

Special Issue: Race and Mental Health Among Older Adults: Original Research Article

# Is “Busy” Always Better? Time-Use Activities and Depressive Symptoms Among Older Mexican Adults

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Received: March 31, 2020; Editorial Decision Date: July 16, 2020

**Decision Editor:** Robert J. Taylor, PhD, MSW

## Abstract

**Background and Objectives:** Depression among older Mexican adults is underrecognized and of increasing concern due to its association with comorbidities including cognitive and functional impairments. Prior studies have found an association between low involvement levels in social activities and depression. We aimed to examine the association of time-use activities and depressive symptomatology by sex.

**Research Design and Methods:** We used data from the 2012 and 2015 waves of the Mexican Health and Aging Study. Participants aged 60 and older who had low or no depressive symptoms in 2012 were included in these analyses ( $N = 4,309$ ). Factor analysis was used to group activities and logistic regression models were used to assess the association of baseline time use with depressive symptomatology in 2015.

**Results:** Among those with low or no depressive symptomatology in 2012, 21.0% reported elevated symptoms (5+) in 2015. Those with elevated depressive symptoms were more likely to be women, older, lower educated, and with at least one activity of daily living limitation. Four time-use domains emerged from the factor analysis including hobbies and indoor activities, volunteering, caregiving, and working. The hobbies and indoor activities domain was associated with lower odds of elevated symptoms for men and women (odds ratio [OR]: 0.76, 95% confidence interval [CI]: 0.61–0.96; and OR: 0.75, 95% CI: 0.61–0.91, respectively). Additionally, the volunteer and community activities domain was associated with lower odds of depressive symptoms for women (OR: 0.72, 95% CI: 0.58–0.89) and men (OR: 0.77, 95% CI: 0.60–0.99).

**Discussion and Implications:** Understanding how older Mexicans distribute their time among different activities and its associations with depressive symptoms can help guide policy and sex-specific interventions for psychological well-being. Certain domains had lower odds for elevated depressive symptomatology; future work should examine this association in other countries as well as the context of the built environment.

**Translational Significance:** Certain types of time-use activities are associated with reduced odds of depressive symptomatology. Interventions should be sex-specific and focused on protective time-use activities, such as hobbies and volunteering activities, to reduce the burden of depression among older Mexicans.

**Keywords:** Depression, Loneliness, Mexico, Physical activity, Sedentary behavior, Social engagement

## Background and Objectives

Although Mexico currently remains a relatively young country, its population is rapidly aging. The proportion of adults aged 60 and older in the total population is projected to triple from 10% in 2017 to 25% in 2050 (Department of Economic and Social Affairs Division, 2017). Given the aging population, depression represents a greater challenge among older adults because it can contribute to the development of or adversely affect the evolution and treatment of acute and chronic conditions, while decreasing quality of life (Blazer, 2003; García-Peña et al., 2008). It is estimated that by 2030, unipolar depressive disorders will be the leading cause of disease burden globally, accounting for 6.2% of the total disability-adjusted life years (Mathers et al., 2008). Depression is of concern because of its large global burden (GBD 2017 DALYs and HALE Collaborators, 2018) and significant associated health care utilization costs (Unützer et al., 1997).

There is a lack of data and consistency regarding the prevalence of depression among older Mexican adults, as different scales or populations are used. A study conducted by Sánchez-García et al. (2012) explored the sensitivity and specificity between two depression scales, citing that the revised Center for Epidemiologic Studies Depression scale (CES-D) is superior compared to the Geriatric Depression Scale which may overestimate the prevalence of significant depressive symptoms among beneficiaries of the Mexican Social Security Institute in Mexico City. In this sample of 7,449 older Mexican beneficiaries, there was a 12% prevalence (95% confidence interval [CI]: 9.2–15.3) of significant depressive symptoms using the revised CES-D. Prevalence was 13.9% among women and 8.9% among men. Prevalence also increased by age, from 11.3% in those 60–74 years to 13.0% in those 75–84 years and 16.7% in those 85 years and older. More recently, a study using the Encuesta Nacional de Evaluación del Desempeño 2002–2003 estimated national prevalence of depression of 10% and 5%, respectively, among women and men 60 years and older (Belló et al., 2005). They considered major depression when respondents reported having all the symptoms defined by the Diagnostic and Statistical Manual of Mental Illness (DSM IV). Another study noted a 9.6% lifetime prevalence of the major depressive disorder among Mexican adults aged 55–65 years (Medina-Mora et al., 2007).

Undertreatment of depression among older adults is of increasing concern due to its association with other comorbidities, such as substance use disorders, cardiovascular disease, and a dose–response relationship with disability, and other cognitive and functional impairments (Rodda et al., 2011). One study found that among those who received a diagnosis of the depressive episode based on the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10), only 12.8% reported receiving treatment (Guerra et al., 2009). The varying clinical presentations of depressive symptoms in the context of other physical and neurological illnesses,

such as dementia, Parkinson's, and Alzheimer's disease, may contribute to underdiagnoses of depression (Fiske et al., 2009). Not only does this have significant implications on health expenditures and outcomes, but it highlights the importance of understanding the etiology of depression and barriers to accessing mental health care in older adults.

