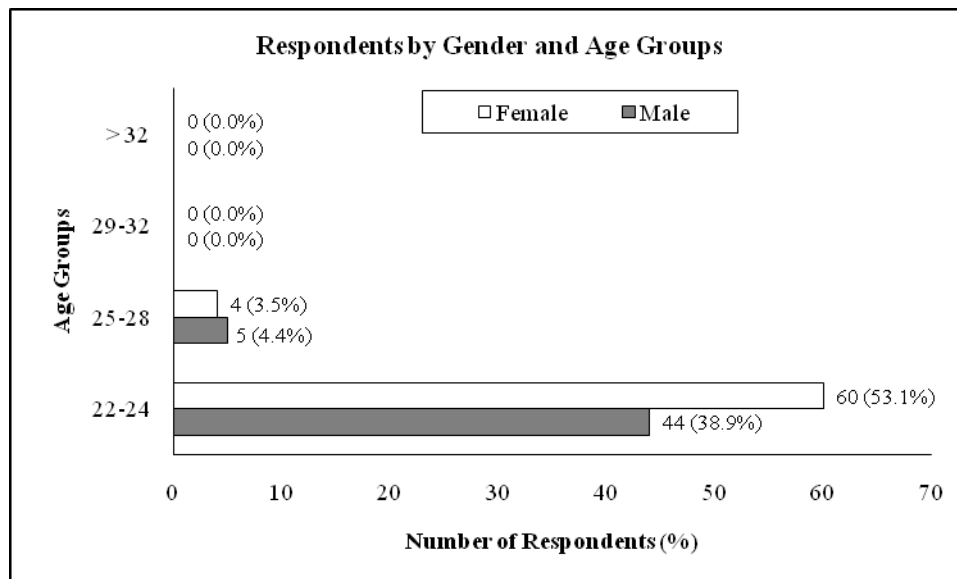
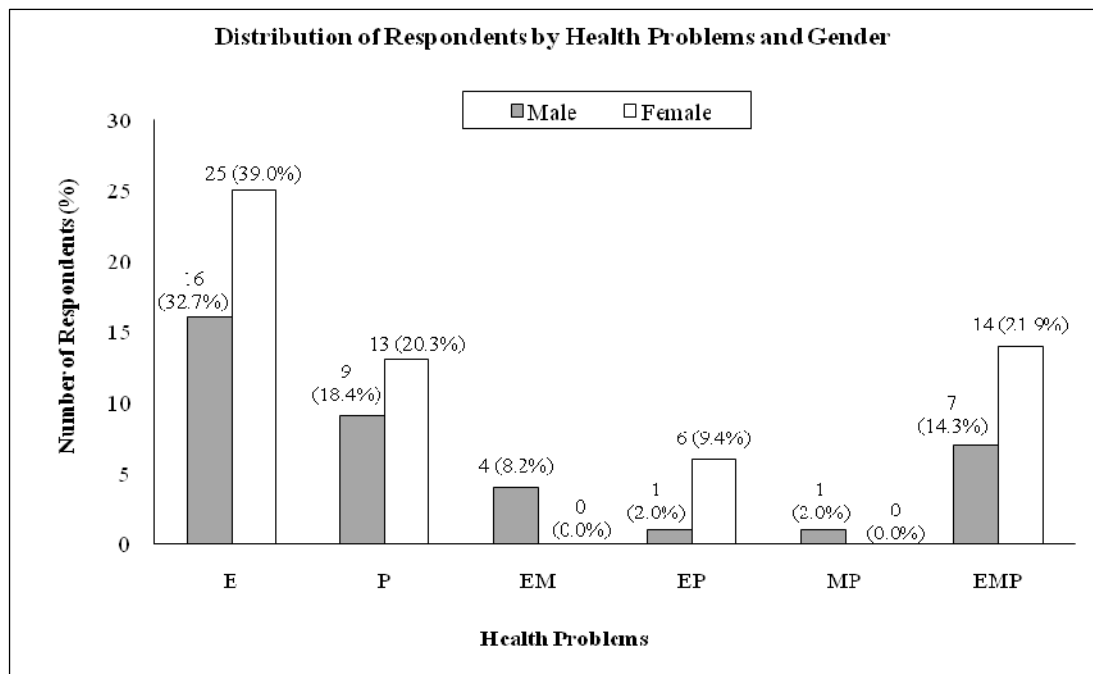


Figure 1. Respondents by Gender and Age Groups

This figure shows the distribution of the respondents by gender and age groups.

Keys:



E-Emotional, M-Mental, P-Physical, EM-Emotional and Mental, EP-Emotional and Physical, MP-Mental and Physical, EMP-Emotional, Mental and Physical

Figure 2. Respondents by Gender and Health Problems

This figure shows the distribution of the respondents by health problems (emotional, mental and physical) and gender.

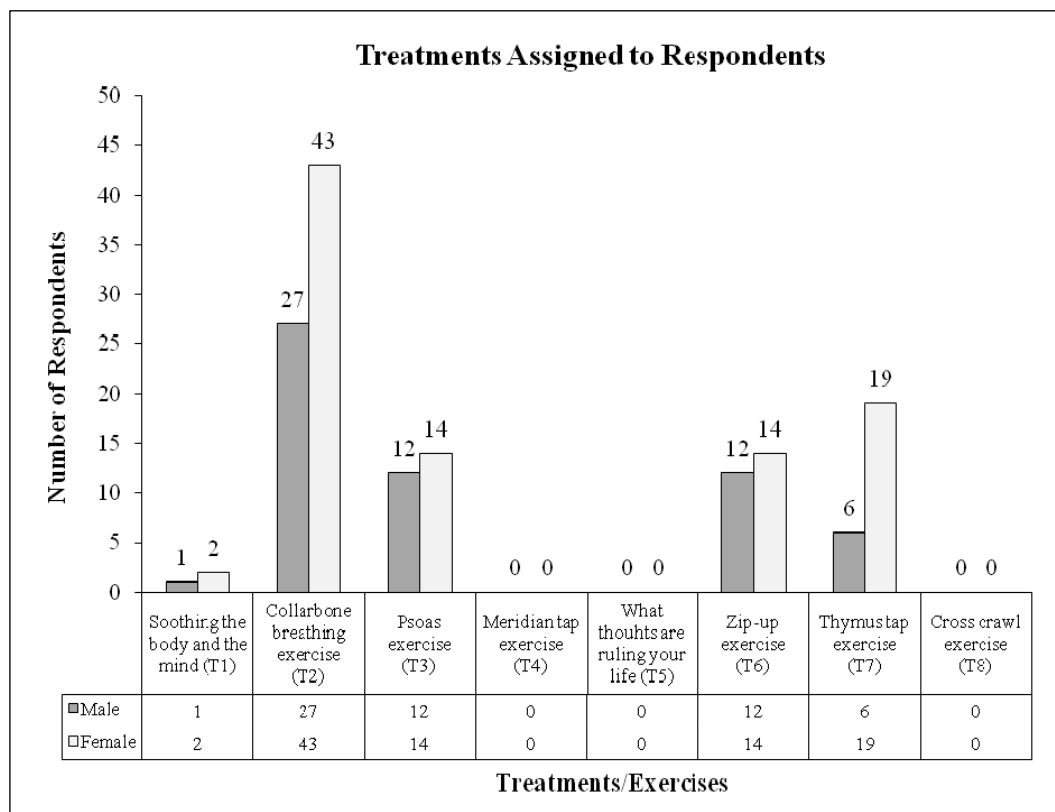


Figure 3. Respondents by Gender and Types of Treatments Assigned

This figure shows the types of treatment assigned to the respondents according to their respective emotional, mental and physical health problem and severity level.



## Information Needs of the Patients with Cervical Cancer

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### Abstract

Cancer patients usually experience a long medical journey. In the process of event, relevant information for cancer patients plays important role in managing their disease. In order to improve healthcare quality for the patients with cervical cancer, this essay discusses the information needs of the patients from three aspects: the information needs at different stages of the patients' journey; relative merits and suitability of different methods for providing the information; and the considerations needed by the information providers when providing the information. The essay suggests that good practice in the provision of the information should give a comprehensive consideration, including technical, legal, policy and social issues.

**Keywords:** Information need, Patients' journey, Cervical cancer, Provision methods, Relative merits, Suitability, Information providers, Consideration

### 1. Introduction

Cervical cancer is a preventable malignant tumour resulting from infection with high-risk types of sexually transmitted human papillomaviruses (HPVs) (Vanslyke et al 2008). HPVs are a very common virus that can affect the cells of the cervix. When a woman's immune system is weakened due to smoking, poor diet, and other infection, such as HIV, the infection is possibly developed as cervical cancer. According to Williams et al (2006), "Each year, about 2,800 women in the UK are diagnosed with cervical cancer." In clinical medicine, cervical cancer can be classified in accordance with its types, stage and grade. The classification may give healthcare providers and patients a clear idea of how quickly it may develop, what is the most appropriate treatment, and how about the prognosis of a patient, and etc. At the early stage of the disease, the most common symptom of the patients with cervical cancer is abnormal bleeding, such as between periods or after intercourse. Often there is also a bed-smelling discharge, and discomfort during intercourse. This symptom or these symptoms, together with the results of the patient's physical examination for diagnosis and further tests, will help doctors to know which the best type of treatment is for every specific patient.

On the other hand, to let women know this information on cervical cancer through suitable method(s) is helpful for preventing, treating and managing the cancer of the cervix. Under the perspective of information studies, tailored healthcare information on clinical manifestation, diagnosis, treatment, and prognosis of the disease, may meet the patients' cognitive need, affective need and physiological need, including (1) provide reassurance and help to cope; (2) understand the processes and likely outcomes of possible tests and treatments; (3) assist in self care and identify self help groups; (4) identify suitable healthcare providers, learn about available services and sources of help; (5) gain a realistic idea of prognosis; (6) learn how to prevent further illness; (7) understand what is wrong; (Note 1) (8) act/respond quicker to health problems; (9) take more responsibility for their health make; (10) seek advice about how to tell children, (11) seek second opinions, and make sense of the stages of the disease; (12) interpret what health professionals have said; (13) tackle isolation; (14) help others understand. (Note 2) According to an investigation, vast majority of the patients with cervical cancer stated that having the information they wanted when they were preparing for treatment, would have reduced anxiety or stress, enhanced quality of life, improved treatment and minimized side effect (Toubassi et al 2007). Lack of the information may lead to increased anxiety and distress, may impact negatively on the patient's satisfaction and may influence a patient's treatment choices.

