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Trajectories of depression and their relationship with health status and social service use

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Abstract
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Keywords
depression, trajectories, their, relationship, service, health, status, social

Disciplines
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Trajectories of depression and their relationship with health status and social service use

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Abstract

This longitudinal study was conducted between 1994 and 2004 in a cohort of southern Taiwan community-living elderly residents. The study aims to explore the trajectories of depression and how these patterns differed between respondents who survived and those who died during data collection phases; this study also investigated how health status change and health/social service use predicted the different trajectories of depression. Eight hundred and ten participants had completed all six waves of the survey or were followed-up at each wave until death in the prospective study in Kaohsiung City. Depressive symptoms were evaluated by the Short Psychiatric Evaluation Schedule (SPES). Changes in levels of depression during the ageing process were identified. Different trajectories clearly reflected heterogeneity within depression and the association with mortality. The study highlighted that diabetes, gastrointestinal problems, heart disease and disability, whether at baseline or as new occurrences, were predictors of health decline. High uses of health/social services were also predictive of increased depression. These findings identified depression as a highly dynamic process, characterized by different trajectories of depression between states of no, mild and severe depression. Greater awareness of these various trajectories should potentially improve the prevention and/or management strategies of depression.

Key words: Depression; SPES; chronic disease; disability; service use; elderly cohort

1. Introduction

Depression is a common mental health disorder experienced by many elderly people, and can negatively impact on their quality of life (Doraiswamy et al., 2002). Three longitudinal community studies, in Cape Town (Benarie et al., 1990), Liverpool (Copeland et al., 1992) and the eastern states of Australia (Henderson et al., 1997), found that persistent depression was associated with an elevated probability of (early) death. Each of these studies focused on only two points in time, and thus may have missed changes in the depression process. This same problem arose with two other longitudinal studies in Singapore (Kua, 1993) and in Ireland (Denihan et al., 2000). In these two studies, it was found that depression could both increase and decrease over time and was related to high mortality. However, the diagnosis of depression at follow-up did not distinguish between those who had relapsed and those who were continuously depressed. Further problematic aspects of these two studies were that they involved only a few participants.

Limited longitudinal studies have shown associations between poor physical health and either the onset or persistence of depression (Henderson et al., 1997, Geerlings et al., 2000). Both chronic disease (Cole and Dendukuri, 2003, Dunlop et al., 2004) and disability (Yang and George, 2005) have been found to be significantly associated with increased depressive symptoms. It is important to identify the vital links between chronic disease and disability with depression because a better understanding of these mutual relationships could avoid unnecessary costs and improve long term health outcomes through the design of better strategies to reduce health decline. It would, therefore, be beneficial to use

longitudinal data to gain a better understanding of changes in depression and its association with chronic disease and disability.

Not only is depression a common symptom of later life, it also has an enormous impact on public health and the use of health care services (Koopmans et al., 2005). To date, there is a lack of investigations into the relationships between health/social service use and health outcomes of depressive processes, including reverse pathways between depression and health/social service use. A better understanding of such issues could delay health decline and improve health outcomes through provision of more targeted health care services.

The aim of this study was to explore trajectories of depression over time, the determinants of these trajectories and their relationship with health/social service use.

2. Materials and methods

2.1 Study population and sample

A longitudinal study of community-dwelling elderly (aged 65 and over) in the San-Min District, Kaohsiung City, Taiwan commenced in 1994, with five biennial follow-up surveys conducted over the following ten years. This study adopted a prospective study design using a closed cohort.

Baseline data on the whole elderly population was obtained from the Kaohsiung City government. In 1994, about 86 000 older adults lived in Kaohsiung City, which is the second largest metropolitan area in southern Taiwan, with 8% of the 1.3 million. Among the eleven urban administration districts in Kaohsiung City, the San-Min District was selected for the study because the proportion of elderly people in the population was very

similar to that in Kaohsiung City as a whole.

