Title

Multiple Chronic Conditions and Disability among Vietnamese Older Adults: Results from the Vietnamese Aging and Care Survey (VACS)

Journal

Journal of Racial and Ethnic Health Disparities, 11(3)

ISSN

2197-3792

Authors

Miyawaki, Christina E
Garcia, Joshua M
Nguyen, Kim N
et al.

Publication Date

2024-06-01

DOI

10.1007/s40615-023-01652-z

Peer reviewed

HHS Public Access

Author manuscript

J Racial Ethn Health Disparities. Author manuscript; available in PMC 2024 June 01.

Published in final edited form as:

J Racial Ethn Health Disparities. 2024 June ; 11(3): 1800–1807. doi:10.1007/s40615-023-01652-z.

Multiple Chronic Conditions and Disability among Vietnamese Older Adults: Results from the Vietnamese Aging and Care Survey (VACS)

Christina E. Miyawaki[1], **Joshua M. Garcia**[2], **Kim N. Nguyen**[3], **Van Ta Park**[4], **Kyriakos S. Markides**[5]

[1]Graduate College of Social Work, University of Houston, Houston, TX 77204, USA

[2]Department of Psychology, University of Houston, Houston, TX 77204, USA

[3]College of Education, University of Houston, Houston, TX 77204, USA

[4]University of California San Francisco, School of Nursing, San Francisco, CA 94143, USA

[5]University of Texas Medical Branch, Galveston, TX 78701, USA

Abstract

Using data from Vietnamese-origin older immigrants/refugees in the Houston, Texas area, we assessed their overall health, chronic conditions, disability, depressive symptoms, and cognitive impairment, and examined the association between their chronic conditions and disability by comorbidity clusters. The mean age of the sample was 76 years old. The majority were married in fair/poor health with several chronic conditions and disabilities and lived with families in low-income households. Hypertension and arthritis were the most common health conditions, but cognitive impairment had the most significant impact on their disability. They experienced similar health conditions to other older Americans but had higher rates of depressive symptoms and cognitive impairment possibly due to cultural factors that may have delayed mental health treatment. Culturally and linguistically tailored services created by policymakers,

✉Christina E. Miyawaki, cemiyawaki@uh.edu.

Author Contributions Christina Miyawaki contributed to the study conception, C. Miyawaki, Joshua Garcia, and Kyriakos Markides developed the study design. C. Miyawaki prepared the materials guided by K. Markides. Kim Nguyen and C. Miyawaki collected data, and J. Garcia analyzed the data. The first draft of the manuscript was written by C. Miyawaki and J. Garcia, and K. Markides and Van Ta Park critically reviewed and edited the first manuscript. All authors commented on several versions of the manuscript, and read and approved the final manuscript.

Declarations

Competing Interests The authors have no relevant financial or non-financial interests to disclose.

Code Availability Not applicable.

Ethics Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the University of Houston (July 4, 2017/STUDY00000419 for VACS Wave 1 and December 18, 2020/ STUDY00002733 for VACS Wave 2).

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Consent to Publish Informed consent for publication was obtained from all individual participants included in the study.

healthcare professionals, and local social service agencies are recommended for the well-being of immigrants/refugees who migrated to the U.S. for a better life.

Keywords

Asian American; Chronic conditions; Disability; Cognitive impairment; Depressive symptoms; Immigrant; Vietnamese

Introduction

Asian Americans are the fastest-growing population in the United States (U.S.) [1], with the older segment of the population (65 years and older) also growing at a fast rate [2]. Asian Americans include many foreign-born individuals as 71% of adults (18 years and older) and 86% of older adults are immigrants [3, 4]. Asian Americans also recorded the highest life expectancy among major racial/ethnic groups in the U.S. (86 years), followed by Hispanic (82 years), non-Hispanic White (79 years), and African American (75 years) counterparts in 2019 [5]. Markides and Rote posited selective migration as one of the potential explanations for the health advantage of immigrants [6]. While a healthy immigrant effect may apply to most Asian-origin immigrants, less is known about the health of refugee populations such as the majority of Vietnamese older adults living in the U.S.