Patterns of gender differences in depression have not been widely studied in older populations. However, studies do find that the gender disparities observed among adolescents persist into adulthood and late life (Hankin et al., 1998; Salk et al., 2017). A meta-analysis restricted to community-based adults aged 75 years and older living in the United States, Europe, Asia, and Australia noted the female-to-male ratio of depression was between 1.4 and 2.2, and the prevalence of major depression (4.6%–9.3%) and depressive disorders (4.5%–37.4%) was higher for the oldest groups, 85–89 and 90 years and older (Luppa et al., 2012). Gender, disability, lack or loss of social contacts, financial strain, and prior history of depression have been found to be associated with depressive disorders and symptoms in studies of adults 50 years or older across the United States and Europe (Cole & Dendukuri, 2003; Djernes, 2006). Prior literature using a nationally representative sample of adults aged 50 or older in Mexico indicates that recently widowed older men ( $\beta = 1.82$ ,  $SE = 0.58$ ) and women ( $\beta = 1.42$ ,  $SE = 0.34$ ) had the greatest prevalence in depressive symptomatology compared to those who were married. Additionally, emotional support from children, coresidence with relatives, and volunteering were associated with smaller increases in depressive symptoms in older Mexican adults (Monserud & Wong, 2015).

The theoretical framework of social capital theory emphasizes the protective benefits found within supportive relationships via the flow of goods or services through social engagement in activities (Berkman et al., 2000). Resources exchanged in social networks may include new skills or opportunities, emotional support, status, health-promoting influences, or an increased sense of belonging. Previous research in primate models indicates that social networks can be instrumental in minimizing the deleterious effects of chronic stress and physical weathering experienced through repetitive activation of the hypothalamus–pituitary–adrenal axis (Thoits, 2011). Stress process theory suggests that the expectation of having social support is sufficient in buffering some of the effects such as elevated heart rate, blood pressure, and increased surveillance, by developing proper coping responses (Pearlin et al., 2005). Health behavior studies have demonstrated the association between social disconnectedness, characterized by low levels of social activities, perceived social isolation and worse health outcomes in older adults, including cardiovascular disease and depression (Cornwell & Waite, 2009; Shankar et al., 2011). Due to the elimination of work-related activity, older age has also been linked with a reduction in physical activity and a lack of diversity in the types of time-use activities (Slingerland et al., 2007; Verbrugge

et al., 1996). In a systematic review limited to adults and children, de Rezende et al. (2014) reported an association between sedentary activities, which involved sitting or lying down, and depressive symptomatology. These psychosocial risk factors can be exacerbated in older adults, due to barriers they face through life course changes such as bereavement, retirement, and increased isolation (Cornwell & Waite, 2009).

To the best of our knowledge, this is the first study investigating the association of time-use activities and depressive symptoms in older Mexicans. Prior studies utilized the Mexican National Time-Use Survey (ENUT 2009), to explore differences in the division of labor by rurality, indigenous groups, socioeconomic status, and gender among adults aged 18–60 years. Relevant findings suggest that adult women in Mexico participate in fewer leisure time and educational activities compared to men. This includes all activities associated with socialization, sports, hobbies, games, communication, attending classes, and studying. However, in Mexico, men who are younger than 40 or who had at least a high school education reported a higher number of hours dedicated to unpaid work such as domestic and caregiving activities compared to men who were older or had less education. Moreover, they note that this gap widens among men living in rural Mexico, compared to those in urban settings (Garcia & Pacheco, 2014). One study using ENUT 2014 cited up to 75% of care activities in Mexico were provided by women (Pederzini & Velazquez, 2017). Men aged 60 and older had a greater percentage of employment time compared to women in Mexico (Ramos, 2017). There are few studies regarding time use, specifically social engagement activities, among older Mexican adults. Most of the findings regarding time use are data briefs compiled by affiliates of the National Institute of Statistics and Geography (INEGI) in Mexico.

Our analyses aim to fill this gap by assessing the association between time-use activities and depressive symptomatology among older Mexicans, using data from the Mexican Health and Aging Study (MHAS). This study uses Activity Theory as its conceptual framework, whereas a positive relationship exists between participating in activities and life satisfaction in adults aged 52 years and older in the United States (Lemon et al., 1972). Those who participate in activities, either individual hobbies or activities that may promote social engagement as they age, are more likely to maintain life satisfaction and psychological well-being. We hypothesize that engagement in activities would produce a lower likelihood of excess depressive symptoms; therefore, we included a variety of time-use activities in the analyses. Additionally, we aimed to investigate differences by sex in patterns of time-use activities and its association on depressive symptoms through time. Female time use will be characterized by domestic work and caregiving activities; conversely, men will be the primary participants in the labor force and leisure activities such as playing games or attending a sporting club. This may be due to the role

of cultural practices and gender inequalities in Mexico. Additionally, we hypothesize that those who engage in social or physical activities will have lower odds of reporting elevated depressive symptoms compared to those who do not engage in these.

## Research Design and Methods

### Sample

The MHAS is a nationally representative sample of individuals aged 50 or older as of 2001 with follow-ups completed in 2003, 2012, 2015, and 2018. Spouses were also interviewed regardless of age. Additionally, a new sample of participants of those born between 1952 and 1962 and between 1963 and 1968 was added in 2012 and 2018, respectively. The MHAS sample was selected from residents of all 32 states of both rural and urban Mexico from the National Employment and Occupation Survey (Wong et al., 2017).

