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台灣地區老人精神抑鬱狀態變化長期趨勢研究

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摘 要

隨著年齡增長所累積的許多生活經驗，會增加老人心理健康的問題，憂鬱會影響老年人的生活品質，因此了解影響台灣老年人憂鬱狀況甚為重要。有鑒於此，本研究擬針對台灣地區影響老人憂鬱狀態變化趨勢相關因素作深入的探討研究，以十四年(1989-2003)台灣地區長期追蹤老人樣本探討台灣地區六十歲以上老人，其憂鬱（Depression）的變動趨勢。利用行政院衛生署國民健康局提供的1989－2003 年五波『台灣地區老人保健與生活問題長期追蹤調查』資料進行分析探討，以憂鬱量表（CES-D）建構老人憂鬱程度指標，指標值 10 分或以上歸類為有憂鬱之老人，本研究使用台灣地區老人憂鬱的變動趨勢(轉移、反轉移、重覆轉移)，利用多重狀態模式進行模式探討比較 1989 年至 2003 年五次調查之背景特徵、家庭狀況、社會經濟及健康狀況與老人憂鬱的關係。研究結果顯示多數轉移至憂鬱的老人可以反轉移回到無憂鬱的狀態；此外，經由反轉移的變化後，大多數老人停留在無憂鬱狀態之機率亦大於憂鬱狀態。由多重狀態模式分析顯示配偶、有無與子女同住、經濟狀況、健康自評及體能狀況對老人憂鬱有顯著的相關。

關鍵詞：長期追蹤、老人、憂鬱、多重狀態模式

A Panel Study for Depression Status of the Elderly in Taiwan

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Abstract

With an increase in proportion of elderly population, the focus of public health also needs major adjustments in health policies in order to face challenges due to change in age composition. One major problem in the elderly population is to deal with the depression. This research used representative panel sample survey data collected in the five waves of "The Longitudinal Sample Survey of Health and Living Status of the Elderly in Taiwan" conducted in 1989, 1993, 1996, 1999 and 2003 by the predecessor organization of the Bureau of Health Promotion, Department of Health. Based on a panel sample of elderly who were 60 years old and over at the time of first interview in 1989 and re-interviewed in 1993, 1996, 1999 and 2003, a complete depression scale（CES-D）data was used for this analysis. Depression index score（CES-D score）was constructed from ten items of depression to measure the level of depression and the elderly with CES-D score equal or higher than 10（CES-D≧10）were regarded as depression（depression status）. This study uses the multi-state model with depression status of the elderly in Taiwan (transition, reverse transition and repeated transition) to explore the effect of the factors e.g. health status, home and environment, and social and economic situation on the changing status of depression of the elderly in Taiwan. The results from the multi-state model show that the most elderly can come back to no depression from the depression status. Moreover, the probability of no depression is larger than depression through reverse transition. In addition, spouse, living with children, economic situation, self-related health and physical functions are employed for analyzing the changing status of depression and its related factors of the elderly in Taiwan.

Key word：panel study, old people, depression, multi-state model

Introduction

Due to the rapid decline in fertility and increased longevity in recent years, Taiwan is experiencing a dramatic demographic transition in which the overall proportion of older adults in the population is increasing. In order to face the change in age composition, health policy needs to be adjusted. Moreover, from several studies, it is evident that there is a steady increase in the incidence and prevalence of depression and related problems among the elderly population (Gurland et al., 1980; Murrell et al., 1983; Williams and Connolly, 1990; Lundquist et al., 1997; Schovers et al., 2000; Doraiswamy, 2001; Beekman et al., 2002; Kales and Valenstein, 2002; Crystal et al., 2003; Fischer et al., 2003; Birrer and Vemuri, 2004). Symptoms of depression experienced in late life have serious implications for the health and functioning of older individuals. Thereby, one major task in the elderly population is to deal with the problem of depression.

The understanding of the mental health status of older adults in Taiwan will help the health care system prepare for the mental health needs of this rapidly growing segment of the population. The emerging issues concerning the analysis of depression among elderly include the identification of risk factors from longitudinal studies. There are some studies discussions the effects of age, gender and mental status on depressive symptoms in late life across 14 European centers. It was concluded that large between-centre differences in depression symptoms were not explained by demography or by the depression measure used in the survey. Consistent, small effects of age, gender and marital status were observed. Moreover, some explored whether physical health problems predict the depression in older adults, afterward they discovered physical health problems can be a predictor of depression in elderly from the Netherlands. Some tried to ascertain the relationship between social network type and depression in the elderly, and then their conclusion is that depression severity differed according to subjects' social network and when treating depression in the elderly it is important to consider the social network. Some assessed the impact of mild depression on health related quality of life among the elderly and some investigated the self-rated quality of life of elderly people diagnosed with depression, and to examine the relationships between quality of life and mental, physical health, functional status and social support. Also, some explored social group differences in the depressive symptom trajectories by gender and ethnicity. However, most of these studies are researches based on foreign elderly survey data (Prince et al., 1999; Geerlings et al., 2000; Freyne et al., 2005; Chan et al., 2006; Chiao et al., 2007; Kirchengast et al., 2009), and there only have less studies are analyses of depression among elderly in Taiwan. Besides, Islam et al. (2007) used the longitudinal elderly data of the U.S. and proposed covariate - dependent Markov models by using the logistic link function to examine the transition to depression, reverse transition from depression to no depression and also repeated transition from no depression to depression after experiencing a reverse transition during a study period of those elderly. Since many aspects of mental health can be targeted for improvement in health care, it is important to know how the transitions among the different states of depression in elderly population occur and how the covariates influence these transitions. Hence, it is of interest to estimate transition rates between mental states of elderly in Taiwan, and also to investigate explanatory variables for the rates of transition. However, there is a lack of research regarding the detail about movement among distinct mental states of elderly in Taiwan.

The aim of this study is to analyze how the variables related to demographic, health-related and home condition determinants affect the state of depression for the elderly in Taiwan with multi-state model, which was based on the framework of Cox model. Panel data come from the Taiwan Survey of Health and Living Status of the Elderly, a survey conducted in five waves (1989, 1993, 1996, 1999 and 2003).