After the fall of Saigon in 1975, three waves of Vietnamese immigrants/refugees arrived in the U.S. Over the years, earlier waves of immigrants/refugees brought other family members including older members to unite with them. The current Vietnamese-origin population of the U.S. is 2.2 million [7] and is still growing. At the same time, the health of Vietnamese immigrants, especially those who are currently older has been understudied. To explore this knowledge gap, we developed a comprehensive health survey, *the Vietnamese Aging and Care Survey (VACS)*, and collected a convenience sample of community-dwelling older Vietnamese' health data in Houston, Texas in 2018 (N = 199) and 2021 (N = 204). Houston is the 2nd largest Vietnamese-populated metropolitan area in the U.S. with 143,000 Vietnamese following Los Angeles [4]. The majority of Vietnamese in Houston live in multigeneration households in ethnic enclaves as many Vietnamese towns exist in the Houston metropolitan area and its vicinity. While ethnic enclaves have been known to protect immigrants' health [6, 8], preliminary work has suggested that generally poor health by a variety of indicators among Vietnamese-origin older adults, is likely to be due to their refugee status [9–12]. Our previous study with VACS Wave 1 data found that having more physical disabilities was associated with higher depressive symptoms and loneliness. Social support moderated the effect of physical disability on loneliness but not of depressive symptoms [11]. The VACS Wave 1 and 2 data (N = 210) revealed that older Vietnamese-origin respondents with more activities of daily living (ADL) disability, arthritis, and liver disease reported higher depressive symptoms while some of their health conditions have their origin in Vietnam, accompanied them to the U.S., and have been exacerbated by factors associated with their adjustment to a new country [13]. However, their most common chronic conditions such as cognitive impairment, as well as their impact on disability in this population have not been investigated. Below, we examine the most

common multiple chronic conditions in Vietnamese-origin older adults, and their association with disability using the VACS Wave 1 and Wave 2 data. Understanding the association between multiple chronic conditions and disability is significant since Asian Americans have the highest life expectancy and older adults tended to have more chronic conditions and disabilities [14]. Thus, this paper will contribute to the limited knowledge among a largely refugee population.

Methods

Study Design

This paper analyzed data from the VACS Wave 1 and 2. The VACS 1 was developed in 2018, and was modeled after the Hispanic Established Populations for Epidemiological Studies of the Elderly [15] as a base design and created surveys for Vietnamese-origin older adults. The survey included questions about respondent's sociodemographic data, physical, mental, and cognitive health status, social service use, and social support. We added several instruments pertinent to Asian culture such as filial expectations of caregiving. In 2021, we conducted VACS Wave 2 and included an additional culturally relevant instrument (i.e., religiosity) and one more cognitive instrument, Montreal Cognitive Assessment (MoCA) [16, 17] along with the Mini-Mental State Examination (MMSE) [18]. In this study, we report on the associations between sociodemographic factors, chronic conditions, disability, cognitive impairment, and depressive symptomology.

Sample

Inclusion criteria for samples were that respondents self-identified themselves as Vietnamese, were 65 years and older, spoke English and/or Vietnamese, were community-dwellers in the greater Houston, Texas area, and had a designated family caregiver who supported their physical, mental, or cognitive needs at the time of the survey. During Wave 2 data collection we reached out to respondents from Wave 1. If the same respondents participated in both waves, their Wave 1 data was used because of their first exposure to the VACS survey. As a result, 22 eligible respondents were in Wave 1 and 2 surveys. In addition, five respondents who did not have designated caregivers at Wave 1, became care recipients at Wave 2. Therefore, these respondents were included in this study. The final sample included 177 respondents, 93 from Wave 1 and 84 from Wave 2.

Data Collection

Data collection took place in November 2017 and April–May 2018 for Wave 1, and January through August 2021 for Wave 2. In 2015, we first proposed the idea of health surveys to the Executive Directors of two Vietnamese social service agencies. We formed a Vietnamese advisory committee with five Vietnamese social workers and hired several bilingual/bicultural Vietnamese American Research Assistants. Through the network of the two Executive Directors, we were connected with several Vietnamese bilingual community key informants, and local Vietnamese senior housing, churches, and temples. We developed study flyers and disseminated them using snowball sampling and word-of-mouth. The bilingual Vietnamese Research Assistants interviewed and filled out the surveys on behalf of the respondents. The same procedures were used in Wave 2 data collection. Additionally, as

a new strategy, we visited several large Vietnamese apartment complexes, “villages” with a former village resident knocking on the doors of each household.

The survey interview took 25 to 30 min. We provided a $20 (Wave 1) and a $25 (Wave 2) store gift card to all respondents who took the survey. The study was approved by the University of Houston (Wave 1: STUDY00000419 and Wave 2: STUDY00002733), and written consent was obtained from all the respondents before the survey. More details of data collection can be found elsewhere [9–12].

Measures

Depressive symptoms were assessed by the 20-item Center for Epidemiologic Studies Depression Scale (CES-D) [19], which is one of the most commonly used scales to measure older adults’ depressive symptoms. Scores range from 0 to 60 with higher scores indicating greater depressive symptoms. A score of 16 or greater indicates a risk of clinical depression [20]. We used the validated Vietnamese version of the CES-D [21], which had a strong internal consistency of $\alpha = 0.94$ in the current sample.