For our analyses, we took 2012 as the baseline wave and 2015 as the follow-up wave. The 2018 wave of survey data was not publicly available during the data analyses; therefore, only data from the two most current waves were used. The 2012 MHAS sample included 18,465 respondents (Figure 1); however, we omitted proxy interviews because they were not asked questions on time use or depression ( $n = 5,026$ ), anyone younger than the age of 60 ( $n = 5,271$ ), and individuals missing information on depressive symptoms ( $n = 80$ ), any time-use activities ( $n = 65$ ), current employment ( $n = 6$ ), or any covariates, which included education ( $n = 48$ ), marital status ( $n = 131$ ), and consumer

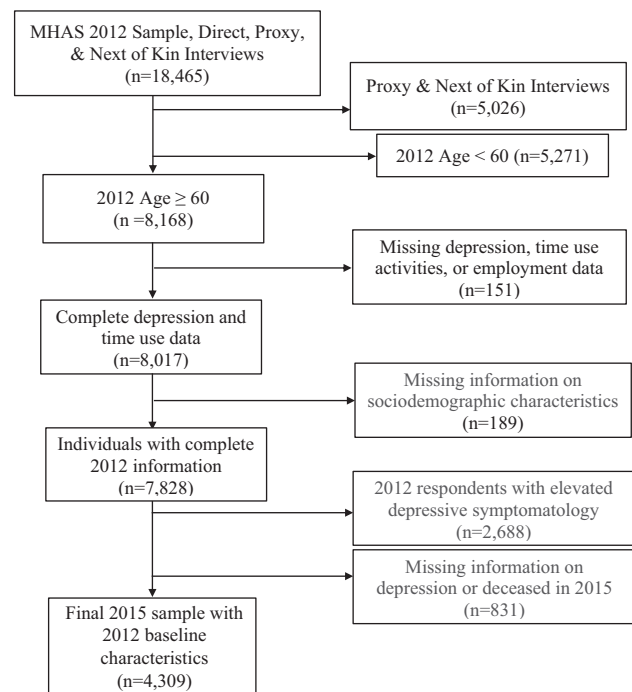


Figure 1. Flow chart of sample selection.

durables ( $n = 10$ ). This resulted in 7,828 individuals who had complete information in 2012. For our study purpose, we were primarily interested in understanding how baseline time-use activities were associated with reporting elevated depressive symptoms at the 2015 follow-up. For this purpose, we used a sample with low or no depressive symptoms at the 2012 baseline. Therefore, those who reported elevated depressive symptomatology ( $n = 2,668$ ) in 2012 and who were missing information on depression or were deceased in the 2015 wave were excluded ( $n = 831$ ) as well. The final analytic sample included 4,309 participants aged 60 and older who had low or no depressive symptomatology in 2012 and provided information on their depressive symptoms in 2015.

## Measures

*Time-use activities* were assessed in 2012 through self-report where the respondents affirmatively answered if they performed any of the following activities during the past year, excluding any activities undertaken as part of their occupation: (a) caring for a sick or disabled adult, (b) caring for children younger than 12 years, (c) volunteering, (d) attending a training session, (e) attending a sporting or social club, (f) reading, (g) doing puzzles, (h) playing games, (i) communicating via the phone/computer, (j) home maintenance, (k) watching television, and (l) sewing/crafts. Responses were dichotomized as yes or no. If participants responded yes, they are asked about the frequency of the activity. This was categorized as never, less than 4 times a week, and at least 4 times a week. Current employment status, regardless of pay, was constructed as an additional time-use activity. We further categorized total weekly hours of employment as part-time (less than 48 h) and full-time (at least 48 h). To make the distinction between those participants who were employed full-time, we based the estimate on Mexico's workweek which is 6 days and 48 h.

*Depressive symptomatology* was assessed using a nine-item modified CES-D which asked respondents if in the past week they experienced the following symptoms a majority of the time: (a) feeling depressed, (b) feeling that everything they did was difficult, (c) feeling they had restless sleep, (d) feeling happy (reverse coded), (e) feeling alone, (f) feeling that they enjoyed life (reverse coded), (g) feeling sad, (h) feeling tired, and (i) feeling very energetic (reverse coded). Participants with scores from 0 to 4 were categorized as having low depressive symptomatology, while those with 5 or more were categorized as having elevated depressive symptomatology. This cutoff has been assessed for its validity and reliability for the MHAS questionnaire (Aguilar-Navarro et al., 2007).

As our goal is to examine how time use is associated with depressive symptoms, we included several control variables that capture the ability of the individual to participate in activities of daily living (ADLs), instrumental activities of daily living (IADLs), and socioeconomic factors

