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Research paper

Changes in depression among older adults in China: A latent transition analysis

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ABSTRACT

Background: Depression in late life is an important public health problem in developing countries. It is timely to investigate stability and transition patterns of depressive symptom subtypes.
Methods: Longitudinal data were used from the China Health and Retirement Longitudinal Study (CHARLS). A total of 853 women and 930 men aged 60–96 years were recruited. Latent class and latent transition analysis (LCA/LTA) were used to identify meaningful subgroups, transitions between those classes across time, and baseline demographic features that help to predict and design tailored interventions.
Results: Three depression subgroups were identified: Class 1 was labeled "M*ild Depression*"; Class 2 was labeled "*Severe Depression*" and class 3 was labeled "*Lack of Positive Affect*". A predominant tendency for stability appeared rather than change, meanwhile individual in *Mild Depression* and *Severe Depression* latent status both had a high probability to convert to the *Lack of Positive Affect* latent status. Social activities played a significant role in buffering the effect of depression, while individuals with chronic diseases, having difficulty with ADLs and smoking might be at-risk groups.
Limitations: The limitations of the present study were inherent limitation in the LTA model and some small proportion of transitions.
Conclusions: This study demonstrated a transition pattern in older adult depression within a person-centered approach. Differential treatment effects were found across baseline depression class, suggesting the benefit for tailored intervention programs to improve depression outcomes among older adults.

1. Introduction

Developing countries, especially in Asia, are experiencing rapid changes in demographics and health as the elderly population becomes more prominent and the nature of health problems changes from infectious to chronic diseases (Zhao et al., 2014). According to the China Health and Retirement Longitudinal Study, about 40% of older adults, almost 74 million aged 60 and over, had reported depressive symptoms, which seriously reduced the health-related quality of late life (Team, 2013). Depression in late life is an important public health problem, which is associated with increased risk of morbidity and suicide, decreased physical, cognitive, and social functioning, and greater self-neglect, all of which are in turn associated with increased mortality (Blazer, 2003).

Geriatric depression is heterogeneous in appearance (Sneed et al., 2008), with several approaches to capturing this heterogeneity. Epidemiological studies often assess diagnose symptoms by self-report instruments such as the Center for Epidemiologic Studies Depression scale (CES-D; Radloff, 1977), the Geriatric Depression Scale (GDS; Yesavage et al., 1982), or the Beck Depression Inventory (BDI; Beck et al., 1988). Such approaches focus only on variability in the total number of depressive symptoms and not on specific patterns of depression. On the other hand, Burns et al. reported than there was an increase in levels of depressive symptoms as older adults aged (Burns et al., 2013). Besides, a number of researches have been turned out that treatment in which depressed individuals' scores on putative vulnerability measures can be compared before and after (Boswell et al., 2014; Gallagher and Thompson, 1982; McMurchie et al., 2013). Treatment scores generally decrease following treatment interventions. All these studies have revealed that the depressive symptoms were not stable, due to various factors. It is important to understand the stability and change of such depression constructs during the late life.

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Latent classes derived specifically from samples of older adults may provide a better way to characterize depressive symptom patterns in late life. More and more researchers applied latent class analysis (LCA) to identify latent class model of depressive symptoms (Carragher et al., 2009; Chen et al., 2000). LCA is a statistical technique that identifies subgroups that characterize the heterogeneity of the population (Lanza et al., 2003).

The latent class-based classification of depressive symptoms for participants was mostly applied to patients, adolescents and children (Ferdinand et al., 2005; Landau et al., 2016; Tisminetzky et al., 2011; Wadsworth et al., 2001). A few studies on the depression of the older adults are based on cross-sectional data, and cannot infer the causal relationship (Hybels et al., 2009; Lee et al., 2012).

This study employed latent class and latent transition analysis (LCA/LTA) to identify classes of depression symptoms in older adults over a 2-year period. The LTA approach is a longitudinal extension of LCA, the emphasis in LTA is on estimating the incidence of transitions from one to one, allowing for the estimation of stability and transition patterns among subtypes.

It was well established that depression was associated with physical chronic disease, such as cardiovascular disease (Carney and Freedland, 2003) and diabetes (Golden et al., 2008), social activities (de Wit et al., 2010; Lee and Kim, 2014), and activity of daily living (Lue et al., 2010). Risk and protective factors become more or less prominent in the etiology of depression as they change in frequency or importance over the course of the life span (Fiske et al., 2009). In order to find out whether these factors were also associated with specific symptom profile and transition pattern, not only better informed clinical management by improving diagnostic practices but would help to design tailored interventions aimed to improve quality of life in these older adults, we also report analyses exploring the association between the following variables and symptom profiles/transition probabilities: *Marital status, Economic supports from children, Social activities, Chronic diseases, Smoking, Alcohol,* and *Difficulty with Activity of Daily Living*.

