

Prevalence, Patterns and Predictors of Depression Treatment among Community-Dwelling Elderly Individuals with Dementia in the United States

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ABSTRACT

Objectives – Co-occurring dementia and depression exerts a substantial burden on the elderly.

This study utilizes data from a nationally representative cohort of community-dwelling individuals 65 years and older to examine the prevalence, patterns and predictors of depression treatment among elderly individuals with co-occurring dementia and depression.

Design: Retrospective, cross-sectional study.

Setting: Multiple years of Medical Expenditure Panel Survey (2002, 2004, 2006, 2008, 2010, and 2012) data.

Participants: The study sample consisted of elderly (age ≥ 65 years) individuals who (i) had dementia, (ii) were alive during the calendar year, and (iii) had co-occurring depression.

Measurements: The dependent variable of this study was depression treatment, identified by antidepressant medication with or without psychotherapy use. Individual level factors associated with depression treatment among elderly individuals with dementia and co-occurring depression were evaluated by conducting multinomial logistic regression.

Results – Co-occurring depression prevalence among community-dwelling elderly individuals with dementia was approximately 22%. An overwhelming majority (nearly 88%) of the study sample reported receipt of depression treatment. Antidepressants only and combination therapy (antidepressant with psychotherapy) was reported by 75% and 13% respectively of the study sample. Age, race/ethnicity, marital status, limitations of instrumental activities of daily living, perceived mental health status, and pain were significantly associated with the reporting of receipt of depression treatment.

Conclusions - An overwhelming majority of the study sample received depression treatment and several subgroup differences (such as in terms of age) existed in terms of reporting the use of depression treatment was observed.

Introduction

Dementia is a major health concern among elderly individuals and it has been estimated that in the United States (US), approximately 8.5% of elderly individuals suffer from dementia, and the prevalence increases substantially with age (e.g.: 2.8% in 65-74 years, while it is 24.9% in 85 years and older).¹ According to the first wave of 2011 National Health and Aging Trends Study, the majority of elderly individuals with dementia reside in community settings with an estimated 3.1 million probable dementia and 4.8 million with possible dementia cases.² Individuals with dementia experience compromised quality of life due to progressive memory impairment as well as several co-occurring physical and mental chronic conditions with depression being the one of the most common psychiatric conditions.³ The prevalence of depression among individuals with dementia has been estimated to be around 32%.⁴ Co-occurring dementia and depression can lead to a wide number of negative outcomes such as decreased ability to perform activities of daily living (ADL) or instrumental activities of daily living (IADL), higher rates of nursing placement, lower adherence, decreased quality of life, faster cognitive decline, and relatively higher rates of mortality.⁵⁻⁸ In order to alleviate the negative outcomes associated with co-occurring dementia and depression, it is essential to treat depression among individuals with dementia.

Antidepressants and/or psychotherapy are commonly used to treat depression in individuals with co-occurring dementia and depression. A recently systemic review of seven trials with 330 patients with dementia and depression concluded that antidepressant treatment in this vulnerable population may be helpful though the data is inconclusive.⁹ Moreover, it has been observed that discontinuing antidepressant treatment in patients with dementia and neuropsychiatric symptoms led to an increase in depressive symptoms.¹⁰

The American Psychiatric Association supports use of antidepressants for the treatment of patient with dementia and depression.¹¹ However, only a handful of studies in the US have reported the use of antidepressants among community-dwelling elderly individuals with dementia or Alzheimer's disease (AD).¹²⁻¹⁵ Couple of these existing studies^{14, 15} were conducted in VA settings, which do not represent the general community-dwelling individuals in the US and the other studies conducted using the Predictors 2 cohort¹² and the Cache County Dementia Progression study¹³ are geographically limited and are not generalizable. Moreover, these studies did not examine the psychotherapy use in the dementia population and also did not systematically evaluate the predictors of depression treatment among elderly individuals with dementia and comorbid depression. Although depression treatment predictors have been studied in general population, elderly individuals with dementia are different from the general population in terms of their needs and medication use patterns. Hence, it is important to investigate these issues specifically among elderly individuals with dementia and depression. Our study adds value to the existing literature by using a nationally representative sample of community-dwelling elderly individuals with dementia and depression and examining the current depression treatment (antidepressants with and without psychotherapy) use and its predictors. Information from our study is significant as it helps in understanding not only the current depression treatment use but also provides the knowledge of the factors where appropriate interventions can be applied for better health outcomes in this vulnerable population.