(age, gender, education, and household consumer durables). Baseline covariates included age (60–69, 70–79, and 80+), sex (male and female), education (0 years, 1–6 years, and 7+ years), marital status (married, not married, and widowed), functional status, locality size, and consumer durables. The respondent's functional status was assessed by obtaining information on difficulties lasting more than 3 months when performing ADLs and IADLs. ADL status was scored through a modified version of the Katz Index of Activities of Daily Living assessing the following five items: bathing, eating, transferring in and out of bed, using the toilet, and dressing (Katz et al., 1963). IADLs included performing the following activities: preparing a hot meal, shopping for groceries, taking medications, and managing money. For each item in the ADL and IADL question, the respondent was asked if they had difficulties performing the activity. If they stated "yes" they experienced difficulty, that they "can't do" the activity, or "doesn't do" the activity and receives help, the single item was coded as an ADL limitation or IADL limitation. Respondents were categorized into two levels: reporting at least one ADL limitation or reporting no ADL limitations and reporting at least one IADL limitation or reporting no IADL limitations. We included ADL/IADL limitations because these are conditions that may be partly caused by chronic diseases, which could directly affect an individual's ability to participate in activities. Locality size was categorized as a population less than 2,500 (rural), 2,500–4,999 (semirural), 15,000–99,999 (semiurban), or more than 100,000 (urban). The availability of consumer durables was assessed by the availability of household assets (radio, television, refrigerator, washing machine, telephone, water heater, internet, or computer) and the consumer durables were categorized as 0–3, 4–6, or 7 or more household assets among the eight listed. Consistent with previous studies, we used consumer durables as a control for economic well-being instead of income, because postretirement income is quite low among older Mexicans, and these individuals may have other forms of wealth that may reflect their true well-being and access to resources (Bollen et al., 2001).

## Analysis

Descriptive statistics were calculated for sample characteristics and time-use activities by depressive symptom status. Chi-square tests of independence were conducted to test differences between depressive symptomatology and sociodemographic characteristics, by sex. Exploratory factor analysis (EFA) was performed to construct domains of time-use activities by using a tetrachoric correlation model. To determine the appropriate use of EFA, Bartlett's test of sphericity was performed beforehand to verify whether time-use variables were sufficiently significantly correlated in the sample of older Mexicans. To identify the optimal number of factors for each sex, a graphic representation of the eigenvalues and the number of factors

was generated. Finally, to assess the validity of variances the Kaiser–Meyer–Olkin (KMO) measure was obtained for our sample. A KMO measure of sampling adequacy at least 0.7 was defined to establish the adequacy of factor analysis for these data. Bartlett’s test of sphericity verified time-use activities correlations were significant among older Mexicans ( $\chi^2 = 3,776.34$ ;  $p < .001$ ). The value of the KMO measure was 0.73; therefore, we determined that the sample data were adequate to complete a factor analysis. Regression models from constructed domains of orthogonal varimax rotated factor scores were used to generate results for Table 3. The fully adjusted model included education, age, marital status, ADL/IADL limitations, locality size, and consumer durables.

Multivariable logistic regression models were used to assess the association of time-use domains in 2012 with depressive symptomatology in 2015 by sex. Sensitivity analyses were performed for the caregiving and employment domains due to the different types of activities comprising each domain and the varying frequency which may have different health implications. We used a standard Heckman correction model in our regression to account for attrition between the 2012 and 2015 waves, that is, to capture possible selection bias due to mortality, loss to follow-up, and refusal of participants by 2015 among those who were present in 2012. Heckman selection models essentially adjust for the probability of being observed in 2015 using variables that affect attrition (Heckman, 1979). All  $p$  values were two-sided;  $\alpha = 0.05$  was considered the cutoff for statistical significance. All statistical analyses were performed using STATA version 15.1 (StataCorp LLC, College Station, TX).

## Results

### Demographics

At baseline in 2012, 34.3% of participants had elevated depressive symptoms and 65.7% had low or no depressive symptoms with an average CES-D score of 3.51 ( $SD = 2.67$ ; data not shown). Furthermore, in 2012, 41.1% women and 25.3% men reported elevated depressive symptomatology and their mean CES-D scores were 3.94 ( $SD = 2.73$ ) and 2.94 ( $SD = 2.49$ ), respectively (data not shown). Of the 4,309 participants with low or no depressive symptoms in 2012, 21.0% reported elevated depressive symptoms in 2015, of which 57.4% were women ( $n = 520$ ) and 42.6% were men ( $n = 386$ ; Table 1).

Overall, those who were 80 years or older reported significantly more elevated depressive symptoms (29.3% men and 32.1% women) compared to those 60–69 years old (15.6% men and 22.4% women) and those 70–79 years old (20.0% men and 22.9% women). In addition, those who had 0 years of education were significantly more likely to report elevated depressive symptoms (26.3% men and 29.1% women), compared to those with 1–6 years (20.1%

men and 24.0% women) and 7 or more years of education (10.8% men and 18.1% women). Marital status was not significantly associated with depressive symptomatology ( $p = .363$ ). Participants with few consumer durables (0–3) were significantly more likely to report elevated depressive symptoms (24.6% men and 27.6% women) compared to those with 4–6 (20.1% men and 25.7% women) and 7 or more assets (11.8% men and 17.0% women). Older age groups, with lower education, any ADL or IADL limitation, in nonurban populations, with limited consumer durables were associated with elevated depressive symptoms ( $p < .001$ ). Within-group differences for elevated depressive symptoms varied significantly by sex with age, marital status, ADL/IADL limitations, and locality size. Among those with elevated depressive symptoms, compared to men, women were more likely to be younger, widowed, have at least one IADL limitation, and live in nonrural areas ( $p < .05$ ).

### Time-Use Activities

Overall, in 2012, the most prevalent time-use activities reported by participants were watching television (92.7%), talking on the phone or using the computer (70.0%), and reading (63.6%; Table 2). Women were significantly more likely to have cared for a sick adult or child, attended a training course, talked on the phone or computer, or sewed compared to men ( $p < .05$ ). Conversely, men were significantly more likely to have volunteered, attended a sporting club, read, played games, performed home repairs, or worked compared to women.