Cognitive impairment was assessed with the MMSE [18] whose scores range from 0 to 30 and the higher scores indicate better cognitive function. We used the cutoff point of ≤ 21 for cognitive impairment for this study as it has previously been used for older adults with low education levels including immigrants [22, 23]. The average years of formal education in this sample were 7.6 years.

Functional disability was assessed by Katz’s ADL scale [24] and Lawton and Brody’s Instrumental Activities of Daily Living (IADL) scale [25]. The ADL scale (i.e., bathing, dressing, toileting, transferring from a bed to a chair, walking across a small room, grooming, and eating) was scored if the respondent needed assistance to perform each activity (1 =needs assistance or 0 =does not need assistance) indicating the higher scores required more assistance. ADL scores ranged from 0 to 7 functional difficulties (standardized $\alpha = 0.92$). The IADL scale (i.e., using the telephone, shopping, preparing food, housekeeping, using transportation, medication management, and managing finances) was scored if the respondent was able to perform each activity (0 = independent, or 1 = unable to perform). IADL scores ranged from 0 to 7 functional difficulties (standardized $\alpha = 0.89$) indicating that higher scores suggest greater IADL difficulty. Following grouping methodologies from Collins et al. [26], we labeled severe ADL and IADL disability as reporting more than three difficulties on these measures. Variables representing difficulties in ADL items of mobility (walking across a small room, transferring from a bed to a chair) and self-care (bathing, grooming, dressing, and eating) tasks were also constructed.

Health was assessed by self-rated health (good/excellent vs fair/poor), and the number of chronic diseases which are prevalent in most older adults (arthritis, cancer, diabetes, heart problems, hypertension, liver disease, lung disease, and stroke). Respondents were asked if a doctor or other healthcare professional had ever told them that they had each condition. In addition, we included depression and cognitive impairment as two common chronic conditions in older adults. We dichotomized chronic condition status into three or more and two or fewer comorbidities [26].

Sociodemographic characteristics asked age, sex (male, female), marital status (married or had a partner, not married), years of residence in the U.S., years of education, Vietnamese nativity, annual household income (<$25,000, $25,000–$50,000, > $50,000), living arrangements (live alone, live with other(s)), and language spoken at home (Vietnamese, Vietnamese & other).

Data Analysis

We used chi-square tests and t-tests to compare the sociodemographic and health characteristics of the samples with three or more reported health conditions to those with two or fewer conditions. We also conducted multivariable logistic regression models to estimate the odds of respondents having a disability in one or more mobility tasks or self-care tasks, severe ADL disability, and severe IADL disability based on their health condition status (≥ 3 comorbidities). The odds ratio (OR) of respondents having these disabilities by comorbidity status was adjusted for age, education, gender, and marital status. The false-discovery rate (FDR) method was used to adjust *p*-values across the four comparisons conducted to protect against risk of type I errors [27]. Missing data analysis demonstrated that, compared to those with complete data ($n = 128$), those with some missing data ($n = 49$) were slightly older (M = 78.35 ± 7.22 vs 75.16 ± 7.23; $d = 0.44$, $p = 0.009$), and had a higher prevalence of stroke (23.4% vs 10.2%). These differences may partially contribute to mechanisms of missingness. The Multivariate Imputation by Chained Equations (MICE) package in R was used for data imputation.

Comorbidity clusters were identified as follows. First, we identified the combination of the two most common health conditions among respondents. We then identified the next three most prevalent health conditions that were comorbid with the two most common health conditions. As an exploratory analysis, marginal means for the number of ADLs and IADLs were estimated for these comorbidity groups, adjusted for age and gender. All statistical analyses were conducted in R.

Results

Table 1 shows that the mean age of the respondents was 76 years (range: 65–97) with 57.6% of them being female. All were born in Vietnam and have lived in the U.S. for 23.9 years (range: 1–74) on average. The majority were married/partnered (62.1%). The vast majority lived with other Vietnamese people (88.1%) speaking Vietnamese (92.1%), and their annual households (89.8%) belonged to the low-income category (< $25,000). The vast majority self-rated their health as fair/poor (84.2%). The average numbers of disability were 1.7 (ADL out of 7) and 4.0 (IADL out of 7), and the number of chronic conditions was 3.0. Among chronic conditions, hypertension recorded the highest prevalence (78.5%) followed by arthritis (53.7%), diabetes (43.5%), depression (40.1%), cognitive impairment (32.2%), and heart attack (22.6%).

Of the total sample ($N = 177$), 72 (40.7%) had 2 or fewer chronic conditions, and 105 (59.3%) had 3 or more conditions. While 7 (4%) had no chronic conditions, 34 (19.2%) experienced 5 or more conditions. Respondents with 3 or more chronic conditions tended to be older (average 77.9 years old) compared to those with 2 or fewer chronic conditions (73.3

years old). The number of chronic conditions reflected the self-rated health as fair or poor of respondents with 3 or more (91.4%) compared to those with 2 or fewer (73.6%) chronic conditions. The same pattern was found with the numbers of ADLs and IADLs: the higher number of ADL (2.2) and IADL (4.6) disability were found in older respondents with a higher number of chronic conditions compared to respondents with a fewer number of health conditions (ADL: 0.9 and IADL: 3.2).

