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Correlates of Depressive Symptoms among Homebound and Semi-Homebound Older Adults

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Abstract

This study aimed to provide a national profile of homebound and semi-homebound older adults with depressive symptoms and to compare risk factors of depressive symptoms by home-bound status. A sample of 1,885 homebound and semi-home-bound older adults was selected from Round 1 of the National Health and Aging Trends Study (NHATS). The prevalence of depressive symptoms was 43.9% in homebound older adults and 28.1% in semi-homebound older adults, representing over 830,000 and 1.4 million individuals in the population, respectively. Nearly two-thirds of homebound and over half of semi-homebound older adults with clinically significant depressive symptoms also had significant anxiety symptoms. Results from logistic regression showed that younger age, certain medical morbidities, severity of functional limitations, and pain were common risk factors for depressive symptoms among home-bound and semi-homebound older adults. Some differences in the risk factor profile emerged between the homebound and the semi-homebound populations. Alleviating the burden of depression in the semi-homebound population may focus on early prevention that considers the diversity of this population. Home-based, integrated programs of health and mental health services that simultaneously address the medical, psychiatric, and neurologic comorbidities and disabilities of homebound older adults are needed to meet the complex needs of this population.

Keywords

Anxiety; depression; home-based care; homebound

Introduction

Homebound older adults refer to those who are confined to home or require substantial assistance leaving home. The number of homebound older adults is projected to increase as

the number of older adults increases rapidly (Qiu et al., 2010). Community-based studies since the 2000s consistently documented higher rates of depression among homebound older adults compared with their community-dwelling counterparts not confined to homes (Bruce et al., 2002; Choi & McDougall, 2007; Choi, Teeters, Perez, Farar, & Thompson, 2010; Ell, Unutzer, Aranda, Sanchez, & Lee, 2005; Li & Conwell, 2007; Richardson et al., 2012; Sirey et al., 2008). Estimate of current major depressive disorders in older adults receiving home healthcare was as high as 13.5% (Bruce et al., 2002). In comparison, the prevalence of 12-month major depressive disorder was 2.7% among the general older adult population based on results from the National Epidemiologic Survey on Alcoholism and Related Conditions (Hasin, Goodwin, Stinson, & Grant, 2005). Depression complicates the management of other medical disorders, increases fall risks and hospitalization rates, and upsurges healthcare costs for homebound older adults (Qiu et al., 2010). Even mild or subthreshold depressive symptoms can cause serious functional impairment (Lyness, Chapman, McGriff, Drayer, & Duberstein, 2009). However, depression treatment, particularly specialty mental health services, is underutilized by homebound older adults (Gum, Iser, & Petkus, 2010).

Medical morbidity, disability, and social isolation are known risk factors of depression in late life (Reynolds et al., 2012), making homebound older adults at increased risk for depression. Studies examining risk factors of depression in homebound older adults reported that clinical factors such as medical morbidities, functional limitations, cognitive impairment, and pain were strong and consistent correlates of depression (Choi & McDougall, 2007; Choi et al., 2010; Ell et al., 2005; Li & Conwell, 2007; Richardson et al., 2012; Sirey et al., 2008). To a lesser degree, risks of depression differed by sociodemographic characteristics in the homebound population (Choi et al., 2010; Ell et al., 2005; Li & Conwell, 2007).

Previous studies of depression and its correlates among homebound older adults have several limitations. Most studies used regional samples and focused on older adults receiving services from Medicare home health agencies, home-delivered meal programs, and other community long-term care or aging services providers (Bruce et al., 2002; Choi & McDougall, 2007; Choi et al., 2010; Ell et al., 2005; Li & Conwell, 2007; Richardson et al., 2012; Sirey et al., 2008). This approach includes individuals who receive these services but may not meet the definition of homebound and systematically excludes those who are homebound but do not receive services. In addition, none of studies cited previously examined home-bound status as a continuum. Because homebound is a result of declining physical capacity and lack of personal assistance (Ornstein et al., 2015), the degree of confinement depends on the severity of impairment and the availability of personal assistance. A recent descriptive study using the NHATS showed significant differences in sociodemographic and clinical characteristics by the degree of confinement measured by the frequency of leaving homes (Ornstein et al., 2015). Patterns of risk factors may differ across the homebound continuum, which may require different strategies to prevent and treat depression.

