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Depressive Symptoms and Onset of Functional Disability Over 2 Years: A Prospective Cohort Study

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Abstract

OBJECTIVES: This prospective cohort study examined the relationship between depressive symptoms and onset of functional disability over 2 years among US Chinese older adults, a rapidly growing minority older adult population.

DESIGN AND SETTING: This study used survey data from 2713 Chinese older adults who completed both baseline (2011–2013) and follow-up (2013–2015) interviews of the Population Study of Chinese Elderly in Chicago. Depressive symptoms were assessed at baseline by the nine-item Patient Health Questionnaire. Functional disability was measured by three validated scales, Katz Index of Independence in Activities of Daily Living (ADLs), the Lawton Instrumental Activities of Daily Living (IADLs) scale, and the Rosow and Breslau mobility scale. Multivariate logistic regression was conducted to examine the relationship between baseline depressive symptoms and the development of functional disability (ADLs, IADLs, mobility) at 2-year follow-up while adjusting for covariates.

RESULTS: Of the 2713 participants, 5.2% experienced ADL disability onset, 35.6% experienced IADL disability onset, and 23.3% experienced mobility disability onset over 2 years. After adjusting for covariates, the odds of ADL disability onset (odds ratio [OR] = 1.06; 95% confidence interval [CI] = 1.02–1.11), IADL disability onset (OR = 1.05; 95% CI = 1.01–1.09), and mobility disability onset (OR = 1.05; 95% CI = 1.01–1.09) were consistently higher in US Chinese older adults with higher levels of depressive symptoms than their less-depressed counterparts. Other significant risk factors included older age and more chronic physical conditions.

CONCLUSION: Study findings underscore a significant relationship between depressive symptoms and onset of functional disability. Screening and, subsequently, treating depressive symptoms have the potential to reduce disability among US Chinese older adults. Culturally relevant depressive symptom screening may help identify Chinese older adults who are at greater risks for the development of functional disability.

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Keywords

depressive symptoms; disability; longitudinal; minority aging

Functional disability in later life represents a significant public health concern given substantial social, health, and financial ramifications.[1,2] Disability in this article refers to difficulty or inability to perform daily activities necessary for independent living, specifically difficulty in performing activities of daily living (ADLs; ie, bathing and feeding), instrumental ADLs (IADLs; ie, preparing meals and managing money), and mobility tasks (ie, walk up/down stairs).[3,4] Studies have shown that disability worsens over time from inception.[5] It is, therefore, optimal to emphasize screening risk factors and to develop intervention strategies targeted to prevent onset of disability proactively. Understanding risk factors for onset of disability in old age represents a fundamental step in focusing screening and, subsequently, devising such preventive interventions.

Multiple longitudinal studies have established negative effects of depressive symptoms on functional disability in the general US older adult population.[6,7] In a cohort of 3809 community-dwelling adults aged 65 years and older followed for 6 years, the likelihood of developing disability increased by 14% to 17% for each additional depressive symptom at baseline.[8] Another study reported that older adults with persistent depressive symptoms were over five times more likely to develop functional disability over 4 years than their nondepressive counterparts.[9] A population-based cohort study documented deleterious effects of depressive symptoms on disability emerged as early as 1-year follow-up and continued to increase over time.[10] Notwithstanding discrepancies in reported odds ratios (ORs) and relative risk statistics due to methodological differences (ie, varying measures and follow-up durations), existing studies indicated a significant relationship between depressive symptoms and subsequent onset of disability in the general aging population.

While such empirical evidence has been accumulating in the general older adult population, a review of the literature revealed that older ethnic minority populations are disproportionally underrepresented in existing studies, although disability prevalence and trajectories are known to differ by socioeconomic status and ethnicity.[11–13] Specifically, older Asian Americans accounted for less than 10% of samples in prior studies and no population-based longitudinal data are available on this populaiton.[6,7] As a result, understanding of disability trajectories and associated risk factors remain particularly limited among older Asian Americans. However, developing targeted preventive interventions calls for an improved understanding of unique risk factors of disability in this vulnerable subgroup of US older adults. It is thus critical to investigate whether existing knowledge is applicable to this rapidly growing subgroup of older adults.[14]