Two-stage sampling involved random selection of 21 basic administrative units of the San-Min District and then random selection for face-to-face interviews of 50% of the elderly population in these units. The sampling procedure identified 1436 eligible elderly people, 1260 of whom were interviewed at baseline (response rate 88%). For the purpose of this study, 810 were selected for data analysis because they had completed all six waves of the survey or were followed-up at each wave until death. Thus, the responding sample sizes analyzed were 810 (1994), 721 (1996), 653 (1998), 571 (2000), 509 (2002) and 442 (2004).

This study was approved by the Institutional review Board (IRB) in Taiwan (Kaohsiung Medical University) and the Human Research Ethics Committee (HREC) in Australia (University of Wollongong).

2.2. Data and measurement

This study was based on data collected using the Chinese-version of the Multidimensional Functional Assessment Questionnaire (CMFAQ); the reliability and validity of CMFAQ have been investigated and found satisfactory (Chiu et al., 1997). The variables of interest for depression, demographic factors, chronic disease, disability and health/social service use were as follows.

2.2.1. Response variables

Depression was evaluated using the Short Psychiatric Evaluation Schedule (SPES) (Pfeiffer, 1979), a 15-item questionnaire to which participants responded by indicating ‘yes’(1) or ‘no’(0) to questions about depressive symptoms. Ratings on these aspects were added to a final score ranging from 0 (no mental health problems) to 15 (severe mental health problems). A respondent was then classified as having: no depression = ‘0’ (score

0-3); mild depression = ‘1’ (score 4-5); severe depression = ‘2’ (score 6-15) (Pfeiffer, 1979).

2.2.2. Predictor variables

Demographic factors (age, gender and education) were included as predictor variables. It was decided to group baseline age into three categories, two standard five year groups (65-69 years, 70-74 years) and those over 75 years, the latter grouping necessitated by the small number of participants aged 80 and over.

Diagnosis of chronic disease was based on self-reporting of diagnosis by a health professional, at each wave. The five chronic diseases selected as foci for analysis were: arthritis (most important disability related chronic disease), diabetes (most costly chronic diseases), GIT problems (most rapidly increasing chronic disease), heart disease (most lethal chronic disease) and hypertension (a chronic disease and a risk factor for other chronic diseases). The response for each chronic disease was reported as either ‘yes=1’ or ’no=0’.

Disability was assessed using the Instrumental Activities of Daily Living (IADL) (Lawton and Brody, 1969) and Physical Activities of Daily Living (PADL) (Katz et al., 1963) scales. The sum of these items (IADL, PADL) has been shown to be effective in capturing a full range of disability (Spector and Fleishman, 1998). Each of the seven IADL disabilities and seven PADL disabilities was scored as follows. Respondents reported whether they were currently able to perform the function independently (0), with some help (1), or not at all (2). In addition to the sum of the score, as described above, for some analyses, each respondent was classified as having no disability (score 0) or disability (score 1-28) for both IADL and PADL disabilities.

It is important to note that health status (five chronic diseases and disability) was self-reported. As such, different responses may have been noted during the follow-up waves. Hence a 'no' response to questions about health status may have subsequently changed to 'yes' and/or vice versa during ensuing waves.

The CMFAQ contains questions about the use of 10 health/social services (Fillenbaum, 1988). The six selected services included recreational services, homemaker-household, meal preparation, personal care, nursing care and physical therapy services. They were chosen because depression in the elderly was associated with a greater use of home-based services (Larsen et al., 2006). The remaining four social services in the CMFAQ were omitted because they were strongly related to poor health or used by healthy respondents mainly for security purposes.

In the analysis, specific health/social service use was categorized at each wave (1994-2004) by a dichotomous variable: 1=use, 0=do not use.

2.3. Statistical analyses

The trajectories of depression were identified using coded pathways for individual respondents. The pathways were then grouped into six clusters.

Surviving respondents were classified into three trajectory clusters:

- **Trajectory 1 - no depression, alive** - included surviving respondents who reported having no depression during all six waves.
- **Trajectory 2 - mild depression, alive** – included respondents who reported having mild depression one or more times during the six waves or severe depression only once during all six waves.
- **Trajectory 3 – severe depression, alive** – included surviving respondents who

reported having severe depression two or more times during the six waves.