This essay discusses information needs of the patients with cervical cancer from the following three sides: (1) the information needs at different stage of the patients' journey; (2) relative merits and suitability of different methods for providing the information; and (3) the considerations needed by the information provider. It is hoped that the discussion of the three issues would be valuable in providing (healthcare) information for the patients not only in the prevention, diagnosis, treatment and management of the disease, but also in the protection of the patients' legitimate rights, for example, how the patients can properly accept proposed medical measure(s)?



## 2. Information Needs at Different Stage of the patients' Journey

Under clinical medicine, cervical cancer can be treated in a number of different ways and there may be different options depending upon a patient's conditions (the type, stage and grade of the cervical cancer, and etc.) (Note 3), and how it is affecting the patient. A study suggests that the patients at different stages of the tumour may have different needs of (healthcare) information (Ziebland et al 2004). Therefore, during whole periods of the disease, according to Mossman et al (1999), the patients (and their carers) often have a continuing need for information on the healthcare journey; although the type of information is probably change:

### 2.1 Before visiting her GP (usually the patient is at the stage 1 or 2 of the tumor)

Let us imagine **Scenario (1)**:

A 45 year-old woman notices that she has abnormal bleeding between periods, with a little bad-smelling vaginal discharge. She is worried and makes an appointment with her GP, who informs her do not worry but refers her to the local hospital.

What information might she require when she left her GP? At this point, the following information is usually needed by the patient: what is the possible meaning of these symptoms. What is cause of the problem? What procedures will be followed when going to hospital? Is there anything I can do myself to ameliorate the problem? Is it essential to have treatment for this problem? Where can I get more information about the problem?

### 2.2 During investigation

The patients need the information to seek reassurance that the doctor is doing the right tests, to prepare for the result(s), to improve the value of the consultation. After the diagnosis, the patients may collect the information about diagnosis, treatment, prognosis of the cancer, particularly, the information that is "difficult" to ask about directly, to seek second opinions, to seek advice about how to tell her family, to make sense of the stages of the disease, to interpret what health professionals have said, to tackle isolation.

### 2.3 When choosing treatment

The patients need the information about treatment options and side effects, alternative and/or complementary treatments, and the information that is included together with an honest assessment of whether the treatments are known to be effective (Coulter et al 1999). Before treatment, the patients need to find out what to take to hospital, how to identify and to prepare questions to ask the doctors, how to avoid the treatment risks. The patients want the information about the full range of treatment possibilities, including complementary therapies (Coulter et al 1999). Let us imagine **the scenario (2)**:

At the local hospital the consultant examines her with colposcopy and takes a biopsy. A week later she returns and is informed that she suffered from cervical cancer and will have to be removed by surgery, either trachelectomy (for the patients with an early stage of cervical cancer.) or hysterectomy. She may then have to undergo chemotherapy.

At this point, the patient may need following specific information: What is the best way to treat my cervical cancer? Do I have to have the treatment offered to me? What will happen if I don't have the treatment? Are there any financial costs to me? Are there any advantages to having the combination of treatments of surgery with chemotherapy? What can I do to speed recovery? What are the risks of the treatment(s)? Will the treatment(s) relieve the symptoms? What are the possible side effects? What effect will the treatment(s) have on my feelings and emotions? What effect will the treatment(s) have on my sex life? How can I prepare myself for the treatment?

### 2.4 Short term follow up

The patients may need information about side effects, reassurance about symptoms, advice about diet, complementary treatments, and advice on benefits and finances, to check that the treatment was optimal, perceived therapeutic benefits.

Imagine **scenario (3)**:

The next month the patient accepts the surgical operation and is informed afterwards that the cancer had spread into the upper part of the vagina and tissues next to the cervix, where lymph nodes had to be removed. She undergoes chemotherapy (cisplatin) for six months and 3 months later the doctors inform her that there is no evidence that the cancer has spread.

At this point, the patient may need particularly the following information: what damage has been caused by the misdiagnosis and/or mistreatment? To what extent the medical error (or negligence) has damaged her physical body (fertility or my sex life)? What is the complaint procedure? What are the options for rehabilitation? What remedies for the wrong doing can be got?

### 2.5 Long term follow up

The patients need to share experience and advice, contact support groups and chat rooms, to campaign about the condition, to make anonymous inquiries (Ziebland et al 2004). It should be mentioned that the patients with stage 3 or 4 of cervical cancer, may want more information on how to prevent further spread of the tumor, its prognosis, and how to tell her children and husband.

Understanding the information needs of the patients at different stages of the disease may help information providers improving their information service. In practice, very few of the materials reviewed met all these needs adequately; particularly, the information about consequences of conditions and prevalence of the disease was often missing (Coulter et al 1999). Yet, the situation can be improved if the patients had been consulted about their information needs before the materials were developed.

In conclusion, “better information, better choices.” (Department of Health 2003) Providing the patients more information about how, when and where they receive treatment at different stages, has become one cornerstone of the government’s health strategy (Department of Health 2003).

### 3. Relative Merits and Suitability of Different Methods in Providing the Information

Healthcare information can be provided by four methods: (1) internet, (2) professional medical books and journals, (3) mass media, including booklets, leaflets, magazines and newspapers, audio visual like TV and radio Video/ tapes, electronic like CD-ROM, and etc, (4) clinician consultation or specialist advice. Every method, as stated as follows, has itself relative merits and suitability for the provision of the information:

“Information materials are no substitute for good verbal discussions, but consultations are usually short and plenty of evidence exists that patients do not receive the information they want and need. Leaflets and other materials can therefore play an important part in supplementing and reinforcing information provided by clinicians, but the information they contain must conform to the highest standards of scientific accuracy and must be tested for comprehensibility and relevance.”(Gardiner et al 1999).

This section respectively discusses the advantages and disadvantages of the four methods, and their suitability in offering the information for the patients with cervical cancer.

#### 3.1 The Relative Merits and Suitability of Internet Information

Internet based information may provide a versatile and all-inclusive source of information available to the majority of the patients in developed country or economy developed region (Helft et al 2005). The advantages of internet information are: (1) easy to access. A study on medical internet information suggests that the growth and wider availability of the internet have greatly increased access to health information (Eysenbach and Diepgen 1998). (2) Reduce the cost of healthcare information. (3) Increase of efficiency in producing and spread healthcare information. (4) Time-saving. (5) Internet can be used to provide tailored healthcare information for specific individual(s) by e-mail.

However, the disadvantages of internet healthcare information are also obvious: (1) the lack of accuracy. “Much of this material is inaccurate or misleading, but it is difficult for non-specialists to sort out the wheat from the chaff.”(Ziebland 2004). (2) The lack of reliability. Internet information may completely lack quality control at the stage of production. This may lead more easily to the lack of reliability. (3) The probability of misread. Publics lacking information skill train likely read a web page without seeing context pages or the “cover” page containing disclaimers and warnings. (4) Distortion by commercial interests. (5) Volatility. This means that the internet is too active and swiftly changing to be reviewed by a few such filtering services.

In short, access to the Internet varies widely across socioeconomic and age groups. At present, the Internet chiefly serves the working population and younger population better than those who have retired (Helft et al 2005). Nevertheless, this is changing as the retired population becomes increasingly computer literate. It is believed that the internet is a powerful resource of healthcare information if used correctly in the future (Hunter and Bridger 2004).

#### 3.2 The Relative Merits and Suitability of Professional Medical Book and Journal

Accuracy, reliability and professional are the advantages of the information provided by medical book and journal. But, under the eye of the patients, its main disadvantage is that “the Patients reading information intended for health professionals may misinterpret information, leading to false expectations about treatment options”(Helft et al 2005). In addition, the readability and accessibility of medical book and journal is also doubted. Thus, the suitability of medical books and journals is usually for the use of healthcare professionals.

#### 3.3 The Relative Merits of and suitability of Mass Media

Mass media information is thought to possess a number of advantages. The most outstanding advantage of mass media, such as video information, is that this information may be suitable for any persons, both able to read and unable to read. A study shows that women like seek healthcare information from a variety of mass media sources, including popular

medical books, women's magazines, and television program (Rees and Bath 2000). Another outstanding merit is that the information is usually vivid and acceptable. For example, the booklet may give general information about the diagnosis and treatment of cervical cancer, with simple, acceptable, readable and accurate language. Thus, the mass media is able to overcome the problem of people not understanding the data.

Healthcare information carried by mass media, however, is also viewed as having a number of disadvantages. One obvious shortcoming is that mass media cannot advise a patient (with cervical cancer) about the best treatment and prevention for the patient because this information can only come from the patient's own doctor, who knows full medical history of the patient. Another obvious shortcoming is that the mass media are not targeted and can be costly to use. The third shortcoming is once diagnosed the patients thought that mass media sources such as magazines were frightening and depressing owing to their often negative and sensationalized nature.

Given the relative merits of mass media, a survey shows that among older persons only 21.7% of patients preferred internet information and that 68.8% would rather be given a leaflet (Eysenbach and Diepgen 1998). It can be concluded that healthcare information provided by popular booklets and women's magazines are suitable for the patients who are able to read. Information leaflets, videotapes, and television program are still an important source of information favoured by all patients (Rees and Bath 2000).

### *3.4 The Relative Merits and Suitability of Clinicians' Consultation*

Clinicians' consultation or advice may provide tailored and detailed healthcare information by taking account of individual circumstances. For this reason, the healthcare information for the patients with cervical cancer is reliable, accurate, relevant, safe and acceptable. This is the most outstanding strength of clinicians' consultation that is different from the information of internet, professional medical publications and mass media. A survey finds out that "rather than refer to written materials, many people prefer to rely on the guidance of trusted communicators, such as physicians." (Hunter and Bridger 2004).

However, it is usually the most expensive and time consumed because it usually is offered one by one and face to face. Further, patient focus groups have reported considerable dissatisfaction with their experiences of communication with health professionals. A survey found that "most had wanted much more information about their condition and treatment than they had been given. Many did not feel they had been offered any choices about their treatment, and some had not realized that there were other options." (Toubassi 2007). Therefore, in order to enhance the clinical effectiveness of cervical cancer, the GP, particularly, gynecologists should value the communication with the patients. This is because clinicians' consultation or advice is regarded by the patients as the most valuable information, which is suitable for every patient.

To sum up, every method has its relative merits and applicable scope. Information providers should notice these.

## **4. The considerations needed by the information provider**

Healthcare Information is a relatively cheap intervention that could and should be part of standard care (Mossman 1999). According to the Patients' Charter (1991), patients are entitled to be given information on: (1) detailed information on local health services, including quality standards and maximum waiting times. (2) Services they have arranged. Health authorities must provide a clear explanation of any treatment proposed, including any risks and any alternatives, for the patients decide whether or not agree to the treatment. (3) Common diseases, conditions and treatments. (4) How to complain about NHS services. (5) How to maintain and improve patient own health.