To bridge the knowledge gap, the purpose of this prospective cohort study was to investigate the relationship between depressive symptoms and onset of disability in a population-based study of US Chinese older adults. It was hypothesized that, compared to their less-depressed peers, US Chinese older adults with higher levels of depressive symptoms at baseline will have a greater likelihood to develop functional disability over 2 years.[8,9] A focus on Chinese older adults in the present study is warranted for two reasons. First, Chinese older

adults, with an estimated population of 366, 760 in 2010, represent one of the largest and fastest-growing older minority population in the Unites States.[14] Second, examining the relationship between depressive symptoms and disability is of particular relevance to US Chinese older adults because prevalence of both conditions has been reported to be high in this community, with approximately 50% and 54% of this population experiencing various levels of functional disability and depressive symptoms, respectively.[15,16] Study findings could potentially facilitate the development of targeted prevention strategies (ie, enhanced screening of depressive symptoms) to reduce disability in US Chinese older adults.

METHODS

Sample and Setting

Data were obtained from the Population Study of Chinese Elderly in Chicago (PINE), a prospective cohort study of community-dwelling Chinese older adults aged 60 years and older in the greater Chicago, IL, area. The purpose of PINE was to examine physical and psychological well-being of US Chinese older adults.[17,18] A total of 3157 Chinese older adults completed baseline interviews between July 2011 and June 2013. Of baseline participants, 115 (3.6%) died and 329 (10.4%) were lost to follow-up during the 2-year period. Consequently, follow-up interviews were conducted with 2713 participants, yielding a follow-up rate of 85.9%.[19] Design and implementation information of PINE have been published elsewhere.[17,20,21] The present study used data from 2713 participants who completed both the baseline and follow-up interviews. The average time between baseline and follow-up interviews was 1.92 years. Face-to-face interviews were conducted by trained bicultural and multilingual research assistants in participants' preferred language or Chinese dialects (English, Mandarin, Cantonese, or Taishanese). All participants signed informed consent forms. Study protocol was approved by the institutional review board of Rush University Medical Center.

Measures

Dependent Variables—Functional disability was measured using three validated instruments, modified Katz Index of Independence in ADLs,[22,23] Lawton IADLs scale,[24] and Rosow and Breslau mobility scale.[25]

The modified ADL index asked participants whether they needed help with eight basic self-care activities, including feeding, dressing, bathing, walking, transferring, grooming, incontinence, and toileting. Participants rated the extent to which they needed help for each task on a four-point scale ranging from 0=none to 3 = most of the time. Total scores ranged from 0 to 24, with higher score indicating greater levels of disability (Cronbach's α = .92).[15] For the IADL scale, participants were asked to rate the extent to which they needed assistance with 12 activities that are cognitively and functionally more complex than those in ADL, including managing money, using a telephone, preparing meals, doing laundry, taking medication, doing housework, maintaining routine health, attending to special health needs, shopping, traveling, getting outside of home, and being alone.[24] Total scores ranged from 0 to 36, with higher score indicating higher level of disability (Cronbach's α = .90).[15] Mobility scale assessed whether participants needed help in performing three mobility tasks:

heavy work around the house, walk up/down stairs to the second floor, and walk a half mile.[25] Participants responded yes/no to each item. Final score is a sum of responses to the three items, ranging from 0 to 3. A higher score indicates a greater level of functional disability (Cronbach's $\alpha = .80$).[15]

Previous studies suggested that ADL disability represents the most advanced form of functional disability because such disability prevents older adults from performing basic self-care tasks to live independently. IADL and mobility disabilities are generally considered as less severe.[3,26] The present study examined onset of disability in three domains (ADL, IADL, and mobility tasks) to capture effects of depressive symptoms on disability of varying severity. The onset of functional disability was defined as reporting no difficulty in completing any tasks in three domains (ADL, IADL, and mobility tasks) at baseline but needing help in completing one or more tasks in these three domains at follow-up interview. The three dependent variables assessing onset of disability (ADL, IADL, and mobility) were coded dichotomously (yes/no) for analyses purposes.