This study addresses these limitations by (1) providing a national profile of homebound and semi-homebound older adults with depressive symptoms, and (2) comparing socioeconomic and clinical risk factors of clinically significant depressive symptoms between homebound

and semi-homebound older adults. An ecological model of aging (Satariano, 2006) and previous studies guided the selection of risk factor, including sociodemographic characteristics, disease and comorbidities, physical functioning and impairment, cognitive status, falls and injuries.

Design and methods

Data

Data came from Round 1 (2011) of the NHATS public use files. The NHATS is a nationally representative panel study of Medicare beneficiaries aged 65 or older with oversamples of the oldest-old and African Americans. A total of 7,777 older adults who lived in the community (including traditional community settings, retirement communities, and alternative residential care) completed sample person interviews at baseline. This study examined 1,360 semi-homebound and 561 homebound older adults. After excluding cases with missing data on the depression screener ($n = 36$), the final analytical sample consisted of 1,885 older adults (1,341 classified as semi-homebound and 544 as homebound).

Measures

Homebound status—Participants were homebound if they “never” or “rarely” went out the home in the last month. Participants were semi-homebound if they (1) received help going out of the home and would “never,” “rarely,” or “sometimes” go outside by themselves; or (2) did not receive help going out of the home but reported “a lot,” “some,” or “a little” difficulty leaving the home by themselves. This classification of homebound status is modified based on the measures developed by Ornstein et al. (2015).

Depressive symptoms—Depressive symptoms were assessed using the Patient Health Questionnaire-2 (PHQ-2) (Löwe, Kroenke, & Gräfe, 2005). The PHQ-2 measures how often the participant has been bothered by “little interest or pleasure in doing things” and “feeling down, depressed or hopeless” over the last month. Responses were on a four-point Likert scale, from “not at all” (0), “several days” (1), “more than half the days” (2), to “nearly every day” (3). Clinically significant depressive symptoms were defined as a PHQ-2 score of 3 and above. A cut-off score of 3 has a sensitivity of 0.87 and a specificity of 0.78 for major depressive disorder; and has a sensitivity of 0.79 and specificity of 0.86 for any depressive disorder (Löwe et al., 2005).

Sociodemographic characteristics—Sociodemographic variables included age, sex, race/ethnicity, nativity (foreign born or US born), English proficiency, education, living arrangement (live alone or live with others), and Medicare–Medicaid dual eligibility. Limited English proficiency refers to a response of “not well” or “not at all” when asked how well one understood or spoke English.

Disease and comorbidities—Participants reported whether a doctor had ever told them that they had the following conditions: heart attack/heart disease, arthritis, osteoporosis, diabetes, lung disease, stroke, and cancer. Anxiety symptoms were assessed using the Generalized Anxiety Disorder Scale (GAD-2) (Kroenke, Spitzer, Williams, & Löwe, 2010).

The GAD-2 measures how often participants “felt nervous, anxious, or on edge” and “been unable to stop or control worrying” over the past month on a four-point Likert scale. A cut-off score of 3 has been associated with symptoms of generalized anxiety, panic, social anxiety, and post-traumatic stress disorder (Kroenke et al., 2010).