1. Data and Method

1.1 Data

The data used in this study come from the survey of Health and Living Status of the elderly in Taiwan which is conducted by Taiwan Provincial Institute of Family Planning in Department of Health with assistance from the Population Studies Center and the Institute of Gerontology of The University of Michigan during the period from 1989 to 2003. The survey consisted of five waves (1989, 1993, 1996, 1999 and 2003). Respondents were adults aged 60 or older in 1989 living in the 331 non-aboriginal areas (countryside, town and city) of Taiwan, and also including those in institutions as well as regular households. The Wave 1 survey used a stratified three-stage probability sample, identifying 27 strata defined by three administrative levels, three levels of education, and three levels of the total fertility rate. The primary sampling unit was township, with block as the second stage unit. Among 4,412 persons for the survey, 4,049 responded, then yielding response rate of 91.8% and followed up in 1993, 1996, 1999 and 2003. We track the survival status of the respondents over the 14-year period for which death data are available, and basic demographic characteristics (e.g., age, gender, level of education), occupational history, social relationships, health status and health care utilization determinants of survival using information reported in five survey waves. Details of sampling and the questionnaire appear in the 1989 Survey of Health and Living Status of the Elderly in Taiwan: Questionnaire and Survey Design (Hermalin et al., 1989).

A series of demographic characteristics, home & environment participation and health status are considered as explanatory variables. Demographic characteristics measures are age level (60-64 = 0, 65-69 = 1, 70-74 = 2, 75-79 = 3, 80+ = 4), gender (female = 0, male = 1), ethnicity (Fukien = 0, Hakka = 1, Mainlander = 2, Aborigine = 3) and level of education (illiterate = 0, elementary school / no formal education = 1, junior high school = 2, senior high school+ = 3). Home and environment participation measures are spouse (having spouse = 0, having no spouse = 1), living status (not living with children = 0, living with children = 1) and economic status (good = 0, fair =1, poor = 2). Health status measures are ADL function, physical function, self-rated health (good = 0, fair = 1, poor = 2).

In common, most of the demographic characteristics, such as age level among whole sample, gender, ethnicity and level of education do not change over time. All of the home & environment participations and health characteristics, subject to change with time. An individual may develop a health problem or may recover from one. An individual who is married at one time may become widowed at a later date while still under observation. However, we do not have information on the exact day of a change in a covariate. Thus, we make use of the data provided from the most recent observation. All these variables were treated as dummy variables and used to assess the effects on the transition probabilities.

Table 1 shows the characteristics of the 4,049 respondents at the time of the first survey in 1989. The age ratio of the elderly from 60 to 69 years old is about two-thirds. As for gender, male outnumber female in the ratio of three to two. About the ethnicity, the percentage of Fukien people is about 61%; mainlander is about 22%; Hakka is 15% and aborigine is only 1.7%. Regarding education, most of the elderly have low level of education. The percentage of illiteracy is around 40%; and only one-fifth of the elderly have junior high degree or more advanced degree. In relation to home and environment, about one-third of the elderly do not have spouses, around 70% live with their children and up to 80% have ideal economic status. About the health status, over four-fifths of the elderly are in good condition in ADL function and physical function; only one-third of the elderly are good in self-rated health. Regarding status of depression, about 75% have ideal mental health status.

1.2 Cox proportional hazard model

With censoring, let T_i and C_i be the event time and the censoring time for *i*th subject, respectively. In practice, the observed data is $X_i = \min(T_i, C_i)$ and $\delta_i = I(T_i \le C_i)$ is the indicator function about censoring. In survival analysis, we assume that $X_i \sim S$ with $S(t) = P(T > t)$. Thus, the hazard function at time t can be defined as

$$\lambda(t) = \lim_{\Delta t \to 0} \frac{\Pr ob(t \le T < t + \Delta t \mid T \ge t)}{\Delta t},$$

and the cumulative hazard is defined by $\Lambda(t) = \int_0^t \lambda(s)ds$.

Consider with covariates, Cox (1972) proposed a proportional hazard model that specifies the hazard at time t for an individual with covariate vector $Z = (Z_1, Z_2, ..., Z_p)'$ as given by

$$\lambda(t \mid Z) = \lambda_0(t)\exp(\beta^{\mathrm{T}} Z),$$

where $\beta = (\beta_1, \beta_2, ..., \beta_p)'$ is the vector of regression coefficients and $\lambda_0(t)$ is an arbitrary and unspecified baseline hazard function. Let $0 < t_1 < t_2 < ...... < t_N$ be the ordered failure times and $R(t)$ be the risk set at time t. Assuming all event times are distinct, the parameter vector β is found by maximizing the partial likelihood

$$L(\beta) = \prod_{j=1}^{N} \frac{\exp(\beta^{\mathrm{T}} Z_j)}{\sum_{l \in R_j} \exp(\beta^{\mathrm{T}} Z_l)},$$

where $\beta^{\mathrm{T}} Z = \sum_{k=1}^{p} \beta_k \times Z_k$. Furthermore, for the baseline cumulative hazard, the estimate $\hat{\beta}$ is used in Breslow's estimate

$$\hat{\Lambda}_0(t) = \sum_{j:t_j \le t} \frac{1}{\sum_{l \in R_j} \exp(\hat{\beta}^T Z_l)}$$

1.3 Competing risks and multi-state models

In survival data, it is desirable to distinguish different kinds of endpoints and treat them differently in analysis. Competing risks concern the situation where more than one type of failure is possible. If failures are different types, only the first of these to occur is observed. In competing risks setup, each of the cause specific hazards may be modeled by the Cox regression model. Usually the estimation is performed by fitting a separate Cox regression model for each endpoint. In many cases, interest will be on the probability of observing a specific endpoint (cumulative incidence) for subjects with a given value of covariate vector. The competing risks problem with k types of failures is shown in Figure 1.