Independent Variable—Depressive symptoms were assessed by the nine-item version of the Patient Health Questionnaire.[27] Participants were asked to rate the extent to which they experienced nine symptoms on a four-point scale ranging from 0=not at all to 3 = nearly every day. The nine items included little interest or pleasure in doing things, feeling down, sleep problems, poor appetite or overeating, feeling bad about self, trouble concentrating on things, restless, and thoughts better off dead, which corresponded with diagnostic criteria for depressive disorders in the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*).[27] Total scores ranged from 0 to 27, with higher score indicating higher levels of depressive symptoms (Cronbach's $\alpha = .82$).[28]

Covariates—Baseline variables that have been found to predict disability in a recent systematic review were included as covaites.[29] Covariates were age (in years), sex (male/female), education (in years), marital status (married/not married), household size (number of household members beside self), currently smoking (yes/no), and body mass index (BMI; calculated by weight in kilograms divided by height in meters squared). In the present study, a BMI score of 18.5 kg/m^2 or below was defined as underweight, 18.5 to 24.9 kg/m^2 was defined as normal weight, 25.0 to 29.9 kg/m^2 was defined as overweight, and 30.0 kg/m^2 or above was defined as obese.[30] Income was operationalized as annual income from all sources in 10 categories, ranging from 1 = $0 to $4999 to 10 = $75 000 and above. Acculturation was measured by a 12-item scale adapted from the Short Acculturation Scale for Hispanics.[31] The scale assessed participants' preference of speaking English vs Chinese in various settings, using Chinese vs English media, and having Chinese vs American social contacts on a five-point scale ranging from 1 = only Chinese to 5 = only English/American. Higher scores indicated higher acculturation levels (Cronbach's $\alpha = .88$).[31] Number of chronic conditions was ascertained by summing the presence of nine chronic medical diagnoses (ie, heart disease, stroke, cancer, high cholesterol, diabetes, high blood pressure, hip fracture, thyroid, and osteoarthritis). Global cognitive function was a composite score based on five well-validated individual cognition tests, including Chinese Mini-Mental State Examination, East Boston Memory Test (EBMT)-Immediate Recall, EBMT-Delayed

Recall, Digit Span Backwards test, and Symbol Digit Modalities Test.[32] Global cognitive function score was constructed by (1) transforming scores on each instrument to a z score; and (2) averaging the four z scores. This approach assured that measurement error and flooring/ceiling effects in individual tests were minimized.[33]

Data Analysis

Univariate statistics were used to describe prevalence of disability at baseline and follow-up and onset of disability over 2 years. Descriptive statistics were calculated to summarize sample characteristics at both baseline and follow-up. χ^2, Wilcoxon, or *t*-tests were used to compare characteristics between those with or without onset of functional disability in three domains, depending on which statistic was appropriate to the data. Three multivariable logistic regression models were conducted to examine the relationship between baseline depressive symptoms and onset of functional disability across three domains (ADL, IADL, and mobility disability), controlling for time and relevant baseline covariates. Time was entered in all models to account for its potential influence. All analyses were conducted using SAS Version 9.2 (SAS Institute Inc, Cary, NC).

RESULTS

Table 1 summarizes prevalence rates of ADL, IADL, and mobility disability onset. A relatively small percent of US Chinese older adults experienced onset of ADL disability (5.2%). Over one third (35.6%) experienced onset of IADL, and 23.3% experienced onset of mobility disability.

Table 2 presents sample characteristics based on onset of disability in the three domains. Overall, US Chinese older adults with ADL disability onset were more likely to be older, not married, nonsmokers, and obese. Additionally, they had fewer household members, and more chronic conditions and depressive symptoms on average. US Chinese older adults with IADL disability onset were more likely to be older, female, and not married. On average, they had lower income, fewer household members, and more chronic conditions. Finally, US Chinese older adults with mobility disability onset were more likely to be older, female, not married, and nonsmokers. They had lower education, fewer household members, more chronic conditions and depressive symptoms, and lower cognitive function.

Table 3 shows relationships between baseline depressive symptoms and onset of disability in three domains. Baseline depressive symptoms predicted onset of disability across all three domains over 2 years, even when controlling for all covariates. Specifically, odds of ADL disability onset (OR = 1.06; 95% confidence interval [CI] = 1.02–1.11), IADL disability onset (OR = 1.05; 95% CI = 1.01–1.09), and mobility disability onset (OR = 1.05; 95% CI = 1.01–1.09) were consistently higher in US Chinese older adults with higher levels of depressive symptoms than their less-depressed counterparts. Furthermore, US Chinese older adults who were older and had more chronic conditions were more likely to develop disability across all three domains. Lastly, higher education (OR = 1.08; 95% CI = 1.03–1.13) and lower cognitive function (OR = 0.63; 95% CI = 0.46–0.86) predicted onset of ADL disability; lower income (OR = 0.85; 95% CI = 0.75–0.96), lower levels of acculturation (OR = 0.96; 95% CI = 0.93–0.99), and obesity (OR = 3.06; 95% CI =

1.31–7.17) predicted onset of IADL disability; and female predicted onset of both IADL disability (OR = 1.66; 95% CI = 1.24–2.24) and mobility disability (OR = 1.54; 95% CI = 1.14–2.09).