Hypertension (78.5%) and arthritis (53.7%) were the two most frequently reported chronic conditions. Diabetes (43.5%) and depressive symptoms (40.1%) were the next two most prevalent conditions. Of respondents with 3 or more health conditions (Table 3), almost half of them experienced cognitive impairment (49.5%) followed by heart attack (33.3%) and stroke (22.9%). Fifty-six respondents had difficulty with mobility and 68 with self-care tasks, 35 had severe ADL, and 102 had severe IADL impairment (not shown in tables).

Results of the multivariable logistic regression (Table 2) indicated that compared to respondents with 2 or fewer chronic conditions, respondents with 3 or more chronic conditions had significantly higher odds of having a disability in one or more mobility tasks (OR = 2.76; 95% confidence interval [CI], 1.25–6.42), self-care tasks (OR = 2.12; 95% CI, 1.04–4.44), severe ADL disability (OR = 2.77; 95% CI, 1.06–8.19) and severe IADL disability (OR = 2.33; 95% CI, 1.17–4.47). These estimates remained significant when FDR adjustments were applied.

Table 3 demonstrates the representation of chronic conditions and disabilities in daily functioning among respondents with 3 or more health conditions, in addition to the arthritis and hypertension comorbidity group. The top three most common conditions comorbid with arthritis and hypertension were depressive symptoms (35, 47.9%), diabetes (34, 46.4%), then cognitive impairment (25, 34.2%).

Table 4 demonstrates the estimated marginal means for the number of ADL and IADL difficulties among various groups. These estimated marginal means aid in the interpretation of what the common comorbidities were among the three or more health conditions group analyzed in the logistic regression models. While depression and diabetes had similar numbers of ADL and IADL disabilities, cognitive impairment combined with additional comorbidities appeared to impact the most on the ADL and IADL disability numbers.

Discussion

Using the VACS Wave 1 and Wave 2 health data, we examined the most common chronic conditions of community-dwelling Vietnamese-origin older adults in Houston, Texas, and assessed the associations between multiple chronic conditions and their ADL and IADL disability by different clusters of health conditions. Their most prevalent conditions were hypertension and arthritis which is not surprising as these two chronic conditions were experienced by most older adults in the U.S. regardless of racial/ethnic groups [28]. Other prevalent chronic conditions included high depressive symptoms, diabetes, cognitive impairment, heart disease (i.e., heart attack), and stroke. The high prevalence of high depressive symptoms in this sample is consistent with previous literature [29–31] and

alarming. Many Vietnamese experienced a great deal of adversity throughout their lives in Vietnam as well as during and after their migration to the U.S., which may have impacted their mental health despite having a strong family and community support [32]. Many lost family members or left them behind and those who made it to the U.S. may have suffered from survivor guilt [31], all of which may have contributed to their depressive symptoms.

Also of concern is the high prevalence of cognitive impairment (32%) in this sample which appears to be more prevalent than in other racial/ethnic groups (e.g., 24% in the Hispanic group) [28]. While cognitive impairment may go untreated because it is seen as a normal part of aging [31], it may be associated with feelings of shame with a stigma attached to it [31, 33, 34]. Such cultural factors along with limited or no health insurance may result in the delay of treatment for cognitive and mental health problems [35, 36].

The sample's high prevalence of chronic conditions and associated high prevalence of disability have resulted in poorer self-rated health. These patterns were consistent with findings with other racial/ethnic groups of older adults [26, 37, 38]. The high prevalence of cognitive impairment and its impact on respondents' ADL and IADL disability among respondents with arthritis and hypertension comorbidity was worth noting again. Similar to other racial/ethnic groups of older adults, this study showed that older Vietnamese-origin immigrants/refugees shared and were susceptible to the most common chronic conditions in the U.S. Previous studies have reported that older Vietnamese had the highest ADL disability rates among all Asian American populations [39, 40]. Their unique immigration experiences with a tremendous amount of pre- and post-migration physical and mental adversity, low English language proficiency, and low educational attainment, as well as their traditional cultural background including the stigma and the resistance to preventive healthcare make their transition to the new lifestyle in the host country challenging. The high prevalence of depressive symptoms and cognitive impairment, in particular, are two chronic conditions that all healthcare professionals should pay special attention to since the negative impact of cognitive impairment on their ADL and IADL disability was higher than those of any other chronic conditions.