The observable data in competing risks models is represented by the time of failure T, the type of failure D, and a given covariate vector Z. The fundamental concept in competing risks models is the cause-specific hazard function, the hazard of failing from a given cause in the presence of the competing events

$$\lambda_k(t) = \lim_{\Delta t \downarrow 0} \frac{P(t \le T < t + \Delta t, D = k \mid T \ge t)}{\Delta t}.$$

Since the cause-specific hazards are identifiable, regression on the cause-specific hazards is possible. In proportional hazards regression on the cause-specific hazards, we can model the cause-specific hazard of cause k for a subject with covariate vector Z as

$$\lambda_k(t \mid Z) = \lambda_{k,0}(t) \exp(\beta_k^{\mathrm{T}} Z),$$

where $\lambda_{k,0}(t)$ is the baseline cause-specific hazard of cause k, and the vector β_k represents the covariate effects on cause k. At each time some person moves to state k, the covariate values of this subject are compared with the covariates of all other subjects still event-free and in follow-up. Traditionally, subjects who move to another state are treated as censoring at their transition time in competing risk problem.

Standard survival data measure the time span from some time origin until the occurrence of one type of event. If several types of events occur, a model describing progression to each of these competing risks is needed. Multi-state models generalize competing risks models by also describing transitions to intermediate events. It can be seen as an extension of survival or competing risk models when there are several events. A multi-state model (MSM) is a model for a continuous time stochastic process that provides a convenient way to characterize the movement of individuals among distinct states. A change of state is called a transition, or an event. States can be transient or absorbing, if no transitions can emerge from the state (for example, death). In health research, for instance, multi-state models are often employed to provide a comprehensive description of complex disease processes, including estimation of transition intensities and transition probability. For MSM, the transition intensities provide the hazards for movement from one state to another. A Cox model is used to model the effect of covariates on each of the transition intensities. Putter et al. (2006) provided a tutorial aims to review statistical methods for the analysis of competing risks and multi-state models.

For a multi-state model, let T denote the time of reaching state *j* from state *i*, the hazard rate of the $i \to j$ transition is given by

$$\lambda_{ij}(t) = \lim_{\Delta t \to 0} \frac{P(t \le T < t + \Delta t \mid T \ge t)}{\Delta t},$$

and the cumulative hazard for transition $i \to j$ is defined by

$$\Lambda_{ij}(t) = \int_0^t \lambda_{ij}(s)ds.$$

Moreover, the Cox proportional hazards model of each transition for a subject with covariate vector Z is given by

$$\lambda_{ij}(t \mid Z) = \lambda_{ij,0}(t \mid Z)\exp(\beta_{ij}^{\mathrm{T}} Z),$$

where $\lambda_{ij,0}(t)$ is the baseline hazard of transition $i \to j$, and β_{ij} is the vector of regression coefficients that describe the effect of Z on transition $i \to j$.

For a simple case, like Figure 2, there are two possible states. The first is from no depression state to depression, and another is to death. Let $P_{ij}(0,t)$ denote the transition probability from state i to j at time interval $(0,t]$. Thus, the transition probabilities in this model are as follows:

$$P_{00}(0,t) = \exp(-\Lambda_{01}(t) - \Lambda_{02}(t)),$$

$$P_{01}(0,t) = \int_0^t P_{00}(0,u)\lambda_{01}(u)du,$$

$$P_{02}(0,t) = \int_0^t P_{00}(0,u)\lambda_{02}(u)du.$$

2. Results

We have used the panel data on depression for the period 1989-2003. The depression index is based on the score on the basis of the scale proposed by the Center for Epidemiologic Studies Depression scale (CESD). The CESD score is computed on the basis of eight indicators attributing depression problem. The indicators of depression problem are based on eight negative (all or most of the time: poor appetite, everything is an effort to do, sleep is restless, depressed, felt alone, felt isolated, felt sad, and could not get going) and two positive indicators (felt happy, enjoyed life). These indicators are 4 option (0: never, 1: seldom, 2: sometimes, 3: very often) responses of the feelings whether or not they experienced mood changes in the past week prior to the interview. The CESD score is the sum of eight negative indicators minus two positive indicators. Hence, severity of the emotional health can be measured from the CESD score. From the panels of data, we have used 4049 respondents for analyzing depression among the elderly in Taiwan during 1989-2003.

The dependent variable in this study is the depression status: no depression (0≦ CESD score < 10) = 0, depression (10≦ CESD score < 30) = 1, and death = 2 if a respondent died during any two of the consecutive waves. Moreover, the event time in this study means the time from the entry into this study until event occur or end of follow up.

Figure 3 shows the framework of the following analysis. In this study, we considered only subjects with no depression and we are interested in the following situations, depression (transition case), no depression after experiencing depression (reverse transition case), and depression after reverse transition to no depression (repeated transition case). In order to understand the structure of the status of depression of the elderly, Table 2 shows respondent counts based on different transition types and Table 3 summarizes the counts in terms of the proposed models for transitions, reverse transitions and repeated transitions.

For the case of transition, there are 3028 no depression individuals at 1989. From Figure 4, there are 947 subjects on transition $0 \rightarrow 1$, and 795 subjects on transition $0 \rightarrow 2$. Finally, 1286 of 3028 respondents did not experience any event. From the Cox's proportional model, the results of transitions $0 \rightarrow 1$ and $0 \rightarrow 2$ are shown in Table 4. There are four variables (gender, economic, self-rated health, physical function) strongly related to the depression status of the elderly. The hazard ratios of all significant covariates for transition $0 \rightarrow 1$ are explained as follows:

1. Gender: The hazard ratio for males is 0.742 times that of females. It implies that the status of depression for males is less than females.
2. Economic: The hazard ratios of economic for fair and poor statuses are 1.846 and 2.425 times that of good status, respectively.

3. Physical functions: The hazard ratio of poor physical functions is 1.312 times that of good physical functions.
4. Self-rate health: The hazard ratios of fair self-rated health and poor self-rated health are 1.724 times and 2.550 times that of good self-rated health, respectively.

Furthermore, the prediction transition probabilities of the transition case which are adjusted for these covariates are presented in Figure 5. For the transition probability of $0 \rightarrow 1$ increases as time increases. Besides, it is comparatively serious at the first period (1989-1993). For the transition probability of transition $0 \rightarrow 2$, it increases as time increases.