DISCUSSION

To our knowledge, this is the first population-based longitudinal study examining the prospective relationship between depressive symptoms and onset of functional disability among US Chinese older adults. Findings indicate that depressive symptoms predict subsequent onset of ADL, IADL, and mobility disabilities over 2 years among US Chinese older adults. The adjusted OR found in this study is comparable to those reported in the general US aging population (ranged from 1.14 to 5.47), despite methodological differences.[8,9,34,35] Nevertheless, the findings extend knowledge by establishing the relationship between depressive symptoms and disability onset in an underrepresented minority aging population.

There are several potential mechanisms underlying the relationship between depressive symptoms and development of functional disability. First, prolonged presence of certain somatic depressive symptoms, particularly fatigue and pain, may contribute to enhanced decline of physical functioning over time.[4,10] Moreover, older adults with depressive symptoms are more likely to experience amplified symptom burden and complications of chronic medical conditions, both of which may increase risks for disability.[36,37] For instance, diabetic patients with depression were two to five times more likely than their nondepressed peers to report diabetic symptoms even when severity of diabetes and number of complications were accounted for.[37]

Furthermore, depressive symptoms may contribute to disability indirectly through psychobehavioral mechanisms. Specifically, it has been well documented that depressive symptoms are associated with negative health behaviors (ie, physical inactivity, obesity, and smoking), which are known behavioral risk factors for disability.[10,36] Older adults with depressive symptoms may be less likely to adhere to treatment regimens, which consequently may be linked to onset or progression of medical conditions resulting in impairment that leads to disability.[38,39] According to a recent meta-analytic review, medical patients who were depressed were three times more likely to be noncompliant with various treatment regimens than those not depressed.[39] Adverse outcomes of depressive symptoms, such as social withdrawal, lack of energy/interest, and declining sense of self-efficacy, might diminish older adults' motivation to attempt physical activities, leading to overreporting of disability.[35,40] This explanation resonates with findings from previous studies that suggest disability can be attributed to both individuals' impaired physical capacity and reduced willingness to engage in daily activities.[8,35] Furthermore, given the Chinese culture influences the expression of depression more somatically, this orientation may have a heightened effect on functional disability.[41]

Another potential explanation is that biological changes associated with depressive symptoms, such as elevated cortisol levels and insulin resistance, may increase disability risks.[36] Furthermore, several longitudinal studies indicated that there exists a bidirectional

relationship between depressive symptoms and disability.[40] In other words, the two conditions may reinforce each other over time to exert greater negative influence on physical functioning. Although testing the reciprocal relationship is beyond the scope of the present study, such possibility should be explored in diverse aging populations.

Taken together, study findings highlight the importance of depressive symptoms in onset of disability among Chinese older adults. However, it has been well established that depressive symptoms are often underrecognized and untreated in this population.[42] Further, US Chinese older adults with depressive symptoms are more likely to report somatic symptoms, such as insomnia and fatigue.[16,41] As a result, they tend to seek care from primary care providers.[43] Consequently, brief screening instruments capturing somatic presentations of depressive symptoms that can easily be employed routinely by primary care providers should be instituted for use among US Chinese older adults. Enhanced screening and treatment of depressive symptoms may ultimately reduce disability in this population.

LIMITATIONS

Several limitations of the present study need to be acknowledged. Since data from the present study were collected in the greater Chicago area, it is unclear whether study findings may be relevant to other ethnic minority populations or Chinese older adults in other locations. Also, the present study used two waves of data to examine the longitudinal relationship between depression and functional disability onset. The short duration of about 2 years limits the ability to determine whether the findings differ in longer time frames.[44] Third, depressive symptoms and disability were measured by self-report instruments, which may reflect recall bias. It is unknown whether study findings would vary if depressive symptoms and disability were clinically assessed. Furthermore, the possibility that disability may lead to subsequent onset of depressive symptoms was not considered in the present analyses. Finally, since the current analyses focused exclusively on functional disability, it is unknown whether depressive symptoms affect other disability dimensions in US Chinese older adults.