Methods

Study Design

A retrospective, cross-sectional study was conducted using multiple years of Medical Expenditure Panel Survey (MEPS) (2002-2012) data. This study utilized alternate years of

MEPS data (2002, 2004, 2006, 2008, 2010, and 2012) to minimize the chance of observing the same participants as they are followed for two years.¹⁶ Multiple years of MEPS data were used in order to achieve adequate sample size, as recommended by MEPS survey designers.¹⁷

Data Source

Conducted by the Agency for Healthcare Research and Quality (AHRQ), MEPS is a large-scale, nationally representative survey of non-institutionalized US civilians, their healthcare providers (such as physicians, hospitals, pharmacies) as well as employers. MEPS collects data on healthcare service utilization, expenditures and insurance of non-institutionalized US civilians.¹⁸ MEPS participants are derived from the sampling framework of the National Health Interview Survey (NHIS). To achieve a nationally representative sample, MEPS oversamples minority groups and disabled people. The two major components of MEPS are: (i) the household component (MEPS-HC) and (ii) an insurance component (MEPS-IC). MEPS-HC collects comprehensive information for each participant in terms of their demographic characteristics, medical conditions, health status, healthcare service use and expenditures, health insurance, satisfaction with care, income, and employment.¹⁸ Professional coders convert the medical conditions information collected from the MEPS participants into International Classification of Diseases, 9th Edition, Clinical Modification (ICD-9-CM) codes and clinical classification codes. Medical conditions reported by the MEPS participants, have been observed to adequately correlate with the Medical Provider Component.¹⁹ Along with the MEPS-HC, four other files were used for this study: (i) Medical Conditions file to identify dementia, depression as well as other co-occurring chronic conditions, (ii) Prescription Use file to identify medication use, and (iii) Outpatient and (iv) Office-based Provider Visits files to identify psychotherapy use.

Study Sample

The study sample consisted of elderly (age ≥ 65 years) individuals who (i) had dementia, (ii) were alive during the calendar year, and (iii) had co-occurring depression. Elderly individuals with dementia were identified by ICD-9-CM code of 290.XX or 294.XX or 331.XX or if they reported use of cholinesterase inhibitors or memantine.²⁰ Multum Lexicon therapeutic classification code of '313' was used to identify the use of cholinesterase inhibitors, while generic drug name code was used to identify memantine.²⁰ ICD-9-CM code of 296.xx, or 311.xx was used to identify co-occurring depression.²¹ It has been observed that despite the possibility of including bipolar disorder in the ICD-9-CM code of 296.xx, an overwhelming majority (>90%) of individuals with this code have major depression and also had a code of 311.xx, which corresponds to unspecified depression.²¹

Dependent variable

The dependent variable of this study was depression treatment, identified by antidepressant medication and/or psychotherapy use. Antidepressant use was determined from the prescription drug files using Multum Lexicon therapeutic class code (second level) of "249". Antidepressants were categorized into seven subclasses as follows: (i) Selective serotonin reuptake inhibitors (SSRIs); (ii) Serotonin–norepinephrine reuptake inhibitors (SNRIs); (iii) Tricyclic antidepressants (TCAs); (iv) Monoamine oxidase inhibitor (MAO inhibitors); (v) Phenylpiperazine antidepressants; (vi) Tetracyclic antidepressants; and (vii) Miscellaneous antidepressants. These subclasses of antidepressants were identified by the third level of Multum Lexicon therapeutic class codes (see Appendix A). Individual antidepressant agents were identified using National Drug Codes (NDCs). Outpatient and office-based provider files were utilized to identify psychotherapy use and the study sample reporting at least one visit for

psychotherapy or mental health counseling services were classified in the group of psychotherapy receipt.