The quality of healthcare information on cervical cancer for the (potential) patients should be considered because, firstly, good quality of the information can bring the patients take an active part in decisions about their health care; secondly, misinformation could be a matter of life or death (Eysenbach and Diepgen 1998).

According to Gardiner et al (1999), the following criteria can be used for the judgment of the information quality: (1) Accessibility; (2) acceptability; (3) readability; (4) comprehensibility; (5) presentation; (6) accuracy and reliability; (7) sources and strength of evidence; (8) reference to sources of further information; (9) credibility of authors, publishers, and sponsors; (10) relevance; (11) utility.

According to these criteria, the following healthcare information on cervical cancer may be judged as unqualified (Eysenbach and Diepgen 1998): (1) the information adopting the paternalistic view that patients cannot cope with bad news and must be kept ignorant of medical uncertainties; (2) the information in which the patients are seen as ignorant children in need of instruction and reassurance, rather than as experts in their own needs and preferences; (3) the information that benefits of proposed or adopted medical measures are emphasized, their risks and side effects are glossed over; (4) the information contained in patient information leaflets is inaccurate or misleading. (5) The information that lacks quantitative statement about recovery time and outcome probabilities.

**In order to improve the quality of the information, the following issues should be considered when providing (healthcare) information for the patients (Note 4):**

#### *4.1 Considerations for Keeping Patients Informed About Treatment and Care*

4.1.1 The information about diagnosis, treatment and care should be presented in a form that is acceptable and useful to support treatment decisions, and given in stages and be reinforced over time.

4.1.2 The information should be tailored to the needs, circumstances and wishes of every specific patient.

4.1.3 Information should be based on the current available. The evidence base of the healthcare information and the involvement of readers in the production of the material base should be considered.”(Shepperd 1999)

4.1.4 Health care providers should be prepared to share information with the patients that supports and promotes informed decision making about HPV testing and vaccines and their complementary roles in cervical cancer screening and prevention.(Vanslyke et al 2008)

4.1.5 The patients should be viewed as active rather than passive recipients of the information. The information should be offered to promote informed choice and shared decision-making.

4.1.6 To improve cancer screening practices, NPs need to address minority women’s beliefs about cervical cancer and provide information and services in a culturally sensitive manner at an appropriate level of learning (Ackerson and Gretebeck 2007).

4.1.7 In order that women’s information needs are met, more accurate and balanced representations of medical and psychosocial HPV information should be provided in patient information leaflets(Hall et al 2008).

#### *4.2 Considerations for Healthcare Information Communication with the Patients*

4.2.1 The patients should always be given the opportunity and time to ask questions about what they are told, to seek clarification and to ask for more information.

4.2.2 The patients should receive a copy of any letter written about their care or treatment by one healthcare professional to another, and must be given such information as enables them to participate in their care.

4.2.3 Before embarking on any procedure, patients should be given an explanation of what is going to happen and; after the procedure the patients should have the opportunity to review what has happened.

4.2.4 Healthcare information providers should avoid giving a specific patient conflicting advice and information. For the aim, professionals that are responsible for the care of any particular patient must communicate effectively with each other.

#### *4.3 Considerations for Feedback from the Patients*

4.3.1 The Patients must be given the opportunity to pass on views on the service which they have received. Formal, systematic structured surveys of the patients’ experience of their care (not merely satisfaction surveys) should be routinely conducted.

4.3.2 Information for the patients with cervical cancer should be nationally relevant and produced by an experienced organization and should have been tested on the patients for its appropriateness. For those patients who will die from their disease, the information on quality of life must be a priority since survival is unattainable; for those who will recover; it makes sense that they do so without unnecessary psychological sequelae from information deprivation (Mossman 1999).

4.3.3 Hospitals must have systems which ensure that the patients know where and to whom to go when they need further information or explanation.

#### *4.4 Considerations for Responding to the Patients When Things Go Wrong*

4.4.1 the following information need for the patients should be considered”: (1) the patients are entitled to receive an acknowledgement, an explanation and an apology. (2) Healthcare providers must explain fully and promptly to the patients what has happened and the likely long- and short- term effects.

4.4.2 Complaints should be dealt with swiftly and thoroughly, keeping the patients informed. An independent advocacy service should be established to assist the patients with specific information needed.

4.4.3 There should be an urgent review of the system for providing compensation information to those who suffer harm arising out of medical care.

### **5. Conclusion**

When providing information for the patients with cervical cancer, besides the patients’ conditions and relevant medical knowledge should be considered, the relevant provisions on offering healthcare information in “Good Medical Practice” established by the General Medical Council, and the recommendations regarding information communication provided by the “Final Report of Bristol Inquiry” should be followed.

## References

- Ackerson, K. Gretebeck, K. "Factors influencing cancer screening practices of underserved women" (2007), 19(11) *Journal of the American Academy of Nurse Practitioners*, p.591-601
- Department of Health, (2003), Strategy paper: building on the best: choice, responsiveness and equity in the NHS
- Department of Health, (2004), "Better Information, Better Choices" 3<sup>rd</sup> May, 2008 Found at [Online] Available: [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_076331](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_076331)
- Eysenbach, G. and Diepgen, T. L. (1998), "Towards quality management of medical information on the internet: evaluation, labelling, and filtering of information", 317*BMJ*1496-1502.
- Gardiner. P.V., *et al.*, "Evidence based patient information", (1999), 318 *BMJ* 461.
- Hall, B., Howard, K., McCaffery, K. (2008), "Do cervical cancer screening patient information leaflets meet the HPV information needs of women?" *Patient Education and Counseling* forthcoming Publishing. 20 May 2008 found at [Online] Available:<http://www.scopus.com/scopus/record/display.url?view=basic&eid>
- Helft, P.R. Eckles, R. E. Johnson, C.S. *et al.* (2005), "Use of the Internet to Obtain Cancer Information Among Cancer Patients at an Urban County Hospital", 23(22) *Journal of Clinical Oncology* 4954 – 4962. 20 May 2008 found at [Online] Available:<http://jco.ascopubs.org/cgi/content/abstract/23/22/4954>
- Hunter, B. G. Bridger, M. W. "An out-patient study into the suitability of providing Ear, Nose & Throat patients with internet based information", *The Internet Journal of Medical Informatics* <sup>TM</sup> ISSN: 1937-8300
- Mossman. J., Boudioni. M. and Slevin. M. (1999), "Cancer information: a cost-effective intervention" 35(11) *European Journal of Cancer* 1587-1591. 20 May found at [Online] Available:[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6T68-3XK0X5C-V&\\_user=128590&\\_rdoc=1&\\_fmt](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6T68-3XK0X5C-V&_user=128590&_rdoc=1&_fmt)
- Rees C. and Bath P.A. (2000), "Mass media sources for breast cancer information: their advantages and disadvantages for women with the disease", 56 (3) *Journal of Documentation*, p.235-249.
- Shepperd, S. Charnock, D. Gann, B. (1999), "Helping patients access high quality health information" 319*BMJ*764-766.
- Vanslyke. J. G., Baum, J. and Plaza. V. (2008), "HPV and Cervical Cancer Testing and Prevention: Knowledge, Beliefs, and Attitudes Among Hispanic Women", 18(5) *Qualitative Health Research* 584-596. 23 May 2008 found at [Online] Available:<http://www.scopus.com/scopus/record/display.url?view=basic&eid=2-s2.0>
- Williams. T., Blake. P. and Priestma T. (2006), *Understanding Cervical cancer*, Informing Understanding Supporting, Cancerbackup.
- Ziebland. S., Chapple. A. and Dumelow, C. and *et al* (2004), "How the internet affects patients' experience of cancer: a qualitative study" 328 *BMJ* 564.

## Notes

- (1) The 1-7 needs of information are original from Coulter. A., Entwistle. V. and Gilbert, D. (1999), "Sharing decisions with patients: is the information good enough?" 318 *BMJ*318-322.
- (2) The 8-14 needs of information are reported by Toubassi. D., Hime. D., Winton. L. S. and *et al.* (2007), "The informational needs of newly diagnosed cervical cancer patients who will be receiving combined chemoradiation treatment", 21(4) *Journal of Cancer Education* 263-268.
- (3) Under medicine, cervical cancer can be classified into 1-4 stages.
- (4) The following section is written by taking "the Final Report of Bristol inquiry" as a reference besides otherwise citing. 27 November, 2007 found at [http://www.bristol-inquiry.org.uk/final\\_report/htm](http://www.bristol-inquiry.org.uk/final_report/htm)



## A Method on Assessing Complication-Base Risk Factors for Neonatal Morbidity: Application for Pattani Hospital Delivery

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### Abstract

We investigated risk factors for neonatal morbidity based on a database of 19,268 singleton maternal deliveries at Pattani Hospital during the period from 1 October 1996 to 30 September 2005 inclusive. This database includes demographics of the mother and delivery outcomes including birth weight, one- and five-minute Apgar scores, and at most one complication selected from a list of 62 by the deliverer. In our study the neonatal risk associated with a complication was defined by averaging the results given by 11 obstetricians who independently scored each complication on a scale from 0 to 9 (highest risk to baby). Using logistic regression to adjust for demographic and pregnancy-history factors, we found risk that Muslim women have higher neonatal morbidity risks, particularly those associated with severe pregnancy-induced hypertension, eclampsia and thick meconium stain.

**Keywords:** Neonatal morbidity, Demographic factors, Ethnicity, Logistic regression analysis

### 1. Introduction

The World Health Organization estimated that more than nine million infants die each year before birth or in the first few weeks of life, with nearly all of these deaths occurring in developing countries. Most of these deaths were caused by pregnancy related complications such as placenta previa and abruption placenta, and delivery related complications including intrapartum mortality (WHO, 1999). In their review of maternal health in poor countries, Filippi et al. (2006) pointed out that 2.4% of neonates are stillborn and another 3% die within 30 days with many due to obstetric complications, and that mother and child outcomes are closely linked. A systematic international review of causes of maternal death by Khan et al. (2006) found abortion and complications leading to hemorrhage, hypertensive disorders and sepsis as leading factors, depending on the region.

In developed countries the maternal mortality risks are now quite low, although a study by Berg et al. (2005) found that 40% of deaths due to pregnancy complications were potentially preventable. Wen et al. (2005) suggested that in

industrialized countries such as Canada maternal morbidity based on delivery complications including venous thromboembolism and uterine rupture should be used instead of mortality as a health care measure.

If a pregnancy complication is assessed as high, preventative medical practices to assist the newborn's survival could be undertaken. Early detection of risk factors in pregnant women is important. Identifying neonatal morbidity risk can help health officers to ensure that pregnant women receive proper care, thereby significantly decreasing maternal and neonatal morbidity and mortality rates (Dangal, 2007). However, assessing the pregnancy complication risk based on the mother's demographic and pregnancy history has not been seriously addressed, especially in developing countries.