IMPLICATIONS

Study findings have significant clinical and policy implications. Compared to other risk factors of functional disability, such as old age and medical comorbidity, depressive symptoms are more amenable to psychosocial interventions.[40] Consequently, culturally relevant depression screening and subsequent treatment interventions may have the potential to reduce functional disability in US Chinese older adults. Findings underscore the pressing need to develop culturally appropriate interventions to address depressive symptoms in this population. Randomized controlled trials are essential to examine whether enhanced screening and treatment of depressive symptoms do reduce disability in diverse populations.

DIRECTION FOR FUTURE RESEARCH

Future studies should explore longitudinally the relationship between depressive symptoms and onset of disability in specific ADL or IADL tasks to determine whether such a

relationship varies over time by specific activities.[45] Additionally, the relationships between depressive symptoms and disabilities in other dimensions (ie, work disability, social functioning) and the number of disabilities in various domains should be evaluated in future research. Rigorous randomized clinical trials need to be conducted to determine the effectiveness of targeted depression screening followed by interventions to prevent functional disability in diverse populations. Future studies of longer durations have the potential to validate present findings. Moreover, the relationship between depressive symptoms and onset of disability requires further investigation with other ethnic minority aging populations. Future studies using advanced statistical techniques, such as cross-lagged path analysis, to elucidate the causal mechanisms underlying the longitudinal relationship between depressive symptoms and onset of disability and the potential reciprocal relationship between the two conditions need to be undertaken.[5,40]

CONCLUSION

Study findings extend existing literature by demonstrating that depressive symptoms among a rapidly growing ethnic minority aging population are significant risk factors for development of functional disability over 2 years. Such findings suggest that culturally sensitive screening followed by developing culturally relevant intervention programs addressing depressive symptoms may have the potential to reduce functional disability in US Chinese older adults.

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REFERENCES

1. LaPlante M, Harrington C, Kang T. Estimating paid and unpaid hours of personal assistance services in activities of daily living provided to adults living at home. Health Serv Res. 2002;37(2):397–415. [PubMed: 12036000]
2. de Meijer CAM, Koopmanschap MA, Koolman XHE, van Doorslaer EKA. The role of disability in explaining long-term care utilization. Med Care. 2009;47(11):1156–1163. [PubMed: 19786914]
3. Verbrugge LM, Jette AM. The disablement process. Soc Sci Med. 1994;38(1):1–14. [PubMed: 8146699]
4. Bruce ML. Depression and disability in late life: directions for future research. Am J Geriatr Psychiatry. 2001;9(2):102–112. [PubMed: 11316615]
5. Chen C, Mullan J, Su Y, Griffiths D, Kreis IA, Chiu H. The longitudinal relationship between depressive symptoms and disability for older adults: a population-based study. J Gerontol A Biol Sci Med Sci. 2012;67(10):1059–1067. [PubMed: 22454375]
6. Wang L, Van Belle G, Kukull WB, Larson EB. Predictors of functional change: a longitudinal study of nondemented people aged 65 and older. J Am Geriatr Soc. 2002;50(9):1525–1534. [PubMed: 12383150]
7. Barry LC, Allore HG, Bruce ML, Gill TM. Longitudinal association betweendepressive symptoms and disability burden among older persons. J Gerontol A Biol Sci Med Sci. 2009;64A(12):1325–1332.