Depression treatment was classified into four groups: (i) antidepressant use alone; (ii) psychotherapy alone; (iii) antidepressant with psychotherapy; and (iv) no depression treatment. As the sample size of the study sample, who used psychotherapy alone (unweighted N = 2) was extremely small, they were not included in the final study sample. Sensitivity analyses was conducted by categorizing depression treatment as (i) receipt of antidepressants with/without psychotherapy; and (ii) no depression treatment.

Independent variables

The association of individual level characteristics such as predisposing, enabling, need, personal health practices, and external environmental factors with depression treatment was examined using the Ronal M. Andersen's Behavioral Model of Health Services Use framework.²² Age, sex, and race/ethnicity were categorized as predisposing factors. Education, marital status, and type of insurance, constituted the enabling factors. Need factors in this study consisted of the total number of co-occurring chronic conditions [anemia, arthritis, cancer, diabetes, emphysema, diseases of eye, gastro esophageal reflux disorder (GERD), heart disease, hypertension, hyperlipidemia, osteoporosis, stroke, and thyroid disorders], ADLs limitations (yes/no), IADLs limitations (yes/no), limitations of activities in work or housework (yes/no), limitations of functional activities (yes/no), perceived physical health status (excellent/very good; good; and fair/poor), perceived mental health status (excellent/very good; good; and fair/poor), and pain (quite a bit or extreme pain; moderate or little pain; and no pain). Body Mass Index (BMI) (under or normal; and overweight or obese) constituted the personal health

practices factor. Region (Mid-West; Northeast; West; and South), and Metro status (metro; and non-metro) were classified as external environmental factors.

Pain

Depression treatment patterns among elderly individuals with dementia and co-occurring depression can be influenced by the presence or absence of pain, as antidepressants are often prescribed for the treatment of pain associated with different chronic conditions.²³ Pain was adjusted as one of the independent variables in the multivariable analyses in this study to minimize its influence on depression treatment among the study sample. The pain variable was constructed by asking the MEPS participants if - "*During past 4 weeks, pain interfered with normal work outside the home and housework*"²⁴, which was self-reported on a 5-point scale: (i) not at all; (ii) a little bit; (iii) moderately; (iv) quite a bit; and (v) extremely. In this study, pain was categorized into two categories: (i) any pain; and (ii) no pain.

Statistical analysis

Statistically significant differences between depression treatment groups (antidepressant use alone, combination therapy of antidepressant and psychotherapy and no depression treatment) were examined by conducting chi-square tests and ANOVA. Individual level factors associated with depression treatment in the study sample were evaluated by conducting multinomial logistic regression. Depression treatment (dependent variable) comprised of three categories: (i) antidepressant use only; (ii) combination therapy of antidepressant and psychotherapy; and (iii) no depression treatment (reference group for the multinomial logistic regression). Sensitivity analysis using binary logistic regression was conducted with any form of depression treatment compared to no depression treatment as dependent variable controlling for

individual level factors. Due to small cell size of several individual level characteristics categories they were collapsed together to achieve reliable estimates in multivariable analyses. An a priori α level of 0.05 was used to ascertain statistical significance. PROC SURVEYFREQ, SURVEYREG and SURVEYLOGISTIC commands in SAS was used to obtain national level estimates adjusting for the complex survey design of MEPS. Due to the small sample size, the “NOCOLLAPSE” option in STRATA statement in SAS was used to accommodate the SURVEYREG procedure. All analyses were conducted using SAS version 9.4 (SAS institute Inc., Cary, NC, USA).