In all cases of ambiguity of definition e.g. when a respondent had indicated two instances of mild depression and two of severe depression, the respondent was categorized in the trajectory cluster with the higher number.

Non-surviving respondents were also classified into three trajectory clusters:

- **Trajectory 4 - no depression, dead** -included non-surviving respondents who reported having no depression during the wave prior to death
- **Trajectory 5 - mild depression, dead** - included non-surviving respondents who reported having mild depression at the wave prior to death
- **Trajectory 6 - severe depression, dead** – included respondents who reported having severe depression at the wave prior to death

Multinomial regression analysis was adopted to model the factors predicting different trajectories for depression over the six waves. Instead of standard logistic regression, multinomial regression was used when the response variables had more than two outcome possibilities. In an analogous manner to logistic regression, multinomial regression allows correcting for confounders and it expresses the results using odds ratios (OR) and 95% Confidence Intervals (CI).

A reference trajectory cluster was chosen for each multinomial analysis. For the analysis of demographic factors and previous health status the chosen reference cluster was the ‘no depression, alive’ cluster. A slightly different approach was taken in examining the effect of the use of each of the six services on trajectories. Instead of the null cluster (i.e. ‘no depression, alive’), the chosen reference cluster was ‘severe depression, alive’.

3. Results

3.1. Pathways of depression

There were many possible pathways for depression over the six waves, and 240 occurred in this study. Of these, the most common was the pathway of no depression at each wave (n=118), with the second most common being no depression at wave one, followed by death at wave two (n=54). Among the 240 realized pathways, 61.3% (147/240) occurred only once, about 6.7% (16/240) occurred at least 10 times and 40.4% (97/240) of the pathways involved death.

3.2. Clustered trajectories of depression

Table 1 presents the depression trajectory clusters for the 810 respondents and the frequency of each depression cluster during each of the six waves (1994-2004). Among the surviving respondents, only 26.7% (118/442) remained free from depression and about 73.3% (324/442) experienced some form of depression (ranging from mild to severe). Among the non-surviving respondents, approximately 49.2% (181/368) suffered no depression prior to death and approximately 50.8% (187/368) experienced some form of depression (mild, severe) prior to death.

[Table 1 about here]

Figure 1 illustrates the depression trajectory of the mean SPES scores for all respondents in each trajectory. For non-surviving respondents, individual scores were only available up to the final wave when the individual was alive, since there was no depression score assigned for those who were dead. This figure clearly indicates that the mean score for non-surviving respondents was higher at each wave than that for surviving respondents

in the analogous cluster.

[Figure 1 about here]

3.3. The relationships of trajectories with demographic variables and health status

Using a multinomial model, the odds ratios for depression trajectory clusters were calculated. For each predictor (age, gender, education and (previous) health status), the ORs for other trajectories (compared with the reference trajectory) are presented in Table 2. The reference cluster was ‘no depression, alive’.

Table 2 highlights that age and education were significantly associated with the depression trajectories, while no gender effects were found. Those aged 75 and older were at higher risk of not surviving, whether or not, with prior depression (trajectory 4, 5 and 6). Also, since the ORs for respondents with a formal education (both surviving and non-surviving) were less than one (ranging between 0.1-0.5), poor education was associated with a higher risk of developing depression.

For surviving respondents, with (baseline and new onset) GIT problems, heart disease and disability, the ORs were greater than one for trajectories 2 (mild depression, alive) and 3 (severe depression, alive). These results imply that survivors who suffered from these diseases and disability were at higher risk of developing some level of depression. Non-survivors with (baseline) diabetes, heart disease and disability had ORs greater than one for trajectories 6 (severe depression, dead), 5 (mild depression, dead) and 4 (no depression, dead). Thus, these groups were at higher risk of developing depression prior to death. In contrast, however, for non-survivors who developed new health conditions, the ORs were less than one for trajectory 4 (no depression, dead). Thus this group had a reduced risk of developing depression prior to death.