There were significant differences by depressive symptom category across time-use activities for all except for caring for a sick or disabled adult, sewing or other crafts, and doing puzzles. Those who cared for children, volunteered, attended a training course, or a sporting club, read, did puzzles, played games, talked on the phone or computer, did repairs, watched television, or worked reported fewer depressive symptoms than those who did not participate in the activities ( $p < .05$ ).

Time-use activities also differed by depressive symptomatology and sex. Among those with elevated depressive symptoms who cared for children younger than 12 years, 19.0% were women compared to 15.1% men ( $p < .001$ ). Of those participants with elevated symptoms who reported reading, 19.6% were women and 16.0% were men ( $p = .041$ ). In addition, those with elevated symptoms differed significantly across sex among participants who talked on the phone or computer (22.7% women and 16.7% men), performed home maintenance (21.6% women and 17.5% men), sewed (20.8% women and 10.6% men), or were currently employed (20.5% women and 15.9% men).

The EFA was performed separately by sex to produce eight unique factors, which we denominate “domains,” with different saturations of factor loadings. They explained 56.7% of the total variance among men and 56.6% among

**Table 1.** Among Those With Low or No Depressive Symptomatology in 2012, Sociodemographic Characteristics of Older Mexican Adults (60+), by Sex and Level of Depressive Symptoms in 2015 (*N* = 4,309)

Characteristics in 2012	Total ( <i>N</i> = 4,309)	Elevated depressive symptoms ( <i>n</i> = 906; 21.0%)		Low or no depressive symptoms ( <i>n</i> = 3,403; 79.0%)	
		Men ( <i>n</i> = 386; 18.5%)	Women ( <i>n</i> = 520; 23.4%)	Men ( <i>n</i> = 1,704; 81.5%)	Women ( <i>n</i> = 1,699; 76.6%)
<b>Age<sup>b,c</sup></b>					
60–69 years	2,445 (56.7%)	180 (15.6%)	289 (22.4%)	976 (84.4%)	1,000 (77.6%)
70–79 years	1,463 (34.0%)	145 (20.0%)	169 (22.9%)	581 (80.0%)	568 (77.1%)
80 or more years	401 (9.3%)	61 (29.3%)	62 (32.1%)	147 (70.7%)	131 (67.9%)
<b>Education<sup>a,b,d</sup></b>					
0 years	786 (18.2%)	88 (26.3%)	131 (29.1%)	247 (73.7%)	320 (71.0%)
1–6 years	2,353 (54.6%)	235 (20.1%)	283 (24.0%)	937 (80.0%)	898 (76.0%)
7 or more years	1,170 (27.2%)	63 (10.8%)	106 (18.1%)	520 (89.2%)	481 (81.9%)
<b>Marital status<sup>a,c,d</sup></b>					
Married/civil union	2,936 (68.1%)	311 (18.0%)	289 (23.8%)	1,413 (82.0%)	923 (76.2%)
Single/divorced/separated	454 (10.5%)	31 (20.8%)	68 (22.3%)	118 (79.2%)	237 (77.7%)
Widowed	919 (21.3%)	44 (20.3%)	163 (23.3%)	173 (79.7%)	539 (76.8%)
<b>ADL limitations<sup>a,b,d</sup></b>					
None	3,828 (88.8%)	326 (17.2%)	417 (21.5%)	1,566 (82.8%)	1,519 (78.5%)
At least one	481 (11.2%)	60 (30.3%)	103 (36.4%)	138 (69.7%)	180 (63.6%)
<b>IADL limitations<sup>a,b,c,d</sup></b>					
None	3,990 (92.6%)	356 (17.9%)	443 (22.1%)	1,630 (82.1%)	1,561 (77.9%)
At least one	319 (7.4%)	30 (28.9%)	77 (35.8%)	74 (71.2%)	138 (64.2%)
<b>Locality size<sup>a,b,c,d</sup></b>					
<2,500	729 (16.9%)	93 (23.3%)	81 (24.6%)	306 (76.7%)	249 (75.5%)
2,500–14,999	473 (11.0%)	40 (17.0%)	65 (27.3%)	195 (83.0%)	173 (72.7%)
15,000–99,999	527 (12.2%)	58 (21.6%)	81 (31.4%)	211 (78.4%)	177 (68.6%)
≥100,000	2,588 (59.9%)	195 (16.4%)	293 (21.0%)	992 (83.6%)	1,100 (79.0%)
<b>Consumer durables<sup>b</sup></b>					
0–3	751 (17.4%)	91 (24.6%)	105 (27.6%)	279 (75.4%)	276 (72.4%)
4–6	2,285 (53.0%)	223 (20.1%)	303 (25.7%)	884 (80.0%)	875 (74.3%)
7+	1,273 (29.5%)	72 (11.8%)	112 (17.0%)	541 (88.3%)	548 (83.0%)

Notes: ADL = activities of daily living; IADL = instrumental activities of daily living. The total column reports column percent while the remaining columns report row percent.

<sup>a</sup>*p* ≤ .05 for differences by sex only.

<sup>b</sup>*p* ≤ .05 for differences by depressive symptoms only.

<sup>c</sup>*p* ≤ .05 for sex differences by elevated depressive symptoms.