8. Cronin-Stubbs D, de Leon CFM, Beckett LA, Field TS, Glynn RJ, Evans DA. Six-year effect of depressive symptoms on the course of physical disability in community-living older adults. Arch Intern Med. 2000;160(20):3074–3080. [PubMed: 11074736]
9. Lenze EJ, Schulz R, Martire LM, et al. The course of functional decline in older people with persistently elevated depressive symptoms: longitudinal findings from the cardiovascular health study. J Am Geriatr Soc. 2005;53(4):569–575. [PubMed: 15817000]
10. Penninx BW, Leveille S, Ferrucci L, van Eijk JT, Guralnik JM. Exploring the effect of depression on physical disability: longitudinal evidence from the established populations for epidemiologic studies of the elderly. Am J Public Health. 1999;89(9):1346–1352. [PubMed: 10474551]
11. Minkler M, Fuller-Thomson E, Guralnik JM. Gradient of disability across the socioeconomic spectrum in the United States. N Engl J Med. 2006;355(7):695–703. [PubMed: 16914705]
12. Seeman TE, Merkin SS, Crimmins EM, Karlamangla AS. Disability trends among older Americans: National Health and Nutrition Examination Surveys, 1988–1994 and 1999–2004. Am J Public Health. 2010;100(1):100–107. [PubMed: 19910350]
13. Dong X. Achieving Health Equity in Asian Populations. Gerontology and Geriatric Medicine. 2018;4:2333721418778169.
14. Hoeffel EM, Rastogi S, Kim MO, Hasan S. The Asian population: 2010. 2012.
15. Dong X, Chang E, Simon MA. Physical function assessment in a community-dwelling population of US Chinese older adults. J Gerontol A Biol Sci Med Sci. 2014;69(suppl_2):S31–S38. [PubMed: 25378446]
16. Dong X, Chen R, Li C, Simon MA. Understanding depressive symptoms among community-dwelling Chinese older adults in the greater Chicago area. J Aging Health. 2014;26(7):1155–1171. [PubMed: 25239971]
17. Dong X, Wong E, Simon MA. Study design and implementation of the PINE study. J Aging Health. 2014;26(7):1085–1099. [PubMed: 24667107]
18. Dong X. Addressing Health and Well-being of US Chinese Older Adults through Community-Based Participatory Research&58; Introduction to the PINE Study. AIMS Medical Science. 2015;2(3):261–270.
19. Dong X. Advancing community and health equity: health and wellbeing of US Chinese populations. J Gerontol A Biol Sci Med Sci. 2017;72(suppl_1): S1–S4. [PubMed: 28575271]
20. Dong X. Addressing health and well-being of U.S. Chinese older adults through community-based participatory research: introduction to the PINE study. J Gerontol A Biol Sci Med Sci. 2014;69(suppl_2):S1–S6.
21. Simon MA, Chang ES, Rajan KB, Welch MJ, Dong X. Demographic characteristics of US Chinese older adults in the greater Chicago area: Assessing the representativeness of the PINE study. Journal of Aging and Health. 2014;26(7):1100–1115. [PubMed: 25239968]
22. Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW. Studies of illness in the aged: the index of ADL: a standardized measure of biological and psychosocial function. JAMA. 1963;185(12):914–919. [PubMed: 14044222]
23. Katz S, Downs TD, Cash HR, Grotz RC. Progress in development of the index of ADL. Gerontologist. 1970;10(1):20–30. [PubMed: 5420677]
24. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist. 1969;9(3):179–186. [PubMed: 5349366]
25. Rosow I, Breslau N. A guttman health scale for the aged. J Gerontol. 1966;21(4):556–559. [PubMed: 5918309]
26. James BD, Boyle PA, Buchman AS, Bennett DA. Relation of late-life social activity with incident disability among community-dwelling older adults. J Gerontol A Biol Sci Med Sci. 2011;66(4):467–473. [PubMed: 21300745]
27. Kroenke K, Spitzer RL. The PHQ-9: a new depression diagnostic and severity measure. Psychiatr Ann. 2002;32(9):509–515.
28. Chang E, Beck T, Simon MA, Dong X. A psychometric assessment of the psychological and social well-being indicators in the PINE study. J Aging Health. 2014;26(7):1116–1136. [PubMed: 25239969]