[Table 2 about here]

3.4. The relationships of trajectories with health/social service use

In assessing the predictive ability of health/social service use, the multinomial model for the trajectories of depression was adjusted for age, gender, education and previous health status. For each predictor (recreational services, homemaker-household service, meal preparation, personal care, nursing care, physical therapy), the ORs for trajectories 1, 2, 4, 5 and 6 (compared against the reference trajectory 3) are presented in Table 3. The reference cluster was ‘severe depression, alive’.

Table 3 highlights that greater use of most health/social services was a strong predictor of depression trajectories, except for the use of recreational services. For both surviving and non-surviving respondents, those who used more recreational social services were significantly less likely to develop depression. The odds were higher for trajectory 1 (no depression, alive) and trajectory 2 (mild depression, alive), but lower for trajectory 6 (severe depression, dead). These results suggest that greater use of recreational social services reduced the risk of depression and lowered the risk of suffering from depression prior to death.

Surviving respondents who were high users of physical therapy services in this study were less likely to suffer from mild depression or no depression than from severe depression; the ORs were less than one for trajectories 2 (mild depression, alive) and 1 (no depression, alive). For non-surviving respondents, who were users of meal preparation, physical therapy and/or homemaker household services, the ORs were less than one for trajectories 4 (no depression, dead) and 6 (severe depression, dead), indicating that non surviving respondents who were high users of these health/social services were less likely,

prior to death, to suffer from severe depression, or to have no depression. Furthermore, non surviving respondents who were high users of nursing care and personal care services were more likely to suffer from depression prior to death. The ORs were greater than one for trajectories 5 (mild depression, dead) and 6 (severe depression, dead). For the same services, an OR greater than one for trajectory 4 (no depression, dead) shows that there was an increased chance of not suffering from depression prior to death.

[Table 3 about here]

4. Discussion

4.1. Trajectories of depression

This study defined six depression trajectory clusters; which facilitated the identification of high variability in depression trajectories. Heterogeneity was found in the three trajectory clusters for survivors, as well as for non-survivors. For both surviving and non-surviving respondent groups, the trajectory clusters identified that the depression process was progressive. The variation in pathways may have be even larger, than that expressed by variability in the six trajectory clusters, if the spacing between interview waves had been less than two years used in this study. Further investigations into this phenomenon should therefore take place.

It was important not to have excluded deaths from analyses because this may have led to underestimation of the presence of depression. Although other studies are needed to support our findings, it is certainly reasonable to conclude that at least three groups, differing in their trajectories of depression prior to death, are present in the population. In the absence of comparable prior studies, this study can be considered as pioneering the use

of trajectory clusters in examining the process of depression development in the elderly.

4.2. Impact of demographic factors on trajectories of depression

Results from this study confirm previous evidence about the important role of older age on the depression process and on consequent mortality (Saz and Dewey, 2001). Consistent with the findings of Koster et al. (2006), education was found to be a protective factor against developing depression. A possible explanation for this is that the poorly educated respondents experienced barriers in accessing health care services, especially with regard to medication and treatment services for depression, as highlighted in the literature (Sareen et al., 2007). These results emphasize the need for mental health support by primary care services for poorly educated elderly people in order to reduce the incidence of depression. Given the importance of wellbeing to quality of life, additional research is warranted to better elucidate the determinants of changes in depression, with the ultimate goal of developing evidence-based strategies to maintain or reduce mild depression and delay the progression of depression in elderly people, especially those who are poorly educated.

4.3. Impact of chronic disease and disability on trajectories of depression

The results of this study highlighted the disease-specific associations between chronic disease and the trajectories of depression. This study found that chronic diseases such as diabetes, heart disease and GIT problems were associated with the development of depression. This is similar to the results of a previous study (Cole and Dendukuri, 2003) suggesting that chronic disease could be a risk factor for the development of depression.