Physical functioning and impairment—We examined needs for assistance with activities of daily living (ADL; including eating, bathing, toileting, and dressing) and instrumental activities of daily living (IADL; including laundry, grocery shopping, meal preparation, banking or paying bills, and keeping track of medication). Participants were considered to have a need for assistance for an activity if they (1) received assistance with the activity for health or functioning reasons, or (2) performed the activity alone with difficulty. Other indicators of physical impairment included self-reported limitations in activities due to pain, and difficulty in hearing, seeing, and communication. Participants were classified as having hearing difficulty if with a hearing aid, they could not hear well enough to use telephone, carry on a conversation in a room with a radio or TV playing, or carry on a conversation in a quiet room. Participants were classified as having a seeing difficulty if with glasses or contacts or vision aids, they could not see well enough to recognize someone across the street, watch television across the room, or see well enough to read newspaper print. Communication difficulty referred to problems in speaking or making themselves understood during communication in the last month.

Cognitive status—NHATS classifies participants into three groups—no dementia, possible dementia, and probable dementia—based on self-reported diagnosis of dementia or Alzheimer's disease, AD8 Dementia Screening Interview, and cognitive tests (Kasper, Freedman, & Spillman, 2013).

Falls and injuries—Participants responded if they had fallen down in last month. A fall refers to any fall, slip, or trip in which one loses balances and land on the floor or ground or at a lower level.

Data analysis

Bivariate comparisons of sample characteristics by depression status stratified by homebound status were conducted using χ^2 tests. Multiple logistic regression was used to identify risk factors of clinically significant depressive symptoms stratified by homebound status. Selection of independent variables in multiple logistic regression was based on the following criteria: (1) p -value cut-off point of 0.25 from χ^2 tests. Traditional p -value of 0.05 can fail to identify important variables (Bendel & Afifi, 1977); (2) the inclusion of a variable leads to a significant improvement in the overall model fit as evaluated by the likelihood ratio test; (3) the variable to be included is not highly correlated with other independent variables. This process was repeated to reach the most parsimonious model in each homebound group using the same set of risk factors.

A summary score of the total count of ADL and IADL needs was used in multivariable analysis to address the collinearity between individual items and to improve statistical power. Race/ethnicity, nativity, living arrangements, and dementia status were excluded from

multiple logistic regression due to collinearity and/or failing to improve model fit for both homebound and semi-homebound groups. Anxiety symptoms were not included as a covariate in multiple logistic regression models. Anxiety and depression consistently co-occur. A dimensional, rather than a categorical, classification of anxiety and depression in older adults has been suggested (Schoevers, Deeg, van Tilburg, & Beekman, 2005). Given the conceptual similarity between depression and anxiety, inclusion of anxiety in the regression model could bias the estimates of the impact of other covariates.

Because direct comparisons of odds ratios from different samples can be problematic (Mood, 2010), comparison of the effect sizes of risk factors between the homebound and the semi-homebound groups involved estimating and testing the differences of the average marginal effects (AMEs). The AME refers to the average change in the probability of depression when a predictor increases by one unit while holding other covariates constant. Analyses accounted for the sampling weights and design factors of NHATS, using the *svy* command of Stata 12.0, SE version (StataCorp, College Station, TX, USA). Stata *margins* command was used to estimate and compare AMEs across the homebound groups.

Results

Characteristics of homebound and semi-homebound older adults

The prevalence rate of clinically significant depressive symptoms was 43.9% (95% CI = 38.9–49.0%) among homebound older adults, representing 836,249 individuals in the population. The rate of clinically significant depressive symptoms was 28.1% (95% CI = 25.4–30.9%) among semi-home-bound older adults, representing 1,465,010 individuals in the population. In comparison, 1 in 10 (95% CI = 9.0–11.2%) non-homebound older adults had clinically significant depressive symptoms ($p < .001$).