In Thailand the major important causes of maternal death in 2003 were hemorrhage (27.8%), indirect cause (21.4%), hypertension (16.7%), amniotic fluid embolism (11.9%), sepsis (8.7%), and direct cause (8.7%) (Ministry of Public Health, 2004).

Located in southern Thailand with population 85% Muslim, Pattani province had perinatal mortality rates 11.4 and 13.0 per 1,000 total births in 2004 and 2005 respectively (Pattani Public Health Provincial Office, 2005). Although perinatal morbidity in the three Muslim majority southern provinces of Thailand is relatively high compared to the predominantly Buddhist provinces to the north, it is difficult to get precise estimates of the underlying relative risks for two reasons. First, birth certificates do not routinely record data other than the birth weight and length, 1-minute and 5-minute Apgar scores, the mother's age and the location of the hospital (rather than the mother), and hospital records of perinatal morbidity including complications are not routinely reported to Public Health authorities. Second, the morbidity rates, even for the less serious complications, are too low to accurately compute relative risks unless the sample size is very large.

However, if a complete record of delivery complications and full demographic information about the mother is recorded consistently by birth attendants at a major hospital over a period of several years, these data can be used to estimate the risk of a serious complication, and to compare these risks with respect to demographic and pregnancy history factors. Provided the risk associated with each complication is known, this can be done even if the actual morbidity events themselves are not recorded at the time, as is often the case when such problems manifest themselves much later. To do this, it is necessary to have estimates of the risk of perinatal morbidity associated with each recorded complication. These estimates can then be applied to estimate the risk itself based on the complication that occurred.

## **2. Materials and methods**

### *2.1 Selection of data*

We selected Pattani Hospital for our study because it has an ongoing well-maintained computerized database with case-by-case records containing birth outcomes including complications as well as 1- and 5-minute Apgar scores and birth weights, and demographic and pregnancy history data for the mother, for all deliveries since 1 October 1996. Our study included deliveries before 30 September 2005. This sample does not reflect births in Pattani Province as a whole, because there are other hospitals, and not all births occur in hospitals. Of the 12,587 births recorded in Pattani province in 2003 and 2004 respectively, 14.4% and 19.0% of mothers delivered in Pattani Hospital, 61.7% and 64.0% in community hospitals and 23.9% and 17.0% with traditional birth attendants (Pattani Public Health Office, 2005).

We excluded women having multiple births (329 deliveries) or previous caesarean births (3,311 deliveries) because no complication was recorded for such deliveries even if one existed. Transfers from another ward and referrals from another hospital (3,250 deliveries) were also excluded because they tend to have much higher morbidity than new cases. The data were entered into a database by nurses at Pattani Hospital, based on information in the hospital records system, giving a study sample of 19,268 for the nine-year period.

### *2.2 Determinant and outcome variables*

The main outcome variable was the risk to the baby, based on the expert opinions of a panel of 11 obstetricians who gave a score from 0 to 9 for each of 62 complications specifying the condition of the infant after birth. These 62 complications were gathered from the existing maternal delivery records in computerized database for 10 years (1996 – 2005). Therefore, all possible mothers' complications were included in this study. A serious complication was defined as one given a score of 7 or more. Other outcomes of interest were one-minute and 5-minute Apgar scores and birth weight. Seven categorical determinants associated with the mother were considered, classified as follows: religion (Islamic or other), education (primary school, junior high school, senior high school, diploma/bachelor's degree, or other), occupation (housewife, government officer, farmer/gardener, business, worker, or other), number of previous pregnancies (gravidity: 0, 1, or more than 1), mother's age (less than 20, 20-24, 25-29, 30-34, or 35 or more), budget year of delivery (defined as the period from 1 October in the preceding calendar year to 30 September in the current year) from 1997 to 2005 inclusive, and residence (15 regions comprising seven based on sub-districts of Pattani city, six based on other districts of Pattani province, Songkla province, or other). In each of these categories 'other' includes 'not stated'.

### 2.3 Severity score for complications

For reasons stated earlier the study did not use an observed outcome because mortality was rare. While manual guidelines are used for detecting possible complications based on the mother's obstetric history there is no objective measure of morbidity based on all the delivery complications that routinely occur. We used a score for predicting the morbidity risk based on the assessments of eleven obstetricians personally known to the first author and working in three hospitals: Pattani Hospital (4), Chiang Mai Hospital (4) and Trang Hospital (3). All eleven agreed to provide their assessments when approached.

The obstetricians were asked to assess on a scale from 0 (no risk) to 9 (most serious risk), the risk to the baby for each of the 62 delivery complications listed in Table 1. These 62 complications were the ones routinely recorded at the hospital, largely by the same delivering personnel over the period of data collection. Although some of them are associated with very low risk and arguably could be omitted from consideration, and others were not defined as accurately as they could be, and the list could be expanded to more accurately reflect changes in medical practice, all were included without any further redefinition, in the same order as on the hospital's list, to ensure that the opinions of the obstetricians were not preempted or biased by any factors other than their own personal judgments.

The average for the 11 assessors – also given in Table 1 – was then taken as the risk score for each complication. For each complication, the average range (disagreement) in scores between the 11 assessors was 4.2. The complications whose associated risks they agreed on most were DFIU (complete agreement), anencephalus, eclampsia, prolapsed cord, and uterine rupture (range 1), and fetal distress, oligohydramnios, and thalassemia in pregnancy (range 2). The complications whose associated risks differed most between assessors were transverse lie (range 8), low fetal movement and placenta previa (range 7) and anemia, asthma, appendicitis, condyloma, gut obstruction, epilepsy, fever, myoma uteri, prolong stage 2, trauma, and VDRL positive (range 6).

### 2.4 Statistical methods

Preliminary statistical analysis involved examining the frequency distributions of the determinants and their univariate associations with the outcome.

We used logistic regression (Kleinbaum and Klein, 2002) to estimate odds ratios and their 95% confidence intervals to compare the high-risk outcome with respect to each determinant both before and after adjusting for the six other factors. For each risk factor the referent category for the odds ratio was taken to be the one with the largest frequency, thus minimizing the widths of confidence intervals for individual odds ratios.

All relevant data were stored in a MySQL database and the R statistical system (Venables and Smith, 2002) was used for the statistical analysis.

## 3. Results

### 3.1 Preliminary results

We graded the severity of a complication as high, medium or low if its average obstetrician-judged rank was 7 or more, 6 to 6.99, or less than 6, respectively. We then created 16 categories of complications by including complications observed on more than 120 occasions individually, and grouping the less frequently occurring complications within each severity group. Table 2 shows the prevalences of these 16 complication groups and the demographic risk factors.

No complication was recorded for 13,511 (70.1%) of the 19,268 deliveries. The most common complications were cephalopelvic disproportion (1,244 cases, 6.5%) and breech presentation (719, 3.7%).

The most common places of residence of the mother were Bana and Sabarang subdistricts of Pattani City (15.4% and 13.1%, respectively), and the most common age groups were 25-29 (28.8%) and 20-24 (26.6%). With respect to gravidity, 43.4% were second pregnancies. Most of the mothers were Islamic (58.4%). In 34.8% of cases education was either not stated or not one of the given categories on the form. Of the remainder, primary school was most common (28.6%). Nearly half of the mothers (42.0%) were housewives. The proportions of cases changed very little from year to year, ranging only from 10.3% in 2000 to 11.8% in 1997.

Table 3 shows the associations between each demographic risk factor and the binary high-risk outcome. Factors associated with high risk delivery complications were mothers aged 35 or more, having two or more previous pregnancies, Islamic religious affiliation, only primary school education and occupation farmer or gardener.

### 3.2 Logistic regression

Table 4 shows the same odds ratios for each risk factor as those in Table 3, together with corresponding 95% confidence intervals, after adjusting for the other risk factors using logistic regression. With respect to the residence of the mother, the risks were found to be generally lower for mothers living in Pattani City with the exception of its central and eastern sub districts. Mothers aged 30 or more had higher risks than younger mothers, whereas those in delivering for the first time were also at higher risk than others. Women who had completed senior high school were at lower risk



than others, whereas farmers and gardeners had higher risk of complications. There was no evidence of a trend over the period 1997-2005.

Adjusting for all the measured socioeconomic factors reduced the odds ratios for Islamic mothers compared to those of other religious affiliation from 1.6 to 1.4, respectively, but the relative risks remained highly statistically significant and substantially greater than 1, with lower bound 1.26 for the 95% confidence interval.

### *3.3 Association between outcomes*

In most maternal morbidity studies a one-minute Apgar score of 7 or less is regarded as an indication of risk signaling that special care is required (Chandra, 1997).

Table 5 shows odds ratios describing the associations between the risks based on the complication severity score and the conventional neonatal morbidity measures 1-minute Apgar score and birth weight group. It shows how the risks based on the Apgar-1 scores may be quantified into six groups with decreasing Apgar-1 score and higher complication-based risk; whereas those based on the very low, low and normal birth weight groups also neatly separate into three complication-based severity groups.

## **4. Discussion**

The present study confirms the accepted wisdom Graham (1998) that the highest risks to newborns arise from specific pregnancy related complications: severe pregnancy-induced hypertension, eclampsia and thick meconium stain. The study showed that rural residence, age, first pregnancy, Islamic mothers, lower educational completion and strenuous occupation are risk factors.

The higher risk among rural residence mothers may be due to the longer distance to access health care services or the difficulty of transportation from living place to the hospital. This result supports a European study finding that rural populations have higher maternal and perinatal mortality than corresponding urban populations (WHO, 2005).

Mothers aged 30 or more had higher risks than younger mothers. This confirms results reported by Uma (2006), Srisomboon (1994) and the Public Health, University of California (1994). Mothers delivering for the first time were at higher risk than others. This result agrees with a study conducted by Islam et al. (2004).

Women who had completed senior high school were at lower risk than others. A similar result was reported by Grijbovski (2002). More highly educated mothers may know how to better take care of themselves during pregnancy. This result is consistent with Raum et al. (2001).

Farmers and gardeners comprised only a small proportion of the study sample but had higher risk of complications. This could be due to their lower income or inferior nutrition.

Islamic mothers had higher risk than others, even after adjusting for all other recorded socio-demographic factors.

Since mothers who had had previous caesarean births were excluded from our study because a complication was not recorded for them even if one existed, it is possible that the omission of these women from our study could have given rise to a selection bias, which could account at least in part for our result. This question is being examined in a separate study.