Limitations of the study should be noted. Our data are based on a small convenience sample from community-dwelling Vietnamese-origin older adults in the greater Houston area. Most lived in multi-generation households in ethnic enclaves, thus benefitting from strong family and community support. More acculturated and more isolated older adults from such supports with different sociodemographic backgrounds are underrepresented. Future research with larger and more representative samples of Vietnamese-origin older adults is needed. With larger, representative data, we will have a better picture of their well-being.

The policymakers should support these refugees who did not arrive in the U.S. as selected immigrants, and healthcare professionals should provide culturally and linguistically tailored healthcare services to them. For example, a number of free Vietnamese health fairs have been offered by Vietnamese healthcare professionals throughout the Houston metropolitan area for the past decade. Especially the October health fair attracts over 1,000 Vietnamese immigrants/refugees including seniors because these fairs are offered in a culturally- and

linguistically-tailored way. However, mental/cognitive services have been missing among the services that were offered. This year, in collaboration with all Vietnamese healthcare professionals, we have been offering a “brain booth” to check on seniors’ cognitive status by training local Vietnamese university students on MMSE and/or MoCA. After the assessments by the students, seniors are to bring the results to their primary care doctors, who in turn, take on their clients’ further cognitive assessments. This cycle can benefit not only the seniors but also the local healthcare professionals and the students who will have real-world experiences of contributing to their local Vietnamese residents. Together with policymakers, these collaborative efforts among healthcare professionals, local social service agencies, and higher education sectors can make an impact on the well-being of immigrant/refugee populations that migrated to the U.S. where they all relied on a better life.

Acknowledgements

The authors appreciate the Executive Directors of VN TeamWork and BPSOS, as well as a countless number of Vietnamese key informants who facilitated years of sample recruitment. We thank all the Vietnamese older adults and their family caregivers who welcomed us to their homes and shared their health information despite their busy lives.

Funding

Miyawaki was partially funded by the National Institutes of Health (NIH)/National Institute on Aging (NIA) Texas Resource Center for Minority Aging Research (RCMAR) (P30AG059301). Park’s time was funded by the NIA of the NIH under Award Number R24AG063718 and R56AG069130.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. Budiman A, Ruiz NG. Asian Americans Are the Fastest-Growing Racial or Ethnic Group in the U.S. Pew Research Center; 2021. https://www.pewresearch.org/fact-tank/2021/04/09/asian-americans-are-the-fastest-growing-racial-or-ethnic-group-in-the-u-s/. Accessed 17 Oct 2022.
2. Administration for Community Living (ACL). 2020 Profile of Asian Americans Age 65 and Older. U.S. Department of Health and Human Services; 2020. https://acl.gov/sites/default/files/Profile%20of%20OA/AsianProfileReport2021.pdf. Accessed 17 Oct 2022.
3. Blacher K Asian Americans and Pacific Islanders in the United States Aged 65 Years and Older: Population, Nativity, and Language. National Asian Pacific Center on Aging (NAPCA); 2013. https://www.napca.org/wp-content/uploads/2017/10/65-population-report-FINAL.pdf. Accessed 17 Oct 2022.
4. Pew Research Center. Top 10 U.S. Metropolitan Areas by Vietnamese Population, 2019. Pew Research Center; 2021. https://www.pewresearch.org/social-trends/chart/top-10-u-s-metropolitan-areas-by-vietnamese-population-2019/. Accessed 19 July 2022.
5. National Institutes of Health. Life Expectancy in the U.S. Increased between 2000–2019, but Widespread Gaps among Racial and Ethnic Groups Exist. National Institute on Minority Health and Health Disparities (NIMHD); 2022. https://www.nih.gov/news-events/news-releases/life-expectancy-us-increased-between-2000-2019-widespread-gaps-among-racial-ethnic-groups-exist. Accessed 20 Dec 2022.
6. Markides KS, Rote S. The healthy immigrant effect and aging in the United States and other western countries. Gerontologist. 2019;59(2):205–14. 10.1093/geront/gny136. [PubMed: 30383212]