Results

Co-occurring depression prevalence among community-dwelling elderly individuals with dementia was 21.59% [95% Confidence Interval (CI) 18.44% - 24.74%]. Receipt of depression treatment was reported by an overwhelming majority [87.9%, (95% CI, 84.9% - 90.8%)] of the study sample. Antidepressants only and combination therapy (antidepressant with psychotherapy) was reported by 74.9% (95% CI, 69.8% - 80.0%) and 13% (95% CI, 8.9% - 17.1%) respectively of the study sample.

Overall and depression treatment group (no depression treatment, antidepressants only, and combination of antidepressants with psychotherapy) specific distribution of predisposing, enabling, need, personal health practices and external environmental characteristics are presented in Table 1. Overall, the majority of the study sample were 75 years and older (78.7%), female (69.7%), white (82.7%), reported fair or poor perceived mental health status (60.3%), reported having some form of pain (79.1%) and resided in metropolitan areas (86.3%). Subgroup differences can be observed in Table 1 in the study sample in terms of age, sex, race/ethnicity, marital status, education, perceived physical and mental health status, ADL and IADL

limitations, functional and activities disability, and region. For example: based on chi-square test, combination therapy was used by the majority (64.1%) of younger individuals (65-74 years) with dementia and depression while older individuals (75 + years) were treated predominantly (84.3%) with antidepressants alone ($\chi^2 = 219.29$; $df = 2$; $p < 0.0001$). Based on ANOVA (using SURVEY REG procedure in SAS), there was no statistically significant difference between the three groups in terms of the total number of chronic conditions (F-value = 0.04; numerator $df = 2$ and denominator $df = 27$; $p = 0.965$). Despite the need to use the “NOCOLLAPSE” option in SURVEYREG procedure, the Relative Standard Errors (RSEs) of the mean chronic disease numbers in each of the depression treatment groups were less than 10% indicating that these estimates were reliable (RSE < 30% is considered to be reliable in these complex survey data).

Supplemental Table 1 provides the distribution of the individual co-occurring chronic conditions.

Nationally representative depression treatment patterns among the study sample are shown in Table 2. Among the study sample, nearly 65% (95% CI: 58.8% - 71.7%) reported using SSRIs, followed by tetracyclic antidepressants (11.6%, 95% CI: 7.3% - 15.9%), SNRIs (11.3%, 95% CI: 6.9% - 15.6%), phenylpiperazine antidepressants (8.7%, 95% CI: 4.2% - 13.3%), TCAs (8.1%, 95% CI: 4.7% - 11.5%), and miscellaneous antidepressants (7.3%, 95% CI: 4.4% - 10.1%). Among individual antidepressants (data not presented in tabular form), the highest use was reported for escitalopram (17.38%, 95% CI: 13.27% - 21.48%). Rates of use for other individual antidepressants were: sertraline (17.01%, 95% CI: 11.56% - 22.46%), citalopram (16.52%, 95% CI: 12.66% - 20.39%), mirtazapine (10.9%, 95% CI: 6.6% - 15.2%), trazodone (8.9%, 95% CI: 4.4% - 13.5%), paroxetine (7.2%, 95% CI: 5.7% - 8.7%), fluoxetine (6.5%, 95% CI: 4.5% - 8.5%), duloxetine (6.2%, 95% CI: 3.1% - 9.4%), venlafaxine (5.06%, 95% CI: 2.1% - 7.9%), bupropion (5.06%, 95% CI: 2.2% - 7.9%) and nortriptyline (3.4%, 95% CI: 1.3% - 5.5%).

Findings from the multinomial logistic regression are summarized in Table 3. Age, race/ethnicity, marital status, education, pain, perceived mental health status, and IADL limitations were significantly associated with reporting receipt of depression treatment among elderly individuals with dementia and depression. For example, elderly individuals with dementia and depression, aged 75 years and older were significantly less likely to receive antidepressant only [Adjusted Odds Ratio (AOR): 0.53, 95% CI: 0.33-0.86, $\chi^2_{(1)} = 6.58$, $p = 0.01$] and combination therapy (AOR: 0.06, 95% CI: 0.03-0.11, $\chi^2_{(1)} = 85.0059$, $p < 0.0001$) compared to those who were 65-74 years old. Sensitivity analyses (see Supplemental Table 2) using binary logistic regression showed similar findings as multinomial logistic regression for age, race/ethnicity, and perceived mental health status.