The result from this study can be applied for screening of pregnant women who are at risk of complications in public health. Education on good practice during pregnancy to prevent complication from developing should be implemented, for institutional early detection and quality of management of antenatal care. We found risk that Muslim women have higher neonatal morbidity risks, particularly those associated with severe pregnancy-induced hypertension, eclampsia and thick meconium stain. Future more women aged over 30 years, lower education, being gardener or farmer and having first gravidity had higher risk of having neonatal morbidity.

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## References

- Berg ,C.J., Harper, M.A., Atkinson, S.M., Bell, E.A., Brown, H.L., Hage, M.L., Mitra, A.G., Moise, K.J. Jr. & Callaghan, W.M. (2005). Preventability of Pregnancy- Related Deaths: Results of a State Wide Review. *Obstetrics and Gynecology*, 106, 1228-1233.
- Chandra, S., Ramji, S. & Thirupuram, S. (1997). Perinatal asphyxia: multivariate analysis of risk Factors in hospital Births. *Indian Journal Pediatrics*, 34, 206-212.
- Dangal,G. (2007). High risk pregnancy. Internet Journal of Gynecology and Obstetrics, 7, [Online] Available: <http://www.ispub.com/ostia/index.php?xmlFilePath=journals/ijgo/vol7n1/risk.xml> (February 2, 2008)
- Filippi, V., Ronsmans, C., Campbell, O.M., Graham, W.J., Mills, A., Borghi, J., Koblinsky, M. & Osrin, D. (2006). Maternal health in poor countries: the broader context and a call for action. *The Lancet* , 368,1535-41.
- Graham, W. (1998). Every Pregnancy Faces Risk. *Planned Parenthood Challenges*, 1, 13-14.
- Grjibovski, A., Bygren, L.O. & Svartbo, B. (2002). Sociodemographic determinants of poor infant outcome in North West Russia. *Pediatric and Perinatal Epidemiology*, 16, 255-262.
- Islam, M.A., Chowdhury, R.I., Chakraborty, N., Bari, W. & Akhter, H. (2004). Factors associated with Delivery complications in rural Bangladesh. *The European journal of contraception and reproductive health care*, 9, 203-213.
- Khan, K.S., Wojdyla, D., Say, L., Gulmezoglu, A.M. & Van Look, P.F. (2006). WHO analysis of cause of maternal death: a systematic review. *The Lancet*, 367, 1066-1074.
- Kleinbaum, D.G. & Klein, M. (2002) *Logistic regression: a self-learning text*. (2nd ed.) New York: Springer-Verlag, (Chapter1).
- Ministry of Public Health. (2004). Mother and Child Health Status 2001-2003. Bangkok: Ministry of Public Health.
- Pattani Public Health Provincial Office. (2005). A report on mother and child health care. Pattani: Pattani Public Health Provincial Office.
- Public Health, University of California. (1994). Factors influencing perinatal and infant Mortality. *Acta Obstetricia et Gynecologica Scandinavica*, 73, 14-26.
- Raum, E., Arabin, B., Schlaud, M., Walter, U. & Schwartz, F.W. (2001). The impact of maternal education on intrauterine growth: a comparison of former West and East Germany. *International Journal of Epidemiology*, 30, 81-87.
- Srisomboon, J. & Tongsong, T.C. (1994). Pregnancy Outcome in elderly women aged 35 years or Older. *The Royal Thai College Obstetrician and Gynecologists*, 6 (2), 121-127.
- Uma, M., Reddy, Chia-Wen. K.O. & Marian, W. (2006). Maternal age the risk of stillbirth throughout pregnancy in the United States. *American Journal of Obstetrics and Gynecology*, 195, 764-770.
- Venables, W.N. & Smith, D.M. (2002). *The r development core team, an introduction to r: revised and updated*. Bristol: Network Theory Ltd.
- Wen, S.W., Huang, L., Liston, R., Heaman, M., Baskett, T., Rusen, I.D., Joseph, K.S. & Kramer, M.S. (2005). Severe maternal morbidity in Canada 1991-2001. *Canadian Medical Association Journal*, 173, 1-6.
- World Health Organization. (1999). *Child Health Research Project Special Report*. Geneva, World Health Organization.
- World Health Organization. (2005). *Maternal and newborn health in the WHO European Region: The challenges and the way forward*. Geneva, Fact sheet EURO/03/05 Copenhagen. Geneva, World Health Organization.

Table 1. Complication frequencies and average severities recorded by 11 obstetricians

Complication	Count	Score	Complication	Count	Score
None	13511	0	Birth before admission	16	6.00
Cephalopelvic disproportion	1244	6.18	Prolapsed cord	15	8.82
Breech presentation	719	5.90	Anemia	15	4.36
Post term labour	443	6.72	Gestational edema	15	1.45
Pre-term labour	370	7.36	Herpes	15	5.90
Prolong stage 1	367	5.09	Oligahydramnios	15	7.36
Premature membrane rupture	352	6.27	Abruption placenta	14	8.36
Prolong stage 2	319	7.00	Asthma	14	4.27
Severe PI hypertension	232	7.36	Anencephalus	13	8.73
Mild PI hypertension	218	5.45	Hydrocephalus	12	7.91
Placenta previa	172	5.55	Polyhydramnios	10	5.81
Fetal distress	161	8.36	Home birth with midwife	10	4.00
Not stated	133	3.50	Myoma uteri	9	4.36
Dead fetus in utero	123	9.00	Condyloma	7	5.09
Low fetal movement	119	6.36	Epilepsy	6	5.82
Membrane leak > 24 hrs	55	6.91	Shoulder dystosia	5	8.27
Postpartum hemorrhage	55	1.36	Fetal anomaly	4	8.00
Transverse lie	54	5.27	Uterine rupture	4	8.91
Retain placenta	49	0.36	Acute diarrhea	4	3.36
Gestational diabetes	43	6.18	UTI in pregnancy	3	5.00
Thick meconium stain	41	8.09	Chronic HT + Accrete	3	7.10
Eclampsia	38	8.55	Gastroenteritis	3	3.18
Occiput presentation	31	2.36	Gestational hypertension	2	4.63
Overt diabetes	30	7.27	Pyelonephritis	1	5.64
Hyperthyroid in pregnancy	29	4.81	Pulmonary edema	1	6.91
Thalassemia in pregnancy	26	6.10	Trauma	1	5.91
Antepartum hemorrhage	24	6.00	Gestational proteinuria	1	1.50
Heart disease	20	6.27	Amniotic embolism	1	8.20
Chronic hypertension	20	6.36	Malaria in pregnancy	0	7.45
VDRL positive	19	6.18	Appendicitis	0	5.09
Face presentation	16	7.36	Gut obstruction	0	5.00
Fever	16	5.36			

Table 2. Distributions of complication outcome and demographic factors

Variable	Cases Count (%)	Variable	Cases Count (%)
Complication group:		Age group:	
None	13511(70.1)	less than 20	1954 (10.1)
Prolong stage 1	367 ( 1.9)	20-24	5120 (26.6)
Mild PI hypertension	218 ( 1.1)	25-29	5552 (28.8)
Placenta previa	172 ( 0.9)	30-34	4025 (20.9)
Breech presentation	719 ( 3.7)	35 or more	2617 (13.6)
Other low severity	483 ( 2.5)	Gravid: 0	7232 (37.5)
Cephalopelvic disp.	1244 ( 6.5)	1	8363 (43.4)
Prem membrane rupture	352 ( 1.8)	2 or more	3673 (19.1)
Post term labour	443 ( 2.3)	Islamic	11255 (58.4)
Other medium severity	343 ( 1.8)	Other religion	8013 (41.6)
Prolong stage 2	319 ( 1.7)	Education:	
Pre term labour	370 ( 1.9)	Primary school	5508 (28.6)
Severe PI hypertension	232 ( 1.2)	Junior high	2674 (13.9)
Fetal distress	161 ( 0.8)	Senior high	2013 (10.4)
Other high severity	211 ( 1.1)	Dipl/Bachelor	2365 (12.3)
Dead fetus in utero	123 ( 0.6)	Other/not stated	6708 (34.8)
Place of Residence:		Occupation:	
Anuru	1176 ( 6.1)	Housewife	8085 (42.0)
Bana	2976 (15.4)	Govt officer	741 ( 3.8)
Sabarang	2533 (13.1)	Farmer/gardener	260 ( 1.3)
City-south	1152 ( 6.0)	Business	1442 ( 7.5)
City-centre	1292 ( 6.7)	Worker	3346 (17.4)
City-east	939 ( 4.9)	Other/not stated	5394 (28.0)
Narat/Yala/not stated	724 ( 3.8)	Year: 1997	2272 (11.8)
Nong Chik	1475 ( 7.7)	1998	2105 (10.9)
KhokPho/Maelan	1143 ( 5.9)	1999	2022 (10.5)
Pattani-east	943 ( 4.9)	2000	1978 (10.3)
Yaring	1994 (10.3)	2001	2079 (10.8)
Rusamilae	1315 ( 6.8)	2002	2210 (11.5)
Yarang	680 ( 3.5)	2003	2162 (11.2)
Pattani-south	383 ( 2.0)	2004	2202 (11.4)
Songkla	543 ( 2.8)	2005	2238 (11.6)

Table 3. High risk complication prevalence and associations with demographic factors

Risk factor	Count (OR)( 95% CI)	Risk factor	Count (OR) (95% CI)
<b>Residence:</b>		<b>Religion:</b>	
Anuru	57 (0.48) (0.36-0.66)	Islamic	968 (1.59) (1.42-1.78)
Bana	165 (0.56) (0.45-0.69)	Other religion *	448
Sabarang	147 (0.58) (0.47-0.73)	<b>Education:</b>	
City-south	83 (0.74) (0.56-0.96)	Primary school*	460
City-centre	91 (0.72) (0.73-1.25)	Junior high	194 (0.86) (0.72-1.02)
City-east	86 (0.96) (0.73-1.25)	Senior high	131 (0.76) (0.62-0.93)
Nar/Yala/NS	43 (0.60) (0.43-0.84)	Dipl/Bachelor	114 (0.56) (0.45-0.69)
Nong Chik	121 (0.85) (0.67-1.08)	Other/not stated	517 (0.92) (0.80-1.04)
KhokPho/Maelan	85 (0.76) (0.58-1.00)	<b>Occupation:</b>	
Pattani-east	71 (0.77) (0.58-1.03)	Housewife *	600
Yaring *	190	Govt officer	34 (0.60) (0.42-0.85)
Rusamilae	107 (0.84) (0.66-1.08)	Farmer/gardener	36 (2.00) (1.40-2.88)
Yarang	76 (1.19) (0.90-1.58)	Business	127 (1.20) (0.99-1.47)
Pattani-south	42 (1.17) (0.56-0.96)	Worker	234 (0.94) (0.80-1.10)
Songkla	52 (1.01) (0.73-1.39)	Other/not stated	385 (0.96) (0.84-1.10)
<b>Age group:</b>		<b>Budget year:</b>	
less than 20	145 (1.07) (0.88-1.31)	1997	171 (1.02) (0.81-1.28)
20-24 *	357	1998	144 (0.92) (0.73-1.16)
25-29	347 (0.89) (0.76-1.04)	1999	173 (1.17) (0.93-1.47)
30-34	297 (1.06) (0.91-1.25)	2000	146 (1.00) (0.79-1.26)
35 or more	270 (1.53) (1.30-1.81)	2001 *	154
<b>Gravidity:</b>		2002	173 (1.06) (0.85-1.33)
0 *	596	2003	156 (0.97) (0.77-1.23)
1	475 (0.67) (0.59-0.76)	2004	131 (0.79) (0.62-1.01)
2 or more	345 (1.15) (1.00-1.33)	2005	168 (1.01) (0.81-1.27)