Table 1 presents the characteristics of study sample stratified by homebound and depression status. Among homebound Medicare beneficiaries, people with clinically significant depressive symptoms were more likely to have heart disease (46.6% vs. 31.1%), osteoporosis (43.6% vs. 31.9%), limitations in activities due to pain (68.6% vs. 47.9%), difficulty in seeing (33.8% vs. 23.5%) and communication (37.3% vs. 14.1%), probable dementia (50% vs. 39.7%), and falls in the past month (30.% vs. 19.8%). People with depressive symptoms reported significantly higher rates of ADL and IADL needs across all activities, with the only exception being needs with bathing. The relative difference in the prevalence rate was the biggest for anxiety symptoms, with 65% of homebound older adults with depression reporting clinically significant anxiety symptoms as compared with 18% among those without depression.

Among semi-homebound Medicare beneficiaries, the following sociodemographic groups reported a higher rate of depressive symptoms: men, Hispanics, the foreign-born population, people with limited English proficiency, and people with lower levels of education. The rate of clinically significant depressive symptoms decreased as age increased. Medicare–Medicaid dual eligibles reported a higher rate of clinically significant depressive symptoms compared with the Medicare only group (32.0% vs. 18.6%). People with clinically significant depressive symptoms reported higher rates of heart disease (44.0% vs. 35.6%),

arthritis (78.5% vs. 67.2%), diabetes (47.9% vs. 27.1%), lung disease (27.7% vs. 20.8%), stroke (30.2% vs. 14.6%), all ADL and IADL needs, anxiety symptoms (51.9% vs. 14.2%), limitations in activities due to pain (73.7% vs. 54.0%), hearing (28.6% vs. 20.8%), seeing (23.2% vs. 16.6%), and communication difficulties (22.1% vs. 12.2%), possible (19.5% vs. 13.8%) or probable dementia (32.4% vs. 19.5%), and falls in the past month (28.7% vs. 20.7%).

Risk factors of depressive symptoms among homebound and semi-homebound older adults

Table 2 shows the results from multiple logistic regression on the correlates of depressive symptoms stratified by homebound status. Two separate logistic regressions were estimated, one for the homebound group and the other for semi-homebound group. Among homebound older adults, significant risk factors of depression included a diagnosis of heart disease, higher number of ADL and IADL needs, limitations in activities due to pain, and difficulty in communication. Homebound older adults aged 85 years and older had lower odds of depression compared with the 65–69 years group. Some college education was associated with lower odds of depression relative to less than high school education.

Among semi-homebound older adults, significant risk factors of depression included male sex, limited English proficiency, and a diagnosis of arthritis, diabetes or stroke, higher number of ADL and IADL needs, and limitations in activities due to pain. Semi-homebound older adults aged 85–89 years had lower odds of depression as compared with 65–69 years old.

Comparisons of AMEs revealed different patterns of risk factors of depression by homebound status. Relative to the 65–69 years age group, the 85–89 years age group had an average of 0.30 lower probability of depression among homebound older adults, compared with a 0.08 lower probability of depression among semi-homebound older adults (AME difference = -0.21 , $p < .05$). Semi-homebound men had an average of 0.08 higher probability of depression than semi-homebound women, whereas no significant sex difference emerged in the homebound group (AME difference = -0.12 , $p < .05$). Homebound older adults with heart disease had a 0.13 higher probability of depression, whereas heart disease was not a significant risk factor of depression in the semi-homebound group (AME difference = 0.14 , $p < .01$). Semi-homebound older adults with a diagnosis of diabetes or stroke had a 0.12 and 0.14 higher probability of depression, respectively. Neither diabetes nor stroke was a significant risk factor of depression in the homebound group (AME difference for diabetes = -0.18 for both, $p < .05$). Communication difficulty was associated with a 0.20 higher probability of depression in the homebound group, whereas no significant effect of such was found in the semi-homebound group (AME difference = 0.16 , $p < .05$).

Discussion

In a nationally representative sample of Medicare beneficiaries aged 65 or older, clinically significant depressive symptoms affected 44% of homebound older adults (representing more than 830,000 individuals), and 28% of semi-homebound older adults (representing

more than 1.4 million individuals). Nearly two-thirds of homebound and over half of semi-homebound older adults with clinically significant depressive symptoms also had significant anxiety symptoms. Half of homebound and nearly one-third of semi-home-bound older adults had probable dementia. Younger age, certain medical morbidities, severity of functional limitations, and pain appeared as common risk factors for depressive symptoms among homebound and semi-home-bound older adults.