Discussion

More than one-fifth of the elderly individuals with dementia had co-occurring depression. Existing literature suggests that the prevalence of depression among individuals with dementia in the US to be within the range of 25%-45% depending on the method used and the setting.^{4, 25-27} The prevalence of depression observed in our study was a little lower compared to the prevalence observed in other studies, which might be attributable to the under-diagnosis of depression or stigma associated with reporting mental disorders by MEPS respondents. Receipt of depression treatment was reported by an overwhelming majority (87.9%) of the study sample, which to the best of our knowledge is the first estimate of depression treatment in this population at a national level. Patterns of antidepressant use revealed that approximately two-thirds of the study sample (65%) reported using SSRIs, followed by tetracyclic antidepressants (11.6%), phenylpiperazine antidepressants (8.7%), TCAs (8.1%), and miscellaneous antidepressants (7.3%). It is not surprising that majority of the study sample reported using SSRIs, as they have a

favorable adverse events profile. However, caution should be used while using SSRIs in the elderly, as a population based study demonstrated that SSRIs were associated with a high risk of falls and hyponatraemia.²⁸ Given the patterns of use of individual antidepressant reported in this study, it can be speculated that these specific agents such as citalopram, fluoxetine, paroxetine, and sertraline are used to treat major depression, problems with mood or irritability that do not meet criteria for major depression, sleep problems, or other conditions.²⁹ The current study found that with increasing age, the chances of receiving depression treatment decreased significantly. Physicians may be concerned about the potential adverse effects such as serotonin syndrome, risks of falls and fractures as well as mortality in this age group.

The current study found that combination therapy was reported in 13% of the study sample. A study conducted by Wei et al. (2005) among elderly Medicare beneficiaries with depression, found psychotherapy use in 25% of the cases³⁰, however, it has been observed that the use of outpatient psychotherapy has been declining in the general population³¹. We cannot directly compare the findings from our study to the existing studies as we report the combination use of AD and psychotherapy rather than psychotherapy alone. Moreover, the presence of cognitive decline in this population may lead to less frequent use of psychotherapy. However, it is worthwhile to note that a systematic review of six RCTs involving 439 individuals with dementia and depression, it was observed that when psychological interventions were added to usual form of care, they were helpful in alleviating depressive symptoms among individuals with mild dementia and depression.³² Hence, considering psychotherapy as an adjunctive therapy may merit consideration in person with mild cognitive impairment. Future studies should look into the comparative effectiveness of antidepressant alone versus combination therapy of antidepressants and psychotherapy among elderly individuals with co-occurring dementia and depression.

Findings from this study suggest a race/ethnic disparity in terms of depression treatment, with Whites having significantly greater likelihood of receiving antidepressants alone or as combination therapy with psychotherapy compared to other race/ethnic categories. This finding is consistent with the existing literature.³³⁻³⁷ Some of the proposed reasons for the race/ethnic disparity in depression treatment are access to care, differences in seeking help for depression treatment, health literacy, cultural differences, patient attitudes, and patient-physician relationships.³⁸ Moreover, it has been reported that racial/ethnic minorities such as African-American and Latinos are less likely to accept antidepressant treatment compared to non-Hispanic Whites.³⁹ Furthermore, it can be speculated that as psychotherapy involves high out-of-pocket expenditures, minorities with lower income may be less able to afford these treatments.⁴⁰ Another important factor that plays a role in race/ethnic disparities in depression treatment is the paucity of mental healthcare providers in areas where they reside.³⁰ Despite research evidence suggesting race/ethnic disparity in depression treatment over the past two decades³⁸, there has been very little to no improvement in this area. Hence, there is an utmost need of effective interventions to minimize and eventually eradicate the race/ethnic disparity in depression treatment.