Respondents suffering from diabetes and/or heart disease, were found to have trajectories characterized by severe depression prior to death. For diabetes, we only found a

significant association with depression prior to death, but not with depression among those alive. This is in line with existing knowledge on the diabetes impact of depression (Maraldi et al., 2007). A significant effect of heart disease on depression prior to death was also found in this study, confirming findings of van Melle et al. (2004). Furthermore, similar to previous evidence (Egede et al., 2005, Maraldi et al., 2007), results of this study confirmed that death may come sooner when severe depression coexists with certain chronic diseases, such as diabetes or heart disease.

This research found that progress of depression was related to GIT problem and heart disease for survivors. For survivors with GIT problems, the association with depression in the study confirms previous findings (Locke et al., 2004, Vege et al., 2004), that these have a strong impact on depression. In addition, the present study found significant effects of existing and newly diagnosed GIT problems on trajectories 2 (mild depression, alive) and 3 (severe depression, alive), characterized by the progression from mild to severe depression. For heart disease, significant effects of existing and newly diagnosed heart disease on trajectory 3 were also found. This is in line with the findings of Dunlop et al. (2004), who showed strong association of heart disease with depression. Health decline associated with effects of GIT problems and heart diseases on depression, especially severe depression, suggests that management of chronic disease is not only important in its own right, but is also crucial to the management of depression. Accordingly, further research into the relationship between chronic disease and severe depression would provide a better understanding of the intervention needs required to potentially increase the quality of life in the elderly by reducing their levels of depression.

In contrast to the findings of Dickens et al. (2002), this study found that respondents

suffering from arthritis experienced no significant affects on the depression trajectories. A possible explanation for this may be that only a small number of the respondents actually suffered from arthritis at baseline (n=148). In addition, newly diagnosed arthritis respondents, throughout subsequent waves, may not have experienced extreme levels of pain, thereby not significantly impacting on their development of depression.

Overall, the results of this study highlight the importance of focusing on chronic disease in a depression assessment program and reinforcing the need to prioritize prevention and/or treatment of chronic diseases as an integral component of health care provision. Since diabetes, heart disease, GIT problems and disability were found to be amongst the major predictors of depression, targeting better management of these diseases would perhaps be the most viable strategy to prevent the onset and/or progression of severe depression in the elderly.

The present findings indicate that disability was an important predictor of developing depression, as documented in the literature (Yang and George, 2005). Disability was found to not only be a prognostic factor of depression, but was also a significant predictor of developing severe depression prior to death. Furthermore, the association with depression suggests that once new disability occurs its impact on depression is significant. Accordingly, these results highlight the important role of effective management of disability in preventing or delaying further depression and/or death.

Since depression is affected by multiple factors, and the presence of these factors can vary across individuals and for some factors over time, it is likely that the depression pathway (level and time trend) differs from person to person. Nevertheless, trajectories of depression within disease groups showed large variability. As the burden of depression and

influences of health factors are likely to differ from trajectory to trajectory, taking the variation into account might improve our understanding, and ultimately lead to better prevention, detection and treatment of the health condition. For a fuller understanding of the depression process, further research will require more detailed information on chronic diseases and disability, including severity.

4.4. Impact of health/social service use on trajectories of depression

Consistent with previous studies (Badger, 1998), the high use of recreational services was found to protect against depression. Perhaps promoting the need for mental health support for those people who do not use recreational services could help reduce the development of depression.

Similar to the findings of Shaw et al. (2000), high users of formal community support services (e.g. social services, daily living services and psychological services), in the present study, were more depressed. Therefore, it can be expected that people with poor mental health, received more personal care and nursing care services, as also documented by Larsen et al. (2006). Interestingly, high users of homemaker services showed a low risk of developing severe depression prior to death, while high users of meal preparation and physical therapy services had reduced risks of not surviving without prior depression. Therefore, elderly people may benefit from these aspects of health/social services, which emphasize the importance of the provision of home-based services in later life. Analyzing individual depressive symptoms could be advantageous in determining appropriate health/social service care needs and in predicting long term care service use by the elderly.