In this paper, we aim to classify the Chinese older adults according to their change in depressive symptom severity over time. Our objectives are to determine: (1) whether there are distinct unique classes of trajectories of depressive symptoms over two years; and (2) which baseline demographic and factor variables differentiate these classes and transition patterns.

2. Methods

2.1. Sample

The data used in this study were derived from two waves of the China Health and Retirement Longitudinal Study (CHARLS), collected in 2011 and 2013. The CHARLS, a nationally representative longitudinal survey of persons in China 45 years of age or older, was conducted by the National School of Development in China (China Center for Economic Research) at Peking University in a randomly selected half of the counties and cities of 28 of China's 31 provinces (Zhao et al., 2014). As a comprehensive study, CHARLS was developed on the basis of the best international practices and was harmonized with more than 25 h type surveys in the world, thereby permitting international comparisons of the findings in CHARLS with those in other studies (Chen et al., 2015). In this study, sample loss and missing values on our main outcome variables had to be excluded. The longitudinal cohort study contained a total of 1,783 respondents, aged from 60 to 96, 930 (52.2%) were male, and 853 (47.8%) were female.

2.2. Measurements

2.2.1. Depression

Depression measured by the 10-item version of the Center for Epidemiological Studies Depression Scale (CES-D; Andresen et al., 1994; see Table 1), preserving the same sensitivity and specificity as the 20-itemscale (Kohout, 1993; Shrout and Yager, 1989). The Chinese version of the 10-item CES-D has been used in many studies with satisfactory reliability and validity (Boey, 1999; Lee and Chokkanathan, 2008), loading on Depressed Affect, Somatic Retardation, and Positive Affect three factors. The total possible range of the 10-item CES-D scale was from zero to 30, and a cut off score of ten or higher indicates the presence of significant depressive symptoms. Each of the ten items were yes (coded as 1) and no (coded as 2) statements, indicating if the participants had felt and behaved or not. Reverse-scoring negatively-keyed items, including Item 5 “I felt hopeful about the future” and Item 8 “I was happy”, were reverse-scored before. For the first wave, the Cronbach's alpha for the ten indicators was 0.77, and for the 24 months following discharge the Cronbach's alpha was 0.76.

Table 1
Observed indicators[a].

	Observed indicator
1	I was bothered by things that don’t usually bother me.
2	I had trouble keeping my mind on what I was doing.
3	I felt depressed.
4	I felt everything I did was an effort.
5	I felt hopeful about the future.
6	I felt fearful.
7	My sleep was restless.
8	I was happy.
9	I felt lonely.
10	I could not get”going.”

[a] Item 5 and item 8 had been reverse-scored before analysis.

2.2.2. Covariates

The covariate data were dichotomized into “do” or “not” (coded as 1 or 2), covering (1) Marital status (“on/not”); (2) Economic supports from children (“received/not”); (3) Social activities (“having/not”); (4) Chronic disease, including hypertension, cataract, bronchitis/emphysema/asthma or pneumonia, and other 12 kinds of chronic disease (“having any one of them/not”); (5) Smoking (“do/not regularly”); (6) Alcohol (“drinking regularly /not”); (7) Difficulty with Activities of Daily Living (ADLs; Katz et al., 1963), including 6 items: dressing, bathing, eating, getting into or out of bed, using the toilet, and continence control. Based on previous standards (Hu et al., 2015), total score of 6 pointed to the dividing line, participants were categorized as “having difficulty with ADL” (total score > 6) or “having no difficulty with ADL” (total score=6).

2.3. Statistical analyses

LCA were used to explore whether meaningful latent statuses of depression could be identified at each measurement occasion, and secondly LTA was applied to examine how the prevalence of latent class membership changed across time and the probability that congregations changed from one latent class in Time 1 to another class in Time 2. Instead of the term latent class, latent status was used to indicate that membership in a class might be temporary and congregations might move statuses across time. Also, LTA introduced a new set of transition probabilities that showed the patterns of change between latent statuses (Collins and Lanza, 2010). One matrix of transition probabilities described how the older adults transition from Time 1 to Time 2 in depression profiles. These transition probabilities showed the likelihood that congregations starting in one class in 2011 moved to another class in 2013.

Commonly used statistical fit indices for model comparisons are the Akaike information criterion (AIC; Akaike, 1987), the Bayesian information criterion (BIC; Schwarz, 1978), the consistent Akaike