For the reverse transition case (Figure 6) which is contained on transition $0 \rightarrow 1$, there are 945 observations in this model. In Figure 6, there are 441 subjects on transition $0 \rightarrow 1 \rightarrow 0$, 233 subjects on transition $0 \rightarrow 1 \rightarrow 2$, and 271 of 945 respondents remained in the same state of depression during the remaining period. Similarly, starting at transition $0 \rightarrow 1$, the results of transitions $0 \rightarrow 1 \rightarrow 0$ and $0 \rightarrow 1 \rightarrow 2$ from the Cox model are presented in Table 5. The hazard ratios of all significant covariates for transition $0 \rightarrow 1 \rightarrow 0$ are explained as follows:

1. Ethnicity: The hazard ratio of individuals from mainland China is 1.376 times that of Fukien Taiwanese.
2. Living status: The hazard ratio of living without children is 1.277 times that of living with children.
3. Economic: The hazard ratios of economic for fair and poor statuses are 0.899 and 0.636 times that of good status, respectively.
4. Physical functions: The hazard ratios of fair physical functions and poor physical functions are 0.506 times and 0.362 times that of good physical functions, respectively.

5. Self-rate health: The hazard ratio of poor self-rated health is 0.638 times that of good self-rated health.

For transition $0 \rightarrow 1 \rightarrow 0$, it is difficult from depression status to no depression for the elderly with worse self-related health and physical functions. The worse economic situation has the same trend. Moreover, there is a comparatively special phenomenon that the elderly living without children have a better status than living with children for the transition $0 \rightarrow 1 \rightarrow 0$. As for transition $0 \rightarrow 1 \rightarrow 2$, two covariates, age and self-related health, are strongly related to the survival status after experiencing depression for the elderly. For the transition probability, Figure 7 presents the prediction transition probability of reverse transition case. This means that the elderly experiencing depression can come back no depression as time increases.

For the repeated transition case (Figure 8) which is contained on transition $0 \rightarrow 1 \rightarrow 0$, there are 439 observations in this model. There are 73 subjects on transition $0 \rightarrow 1 \rightarrow 0 \rightarrow 1$, 95 subjects on transition $0 \rightarrow 1 \rightarrow 0 \rightarrow 2$, and 271 of 439 respondents remained in the same state during the remaining period. Starting at transition $0 \rightarrow 1 \rightarrow 0$, Table 6 shows the results of transitions $0 \rightarrow 1 \rightarrow 0 \rightarrow 1$ and $0 \rightarrow 1 \rightarrow 0 \rightarrow 2$ from the Cox model. There are three covariates (economic, self-related health and physical functions) significant. This phenomenon is the same with transition $0 \rightarrow 1$. Besides, for the repeated transition, the elderly remain in the same state through the transition $0 \rightarrow 1 \rightarrow 0$ (Figure 9).

3. Discussions

This study uses the 5 waves of data from the Survey of Health and Living Status of the Elderly in Taiwan and applies the multi-state model based on the Cox proportional hazard model to analyze covariates related to demographic characteristics, mental and physical health, health behavior and home conditions for the elderly in Taiwan.

For the depression status of the elderly, the results from the multi-state model show that the health status (ADL function, self-related health, and physical function) and home condition (economic status) related to the depression of the elderly. Moreover, the hazard of depression for males is lower than females and the hazard of individuals from mainland China who from depression status to no depression is lower than the Fukien Taiwanese.

For the transition probability, the transition probability of no depression to depression ($0 \rightarrow 1$) increases as the time increases. Besides, the elderly who transfer from no depression to depression may come back to the no depression status. However, almost of the elderly in the case of transition $0 \rightarrow 1 \rightarrow 0$ stay at the same state. In other words, the probability of transition $0 \rightarrow 1 \rightarrow 0 \rightarrow 1$ is less much than $0 \rightarrow 1 \rightarrow 0 \rightarrow 0$.

This study uses a simple way, which treats competing risks as multi-state model (Figure 2), to analyze the depression status for the elderly in Taiwan. Thus, the survival status for the elderly is not mentioned much. One reason is that we focus on the depression about elderly. The other is that this study is based on each separated transition and the death is not the only event. In the future, a more complicated multi-state model will be considered.

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Table 1. Characteristics and status of respondents at initial interview in 1989 (N=4,049).

Variables	n	%	Variables	n	%
Age level			Living status		
60-64	1482	36.60%	with children	2873	70.95%
65-69	1152	28.45%	not with children	1010	24.94%
70-74	725	17.91%	Missing	166	4.11%
75-79	438	10.82%	Economic status		
80+	252	6.22%	Good	1683	41.56%
Gender			Fair	1524	37.64%
Female	1738	42.92%	Poor	689	17.02%
Male	2311	57.08%	Missing	153	3.78%
Ethnicity			Self-rated health		
Fukien	2477	61.18%	Good	1528	37.74%
Hakka	603	14.89%	Fair	1494	36.09%
Mainlander	900	22.23%	Poor	1027	25.36%
Aborigine	69	1.70%	ADL function		
Levels of Education			Good	3282	81.06%
Illiterate	1685	41.62%	Fair	624	15.41%
Elementary school	1596	39.42%	Poor	143	3.53%
/ no formal education		8.13%	Physical function		
Junior high school	329	10.84%	Good	3361	83.01%
Senior high school+	439		Fair	478	11.81%
Spouse			Poor	210	5.19%
Yes	2603	64.29%	status of depression		
No	1446	35.71%	No depression	3036	74.98%
			Depression	861	21.26%
			Missing	152	3.76%

Table 2. Respondent counts based on transitions, reverse transitions and repeated transitions.