Study results revealed some differences in the types of risk factors and the relative impact of risk factors between the homebound and the semi-home-bound groups. Disparities in depression rates relating to race/ethnicity and nativity were pronounced in the semi-homebound group. Bivariate comparisons showed that Hispanics, the foreign-born population, and people with limited English proficiency had disproportionately higher rates of depressive symptoms among semi-homebound older adults. In multivariable analysis, English proficiency remained a significant and robust predictor of depressive symptoms in the semi-homebound group. In the homebound group, however, race/ethnicity, nativity, and English proficiency were not significant correlates of depressive symptoms. Heart disease was the only medical morbidity associated with depressive symptoms in the homebound group. In comparison, arthritis, diabetes, and stroke were independently associated with depressive symptoms in the semi-homebound group. Underlying mechanisms for these differences are unknown. A possible explanation is that the homebound group represents a homogenous group characterized by severe disability and impairment. Disability and illness become the most salient predictor of health and mental well-being in this group, leaving little variation in the residuals for sociodemographic differences.

Alleviating the burden of depression in the semi-homebound population may focus on early prevention. Reynolds et al. (2012) detailed the rationale for prevention of depression in late life. For semi-homebound older adults, depression prevention may have the added benefits of preventing or delaying the process of becoming fully homebound. Primary care and aging services agencies that reach the semi-homebound population are well positioned to deliver preventive interventions. Priority areas of depression-prevention research for older adults include demonstrating cost-effectiveness, building community partnerships, and adaptations to the language and culture of an increasingly diverse older adult population (Reynolds et al., 2012).

The substantial burden of depressive symptoms in the homebound population calls for innovative, person-centered mental health delivery models to meet their needs. A number of home-based mental health services programs have been developed that conveniently bring mental health services into clients' homes (Reifler & Bruce, 2014). Opportunities exist to integrate mental health services in home-based primary care programs as they are increasingly available to homebound older adults (Reckrey et al., 2015). For example, the Veterans Affairs has fully integrated mental health services into the VA home-based primary care team (Karlin, Karel, & Meeks, 2013). Other integrated home-based primary care programs have recently been evaluated (Reckrey et al., 2015). In addition, alternative settings such as home health and aging services settings provide tremendous opportunities for improving the recognition and treatment of depression for the homebound population (Choi, Sirey, & Bruce, 2013). Several innovative interventions integrated in these alternative

settings have been developed and assessed, such as the Depression CAREPATH—a home-health integrated, collaborative depression care model (Bruce et al., 2015), and an in-home telehealth problem-solving therapy model using Meals on Wheels as the delivery platform (Choi et al., 2014). Adaptations of depression screening and treatment programs to other community long-term care settings such as in-home services, adult day care, residential care facilities, and retirement communities should be developed and assessed in future studies.

Depression in the homebound and semi-homebound population is characterized by substantial medical, psychiatric, and neurologic comorbidities, as well as various types of functional impairment and disability. However, many late-life depression prevention and treatment studies systematically exclude people with certain comorbidities (Reynolds et al., 2012). Depression interventions not specifically targeted to the homebound population that concurrently address these comorbidities are limited. Existing depression treatment studies targeted to the homebound population have rarely addressed these comorbidities (Bruce et al., 2015; Choi et al., 2014; Ell et al., 2007). The Community Aging in Place, Advancing Better Living for Elders (CAPABLE) intervention is one of the handful of interventions that simultaneously address multiple domains of functional limitations (Szanton, Leff, Wolff, Roberts, & Gitlin, 2016). Preliminary analyses showed that depressive symptoms improved in 53% of the CAPABLE participants at 5-month follow-up. However, depressive symptoms worsened in slightly less than one-third of participants. A randomized controlled trial of CAPABLE is being conducted and will provide a more-rigorous evaluation of the intervention. We would like to echo Reynolds et al.'s (2012) recommendations for treatment studies to recruit clinically representative participants with medical, psychiatric, and neurologic comorbidities and concurrently address the burden of these clinical symptoms in addition to depressive symptoms. Future studies should also examine whether simultaneously addressing these comorbidities will lead to improvement in the alleviation of depressive symptoms compared with addressing depressive symptoms alone.