Elderly individuals with dementia and depression who were married were nearly three times more likely to use combination therapy. This finding is inconsistent with some reports^{41, 42} that individuals who are not married are more likely to receive psychotherapy, perhaps due to social relationship difficulties, which can elevate the incentive to seek care. However, we speculate that our findings reflect a proactive caregiving spouse, who helps insure that the patient receives adequate depression treatment. It is an interesting finding that our study sample reporting pain were more likely to report using combination therapy. This is not surprising

because it has been observed in other disease states that using a combination approach of antidepressants and non-pharmacological interventions yield substantial improvements not only in pain but also helps reducing depression.⁴³

Our findings suggest the study sample reporting fair or poor mental health status were more than four times likely to receive antidepressant treatment. This finding is consistent with an existing study⁴⁴, which found that perceived fair or poor mental health status was significantly associated with longer-term antidepressant use. Such individuals (or their caregivers) may have greater motivation to continue antidepressant therapy.⁴⁴ This study also observed that limitations of IADL are associated with a lesser likelihood of using combination therapy. Although this finding is inconsistent with an existing study⁴⁵, which suggests that greater IADL impairment is associated with opting for active depression treatment, it can be theorized that healthcare providers may not be suggesting combination therapy in the presence of cognitive decline and impaired IADL tasks.

Some of the strengths of this study include the use of a nationally representative sample of community-dwelling elderly individuals with dementia and co-occurring depression and use of a comprehensive set of individual-level variables including pain, which may be associated with depression treatment. However, some of the limitations of this study include that the measures are self-reported and are thus subject to potential recall bias. Types of psychotherapy were not available and patient and physician preferences for alternate forms of depression treatment were also unavailable in the dataset. Moreover, it cannot be ascertained from the dataset if the depression preceded the dementia diagnosis or if it was post dementia diagnosis and also the severity of dementia and depression. Furthermore, it is possible that antidepressants were being used to treat other conditions such as sedation, agitation, sleep and

appetite stimulation. Lastly, it was not possible to measure the severity and duration of dementia and depression.

Conclusions

Notwithstanding the limitations, this is the first study to date to provide national level estimates for depression treatment among elderly individuals with dementia and co-occurring depression. An overwhelming majority of the study sample received depression treatment with SSRIs being the most widely used antidepressant class. Several subgroup differences in terms of age, race/ethnicity existed in terms of reporting the use of depression treatment, which should be further investigated in future research.

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Table 1
Descriptive Statistics of Elderly Individuals with Dementia with Co-occurring Depression
Medical Expenditure Panel Survey (2002-2012)

	All N = 173	No Dep Tx N = 28	AD Only N = 124	AD & Psych N = 21		
	Wt.%	Wt.%	Wt.%	Wt.%	χ²/F- value	p-value
Predisposing factors						
Age					219.293	<0.0001*
65-74 years	21.3	10.6	15.7	64.1		
75,+ years	78.7	89.4	84.3	35.9		
Sex					9.308	0.01*
Women	69.7	73.7	71.8	53.7		
Men	30.3	26.3	28.2	46.3		
Race/Ethnicity					14.803	<0.0001*
White	82.7	70.6	83.3	90.6		
Other	17.3	29.4	16.7	9.4		
Enabling factors						
Marital Status					10.936	0.004*
Married	49.5	41.5	47.4	69.4		
Other	50.5	58.5	52.6	30.6		
Education					35.079	<0.0001*
LT HS	25.3	32.1	26.5	13.0		
HS	41.5	31.8	46.6	25.2		
> HS	33.2	36.1	26.9	61.8		
Insurance					0.801	0.670
Public	40.8	41.2	41.7	35.1		
Others	59.2	58.8	58.3	64.9		
Need factors						
Perceived Physical Health Status					16.757	0.002*
Ex/vgood	21.9	22.5	18.0	44.4		
Good	30.5	31.6	31.6	23.4		
Fair/poor	47.5	46.0	50.4	32.3		
Perceived Mental Health Status					29.044	<0.0001*
Ex/vgood	13.2	8.5	10.2	35.3		
Good	26.4	37.9	24.4	27.4		
Fair/poor	60.3	53.6	65.4	37.4		
Pain					1.364	0.506
Pain	79.1	79.5	80.3	71.6		
No pain at all	20.9	20.5	19.7	28.4		
ADL Limitations					13.039	0.001*
Yes	47.9	49.5	50.9	28.7		
No	52.1	50.5	49.1	71.3		
IADL Limitations					41.787	<0.0001*
Yes	73.0	85.0	77.3	36.9		
No	27.0	15.0	22.7	63.1		