Transition types	N	Transition types	N	Transition types	N
		Transitions			
No transition	(1290)	Transition 0-1	(947)	Transition 0-2	(792)
0-3	315	0-1	452	0-2	335
0-0-3	208	0-0-1	274	0-0-2	172
0-0-0-3	92	0-0-0-1	144	0-0-0-2	135
0-0-0-0-3	67	0-0-0-0-1	77	0-0-0-0-2	153
0-0-0-0-0	612				
		Reverse Transitions			
No transition	(271)	Reverse Tran. 0-1-0	(441)	Reverse Tran. 0-1-2	(233)
0-1-1-1-1	12	0-1-0	187	0-1-2	84
0-0-1-1-1	15	0-0-1-0	119	0-0-1-2	50
0-0-0-1-1	33	0-1-1-0	36	0-1-1-2	18
0-0-0-0-1	77	0-0-0-1-0	58	0-0-0-1-2	45
0-1-3	57	0-0-1-1-0	31	0-0-1-1-2	21
0-1-1-3	19	0-1-1-1-0	10	0-1-1-1-2	15
0-0-1-3	31				
0-1-1-1-3	14				
0-0-0-1-3	8				
0-0-1-1-3	7				
		Repeated Transitions			
No transition	(271)	Repeated Tran. 0-1-0-1	(73)	Repeated Tran. 0-1-0-2	(95)
0-1-0-0-0	64	0-1-0-1	34	0-1-0-2	22
0-0-1-0-0	54	0-0-1-0-1	21	0-0-1-0-2	32
0-0-0-1-0	58	0-1-1-0-1	8	0-1-1-0-2	10
0-1-1-0-0	13	0-1-0-0-1	10	0-1-0-0-2	31
0-0-1-1-0	31				
0-1-1-1-0	10				
0-1-0-3	20				
0-1-0-0-3	6				
0-0-1-0-3	12				
0-1-1-0-3	5				

No depression = 0; Depression = 1; Death = 2; Missing = 3

Table 3. Distribution of respondents in terms of the models for transitions, reverse transitions and repeated transitions.

Transition Types	N	%
Transitions		
No transition from no depression	1294	43
No depression to depression (0 →1)	947	31
No depression to death (0 → 2)	795	26
Total	3036	100
Reverse Transitions		
No transition after transition to depression	271	29
No depression to depression to no depression (0 → 1 → 0)	441	47
No depression to depression to death (0 → 1 → 2)	233	24
Total	947	100
Repeated Transitions		
No transition after reverse transition	271	61
No depression to depression to no depression to depression (0 → 1 → 0 → 1)	73	17
No depression to depression to no depression to death (0 → 1 → 0 → 2)	95	22
Total	441	100

Table 4. Estimated Coefficients and Hazard ratios of Cox Proportional Hazard Model for the first transition.

		Transitions					
		$0 \rightarrow 1$			$0 \rightarrow 2$		
Variables		coef	exp(coef)	*p*	coef	exp(coef)	*p*
Age	65-69	0.081	1.085	0.310	0.158	1.679	<0.001*
	70-74	0.149	1.160	0.130	1.061	2.890	<0.001*
	75-79	0.149	1.161	0.280	1.472	4.359	<0.001*
	80+	0.439	1.552	0.025	1.775	5.900	<0.001*
Gender	male	-0.298	0.742	<0.001*	0.515	1.673	<0.001*
Education	Elementary school	-0.139	0.870	0.083	-0.107	0.899	0.240
	Junior high school	-0.139	0.870	0.310	-0.242	0.785	0.110
	Senior high school+	-0.265	0.768	0.057	-0.345	0.708	0.022*
Ethnicity	Hakka	-0.111	0.895	0.240	-0.025	0.975	0.800
	Mainlander	0.171	1.186	0.072	-0.219	0.803	0.049*
	Aborigine	0.325	1.383	0.200	0.449	1.567	0.150
Spouse	no	-0.079	0.924	0.280	-0.195	0.823	0.016*
Living status	no	0.047	1.048	0.500	0.297	1.346	<0.001*
Economic	fair	0.613	1.846	<0.001*	0.043	1.044	0.590
	poor	0.886	2.425	<0.001*	-0.157	0.855	0.220
Self-rated health	fair	0.545	1.724	<0.001*	0.050	1.051	0.560
	poor	0.936	2.550	<0.001*	-0.029	0.971	0.780
ADL function	fair	-0.235	0.790	0.230	1.625	5.077	<0.001*
	poor	0.0800	1.083	0.720	1.594	4.921	<0.001*
Physical function	fair	0.015	1.015	0.870	-0.577	0.562	<0.001*
	poor	0.272	1.312	0.041*	-1.263	0.283	<0.001*

*Significant at 5% level

Table 5. Estimated Coefficients and Hazard ratios of Cox Proportional Hazard Model for reverse transitions

		Transitions					
		$0 \rightarrow 1 \rightarrow 0$			$0 \rightarrow 1 \rightarrow 2$		
Variables		coef	exp(coef)	*p*	coef	exp(coef)	*p*
Age	65-69	0.176	1.192	0.120	0.260	1.296	0.150
	70-74	0.194	1.214	0.190	0.885	2.422	<0.001*
	75-79	-0.093	0.911	0.730	1.544	4.681	<0.001*
	80+	0.329	1.389	0.400	1.570	4.805	<0.001*
Gender	male	-0.012	0.988	0.920	0.517	1.676	0.002*
Education	Elementary school	-0.091	0.913	0.440	-0.021	0.979	0.900
	Junior high school	-0.298	0.742	0.120	-0.235	0.791	0.440
	Senior high school+	-0.070	0.933	0.720	-0.127	0.881	0.680
Ethnicity	Hakka	0.058	1.060	0.690	0.138	1.147	0.480
	Mainlander	0.319	1.376	0.016*	0.201	1.233	0.330
	Aborigine	0.151	1.163	0.740	0.386	1.471	0.420
Spouse	no	-0.178	0.837	0.090	-0.247	0.781	0.110
Living status	no	0.244	1.277	0.018*	0.130	1.139	0.370
Economic	fair	-0.106	0.899	0.340	0.089	1.093	0.600
	poor	-0.452	0.636	0.001*	0.198	1.219	0.290
Self-rated health	fair	-0.106	0.899	0.420	0.794	2.213	0.016*
	poor	-0.450	0.638	<0.001*	1.205	3.336	<0.001*
ADL function	fair	-0.473	0.623	0.260	0.335	1.398	0.250
	poor	-0.702	0.495	0.150	0.172	1.188	0.580
Physical function	fair	-0.681	0.506	<0.001*	0.225	1.253	0.170
	poor	-1.017	0.362	<0.001*	0.057	1.058	0.810

*Significant at 5% level

Table 6. Estimated Coefficients and Hazard ratios of Cox Proportional Hazard Model for repeated transition.