\* Referent group for odds ratio (OR) calculation

Table 4. Adjusted odds ratios for high risk complications

Risk factor	cases OR (95% CI)	Risk factor	cases OR (95% CI)
<b>Residence:</b>		<b>Religion:</b>	
Anuru	0.59 (0.44-0.81)	Islamic	1.44 (1.26-1.64)
Bana	0.66 (0.52-0.82)	Other relig *	1
Sabarang	0.69 (0.55-0.87)	<b>Education:</b>	
City-south	0.73 (0.55-0.95)	Primary *	1
City-centre	0.79 (0.61-1.03)	Junior high	0.90 (0.75-1.08)
City-east	0.93 (0.71-1.22)	Senior high	0.75 (0.61-0.92)
Nar/Yala/NS	0.73 (0.52-1.04)	Dipl/Bach	0.54 (0.43-0.69)
Nong Chik	0.94 (0.73-1.19)	Other/NS	1.16 (0.95-1.43)
KP/Maelan	0.93 (0.71-1.23)	<b>Occupation:</b>	
Pattani-east	0.94 (0.70-1.25)	Housewife *	1
Yaring *	1	Govt officer	0.77 (0.52-1.14)
Rusamilae	1.05 (0.81-1.35)	Farmer/G	1.63 (1.12-2.38)
Yarang	1.16 (0.87-1.54)	Business	1.19 (0.97-1.46)
Pattani-south	1.17 (0.82-1.68)	Worker	1.01 (0.86-1.19)
Songkla	1.19 (0.85-1.65)	Other/NS	0.58 (0.41-0.82)
<b>Age group:</b>		<b>Budget year:</b>	
less than 20	0.93 (0.75-1.14)	1997	1.37 (0.93-2.01)
20-24 *	1	1998	1.26 (0.85-1.86)
25-29	1.01 (0.86-1.18)	1999	1.33 (1.03-1.73)
30-34	1.22 (1.02-1.46)	2000	1.01 (0.80-1.29)
35 or more	1.58 (1.29-1.93)	2001 *	1
<b>Gravidity:</b>		2002	1.06 (0.85-1.33)
0 *	1	2003	0.96 (0.76-1.22)
1	0.59 (0.51-0.67)	2004	0.79 (0.62-1.01)
2 or more	0.72 (0.60-0.86)	2005	1.01 (0.80-1.27)

Table 5. Associations between conventional neonatal morbidity outcomes and complication based risk outcome

	conventional neonatal morbidity	Number of case		OR (95% CI)
		High risk	Low risk	
Apgar -1 score	9-10*	856	16579	1
	8	132	708	3.6 (3.0-4.4)
	7	66	206	6.2 (4.7-8.2)
	6	52	115	8.8 (6.3-12.2)
	1-5	133	171	15.1 (11.9-19.1)
	0	177	73	47.0 (35.4-62.2)
Birth Weight	2500*	1013	16632	1
	2000-2499	195	1043	3.1 (2.6-3.6)
	<2000	208	177	19.3 (15.6-23.8)



## Opportunity Efficiency - Use Uncertainty Analysis to Evaluate Risks in Construction

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### Abstract

In central Taiwan, around the Taichung basin, the ground condition is boulders with red soils and high ground water level. Local technicians have developed an unusual soil excavation method to build the so-called “soil retaining columns”. It is cheap, practical and highly efficient. However it is fraught with risk and uncertainty.

In general, use of the injury severity method in occupational injury evaluation is a good solution. But, the method seems unsuitable for high risk situation in construction sites. Traditionally, there are 3 excavation methods to frame the soil retaining piles. Their risk distributions are not similar. Thus, we can't use the same safety investment budget when we choose different excavation method. In this study, for increase the exactness of “risk quantity”, we focus on the different “risk distribution”. Based our risk evaluation of the “hazard uncertainty” concept and introducing the notion of “opportunity efficiency” to modify usage of the “risk severity” analysis; this concept will increase the accuracy of safety investment evaluations.

**Keywords:** Opportunity efficiency, Risk evaluate, Occupational safety, Soil retaining columns

### 1. Introduction

When comparing the occupational injury risks of different excavation methods, the problem is how to quantify the different degrees of occupational injuries. In recent years, “injury severity” has emerged as a mature method for safety investment-benefit analysis. This assessment method focuses on occupational injury damage. However, discussion about disproportionate risks in construction sites is not enough. Traditionally the risk distribution is hard to define. There are 3 excavation methods to frame the soil retaining piles. But their risk distributions are dissimilar. During the study, we develop one notion “hazard uncertainty” as the fundamental consideration in injury assessment. We evaluate the “Uncertainty” distribution by an Uncertainty Index (U.I.). Furthermore, for more accurate risk estimation, we provide an “Opportunity Efficiency” (O.E.) index. In this paper, we frame 4 quantification steps: (1) Hazard analysis (2) Hazard severity evaluation (3) Hazard uncertainty distribution and (4) Opportunity efficiency analysis. By those steps, many different construction methods can be defined their “risk quantification” exactly.

### 2. The Introduction of “Soil Retaining Columns”

The ground condition of Taichung basin is boulders mixed with red soil and high ground water level. Local technicians have developed an unusual soil excavation method to build the so-called “soil retaining columns” (Figure 1). The excavation method is very flexible. It can be combined with two or more excavation methods to finish one work by different ground conditions. It is cheap, practical and highly efficient but fraught with uncertainty and risk. Thus, some hazards exist on site. We take a local excavation method as an example below (H.C.Hsu, 2003);

<Figure 1>

In Taiwan, there are 3 methods for build the “soil retaining columns”. They are

Manual excavation after lowering groundwater level

Mechanical excavation

Manual diving excavation

Most of digging labors choose the (1) manual excavation after lowering groundwater level method for excavation because it is the most safety way. But, when we cannot draw down the groundwater level, excavation must be taken under the groundwater level. Then we choose the (3) manual diving excavation method. The engineer might choose the (2) mechanical excavation method if the situation permits (e.g. the soil self-supporting condition can not be exceeded over 5m).

We take the (3) manual diving excavation method for our research topic.

In general, method (3) contains 9 steps as follows (Institute of Occupational Safety & Health, 1997):

Step1: Site survey and construction preparation.

Step2: Set up working canopy (triangle camp) (Figure 2).

Step3: Excavate guide pit (1.5m depth), place soil trash pit, and set up the concrete form work (Figure 3).

Step4: Mix red soil & cement with a 4:1 ratio to make fill balls. These balls will fill in the spaces between gravel and boulder to prevent collapsing of pit (Figure 4 & Figure 5).

Step5: The diver enters the guide pit for diving excavation (Figure 6). For safety, a diver must wear many pieces of equipment (Figure 7) such as diving suit, hot water circulation pump to maintain body temperature, a diving bell for air circulation (Figure 8) and a microphone for communication, etc. Hazards always caused by equipment breakdown.

<Figure 2 and 3>

Step6: Excavate down and send out trash soil by well bucket (Figure 9).

Step7: Pass down the filling balls to fill in the spaces between the gaps of stone.

Step8: Having reached the desired depth, pass down the steel bar cage for reinforcement.

Step9: Pour the concrete.

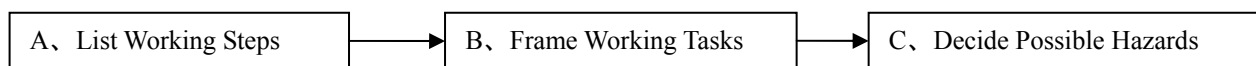
<Figure 4-9>

Top view and section placed are shown in Figure 10 & Figure 11.

<Figure10-11>

### 3. The Operating Items in Hazard Analysis

In the 1<sup>st</sup> step of 4 quantification steps, we use 3 processes to analyze those possible hazards in different construction methods as follow:



In the process A, we can list 9 working steps of the “soil retaining column”.

In the process B, we can decide the 10 working tasks by analyze these 9 steps as shown in Table 1 (Institute of Occupational Safety & Health, 1997).

<Table 1>

In general, operating hazards are due to unsafe behaviors & situations. The two analysis tropics can help us understanding the possible hazards in process C as shown in Table 2.

<Table 2>

When we understand the possible hazard types by each working tasks, we can decide the hazards influence in this excavation method. During the study, the data cannot show “What’s working method by each hazard?” in original information. But we choose the most possible hazard types in actual construction site, and abandon less important hazard. Therefore, we collect 5 possible hazards list in Table 3.

<Table 3>



#### 4. The Analysis of Hazard Severity

Table 4 lists the numbers of persons injured from 1987 to 1996. It is divided by hazard types (Institute of Occupational Safety & Health, 1997). During the study, we choose 5 the most possible hazard types for assessment. The normal injury level assessment method contains the lost working days method, judge theorem method, value analysis method and economic loss method (J.X.Zhou, 2006). We combine the economic loss method and lost working days method, and use “the hazard severity  $\gamma$ ” as the foundation of the injury severity evaluation.

$$(1) \text{ Cripple severity coefficient } \alpha = \frac{\text{Cripple Insurance Indemnification Money}}{\text{Dead Insurance Indemnification Money}}$$

$$(2) \text{ Hurt severity coefficient } \beta = \frac{\text{Hurt Insurance Indemnification Money}}{\text{Dead Insurance Indemnification Money}}$$

$$(3) \text{ Hazard severity coefficient } \gamma = \frac{n_1 + \alpha n_2 + \beta n_3}{N} \quad \text{Eq.(4.1)}$$

In the equation, N means the total number of occupational injuries,  $n_1$  means the number of dead persons;  $n_2$  means the number of crippled persons;  $n_3$  means the number of hurt persons.

The mode we defined the  $\alpha$  and  $\beta$  value by “the insurance indemnifications money” can modified the “man power value” question by “lost working days”.

We collect the number of insurance indemnifications  $P_T$  between 1987~1996 by construction injury, and the insurance indemnification money  $P_M$  between 1987~1996, these statistics are shown in Table 4.