This study has some limitations. All measures were self-reported and subject to recall bias and reporting errors. Estimates of the homebound population may be biased downward if non-respondents and older adults not covered by Medicare were more likely to be homebound. Only the PHQ-2 was available to assess depression. The PHQ-2 is intended as an initial screening tool and requires follow-up with the PHQ-9 to probe severity of depression.

The burden of depression among homebound older adults is even greater than previously reported. Alleviating the burden of depression in the semi-homebound population may focus on early prevention that considers the diversity of this population. Home-based, integrated programs of health and mental health services that simultaneously address the medical, psychiatric, and neurologic comorbidities and disabilities of homebound older adults are needed to meet the complex needs of this population.

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Table 1

Characteristics of homebound and semi-homebound medicare beneficiaries by depression status.

	Homebound (n = 544)		Semi-homebound (n = 1,341)		p
	Depressed	Not depressed	Depressed	Not depressed	
Socio-demographic characteristics					
Age groups (%)					.168
65–69 years	13.1 (.03)	8.5 (.03)	22.3 (.03)	18.4 (.01)	.036
70–74 years	17.9 (.03)	16.8 (.03)	21.5 (.03)	16.4 (.02)	
75–79 years	12.1 (.02)	11.5 (.02)	20.9 (.02)	19.4 (.02)	
80–84 years	23.1 (.03)	16.5 (.02)	16.7 (.02)	18.8 (.01)	
85–89 years	20.9 (.03)	28.9 (.03)	11.9 (.01)	16.8 (.01)	
90 years or over	12.9 (.02)	17.8 (.02)	6.6 (.01)	10.4 (.01)	
Sex (%)					.007
Female	74.8 (.04)	75.7 (.03)	59.6 (.03)	69.3 (.02)	
Male	25.2 (.04)	24.4 (.03)	40.4 (.03)	30.7 (.02)	
Race/ethnicity (%)					.005
White, Non-Hispanic	69.4 (.03)	66.4 (.03)	67.5 (.03)	77.7 (.01)	
Black, Non-Hispanic	9.8 (.02)	13.6 (.02)	11.9 (.01)	9.9 (.01)	
Hispanic	15.1 (.04)	14.6 (.03)	15.0 (.02)	8.3 (.01)	
Other	5.7 (.02)	5.4 (.01)	5.6 (.02)	4.1 (.01)	
Foreign born (%)	18.1 (.04)	20.2 (.03)	22.9 (.03)	13.5 (.01)	<.001
Limited English proficiency (%)	13.9 (.03)	14.3 (.03)	15.8 (.02)	7.4 (.01)	<.001
Education (%)					.065
Less than high school	43.8 (.04)	39.9 (.03)	45.0 (.04)	30.3 (.02)	<.001
High school	32.5 (.04)	25.9 (.04)	24.6 (.03)	27.7 (.01)	
Some college, no degree	11.4 (.03)	20.9 (.03)	17.2 (.02)	21.5 (.02)	
College graduate	12.3 (.03)	13.3 (.02)	13.2 (.02)	20.5 (.02)	
Live alone	31.3 (.04)	41.9 (.04)	34.6 (.03)	35.5 (.02)	.780
Medicare-Medicaid dual eligibility (%)	31.2 (.03)	29.5 (.03)	32.0 (.03)	18.6 (.01)	<.001
Disease and comorbidities					
Heart disease (%)	46.6 (.4)	31.1 (.03)	44.0 (.03)	35.6 (.02)	.032