		Transitions					
		$0 \rightarrow 1 \rightarrow 0 \rightarrow 1$			$0 \rightarrow 1 \rightarrow 0 \rightarrow 2$		
Variables		coef	exp(coef)	*p*	coef	exp(coef)	*p*
Age	65-69	-0.382	0.962	0.890	0.378	1.459	0.170
	70-74	0.127	1.135	0.730	1.192	3.295	<0.001*
	75+	0.910	2.485	0.150	1.544	4.685	<0.001*
Gender	male	-0.162	0.851	0.580	0.797	2.218	0.003*
Education	Elementary school	0.296	1.345	0.310	-0.055	0.946	0.830
	Junior high school	-0.459	0.632	0.470	-1.332	0.264	0.031*
	Senior high school+	-0.187	0.829	0.730	-0.414	0.661	0.360
Spouse	no	0.184	1.202	0.500	-0.039	0.962	0.870
Living status	no	-0.458	0.632	0.070	0.353	1.423	0.140
Economic	fair	0.358	1.430	0.240	0.495	1.640	0.049*
	poor	0.666	1.945	0.042*	0.401	1.494	0.220
Self-rated health	fair	0.942	2.566	0.100	0.506	1.658	0.110
	poor	1.840	6.295	<0.001*	0.446	1.562	0.160
Physical function	fair	0.524	1.689	0.066	-0.056	0.946	0.830
	poor	0.930	2.536	0.006	0.357	1.429	0.260