7. Alperin E, Batalova J. Vietnamese Immigrants in the United States. Migration Policy Institute (MPI); 2018. https://www.migrationpolicy.org/article/vietnamese-immigrants-united-states-5. Accessed 19 July 2022.
8. Markides KS, Eschbach K. Aging, migration, and mortality: current status of research on the hispanic paradox. J Gerontol Ser B. 2005;60(Special Issue 2):S68–75. 10.1093/geronb/60.Special_Issue_2.S68.
9. Miyawaki CE, Chen NW, Meyer OL, Tran MT, Markides KS. Vietnamese adult-child and spousal caregivers of older adults in Houston, Texas: results from the Vietnamese Aging and Care Survey (VACS). J Gerontol Soc Work. 2020;63(1–2):5–18. 10.1080/01634372.2019.1707735. [PubMed: 31900089]
10. Miyawaki CE, Liu M, Markides KS. Association between caregivers' characteristics and older care recipients' well-being among Vietnamese immigrant families in the United States. J Community Psychol. 2022;50(5):2214–24. 10.1002/jcop.22768. [PubMed: 34882808]
11. Miyawaki CE, Liu M, Park VT, Tran MT, Markides KS. Social support as a moderator of physical disability and mental health in older Vietnamese immigrants in the U.S.: results from the Vietnamese Aging and Care Survey (VACS). Geriatr Nur (Lond). 2022;44:151–8. 10.1016/j.gerinurse.2022.01.012.
12. Miyawaki CE, Meyer OL, Chen NW, Markides KS. Health of Vietnamese older adults and caregiver's psychological status in the United States: Result from the Vietnamese Aging and Care Survey. Clin Gerontol Published online June 16, 2020:1–9. 10.1080/07317115.2020.1764157. [PubMed: 31854267]
13. Miyawaki CE, Garcia JM, Medina LD, Nguyen KN, Meyer OL, Markides KS. Associations between physical disability and chronic diseases with depressive symptoms in Vietnamese American older adults. [Unpublished manuscript]. University of Houston Graduate College of Social Work. 2023.
14. Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. Lancet. 2012;380(9836):37–43. 10.1016/S0140-6736(12)60240-2. [PubMed: 22579043]
15. Markides K, Chen NW, Angel R, Palmer R, Graham J. Hispanic Established Populations for the Epidemiologic Study of the Elderly (HEPESE) Wave 7, 2010–2011 [Arizona, California, Colorado, New Mexico, and Texas]. Published online 2016. 10.3886/ICPSR36537.v2.
16. Do M, Ha Bui BK, K. Pham N, et al. Validation of MoCA test in Vietnamese language for cognitive impairment screening. J Glob Health Neurol Psychiatry. Published online May 20, 2022. 10.52872/001c.35656.
17. Nasreddine ZS, Phillips NA, Bédirian V, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriatr Soc. 2005;53(4):695–9. 10.1111/j.1532-5415.2005.53221.x. [PubMed: 15817019]
18. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state." A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. 1975;12(3):189–98. 10.1016/0022-3956(75)90026-6. [PubMed: 1202204]
19. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. Appl Psychol Meas. 1977;1(3):385–401. 10.1177/014662167700100306.
20. Thai TT, Jones MK, Harris LM, Heard RC. Screening value of the Center for Epidemiologic Studies – Depression Scale among people living with HIV/AIDS in Ho Chi Minh City, Vietnam: a validation study. BMC Psychiatry. 2016;16(1):145. 10.1186/s12888-016-0860-3. [PubMed: 27178070]
21. Nguyen HT, Le VA, Dunne M. Validity and reliability of the two scales measuring depression and anxiety used in community survey in Vietnamese adolescents. Vietnam J Public Health. 2007;7(7):25–31.
22. Raji MA, Al Snih S, Ray LA, Patel KV, Markides KS. Cognitive status and incident disability in older Mexican Americans: findings from the Hispanic established population for the epidemiological study of the elderly. Ethn Dis. 2004;14(1):26–31. [PubMed: 15002920]