	Homebound (n = 544)			Semi-homebound (n = 1,341)		
	Depressed	Not depressed	p	Depressed	Not depressed	p
Arthritis (%)	74.4 (.04)	69.7 (.03)	.279	78.5 (.03)	67.2 (.02)	.002
Osteoporosis (%)	43.6 (.04)	31.9 (.03)	.008	35.0 (.03)	30.5 (.02)	.267
Diabetes (%)	31.6 (.04)	32.0 (.03)	.947	47.9 (.03)	27.1 (.02)	<.001
Lung disease (%)	31.3 (.04)	26.3 (.03)	.261	27.7 (.03)	20.8 (.01)	.012
Stroke (%)	24.5 (.04)	21.6 (.03)	.518	30.2 (.03)	14.6 (.01)	<.001
Cancer (%)	26.0 (.03)	20.8 (.02)	.140	27.7 (.03)	27.4 (.02)	.898
Anxiety symptoms in last month (%)	65.3 (.04)	18.3 (.03)	<.001	51.9 (.03)	14.2 (.02)	<.001
Physical functioning and impairment						
ADL needs						
Eating	46.7 (.05)	27.6 (.03)	<.001	29.7 (.03)	17.5 (.10)	<.001
Bathing	68.1 (.04)	60.8 (.03)	.141	62.9 (.03)	45.5 (.02)	<.001
Toileting	55.5 (.04)	30.3 (.03)	<.001	42.8 (.03)	25.3 (.02)	<.001
Dressing	69.3 (.03)	55.2 (.04)	.005	65.2 (.03)	48.4 (.02)	<.001
IADL needs						
Laundry	79.9 (.03)	61.6 (.03)	<.001	64.5 (.03)	48.0 (.02)	<.001
Shopping for groceries	86.9 (.03)	76.1 (.03)	.022	75.8 (.03)	61.7 (.02)	<.001
Meal preparation	83.7 (.03)	68.3 (.03)	.003	70.8 (.03)	52.7 (.02)	<.001
Banking or paying bills	73.0 (.04)	56.3 (.03)	.002	56.4 (.03)	38.5 (.02)	<.001
Keeping track of medication	62.7 (.04)	47.0 (.03)	.004	51.2 (.03)	35.9 (.02)	<.001
Limited in activities due to pain (%)	68.6 (.04)	47.9 (.04)	<.001	73.7 (.02)	54.0 (.02)	<.001
Difficulty in hearing (%)	30.3 (.04)	23.6 (.03)	.110	28.6 (.03)	20.8 (.01)	.004
Difficulty in seeing (%)	33.8 (.03)	23.5 (.03)	.032	23.2 (.03)	16.6 (.01)	.039
Difficulty in communication (%)	37.3 (.04)	14.1 (.02)	<.001	22.1 (.03)	12.2 (.01)	<.001
Cognitive status (%)						
No dementia	35.9 (.04)	44.0 (.04)	.136	48.1 (.03)	66.6 (.01)	<.001
Possible dementia	14.1 (.03)	16.3 (.02)		19.5 (.02)	13.8 (.01)	
Probable dementia	50.0 (.04)	39.7 (.04)		32.4 (.03)	19.5 (.01)	
Any falls in the past month (%)	30.7 (.04)	19.8 (.03)	.031	28.7 (.03)	20.7 (.01)	.007

Note. ADL = activities of daily living. IADL = instrumental activities of daily living. Linearized standard error in parentheses. Sampling weights and design factors were accounted for when estimating prevalence rates and means.

Table 2

Risk factors of depressive symptoms among homebound and semi-homebound medicare beneficiaries.