Overall, the findings on the contribution of service use provide useful information to target subjects at higher risk in order to prevent, stabilize or delay the depression process,

and adjust the provision of care to different and changing demands.

4.5. Limitation

A limitation of this study is the reliance on the self reported level of health status by the respondents, even though it is an efficient and accepted means of assessing many chronic diseases, as identified by previous researchers (Newell et al., 1999). Since this study was based on self reporting of data, participants may have reported depression (and also chronic disease, disability) during one interview wave but may have been inconsistent in their reporting during later waves. However, since respondents were asked to base their responses on what they were told by their doctors, any such bias should have been minimal. This bias could have been further reduced because of the validity and adequacy of the depression (SPES) and disability (ADL) scales which have been tested in the CMFAQ cohort (Chiu et al., 1997). Moreover, the recall bias could also have been minimized because the changes in depression have been measured in several ways: by classifying different levels of depression; and, by identifying the pathways of depression.

A second limitation of this study relates to the study population, which focused on community-living Taiwanese elderly, and thus it may not be representative of elderly Taiwanese people living within hospitals and/or other institutions. This remains an area necessitating future research in populations of far greater range and size.

4.6. Conclusion

Investigations of trajectories of depression and their association with health factors and service use have the advantage of allowing researchers to examine changes in the depression process. These results confirm the notion that depression is a dynamic process in ageing, characterized by different trajectories between no, mild and severe depression

among both surviving and deceased groups. A focus on the effects of chronic diseases and disability on the progress of depression is strongly indicated by the current research which highlighted, in particular, depression in those who suffered from diabetes, GIT problems, heart disease and disability. This provides important information to support the development of future public health interventions that may help to slow the process of mental health decline, especially in an ageing population. For elderly with depression, integration of home-based service in the depression treatment plan is warranted by these preliminary results. Based on such information, interventions to help reduce depression in the elderly may be among the most cost-effective means of improving their quality of life.

Conflict of interest Statement

The author(s) declare that they have no competing interests.

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Table 1 Frequency distribution of the six trajectory clusters of depression, 1994-2004

Trajectory clusters		1994 (W1)		1996 (W2)		1998 (W3)		2000 (W4)		2002 (W5)		2004 (W6)	
		n	%	n	%	n	%	n	%	n	%	n	%
T1	no depression, alive	118	*14.6*	118	*16.4*	118	*18.1*	118	*20.7*	118	*23.2*	118	*26.7*
T2	mild depression, alive	192	*23.7*	192	*26.6*	192	*29.4*	192	*33.6*	192	*37.7*	192	*43.4*
T3	severe depression, alive	132	*16.3*	132	*18.3*	132	*20.2*	132	*23.1*	132	*25.9*	132	*29.9*
T4	no depression, dead	181	*22.3*	127	*17.6*	87	*13.3*	43	*7.5*	16	*3.1*		
T5	mild depression, dead	95	*11.7*	81	*11.2*	72	*11.0*	52	*9.1*	37	*7.3*		
T6	severe depression, dead	92	*11.4*	71	*9.8*	52	*8.0*	34	*6.0*	14	*2.8*		
	Total	810		721		653		571		509		442	

Table 2 Predictive ability of demographic factors and health status for trajectories of depression