29. Stuck AE, Walthert JM, Nikolaus T, Büla CJ, Hohmann C, Beck JC. Risk factors for functional status decline in community-living elderly people: a systematic literature review. Soc Sci Med. 1999;48(4):445–469. [PubMed: 10075171]
30. Centers for Disease Control and Prevention Adult BMI. https://www.cdc.gov/healthyweight/assessing/bmi/. Updated 2017. Accessed December 10, 2018.
31. Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable EJ. Development of a short acculturation scale for Hispanics. Hispanic J Behav Sci. 1987;9(2):183–205.
32. Chang E, Dong X. A battery of tests for assessing cognitive function in US Chinese older adults—findings from the PINE study. J Gerontol A Biol Sci Med Sci. 2014;69(suppl_2):S23–S30. [PubMed: 25324222]
33. Wilson RS, Beckett LA, Barnes LL, et al. Individual differences in rates of change in cognitive abilities of older persons. Psychol Aging. 2002;17(2):179–193. [PubMed: 12061405]
34. Geerlings SW, Beekman ATF, Deeg DJH, Twisk JWR, Van Tilburg W. The longitudinal effect of depression on functional limitations and disability in older adults: an eight-wave prospective community-based study. Psychol Med. 2001;31(8):1361–1371. [PubMed: 11722151]
35. Bruce ML, Seeman TE, Merrill SS, Blazer DG. The impact of depressive symptomatology on physical disability: MacArthur studies of successful aging. Am J Public Health. 1994;84(11):1796–1799. [PubMed: 7977920]
36. Katon WJ. Epidemiology and treatment of depression in patients with chronic medical illness. Dialogues Clin Neurosci. 2011;13(1):7–23. [PubMed: 21485743]
37. Ludman EJ, Katon W, Russo J, et al. Depression and diabetes symptom burden. Gen Hosp Psychiatry. 2004;26(6):430–436. [PubMed: 15567208]
38. Evans DL, Charney DS, Lewis L, et al. Mood disorders in the medically ill: scientific review and recommendations. Biol Psychiatry. 2005;58(3):175–189. [PubMed: 16084838]
39. DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med. 2000;160(14):2101–2107. [PubMed: 10904452]
40. Ormel J, Rijsdijk F, Sullivan M, van Sonderen E, Kempen G. Temporal and reciprocal relationship between IADL/ADL disability and depressive symptoms in late life. J Gerontol B Psychol Sci Soc Sci. 2002;57(4):338–347.
41. Ryder AG, Yang J, Zhu X, et al. The cultural shaping of depression: somatic symptoms in China, psychological symptoms in North America? J Abnorm Psychol. 2008;117(2):300–313. [PubMed: 18489206]
42. Stokes SC, Thompson LW, Murphy S, Gallagher-Thompson D. Screening for depression in immigrant Chinese-American elders: results of a pilot study. J Gerontol Soc Work. 2002;36(1–2):27–44.
43. Kong D, Li M, Wang J, Davitt JK, Dong X. The relationship between depressive symptoms and health services utilization in U.S. Chinese older adults. Gerontologist. 2018;1–9. [PubMed: 29361184]
44. Dong X, Bergren SM, Simon MA. The decline of directly observed physical function performance among US Chinese older adults. J Gerontol A Biol Sci Med Sci. 2017;72(suppl_1):S11–S15. [PubMed: 28575270]
45. Manini T. Development of physical disability in older adults. Curr Aging Sci. 2011;4(3):184–191. [PubMed: 21529321]

Table 1.

Onset of Functional Disability Over 2 Years in US Chinese Older Adults

Functional Disability Domains	Baseline, No. (%)	2-y Follow-Up, No. (%)	Incident Physical Disability, No. (%)
ADL (N = 2711)	192 (7.1)	225 (8.3)	130 (5.2)
IADL (N = 2634)	1333 (50.6)	1413 (52.2)	463 (35.6)
Mobility (N = 2701)	1035 (38.3)	1138 (42.1)	387 (23)

Abbreviations: ADL, activity of daily living; IADL, instrumental ADL.

Table 2.