23. Uhlmann RF, Larson EB. Effect of education on the mini-mental state examination as a screening test for dementia. J Am Geriatr Soc. 1991;39(9):876–80. 10.1111/j.1532-5415.1991.tb04454.x. [PubMed: 1885862]
24. 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. 10.1001/jama.1963.03060120024016. [PubMed: 14044222]
25. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist. 1969;9(3_Part_1):179–86. 10.1093/geront/9.3_Part_1.179. [PubMed: 5349366]
26. Collins DM, Downer B, Kumar A, et al. Impact of multiple chronic conditions on activity limitations among older Mexican-American care recipients. Prev Chronic Dis. 2018;15:170358. 10.5888/pcd15.170358.
27. Benjamini Y, Hochberg Y. Controlling the false discovery rate: a practical and powerful approach to multiple testing. J R Stat Soc Ser B Methodol. 1995;57(1):289–300. 10.1111/j.2517-6161.1995.tb02031.x.
28. Mungas D, Shaw C, Hayes-Larson E, et al. Cognitive impairment in racially/ethnically diverse older adults: accounting for sources of diagnostic bias. Alzheimers Dement Diagn Assess Dis Monit. 2021;13(1). 10.1002/dad2.12265.
29. Kim-Mozeleski JE, Tsoh JY, Gildengorin G, et al. Preferences for depression help-seeking among Vietnamese American adults. Community Ment Health J. 2018;54(6):748–3030. [PubMed: 29129006]
30. Nguyen QCX, Anderson LP. Vietnamese Americans' attitudes toward seeking mental health services: relation to cultural variables. J Community Psychol. 2005;33(2):213–31. 10.1002/jcop.20039.
31. Park VT, Nguyen K, Tran Y, et al. Perspectives and insights from Vietnamese American mental health professionals on how to culturally tailor a Vietnamese dementia caregiving program. Clin Gerontol. 2018;41(3):184–99. 10.1080/07317115.2018.1432734. [PubMed: 29419364]
32. Mazumdar S, Mazumdar S, Docuyanan F, Mclaughlin CM. Creating a sense of place: the vietnamese-americans and little saigon. J Environ Psychol. 2000;20(4):319–33. 10.1006/jevp.2000.0170.
33. Lee MT, Jang Y, Chang WY. How do impairments in cognitive functions affect activities of daily living functions in older adults? Innamorati M, ed. PLoS ONE. 2019;14(6):e0218112. 10.1371/journal.pone.0218112. [PubMed: 31173607]
34. Meyer OL, Nguyen KH, Dao TN, Vu P, Arean P, Hinton L. The sociocultural context of caregiving experiences for Vietnamese dementia family caregivers. Asian Am J Psychol. 2015;6(3):263–72. 10.1037/aap0000024. [PubMed: 26617956]
35. Nguyen TU, Dale A, Gleason D. Vietnamese Health Promotion Project. Online Archive of California; 1998. https://oac.cdlib.org/view?docId=hb2z09n8dm&brand=oac4&doc.view=entire_text. Accessed 17 Oct 2022.
36. Vuong QH, Vu QH, Vuong TT. What makes Vietnamese (Not) attend periodic general health examinations? A 2016 Cross-sectional Study. Osong Public Health Res Perspect. 2017;8(2):147–54. 10.24171/j.phrp.2017.8.2.07. [PubMed: 28540159]
37. Hung WW, Ross JS, Boockvar KS, Siu AL. Recent trends in chronic disease, impairment and disability among older adults in the United States. BMC Geriatr. 2011;11(1):47. 10.1186/1471-2318-11-47. [PubMed: 21851629]
38. Ralph NL, Mielenz TJ, Parton H, Flatley AM, Thorpe LE. Multiple chronic conditions and limitations in activities of daily living in a community-based sample of older adults in New York City, 2009. Prev Chronic Dis. 2013;10:130159. 10.5888/pcd10.130159.
39. Fuller-Thomson E, Brennenstuhl S, Hurd M. Comparison of disability rates among older adults in aggregated and separate Asian American/Pacific Islander subpopulations. Am J Public Health. 2011;101(1):7. [PubMed: 21148708]
40. Yang MS, Burr JA, Mutchler JE. Among older Southeast Asians in the United States. J Aging Health. 2012;24(7):1252–74. [PubMed: 22948086]

Table 1

Characteristics of Vietnamese older adults (≥ 65 years) (N = 177)

Characteristic	Total sample	Number of chronic Health conditions		*p*-value
		≤ 2 (*n* = 72)	≥ 3 (*n* = 105)	
Age (years) Gender	76.04 (7.35)	73.29 (6.32)	77.92 (7.44)	< 0.001
Male	75 (42.4)	33 (45.8)	42 (40.0)	0.537
Female	102 (57.6)	39 (54.2)	63 (60.0)	
Formal education (years)	7.57 (5.55)	7.79 (5.64)	7.42 (5.51)	0.662
Marital status				
Married/partner	110 (62.1)	54 (75.0)	56 (53.3)	0.006
Not married	67 (37.9)	18 (25.0)	49 (46.7)	
Vietnamese nativity	177 (100.0)	72 (100.0)	105 (100.0)	
Years in the U.S	23.94 (13.67)	21.36 (13.57)	25.76 (13.51)	0.036
Household income				
< $25,000	159 (89.8)	62 (86.1)	97 (92.4)	0.007
$25,000–$50,000	11 (6.2)	9 (12.5)	2 (1.9)	
> $50,000	7 (4.0)	1 (1.4)	6 (5.7)	
Co-residents				
Live alone	21 (11.9)	8 (11.1)	13 (12.4)	0.984
Live with other(s)	156 (88.1)	64 (88.9)	92 (87.6)	
Language spoken at home				
Vietnamese	163 (92.1)	63 (87.5)	100 (95.2)	0.112
Vietnamese & other	14 (7.9)	9 (12.5)	5 (4.8)	
Overall health				
Good/Excellent	28 (15.8)	19 (26.4)	9 (8.6)	0.003
Fair/poor	149 (84.2)	53 (73.6)	96 (91.4)	
# of ADL disability	1.67 (2.32)	0.88 (1.62)	2.21 (2.57)	< 0.001
# of IADL disability	3.99 (2.42)	3.15 (2.33)	4.56 (2.32)	< 0.001
# of Health conditions	3.03 (1.56)	1.54 (0.67)	4.05 (1.12)	< 0.001
Arthritis	95 (53.7)	23 (31.9)	72 (68.6)	< 0.001
Cancer	9 (5.1)	2 (2.8)	7 (6.7)	0.419