	mild depression alive (2)		severe depression alive (3)		no depression dead (4)		mild depression dead (5)		severe depression dead (6)	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age (reference group=age 65-69)										
70-74 years	1.0	(0.6 – 1.8)	1.5	(0.8 – 2.7)	1.5	(0.8 – 2.7)	2.0	(0.9 – 4.2)	1.22	(0.6 – 2.6)
75+ years	1.0	(0.5 – 2.3)	0.6	(0.2 – 1.6)	**4.7**	**(2.2 – 10.4)**	**6.5**	**(2.7 – 15.6)**	**2.74**	**(1.1 – 6.6)**
Gender (rg=female)										
Male	0.9	(0.5 – 1.6)	0.6	(0.3 – 1.2)	1.3	(0.7 – 2.3)	1.9	(0.9 – 3.8)	1.92	(0.9 – 4.0)
Education (rg=none)										
1-6 years	**0.3**	**(0.2 – 0.7)**	**0.3**	**(0.2 – 0.8)**	0.5	(0.2 – 1.2)	**0.3**	**(0.1 – 0.8)**	**0.22**	**(0.1 – 0.5)**
7+ years	**0.2**	**(0.1 – 0.4)**	**0.1**	**(0.1 – 0.3)**	**0.3**	**(0.1 – 0.8)**	**0.1**	**(0.0 – 0.2)**	**0.07**	**(0.0 – 0.2)**
Baseline health (rg=no)										
Arthritis(yes)	1.7	(0.8 – 3.5)	1.9	(0.8 – 4.2)	0.7	(0.3 – 1.4)	1.3	(0.5 – 3.0)	0.71	(0.3 – 1.7)
Diabetes(yes)	0.8	(0.3 – 2.3)	1.8	(0.6 – 5.3)	**2.8**	**(1.0 – 7.6)**	**4.1**	**(1.4 – 11.9)**	**4.84**	**(1.7 – 13.8)**
GIT problems(yes)	1.6	(0.7 – 3.8)	**4.4**	**(1.7 – 11.1)**	1.3	(0.5 – 3.1)	1.4	(0.5 – 3.9)	0.85	(0.3 – 2.4)
Heart disease(yes)	1.5	(0.7 – 3.4)	**3.1**	**(1.3 – 7.4)**	**2.5**	**(1.1 – 5.6)**	2.3	(0.9 – 5.6)	**2.62**	**(1.1 – 6.4)**
Hypertension(yes)	1.2	(0.6 – 2.4)	1.4	(0.7 – 3.0)	1.5	(0.8 – 3.0)	1.2	(0.6 – 2.7)	0.98	(0.4 – 2.2)
Disability(yes)	1.7	(0.7 – 3.9)	**3.9**	**(1.5 – 10.2)**	**2.4**	**(1.1 – 5.2)**	**5.2**	**(2.1 – 13.3)**	**7.07**	**(2.8 – 18.1)**
New occurrence (rg=no)										
Arthritis(yes)	1.6	(0.9 – 2.8)	1.5	(0.8 – 2.8)	**0.4**	**(0.2 – 0.7)**	0.9	(0.5 – 1.9)	**0.46**	**(0.2 – 1.0)**
Diabetes(yes)	0.5	(0.3 – 1.1)	1.3	(0.6 – 2.7)	**0.3**	**(0.1 – 0.9)**	0.7	(0.3 – 1.9)	0.31	(0.1 – 1.0)
GIT problems(yes)	**1.8**	**(1.1 – 3.0)**	**2.5**	**(1.4 – 4.7)**	**0.4**	**(0.2 – 0.8)**	1.3	(0.7 – 2.6)	0.51	(0.3 – 1.0)
Heart disease(yes)	1.3	(0.8 – 2.4)	**2.4**	**(1.3 – 4.6)**	0.8	(0.4 – 1.7)	1.1	(0.5 – 2.4)	0.68	(0.3 – 1.6)
Hypertension(yes)	1.1	(0.6 – 1.9)	1.4	(0.7 – 2.7)	**0.4**	**(0.2 – 0.8)**	0.5	(0.2 – 1.2)	0.81	(0.4 – 1.7)
Disability(yes)	**1.9**	**(1.1 – 3.3)**	**3.0**	**(1.4 – 6.3)**	**0.5**	**(0.3 – 0.9)**	1.1	(0.5 – 2.5)	1.31	(0.6 – 3.1)

a) The reference category is trajectory 1: no depression, alive, b) Adjusted odds ratios and 95% confidence intervals, c) significant OR are in bold.