*Significant at 5% level

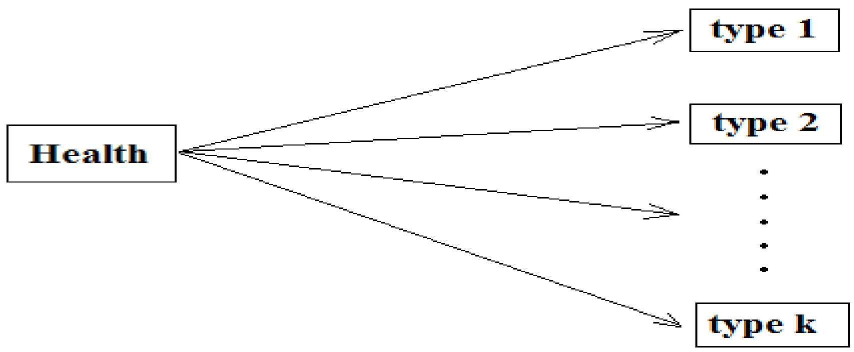

Figure 1 The competing risks situation with k types of failures

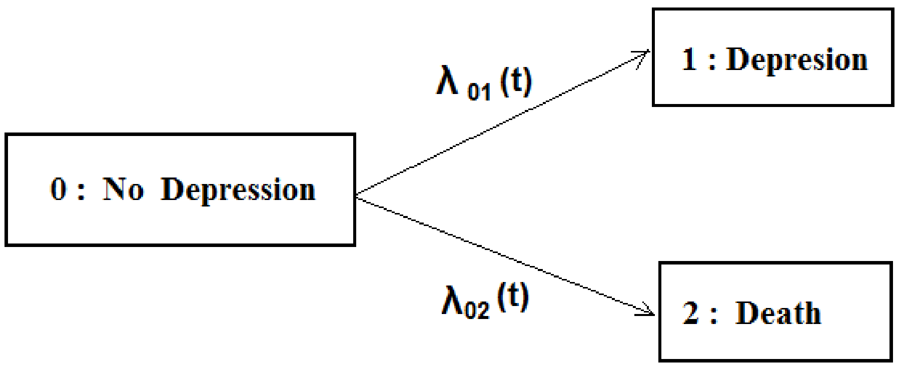

Figure 2 The competing risks model

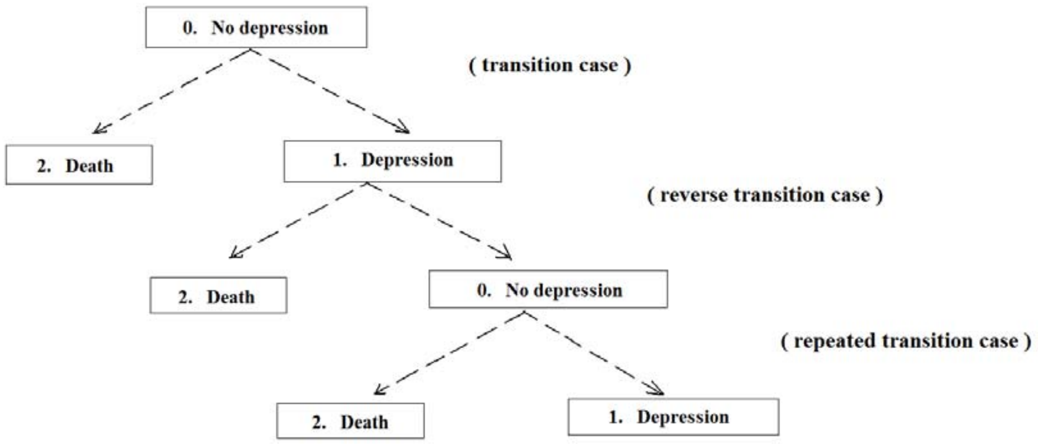

Figure 3 The multistate models

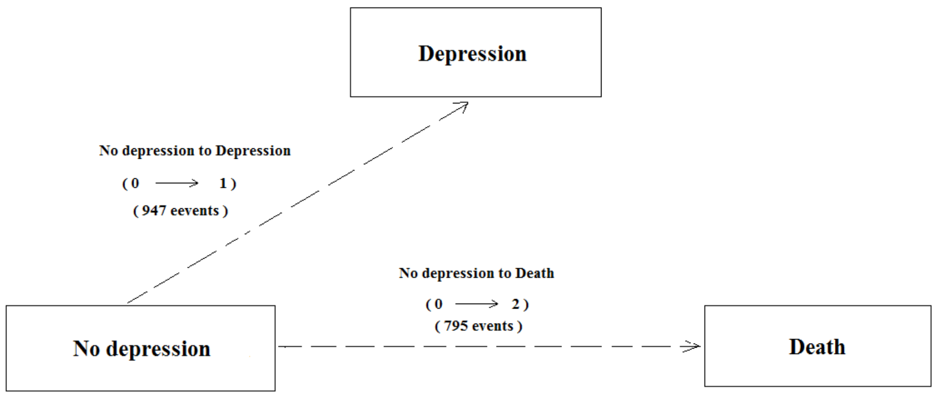

Figure 4 The multi-state model for transition case

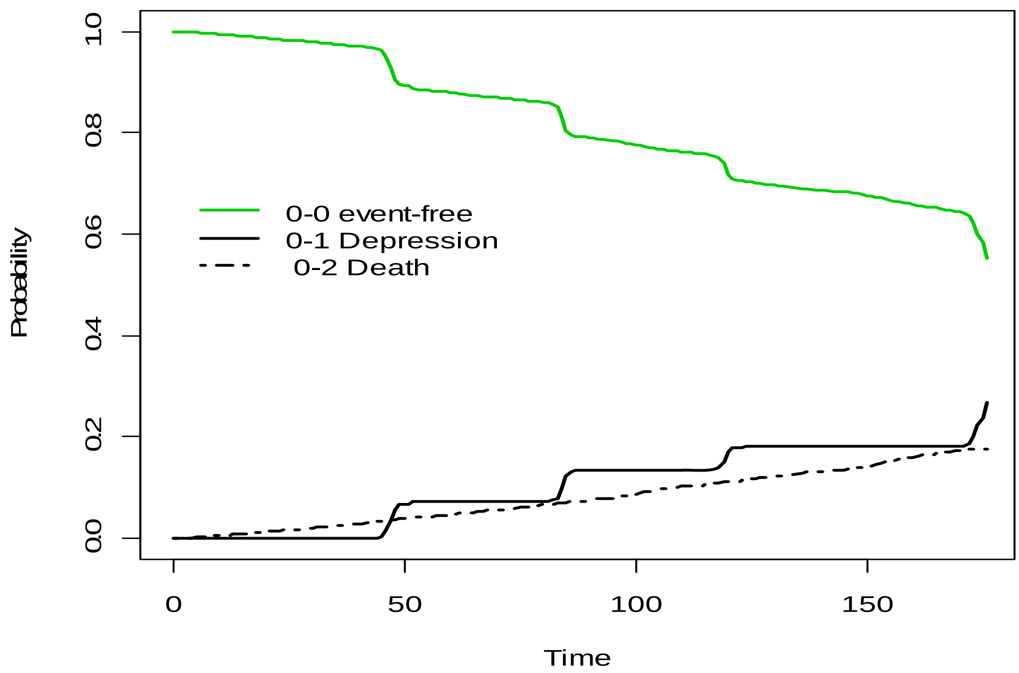

Figure 5 The transition probability for the first transition

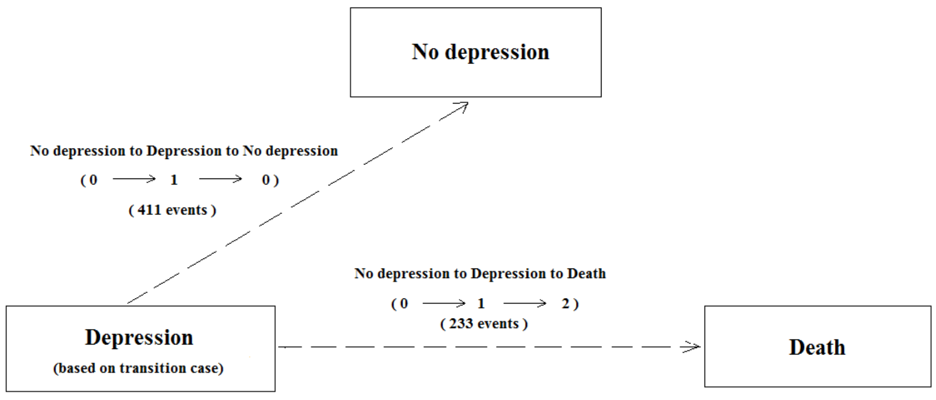

Figure 6 The multi-state model for reverse transition case

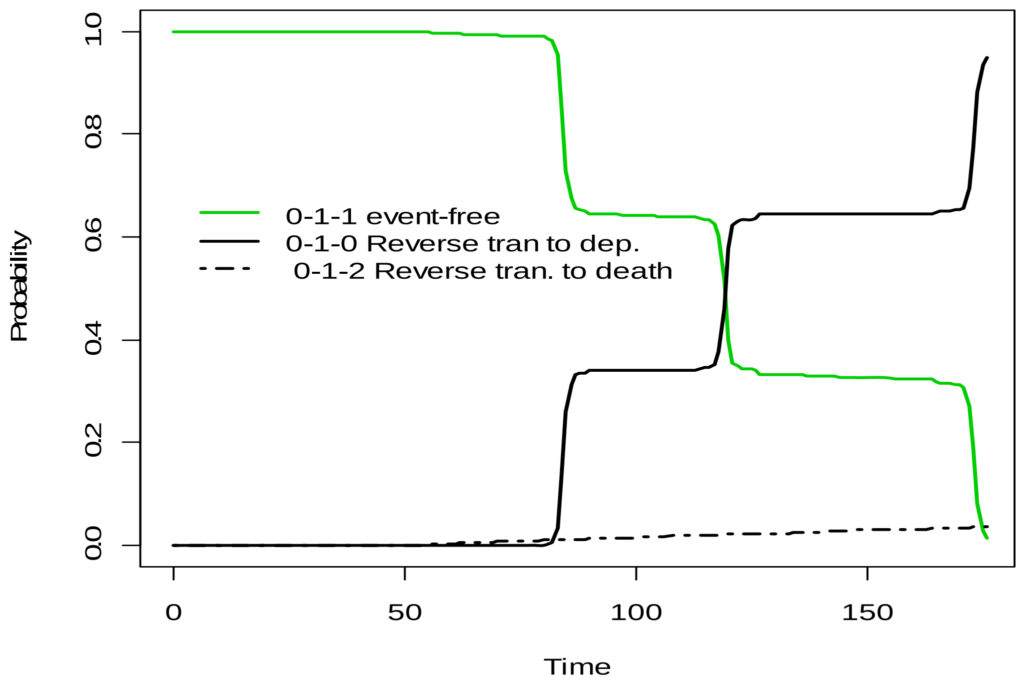

Figure 7. Transition probability for reverse transitions

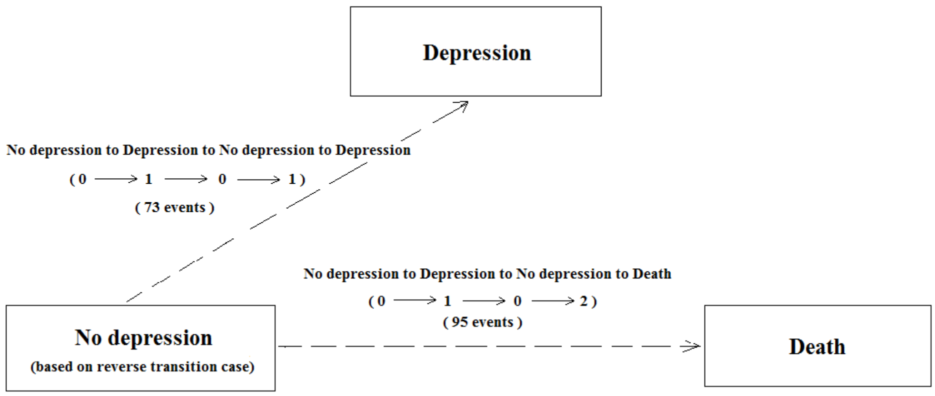

Figure 8. The multi-state model for repeated transition case

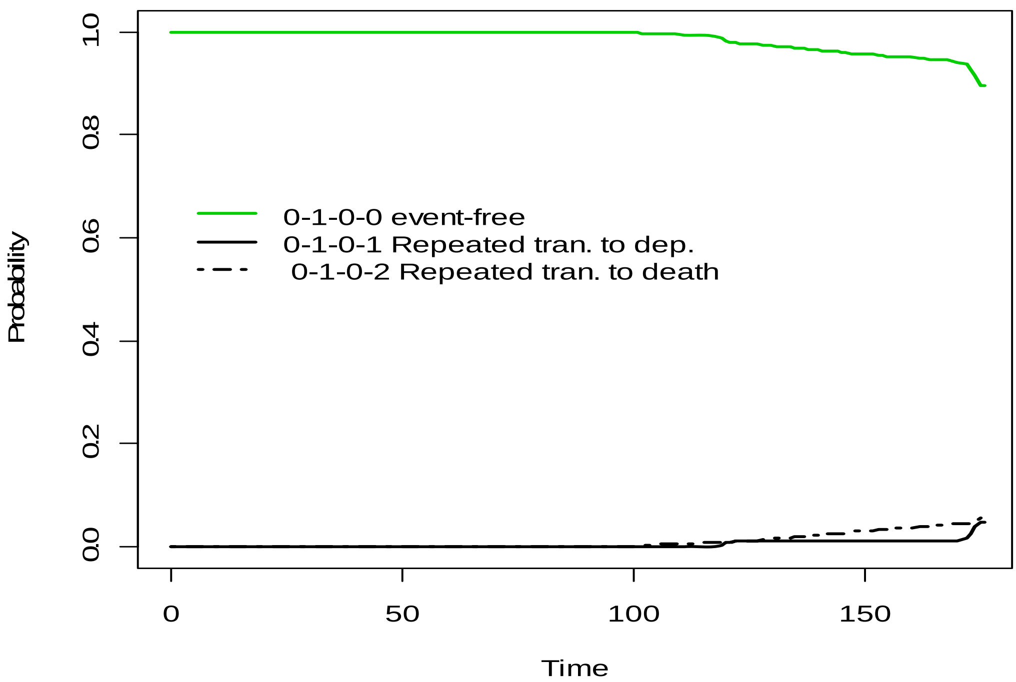

Figure 9. Transition probability for repeated transitions

國科會補助計畫衍生研發成果推廣資料表

日期:2010/12/16

國科會補助計畫	計畫名稱：台灣地區老人精神抑鬱狀態變化長期趨勢研究
	計畫主持人：林正祥
	計畫編號：98-2410-H-029-033-　　學門領域：人口、家庭與社區

無研發成果推廣資料

98 年度專題研究計畫研究成果彙整表

計畫主持人：林正祥			計畫編號：98-2410-H-029-033-				
計畫名稱：台灣地區老人精神抑鬱狀態變化長期趨勢研究							