Characteristic	Total sample	Number of chronic Health conditions		*p*-value
		≤ 2 (*n* = 72)	≥ 3 (*n* = 105)	
Cognitive impairment	57 (32.2)	5 (6.9)	52 (49.5)	< 0.001
Depression	71 (40.1)	12 (16.7)	59 (56.2)	< 0.001
Diabetes	77 (43.5)	17 (23.6)	60 (57.1)	< 0.001
Heart attack	40 (22.6)	5 (6.9)	35 (33.3)	< 0.001
Hypertension	139 (78.5)	47 (65.3)	92 (87.6)	0.001
Liver disease	14 (7.9)	0 (0.0)	14 (13.3)	0.003
Lung disease	10 (5.6)	0 (0.0)	10 (9.5)	0.018
Stroke	24 (13.6)	0 (0.0)	24 (22.9)	< 0.001

M (SD), N (%); *M* Mean; *SD* Standard deviation. *ADL* Activities of daily living. ADL score range: 0–7; *IADL* Instrumental activities of daily living. IADL score range: 0–7. There were 7 participants with 0 chronic health conditions

Table 2

Impact of ≥ 3 multiple chronic conditions on ADL and IADL disability compared to those with ≤ 2 conditions

Outcomes	OR	*P*	adjusted *p*
Mobility task impairment	2.76 (1.25, 6.42)	0.014	0.034
Self-care task impairment	2.12 (1.04, 4.44)	0.041	0.047
≥ 3 ADL disability	2.77 (1.06, 8.19)	0.047	0.047
≥ 3 IADL disability	2.33 (1.17, 4.71)	0.017	0.034

Abbreviations: *ADL* Activities of daily living; *CI* Confidence interval; *IADL* Instrumental activities of daily living; *OR* Odds ratio; *FDR* False discovery rate. All models adjusted for demographic characteristics (age, sex, education, and marital status) of care recipients

Table 3

Characteristics of Vietnamese older adults chronic conditions

Characteristic	≥ 3 chronic conditions (*n* = 105)	Comorbid arthritis & hypertension (*n* = 73)
# of ADL disability	2.21 (2.6)	2.03 (2.6)
# of IADL disability	4.56 (2.3)	4.51 (2.2)
Arthritis	72 (68.6)	73 (100.0)
Cancer	7 (6.7)	5 (6.8)
Cognitive impairment	52 (49.5)	25 (34.2)
Depressive symptoms	59 (56.2)	35 (47.9)
Diabetes	60 (57.1)	34 (46.6)
Heart attack	35 (33.3)	22 (30.1)
Hypertension	92 (87.6)	73 (100.0)
Liver disease	14 (13.3)	8 (11.0)
Lung disease	10 (9.5)	5 (6.8)
Stroke	24 (22.9)	12 (16.4)

M (SD, N (%); *M* Mean; *SD* Standard deviation. *ADL* Activities of daily living. ADL score range: 0–7; *IADL* Instrumental activities of daily living. IADL score range: 0–7

Table 4

Estimated marginal mean number of disabilities across comorbidity groups

	ADL	IADL
Full sample (*n* = 177)		
Female	1.70 (1.28, 2.12)	4.27 (3.82, 4.72)
Male	1.62 (1.13, 2.11)	3.61 (3.08, 4.14)
Arthritis & hypertension sample (*n* = 73)		
No depression/Diabetes/Cognitive impairment	0.66 (−0.22, 1.53)	3.48 (2.67, 4.29)
Depression	1.08 (0.08, 2.07)	3.88 (2.95, 4.80)
Diabetes	1.47 (0.53, 2.41)	3.86 (2.99, 4.73)
Cognitive impairment	2.52 (1.24, 3.80)	5.01 (3.82, 6.19)
Diabetes & depression	1.89 (0.86, 2.92)	4.26 (3.30, 5.22)
Depression & cognitive impairment	2.94 (1.80, 4.08)	5.41 (4.35, 6.47)
Diabetes & cognitive impairment	3.33 (2.06, 4.60)	5.39 (4.21, 6.57)
Diabetes, depression, & cognitive impairment	3.75 (2.64, 4.87)	5.79 (4.75, 6.82)

M (95% Confidence Interval). *ADL* Activities of daily living. ADL score range: 0–7; *IADL* Instrumental activities of daily living. IADL score range: 0–7. Full sample marginal means are adjusted for fixed effects of age and stratified by gender; arthritis & hypertension sample marginals means are adjusted for fixed effects of age and gender