<sup>d</sup>*p* ≤ .05 for sex differences by low or no depressive symptoms.

women. Domain scores were created based on the factor loadings for each of the time-use activities. Within the first one, the hobbies and indoor activities domain, items that showed a high saturation of factor loadings included reading, playing games, doing puzzles, talking on the phone or using the computer, doing home maintenance activities, watching television, and sewing. Furthermore, the second factor, the volunteering and community activities domain, had significant factor loadings for those who participated in volunteer work, attending a training course, and attending a sporting or social club. The third factor, the caregiving domain, showed a high saturation of factor loadings for caring for a sick or disabled adult and caring for children younger than 12 years. The final factor, the working domain, had significant loadings for those currently employed.

Overall, the factor patterns were composed of similar domain activities across both sexes, although the saturations of loadings within each factor were different for each individual activity. For example, the males' pattern matrix had higher loadings for TV watching but a lower loading for talking on the phone/computer compared to women. Another difference between the volunteer and community activities domain is that women had a higher score for the volunteering activity variable compared to men, although the composition of the variables with the highest saturation remained the same in both.

We used these domains as a method to group time-use activities for the multivariate analysis of time use in 2012 and depressive symptomatology in 2015, by sex, adjusting for relevant covariates. After using the Heckman selection

**Table 2.** Among Those With Low or No Depressive Symptomatology in 2012, Percentage of Older Mexican Adults (60+) Who Report Doing Each Activity, by Sex and Level of Depressive Symptoms in 2015 (N = 4,309)

Activity	Total (N = 4,309)	Elevated depressive symptoms (n = 906; 21.0%)		Low or no depressive symptoms (n = 3,403; 79.0%)	
		Men (n = 386)	Women (n = 520)	Men (n = 1,704)	Women (n = 1,699)
<i>Hobbies and indoor activities domain</i>					
Read a book, magazine, or newspaper <sup>a,b,c,d</sup>	2,741 (63.6%)	223 (16.0%)	264 (19.6%)	1,174 (84.0%)	1,080 (80.4%)
Play games such as cards, dominoes, or chess <sup>a,b</sup>	723 (16.8%)	58 (15.3%)	65 (19.0%)	322 (84.7%)	278 (81.1%)
Do crossword puzzles, jigsaw puzzle, Sudoku <sup>b</sup>	767 (17.8%)	45 (12.8%)	74 (17.9%)	308 (87.3%)	340 (82.1%)
Talk on the phone with relatives or friends or use the computer to send messages or use the internet <sup>a,b,c,d</sup>	3,018 (70.0%)	226 (16.2%)	367 (22.7%)	1,173 (83.9%)	1,252 (77.3%)
Do activities having to do with home maintenance, repairs, gardening, etc. <sup>a,b,c,d</sup>	2,468 (57.3%)	235 (17.5%)	243 (21.6%)	1,109 (82.5%)	881 (78.4%)
Watch television <sup>b</sup>	3,994 (92.7%)	340 (17.5%)	467 (22.7%)	1,600 (82.5%)	1,587 (77.3%)
Sew, embroider, knit, or other crafts <sup>a,c,d</sup>	1,195 (27.7%)	13 (10.6%)	223 (20.8%)	110 (89.4%)	849 (79.2%)
<i>Volunteering and community activities domain</i>					
Volunteer work or support an organization without pay or reward <sup>a,b,d</sup>	405 (9.4%)	26 (11.7%)	31 (16.9%)	196 (88.3%)	152 (83.1%)
Attend a training course, lecture, or class <sup>a,b,d</sup>	650 (15.1%)	38 (13.5%)	68 (18.4%)	243 (86.5%)	301 (81.6%)
Attend a sporting or social club <sup>a,b,d</sup>	343 (8.0%)	17 (9.1%)	23 (14.7%)	169 (90.9%)	134 (85.4%)
<i>Caregiving domain</i>					
Caring for a sick or disabled adult <sup>a,d</sup>	620 (14.4%)	46 (19.0%)	79 (20.9%)	196 (81.0%)	299 (79.1%)
Caring for children younger than 12 years <sup>a,b,c,d</sup>	1,056 (24.5%)	57 (15.1%)	129 (19.0%)	321 (84.9%)	549 (81.0%)
<i>Working domain</i>					
Currently employed <sup>a,b,c,d</sup>	1,292 (30.0%)	153 (15.9%)	68 (20.5%)	807 (84.1%)	264 (79.5%)

<sup>a</sup>p ≤ .05 for differences by sex only.

<sup>b</sup>p ≤ .05 for differences by depressive symptoms only.

<sup>c</sup>p ≤ .05 for sex differences by elevated depressive symptoms.

<sup>d</sup>p ≤ .05 for sex differences by low or no depressive symptoms.

method to correct for mortality, loss to follow-up, and refusals by the 3-year follow-up, our crude point estimates slightly increased but were still significant. The hobbies and indoor activities domain was associated with a lower risk of reporting elevated depressive symptoms among both men (odds ratio [OR]: 0.76, 95% CI: 0.61–0.96) and women (OR: 0.75, 95% CI: 0.61–0.91; Table 3). Additionally, the volunteer and community activities domain was significant for both women (OR: 0.72, 95% CI: 0.58–0.89) and men (OR: 0.77, 95% CI: 0.60–0.99). In both groups, the working and caregiving domains were not significantly associated with depressive symptomatology. For men and women, having at least one ADL limitation was associated with increased odds of elevated depressive symptoms and having seven or more assets was associated with lower odds. Additionally, among men, older age and less education were associated with elevated depressive symptoms while, among women, living in a semiurban location was associated with elevated depressive symptoms (data not shown).