<Table 4>

We can calculate the cripple severity coefficient  $\alpha$  and hurt severity coefficient  $\beta$  by Table 4. Thus, by economic loss method, we can get the hazard severity coefficient  $\gamma$  for different hazard type to list them in Table 5. Let's take the “falling down” for example:

$$\alpha = \frac{248}{328} = 0.756 \quad \beta = \frac{8.5}{328} = 0.026$$

$$\gamma = \frac{665 + 243\alpha + 9936\beta}{10,844} = 0.102$$

We calculate the hazard relative severity coefficient  $\gamma'$ ; it can be provided the same comparative foundation (X.Li, 2005). We take the minimize hazard severity coefficient  $\gamma$  to be equal to 1.0. Again take the “falling down” for example:

$$\gamma' = \frac{\gamma_2}{\gamma_1} = \frac{0.102}{0.056} = 1.817$$

<Table 5>

We can get the severity sequence in the 5 hazard types as follow;

Electric shock > Toppling over > Falling down > Objects crashing > Rolling in, Clipping in

#### 5. The Occupational Injury Grade

In general public occupational injury statistics are divided in 3 grades “cripple, hurt, dead”. But this division cannot be responded to risk quality work exactly. During the study, the occupational injury severities are divided into 7 grades (Health and Safety Commission, 1995). We list them as Table 6.

<Table 6>

#### 6. Uncertainty Distributions

To consider the risk distributions efficiently, we take the root-mean-square deviation  $\pm 1\sigma$  to be the range about the hazard distribution statistics by the Table 5.1. The normality distribution will contain 68% hazard distribution. The reason we abandon the other  $\pm 16\%$  is because those occupational insurance statistical data didn't record the causes of the injuries (R.Flanagan, G.Norman, 1993), (C. Fefferman, 1979). We define the various hazard level average values

$I_\mu$  by different working methods, shown as Eq. (6.1)

$$I_{\mu} = \frac{1}{N} \sum_{i=1}^N \chi_i \quad \text{Eq. (6.1)}$$

$\chi_i; i=1 \sim N$  The hazard level

And we use Eq. (6.2) to calculate the root-mean-square deviation  $\sigma$

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (\chi_i - I_{\mu})^2} \quad \text{Eq. (6.2)}$$

Thus, we take the  $\pm 1\sigma$  range  $I_p$  and  $I_o$  for the pessimistic and optimistic possible injury level when  $n=1$ , as shown in Eq. (6.3)

$$\begin{aligned} I_p &= I_{\mu} + n\sigma \\ I_o &= I_{\mu} - n\sigma \end{aligned} \quad \text{Eq. (6.3)}$$

The hazard uncertainty distribution diagram is shown in Figure 12.

<Figure 12>

Therefore, we define an uncertainty distribution index  $\Delta$  as Eq. (6.4.)

Uncertainty distribution index

$$\Delta = \frac{I_p - I_o}{2} = \frac{1}{2} [(I_{\mu} + n\sigma) - (I_{\mu} - n\sigma)] = n\sigma \quad \text{Eq. (6.4)}$$

During the study, we take  $n=1.0$  for define an uncertainty index U.I. for different hazard ranges.

Then take the index to be equal to 1.0 when that item 『hazard severity  $\gamma$ 』 is at its lowest value. We can get another relative index as Eq. (6.5)

Uncertainty index

$$U.I. = \frac{\Delta_i}{\Delta_0} \quad i=1 \sim n \quad \text{Eq. (6.5)}$$

$\Delta_0$  means the lowest possible value for the 『hazard severity  $\gamma$ 』

Because the existing data focus on “Injury type” merely, it does not show “the reason of injuries”. By that information, all injury types of various construction methods cannot be divided. Let’s take the “falling down” for example. Suppose the “hurt” grade is equal to average 2.0, the “cripple” grade is equal to average 5.0, the “dead” grade is equal to 7.0. We

can know  $I_{\mu}=2.5$ ,  $\sigma=1.2$  by basic statistic analysis. It is not rational that use the same  $I_{\mu}$  &  $\sigma$  in different

construction method. So we modify their  $I_{\mu}$  &  $\sigma$  by different construction method. For example, the “falling down in

manual excavation after lowering groundwater level”, we choose the  $I_{\mu}=3.0$ ,  $\sigma=1.0$ , thus,

$$I_p = 3 + 1 = 4 \quad I_o = 3 - 1 = 2 \quad \Delta = \frac{4 - 2}{2} = 1$$

$$\text{Uncertainty distribution index } U.I. = \frac{\Delta_1}{\Delta_0} = \frac{1}{1.5} = 0.667$$

When the U.I. is large, it means the hazard uncertainty is big. The results are listed in Table 7.  
<Table 7>

## 7. The Analysis of Opportunistic Effect

We have the hazard severity ( $\gamma$ ) by Eq. (4.1). Using “safety investment economic analysis”, we define the Hazard Index (H.I.) as Eq. (7.1)

$$\text{Hazard Index (H.I.)} = (\gamma') * (U.I.) \quad \text{Eq. (7.1)}$$

Let's take the “falling down in manual excavation after lowering groundwater level” for example:

$$(H.I.) = 1.817 \times 0.667 = 1.212$$

This index provides an objective reference meaning. The risk level follows when the UI value is known. Starting from the insurance indemnification money  $P_M$  in Table 4.1, we can calculate the insurance indemnification money ratio for different hazard types  $P_r$ . The index shows the real hazard cost. The  $P_r$  (Insurance Indemnification Ratio) is defined

as follows:

$$P_r = \frac{P_m}{\sum_{i=1}^n P_{mi}} \quad i=1 \sim n; n \text{ means the numbers of this construction possible hazards.} \quad \text{Eq. (7.2)}$$

Let's take the “falling down in manual excavation after lowering groundwater level” for example:

$$P_r = \frac{362,840}{813,236} = 0.446$$

We can understand the relationship between cost & risk by the cost index  $P_r$ . Following the necessity of “opportunity quantity”, we provide an index, the Opportunity Efficiency (O.E.) shown as Eq. (7.3). Opportunity efficiency is the efficiency occupational injury budgets. The result is shown in Table 8.

$$\text{Opportunity Efficiency (O.E.)} = (H.I.) / P_r \quad (\text{Eq. 7.3})$$

<Table 8>

$$(O.E.) = \frac{1.212}{0.446} = 2.716$$

By this efficiency assessment, we can evaluate the opportunity efficiencies of different construction methods & different working items. The results prove that the OE method shows real necessity when compared with the injury severity method.

## 8. Conclusions

How much money must be budgeted for safety?

Which possibilities are so improbable that they should not be budgeted? Risk quantification is the first step if we want to control construction hazards. Uncertainty evaluation can help us to determine many problems. In this case study, we understand what is being controlled clearly, and can ensure a safety boundary. Thus, our measures become more exactly and our options become more accurately. “Opportunistic efficiency” is an interesting concept. The goal is to avoid risk, but, construction work is not gambling. We can get more beneficial effects by determine many cases and understanding uncertainty categories. We make two analyses to prove this notion.

The efficiency of OE in manual excavation after lowering groundwater level

In this manual excavation, because the pit is small, rolling in is unusual. But it is likely that objects will crash. When we use the hazard severity method, it can't consider the different construction methods.

The result shows the rolling in hazard severity,  $\gamma=0.102$  is larger than the object crashing hazard severity,  $\gamma=0.074$

We use the OE method by uncertainty analysis we have the hazard index H.I.

The rolling in hazard index H.I. = 1.212 is smaller than the object crashing hazard index H.I. = 1.310.

This means the hazard level is similar when we consider the insurance indemnification ratio Pr.

The rolling in insurance indemnification ratio Pr = 0.446 is larger than the object crashing Pr = 0.062.

When we calculate the OE value the rolling in opportunity efficiency O.E. = 2.716 is larger than the object crashing O.E. = 21.129.

Therefore, the safety investment economic consideration used in object crashing is better than the consideration for objects rolling in.

#### a. The efficiency of OE in mechanical excavation

In mechanical excavation, the retaining piles toppling over are serious hazard. But electric shock is unlikely. If we use the hazard severity method, it can't be considered the different construction methods. The result shows the electric shock hazard severity  $\gamma=0.356$  is larger than the topping over  $\gamma=0.243$ .

We use the OE method. By uncertainty analysis, we have the hazard index H.I.

The electric shock hazard index H.I. = 3.176 is smaller than the topping over hazard index H.I. = 6.491.

This means the hazard level of toppling over is greater than electric shock hazard level.

When we calculate the OE value the electric shock opportunity efficiency O.E. = 20.226 is smaller than topping over crashing O.E. = 81.690.

This result is suitable. The safety investment economic consideration used in toppling over is better than the consideration for electric shock.

When the construction method is different, the risk distribution will not be similar, and the safety investment should not be similar too. Without internet, this method is not so easy. It bases on large amounts of classification work. It is possible now by the internet to transfer large information. If we can create nice hazard codes by different construction methods, the risk quality of occupational injury will be developed more accurately.

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#### References

- H.C.Hsu, D.H.Jiang. (2003). Portugal; "Use Uncertainty Grade Analysis to Reduce Risks in Construction" XXVII *International symposium ISSA*, 65-66.
- Institute of Occupational Safety & Health, Council of Labor Affairs, Executive Yuan. (1997). Taiwan; "1987~1996 *Annual Report*", IOSH Publication.
- Institute of Occupational Safety & Health, Council of Labor Affairs, Executive Yuan. (1997). Taiwan; "*Construction Safety Assessment Research for Soil Retaining Method*", IOSH Publication.
- J.X.Zhou, Z.G.Ren, X.K.Zhang. (2006). China; "Study on enterprise occupational injury ponderous coefficient", *Journal of Safety Science and Technology*, Vol.2 No.4 Aug.2006, 16~19.
- X.Li, L.Wang, Y.R.He, & C.Y.Song. (2005). China; "Economical Analysis on Safety Investment and Benefits Evaluation"; *China Safety Science Journal*, Vol.15 No.3 Mar.2005, 26~29.
- Health and Safety Commission, (1995), London; "1994/95 *Annual Report*", HMSO Publication.
- R.Flanagan, G.Norman. (1993). "*Risk Management and Construction*", Blackwell Publication, ISBN 0632028165.
- C. Fefferman. (1979). USA; "*the uncertainty principle*", American Mathematical Society, Providence, RI, ISSN 0273-0979.