成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數(含實際已達成數)	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	1	2	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%		
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	1	1	100%	人次	
		博士生	1	1	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
國外	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		

其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)	無

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

■達成目標

□未達成目標（請說明，以 100 字為限）

□實驗失敗

□因故實驗中斷

□其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文：□已發表 ■未發表之文稿 □撰寫中 □無

專利：□已獲得 □申請中 ■無

技轉：□已技轉 □洽談中 ■無

其他：（以 100 字為限）

預計發表兩篇論文

1.台灣老人憂鬱狀態變化及其影響因子(林正祥,陳佩含,林惠生).正投稿修改中

2.A Panel Study for Depression Status of the Elderly in Taiwan,正進行撰寫準備發表中

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以 500 字為限）

本研究擬針對台灣地區影響老人憂鬱狀態變化趨勢相關因素作深入的探討研究，以十四年(1989-2003)台灣地區長期追蹤老人樣本探討台灣地區六十歲以上老人，其憂鬱（Depression）的變動趨勢。利用行政院衛生署國民健康局提供的 1989－2003 年五波『台灣地區老人保健與生活問題長期追蹤調查』資料進行分析探討，以憂鬱量表（CES-D）建構老人憂鬱程度指標，指標值 10 分或以上歸類為有憂鬱之老人，本研究使用台灣地區老人憂鬱的變動趨勢(轉移、反轉移、重覆轉移)，利用多重狀態模式進行模式探討比較 1989 年至 2003 年五次調查之背景特徵、家庭狀況、社會經濟及健康狀況與老人憂鬱的關係。研究結果顯示多數轉移至憂鬱的老人可以反轉移回到無憂鬱的狀態；此外，經由反轉移的變化後，大多數老人停留在無憂鬱狀態之機率亦大於憂鬱狀態。由多重狀態模式分析顯示配偶、有無與子女同住、經濟狀況、健康自評及體能狀況對老人憂鬱有顯著的相關。