Predictors	Homebound		Semi-homebound		AME difference ^b
	Odds ratio	AME ^a	Odds ratio	AME ^a	
Age groups (reference 65–69 years)					
70–74 years	0.80 (0.25, 2.55)	–0.04	1.02 (0.59, 1.78)	0.00	–0.05
75–79 years	0.31 (0.08, 1.26)	–0.23	0.83 (0.50, 1.39)	–0.03	–0.20
80–84 years	0.48 (0.14, 1.63)	–0.14	0.75 (0.41, 1.37)	–0.05	–0.09
85–89 years	0.22 (0.07, 0.62)**	–0.30**	0.59 (0.34, 1.01)	–0.08	–0.21*
90 years or over	0.26 (0.09, 0.74)*	–0.26*	0.60 (0.32, 1.12)	–0.08	–0.18
Male sex (reference: female)	0.78 (0.46, 1.32)	–0.05	1.56 (1.11, 2.18)*	0.08*	–0.12*
Limited English proficiency	1.28 (0.64, 2.58)	0.05	1.70 (1.16, 2.48)**	0.09**	–0.06
Education (reference: <high school)					
High school	1.22 (0.77, 1.91)	0.04	.90 (0.54, 1.48)	–0.02	0.06
Some college, no degree	0.42 (0.21, 0.87)*	–0.16*	.70 (0.42, 1.15)	–0.06	–0.10
College graduate	0.71 (0.31, 1.64)	–0.07	.59 (0.38, 1.00)	–0.09	0.02
Medicare–Medicaid dual eligibles	0.98 (0.62, 1.56)	0.00	1.35 (0.92, 2.00)	0.05	–0.05
Disease and comorbidities					
Heart disease	1.92 (1.22, 3.03)**	0.13**	0.94 (0.65, 1.37)	–0.01	0.14**
Arthritis	0.92 (0.51, 1.65)	–0.02	1.45 (1.00, 2.09)*	0.06*	–0.08
Osteoporosis	1.41 (0.94, 2.11)	0.07	1.06 (0.73, 1.56)	0.01	0.06
Diabetes	0.75 (0.45, 1.24)	–0.06	1.99 (1.51, 2.63)***	0.12***	–0.18**
Lung disease	0.87 (0.53, 1.41)	–0.03	1.09 (0.75, 1.58)	0.01	–0.04
Stroke	0.80 (0.45, 1.41)	–0.04	2.10 (1.50, 2.95)***	0.14***	–0.18*
Cancer	1.17 (0.70, 1.97)	0.03	1.04 (0.73, 1.47)	0.01	0.03
Count of ADL and IADL needs	1.17 (1.06, 1.30)**	0.03**	1.15 (1.09, 1.21)**	0.02***	0.01
Limited in activities due to pain	1.92 (1.11, 3.30)*	0.13*	1.80 (1.30, 2.49)**	0.10**	0.03
Difficulty in hearing	1.22 (0.75, 1.99)	0.04	1.19 (0.84, 1.69)	0.03	0.01
Difficulty in seeing	1.36 (0.72, 2.53)	0.06	1.08 (0.68, 1.72)	0.01	0.05

Predictors	Homebound		Semi-homebound		AME difference ^b
	Odds ratio	AME ^a	Odds ratio	AME ^a	
Difficulty in communication	2.58 (1.49, 4.46) ^{**}	0.20 ^{**}	1.26 (0.80, 2.01)	0.04	0.16 [*]
Any falls in the past month	1.53 (0.81, 2.91)	0.08	1.06 (0.74, 1.51)	0.01	0.08

Note. 95% confidence intervals in parentheses. Sampling weights and design factors were accounted for in regression estimates.

AME, average marginal effect. AME shows the average change in the probability of depression when the predictor increases by one unit while holding other covariates constant. For categorical predictors, one unit increase is the change from the reference category.

A significant test result indicates that the impact of the corresponding predictor differs by homebound status.

^{*} $p < .05$,

^{**} $p < .01$,

^{***} $p < .001$.