We performed a sensitivity analysis within the caregiving domain to address whether the frequency (none, less than 4 times per week, and more than 4 times per week) of caring for children and caring for a sick or disabled adult could have different associations with elevated symptomatology. Among men who cared for adults sometimes (OR: 1.22, 95% CI: 0.89–1.68) or frequently (OR: 1.17, 95% CI: 0.91–1.51), there was not a significant association with elevated depressive symptoms, compared to those who did not. Moreover, men who cared for children did not have any significant associations regardless of the frequency of activity. Conversely, women who cared for children younger than 12 years less than 4 times a week had a lower risk of elevated depressive symptoms compared to those who reported not caring for children at all (OR: 0.55, 95% CI: 0.35–0.84). Additionally, to understand the competing effects of psychosocial stress and the contextual benefits of employment, we performed analyses by full-time and part-time designation compared to nonworkers by sex. Only

**Table 3.** Adjusted Logistic Regression Models Assessing the Association Between Time-Use Domain and Reported Elevated Depressive Symptomatology in 2015 Among Older Mexican Adults, by Sex ( $N = 4,309$ )<sup>a</sup>

Time-use domain	Fully adjusted model <sup>b,c</sup>					
	Men ( $n = 2,090$ )			Women ( $n = 2,219$ )		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
Hobbies and indoor activities	0.76	0.61–0.96	.019	0.75	0.61–0.91	.005
Volunteer and community activities	0.77	0.60–0.99	.042	0.72	0.58–0.89	.003
Working	0.86	0.72–1.01	.071	1.02	0.87–1.19	.817
Caregiving	0.93	0.76–1.13	.455	1.02	0.89–1.16	.779

Note: ADL = activities of daily living; CI = confidence interval; IADL = instrumental activities of daily living; OR = odds ratio.

<sup>a</sup>Sample includes adults aged 60 and older who report no or low depressive symptoms in 2012 (see Figure 1 for inclusion criteria).

<sup>b</sup>Model has been adjusted for age, education, marital status, ADL/IADL limitations, locality size, and consumer durables.

<sup>c</sup>Dependent variable: Yes/No reports five or more depressive symptoms.

men who worked full-time had a significant lower risk, compared to men who were unemployed (OR: 0.71, 95% CI: 0.51–0.98).

## Discussion and Implications

This study used data from a representative national sample of Mexican adults aged 60 and older at baseline with low or no depressive symptomatology to investigate the association between time-use activities and depressive symptomatology reported at a 3-year follow-up period. In this longitudinal study of the MHAS, the results suggest that men and women participate in different time-use activities, indicating that there may be a potential protective benefit in engaging in certain activities. Regardless of sex, we observed that hobbies and indoor activities were associated with lower odds of reporting elevated depressive symptomatology. Furthermore, for both men and women, volunteer and community activities were associated with lower odds of reporting elevated depressive symptomatology.

Our findings support our hypothesis of sex differences in time-use activities which may be due to the cultural practices and values in Mexico. Women performed significantly more caregiving activities compared to men. Meanwhile, male participants were significantly more likely to be currently employed compared to females. Consistent with the National Mexican Time-Use Survey data, there is a cultural pattern of disproportionate domestic work activities among women relative to men (Organization for Economic Co-operation and Development, 2014). This trend is persistent throughout the life course and peaks throughout the reproductive years and midlife. Among those 65 years and older, women averaged weekly 30 h of domestic duties compared to men who averaged 11 h. Men engaged in significantly more paid work hours compared to women. Conversely, women performed more weekly caregiving activities compared to men (Pedrero Nieto, 2013). The Mexican Time-Use Survey data highlights other differences,

suggesting that women in Mexico on average have less free leisure time compared to men. Furthermore, this effect on leisure time is more pronounced among women who were in a consensual union or marriage, compared to those who were either divorced or separated or did not have a spouse. Constraints on leisure time suggest limited opportunities for personal enrichment and activities to strengthen social networks among women (Pedrero Nieto, 2013).

In our analyses, among male and female participants, the hobbies and indoor activities domain was associated with significantly lower odds of reporting elevated depressive symptoms. Our findings support the social capital theory (Bourdieu, 1986; Coleman, 1988) and are consistent with other studies where participation in specific social engagement activities, including volunteering and working, was associated with lower odds of depressive symptoms in older adults (Hong et al., 2009; Lin & Dean, 1984; Min et al., 2016). Prior literature highlights the beneficial aspects of social networks via the exchange of social capital and other resources. Therefore, we hypothesized that increased social support found through social engagement in activities would buffer pathways leading to social isolation and depressive symptomatology. Among women 75 years or older, a study found that even the onset of modest amounts of social engagement decreased depressive symptoms and might be beneficial for health-related quality of life, but these results were not observed in men (Hajek et al., 2017). Social engagement activities were similar to our time-use activities, such as tutoring, volunteering, attending a party/social event or a club.

Our finding that volunteer and community activities were associated with lower odds of reporting elevated depressive symptoms in both men and women is consistent with literature that supports the notion that volunteering has positive effects in older adults (Min et al., 2016). Additionally, other investigators found that men who attended a sporting or social club had lower odds of reporting elevated depressive symptoms compared to those who did not perform the activity (Hong et al., 2009). Our findings provide further



support for assessing a wide spectrum of social engagement activities in older adults to establish its relationship with depressive symptomatology.