Table 1. The working tasks listed by each steps

9 steps \ Working Tasks	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9
1. Site arrangement	*								
2. Equipment preparation	*			*					
3. Set up working canopy		*							
4. Excavate guide pit			*						
5. Excavate soil trash pit			*						
6. Manual excavation					*	*			
7. Send out trash soil						*			
8. Fortify pit wall							*		
9. Low down the steel bar cage								*	
10. Pour the concrete									*

\* means the necessary working tasks in this step

Table 2. The possible hazard types listed by each tasks

Working Tasks	Unsafe behavior	Unsafe situation	Hazard type
1. Site arrangement		No suitable site traffic plan	Rolling in, clipping in
2. Equipment preparation	Not using safety gloves	No safety working area	Abrasion
3. Set up working canopy	Not tightening the bearing column & cables	Not keeping the site dry	Toppling over, Objects crashing, Electric shock
4. Excavate guide pit		No suitable excavation procedure	Abrasion
5. Excavate trash soil pit		No suitable excavation procedure	Abrasion
6. Manual excavation	Hammering the gravel without balance	No suitable equipment	Toppling over, Objects crashing, Electric shock
7. Send out gravel	Using windlass incorrectly	No suitable equipment	Toppling over, Objects crashing, Electric shock, Rolling in
8. Fortify pit wall	Hammering the wall surface without balance	No suitable equipment	Toppling over, Objects crashing, Electric shock, Rolling in
9. Low down the steel bar cage	Using windlass incorrectly	No suitable hoisting plan	Rolling in, falling down, Objects crashing
10. Pour the concrete	Excessive vibration, Tremie pipe are not buried inside concrete	No enough bearing equipment	Toppling over

Table 3. The possible hazard list in each step

9 steps Possible Hazards	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9
1. Rolling in, clipping in	*	*	*		*	*			
2. Falling down			*		*			*	*
3. Electric shock		*		*	*	*	*		
4. Toppling over			*		*	*	*	*	
5. Objects crashing		*	*		*	*	*	*	

\* means the possible hazards in this step

Table 4. The statistic data of occupational injuries, 1987~1996, Taiwan.

Possible hazard	Insurance indemnification person-times in 1987~1996 (Pr)				Insurance indemnification moneys in 1987~1997 (Pm) (NTTD/person)				Insurance indemnification average moneys (NTTD/person)		
	hurt	cripple	dead	subtotal	hurt	cripple	dead	subtotal	hurt	cripple	dead
1. Rolling in, Clipping in	9,152	2,107	43	11,302	54,912	139,062	14,104	208,078	6.0	66	328
2. Falling down	9,936	243	665	10,844	84,456	60,264	218,120	362,840	8.5	248	328
3. Electric shock	708	121	263	1,092	4,390	37,026	86,264	127,680	6.2	306	328
4. Toppling over	604	63	144	811	4,530	12,852	47,232	64,614	7.5	204	328
5. Objects crashing, Slashing	1,889	124	61	2,074	12,656	17,360	20,008	50,024	6.7	140	328
Subtotal				26,123			a	813,236			
NTTD:Thousands of Taiwan Dollars ; NTTD 1.0 $\approx$ \$ 0.030 U.S.Dollars											

Table 5. The hazard severity coefficient

Possible hazard	cripple severity $\alpha$	hurt severity $\beta$	hazard severity $\gamma$	relative hazard severity $\gamma'$
1. Rolling in, Clipping in	0.201	0.018	0.056	1.000
2. Falling down	0.756	0.026	0.102	1.817
3. Electric shock	0.933	0.019	0.356	6.351
4. Toppling over	0.622	0.023	0.243	4.327
5. Objects crashing	0.427	0.020	0.074	1.310

Table 6. The physical occupational injuries classification

Grade	Hurt			Cripple			Dead
	1	2	3	4	5	6	7
Condition	Light injury	Hospitalization less than 3 days	Hospitalization over 3 days	Light	Middle	Heavy	

Table 7. The uncertainty analysis index

Probably hazard	Average level	root-mean-square deviation	Injury level		Uncertainty distribution	Uncertainty index
	$I_{\mu}$	$1\sigma$	$I_P$	$I_o$	$\Delta$	U.I.
<b>Manual excavation after lowering groundwater level</b>						
1. Rolling in, clipping in	2.5	1.5	4	1	1.5	1.00
2. Falling down	3	1	4	2	1	0.67
3. Electric shock	2	1	3	1	1	0.67
4. Toppling over	6	1	7	5	1	0.67
5. Objects crashing	3.5	1.5	5	2	1.5	1.00
<b>Mechanical excavation</b>						
1. Rolling in, clipping in	2	1	3	1	1	1.00
2. Falling down	5	1	6	4	1	1.00
3. Electric shock	1.5	0.5	2	1	0.5	0.50
4. Toppling over	5.5	1.5	7	4	1.5	1.50
5. Objects crashing	3.5	1.5	5	2	1.5	1.50
<b>Manual diving excavation</b>						
1. Rolling in, clipping in	2.5	1.5	4	1	1.5	1.00
2. Falling down	3	1	4	2	1	0.67
3. Electric shock	6	1	7	5	1	0.67
4. Toppling over	6.5	0.5	7	6	0.5	0.33
5. Objects crashing	1.5	0.5	2	1	0.5	0.33

Table 8. The opportunity efficiency of different construction methods

Possible hazard	Relative hazard severity	Uncertainty Index	Hazard Index	Insurance indemnification ratio	Opportunity Efficiency
	$\gamma'$	U.I.	H.I.	Pr	O.E.
<b>Manual excavation after lowering groundwater level</b>					
1. Rolling in, clipping	1.000	1.000	1.000	0.256	3.908
2. Falling down	1.817	0.667	1.212	0.446	2.716
3. Electric shock	6.351	0.667	4.234	0.157	26.968
4. Toppling over	4.327	0.667	2.885	0.079	36.307
5. Objects crashing	1.310	1.000	1.310	0.062	21.129
<b>Mechanical excavation</b>					
1. Rolling in, clipping	1.000	1.000	1.000	0.256	3.908
2. Falling down	1.817	1.000	1.817	0.446	4.073
3. Electric shock	6.351	0.500	3.176	0.157	20.226
4. Toppling over	4.327	1.500	6.491	0.079	81.690
5. Objects crashing	1.310	1.500	1.965	0.062	31.694
<b>Manual diving excavation</b>					
1. Rolling in, clipping	1.000	1.000	1.000	0.256	3.908
2. Falling down	1.817	0.667	1.212	0.446	2.716
3. Electric shock	6.351	0.667	4.234	0.157	26.968
4. Toppling over	4.327	0.333	1.442	0.079	18.153
5. Objects crashing	1.310	0.333	0.436	0.062	7.036



Figure 1. "Soil retaining columns"





Figure 2. Cover up working canopy



Figure 3. Set up concrete form work



Figure 4. Mix red soil and making filling balls



Figure 5. Red soil filling balls



Figure 6. Form the red soil pit wall (dry pit)



Figure 7. Diver enter the pit for diving excavation



Figure 8. Diving bell



Figure 9. Send out the trash soil

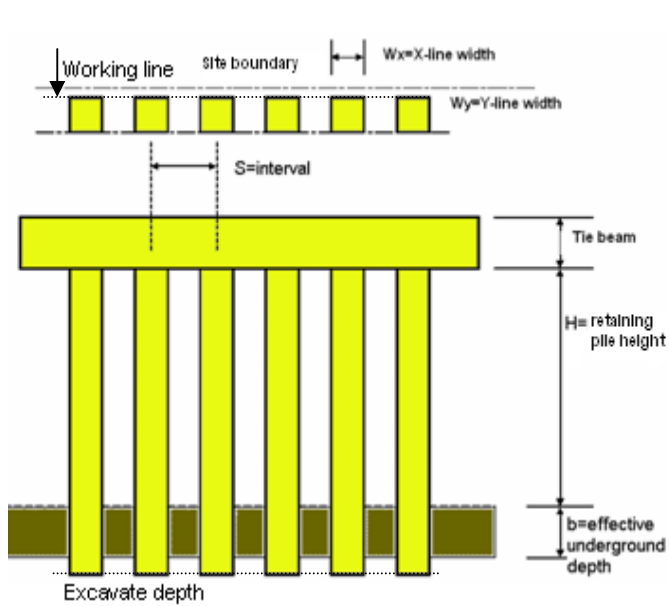


Figure 10. Top &amp; section view pile wall

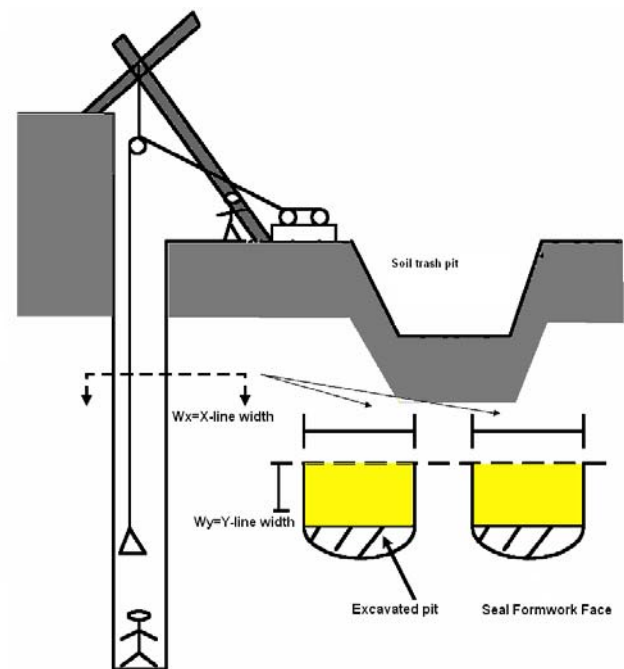


Figure 11. cross section of site &amp; top view of piles

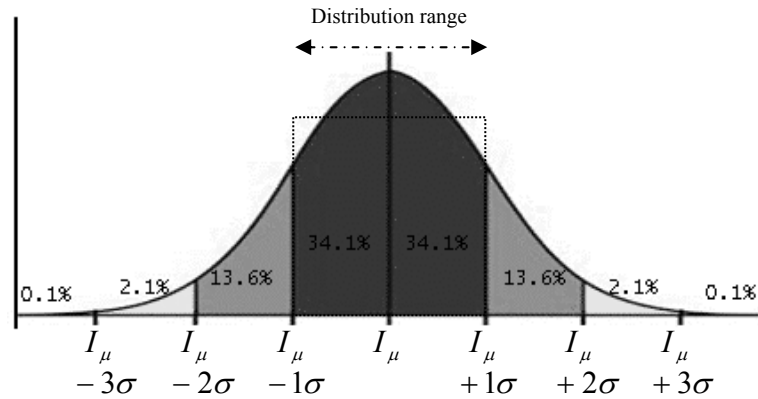


Figure 12. The hazard uncertainty distribution diagram

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