Sample Characteristics by Onset of Disability Categories at 2-Year Follow-Up

Variables	Onset of ADL Disability			Onset of IADL Disability			Onset of Mobility Disability		
	Yes (N = 130, 5.2%)	No (N = 2388, 94.8%)	*P* Value	Yes (N = 463, 35.6%)	No (N = 838, 64.4%)	*P* Value	Yes (N = 387, 23.3%)	No (N = 1277, 76.7%)	*P* Value
Age, mean (SD), y	78.6 (7.5)	71.6 (7.6)	<.0001	71.5 (6.9)	67.8 (6.1)	<.0001	73.7 (7.2)	68.7 (6.5)	<.0001
Sex, No. (%)									
Male	46 (4.3)	1,017(95.7)		200 (32.1)	423 (67.9)		143 (18.8)	617 (81.2)	
Female	84 (5.8)	1,371 (94.2)	.1054	263 (38.8)	415 (61.2)	.0118	244 (27.0)	660 (73.0)	<.0001
Marital status, No. (%)									
Married	71 (3.9)	1,750 (96.1)		354 (27.2)	689 (66.1)		270 (20.4)	1,052 (79.6)	
Not married	59 (8.5)	636 (91.5)	<.0001	109 (42.4)	148 (57.6)	.0111	117 (34.3)	224 (65.7)	<.0001
Education, mean (SD), y	8.5 (5.5)	8.8 (5.0)	.4469	9.2 (5.3)	9.2 (4.5)	.9722	8.5 (5.0)	9.2 (4.6)	.0080
Income, mean (SD) USD	1.8 (0.7)	1.9 (1.1)	.4440	1.8 (1.0)	2.1 (1.4)	.0003	1.8 (0.9)	2.0 (1.3)	.1611
Household size, mean (SD), No.	1.4 (1.6)	1.9 (1.9)	.0032	1.9 (1.8)	2.2 (2.0)	.0001	1.8 (2.0)	2.1 (1.9)	<.0001
Acculturation, mean (SD) No.	14.6 (3.6)	15.2 (4.7)	.2193	15.2 (4.2)	15.8 (5.2)	.1532	15.2 (4.7)	15.4 (4.8)	.1522
Currently smoking, No. (%)									
Yes	4 (1.4)	279 (98.6)		50 (29.1)	122 (70.9)		31 (14.0)	191 (86.0)	
No	126 (5.6)	2,108 (94.4)	.0025	413 (36.6)	716 (63.4)	.0553	355 (24.6)	1,086 (75.4)	.0005
BMI, No. (%)									
Underweight	15 (8.5)	162 (91.5)		27 (32.9)	55 (67.1)		22 (20.3)	86 (79.6)	
Normal weight	69 (4.2)	1,571 (95.8)		315 (35.2)	579 (64.8)		254 (22.5)	875 (77.5)	
Overweight	32 (5.4)	561 (94.6)		102 (34.7)	192 (65.3)		99 (26.1)	281 (73.9)	
Obese	7 (9.7)	65 (90.3)	.0160	15 (60.0)	10 (40.0)	.0750	6 (17.1)	29 (82.9)	.3547
No. of chronic conditions, mean (SD)	2.6 (1.5)	2.0 (1.4)	<.0001	2.0 (1.3)	1.6 (1.3)	<.0001	2.2 (1.3)	1.7 (1.3)	<.0001
Cognitive function, mean (SD) No.	−0.4 (0.9)	0.1 (0.8)	<.0001	0.2 (0.7)	0.3 (0.6)	.0196	−0.01 (0.8)	0.2 (1.6)	<.0001
Depressive symptoms, mean (SD), No.	4.2 (5.1)	2.3 (3.7)	<.0001	2.0 (3.4)	1.5 (2.8)	.056	2.2 (3.3)	1.7 (3.0)	.0020

Abbreviations: ADL, activity of daily living; BMI, body mass index; IADL, instrumental ADL.

Table 3.

Multivariate Associations Between Baseline Characteristics and Onset of Functional Disability at 2 Years[a]

Variables	Onset of ADL Disability	Onset of IADL Disability	Onset of Mobility Disability
Time (intervals)	1.44 (0.74–2.79)	0.51 (0.33–0.79) **	1.10 (0.73–1.66)
Age	1.10 (1.07–1.14) ***	1.09 (1.07–1.12) ***	1.11 (1.09–1.13) ***
Female sex	1.26 (0.78–2.04)	1.66 (1.24–2.24) ***	1.54 (1.14–2.09) **
Education	1.08 (1.03–1.13) **	1.02 (0.99–1.06)	0.98 (0.95–1.02)
Income	0.87 (0.65–1.16)	0.85 (0.75–0.96) **	0.87 (0.76–1.00)
Marital status (married)	0.94 (0.59–1.51)	1.09 (0.78–1.51)	0.79 (0.58–1.08)
Household size	0.99 (0.88–1.12)	0.97 (0.91–1.04)	1.06 (0.99–1.13)
Acculturation	0.96 (0.90–1.02)	0.96 (0.93–0.99) *	1.00 (0.97–1.03)
Currently smoking	0.46 (0.16–1.35)	1.01 (0.67–1.54)	0.78 (0.49–1.24)
BMI (underweight)	1.52 (0.77–3.02)	0.81 (0.48–1.36)	0.78 (0.46–1.33)
BMI (overweight)	1.12 (0.70– 1.80)	0.98 (0.72–1.32)	1.25 (0.93–1.68)
BMI (obesity)	1.87 (0.73–4.79)	3.06 (1.31–7.17) **	0.71 (0.28–1.83)
No. of chronic conditions	1.16 (1.01–1.33) *	1.12 (1.02–1.24) *	1.20 (1.09–1.32) ***
Cognitive function	0.63 (0.46–0.86) **	0.96 (0.75–1.22)	0.93 (0.74–1.16)
Depressive symptoms	1.06 (1.02–1.11) **	1.05 (1.01–1.09) *	1.05 (1.01–1.09) **

Abbreviations: ADL, activity of daily living; BMI, body mass index; IADL, instrumental ADL;

* $p<0.05$,

** $p<0.01$,

*** $p<0.001$.

[a] Data are given as odds ratio (95% confidence interval).

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