The caregiving domain was not significantly associated with a higher risk of elevated depressive symptomatology, which could be due to the inclusion of two different types of caregiving activities. In the sensitivity analysis of type and frequency of caregiving activity, our findings are consistent with the healthy caregiver hypothesis among female participants. Only those who cared less than 4 times a week for children younger than 12 years had a lower risk of elevated depressive symptoms compared to those who reported not caring for children at all. However, the significant beneficial effect for the helper is reduced when caring for a sick or disabled adult. Older adults are at an elevated risk for chronic disease, disability, and cognitive decline with age which may result in an increased need for a caregiver. Prior literature is inconsistent regarding whether the beneficial effect of caregiving outweighs the possible burden, which varies by various factors including the health condition of the caregiver and the one receiving care and the duration and amount of care given (Schulz & Sherwood, 2008). Our finding is consistent with other caregiver studies where their findings are founded on the stress process model which suggests there are deleterious effects of caregiving strain, such as anxiety, depression, health risk behaviors, coronary heart disease, and poor perceived health, also increased with spousal impairment (Beach et al., 2000). Although caregivers may be more psychologically stressed than noncaregivers, our findings are consistent with the healthy caregiver hypothesis among female participants. Prior studies highlight that caregivers had better cognitive performance and even lower mortality rates compared to noncaregivers (Fredman et al., 2015). Additionally, those that cared for children had reduced odds of reporting elevated depressive symptoms compared to those who did not care for children. The caregiver hypothesis is extended to caring for grandchildren and other nonrelated children, as seen as beneficial prosocial behavior that lowered mortality hazards among older adults (Hilbrand et al., 2017).

Regardless of sex, we did not observe a significant association with the employment domain and risk of elevated depressive symptoms. We observed only among men a lower risk of elevated depressive symptoms if they worked full-time compared to those who were not employed. Across the life course older adults experience employment changes and potential loss of income from unexpected health problems and retirement, which may disrupt the established social network development in the workplace (Mirowsky & Ross, 1992). The health benefits of employment on depressive symptoms have been inconsistent in the literature varying on perceived work stress level (Christ et al., 2007; Siegrist et al., 2012). This effect may be attenuated by financial strain reasons driving older adults to seek employment which may explain a null association in

women. Although we adjusted for the confounding effect of ADL/IADL limitations, the healthy worker effect may bias the true effect of employment on depressive symptoms.

In comparison to other nationally representative, population-based studies, the U.S. Health and Retirement Study and the English Longitudinal Study of Ageing, which both utilize a similar test battery, the eight-item CES-D scale for depressive symptoms, have reported lower rates of elevated depressive symptoms in those 65 years and older (17.6% and 14.6%, respectively; Zivin et al., 2010) than what we observed at baseline in 2012 among their Mexican counterparts aged 60 (34.3%). Future studies should aim to understand the varying mechanisms, including sociodemographic characteristics, health conditions, and behaviors that may be contributing to cross-national differences in depressive symptoms. Additionally, studies among older Mexicans merit a focus on understanding the etiologic factors leading to the onset of elevated symptoms. These analyses have limitations that need to be considered. First, for certain activities such as sewing or attending a sporting club, there was a small sample who answered affirmatively among those who have elevated depressive symptoms. Interpretation of findings with small strata sample sizes are to be interpreted with caution. Second, due to the focus on the interplay of various time-use activities and the risk of development of elevated depressive symptomatology, the CES-D score was dichotomized to understand this mechanism across waves in the MHAS. Prior literature has accepted this cutoff, in lieu of a continuous variable for analytical interpretations (Aguilar-Navarro et al., 2007). Third, the relationship between social engagement and depressive symptoms can be reciprocal, with one influencing the other and vice versa. There is a possibility that those with elevated depressive symptoms stopped engaging in time-use activities prior to the 2012 wave, whereas those with low or no symptoms were more likely to be socially engaged before the interview, although we tried to minimize this by using the 3-year follow-up. Another limitation in our study is that time use was dichotomized based on whether participants performed the activity in the past year. To account for the variability in time use, additional secondary analyses were performed using the frequency of the activities, in addition to the domains with factor scores for each activity.

Despite these limitations, the strengths of the study include the use of a nationally representative sample of older Mexicans, a population for which these associations have not been thoroughly explored. Our study is one of few that have investigated time-use activities in older Mexicans and has elucidated not only the prevalence of activities in older adults, but also its association with depressive symptoms. These linkages further expand social engagement research by addressing a gap in understanding the relationship with depressive symptoms. Older adults face unique health challenges and are at increased risk for stressful life events, such as bereavement, chronic illness, and sensory

impairments, that may lead to reduced engagement with their social environment. In these analyses, certain types of activities were protective factors for depressive symptomatology; future work should examine the effect of time-use activities on other cardiovascular and cognitive conditions independent of depressive symptoms, as well as investigating the role of social engagement in the development of symptomatology in other countries. Insight on time use can help identify targeted sex-specific interventions to ameliorate the effect of late-life risk factors on elevated depressive symptoms.

## Funding

This work was supported by the National Institute on Aging/National Institutes of Health (NIA/NIH; grant numbers T32AG000270 and P30AG059301). The Mexican Health and Aging Study is supported by the NIA/NIH (R01 AG018016) in the United States and the National Institute of Statistics (INEGI) in Mexico.

## Conflict of Interest

None declared.

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