Table 3 Predictive ability of health/social service use for trajectories of depression

	no depression alive (1)		mild depression alive (2)		no depression dead (4)		mild depression dead (5)		severe depression dead (6)	
Service use	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Recreational services	**1.5**	**(1.2 – 1.8)**	**1.3**	**(1.0 – 1.5)**	0.9	(0.7 – 1.2)	0.7	(0.5 – 1.1)	**0.7**	**(0.4 – 0.9)**
Homemaker-household	1.0	(0.5 – 1.9)	1.0	(0.6 – 1.7)	0.7	(0.3 – 1.3)	0.6	(0.3 – 1.2)	**0.5**	**(0.2 – 0.9)**
Meal preparation	0.8	(0.4 – 1.4)	0.7	(0.4 – 1.2)	**0.4**	**(0.2 – 0.8)**	0.7	(0.4 – 1.3)	0.7	(0.4 – 1.5)
Personal care	0.6	(0.4 – 1.0)	0.8	(0.5 – 1.1)	**1.8**	**(1.2 – 2.8)**	**1.7**	**(1.1 – 2.5)**	**1.8**	**(1.1 – 2.9)**
Nursing care	1.4	(0.9 – 2.3)	1.4	(0.9 – 2.0)	**2.3**	**(1.4 – 3.7)**	**2.2**	**(1.4 – 3.5)**	**1.7**	**(1.0 – 2.9)**
Physical therapy	**0.5**	**(0.3 – 0.8)**	**0.7**	**(0.5 – 0.9)**	**0.6**	**(0.4 – 0.9)**	0.7	(0.5 – 1.1)	0.8	(0.5 – 1.2)

a)The reference category is trajectory 3: severe depression, alive, b) Adjusted for age, gender, education, baseline and new onset health conditions, c) Adjusted odds ratios and 95% confidence intervals, d) significant OR are in bold.

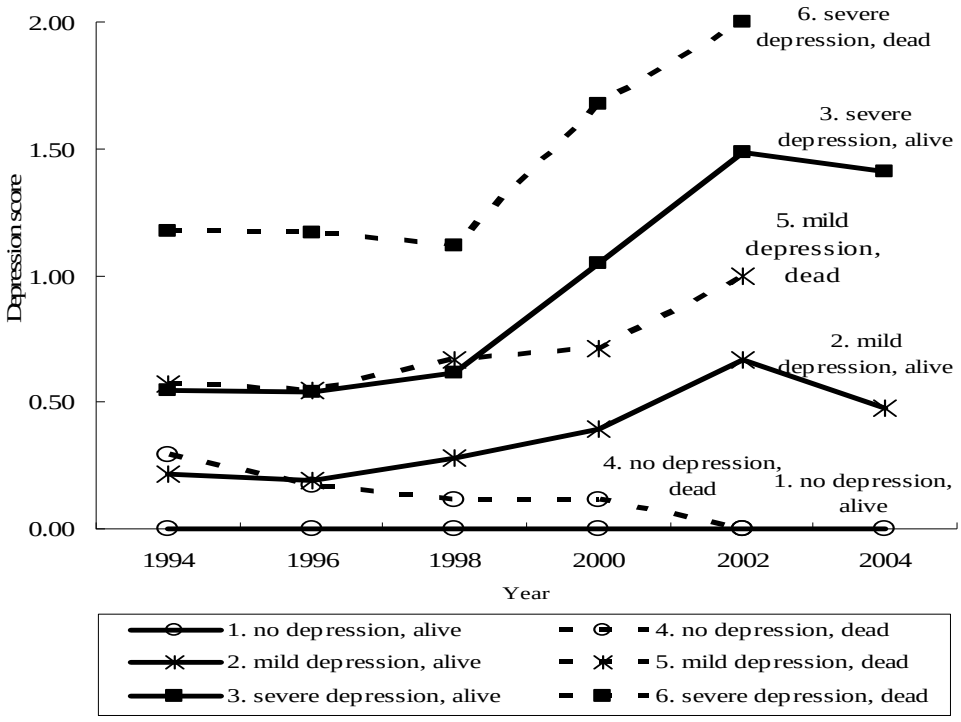

Figure 1 Mean depression score by year for six trajectory clusters