(Contd.)

Table 1
Descriptive Statistics of Elderly Individuals with Dementia with Co-occurring Depression
Medical Expenditure Panel Survey (2002-2012)

	All N = 173	No Dep Tx N = 28	AD Only N = 124	AD & Psych N = 21		
	Wt.%	Wt.%	Wt.%	Wt.%	χ²/F- value	p-value
		12.1	74.9	13.0		
Functional Disability					9.647	0.008*
Yes	92.1	93.7	93.6	82.1		
No	7.9	6.3	6.4	17.9		
Activities Disability					42.814	<0.0001*
Yes	73.7	81.8	77.7	42.7		
No	26.3	18.2	22.3	57.3		
Total Number of Chronic Conditions (mean, S.E.)						0.965
	3.48 (0.12)	3.54 (0.31)	3.46 (0.13)	3.51 (0.34)	0.04	
Personal Health Practices						
BMI					4.321	0.115
Undwt/Normal	87.7	95.3	86.0	91.1		
Overwt/Obese	12.3	4.7	14.0	8.9		
External Environmental factors						
Metropolitan status					1.226	0.542
Metropolitan	86.3	90.4	85.5	87.3		
Rural	13.7	9.6	14.5	12.7		
Region					28.733	<0.0001*
Northeast	14.2	13.2	11.3	31.9		
Mid-west	24.1	28.2	25.1	14.3		
South	41.6	41.5	45.2	21.4		
West	20.0	17.1	18.4	32.4		

Note: Based on 173 elderly (age ≥ 65 years) individuals with dementia and depression who were alive during the calendar year (2002, 2004, 2006, 2008, 2010, and 2012).

Abbreviations --- No Dep Tx: No Depression Treatment; AD only: Antidepressants only; AD & Psych: Antidepressants with Psychotherapy; LT HS: Less than High School; HS: High School; Wt%: Weighted percentage; S.E.: Standard Error; Ex/vgood: Excellent or Very Good; ADL: Activity of Daily Living; IADL: Instrumental Activity of Daily Living; Und/normal: Underweight or Normal; Overwt/Obese: Overweight or Obese; BMI: Body Mass Index

Asterisks represent statistically significant difference between the different depression treatment groups [No Depression Treatment (Unweighted N = 28); Antidepressants only (Unweighted N = 124); and Antidepressants with Psychotherapy (Unweighted N = 21)] at α level of 0.05. The p-value is based on ANOVA (PROC SURVEYREG) for total number of chronic conditions with numerator df = 2 and denominator df=27, and the remaining are based on χ² tests with df = 6 for region, df = 4 for education, perceived physical health status, perceived mental health status, and df = 2 for other categorical variables.

Table 2
Dep Tx Patterns among Elderly Individuals with
Dementia and Co-occurring Depression
Medical Expenditure Panel Survey (2002-2012)

	Wt. %
Any form of Dep Tx	87.9
SSRI	65.2
SNRI	11.3
TCA	8.1
PPAZ	8.7
Tetra Cyc	11.6
Misc ADP	7.3

Note: Based on 173 elderly (age ≥ 65 years) individuals with dementia and depression who were alive during the calendar year (2002, 2004, 2006, 2008, 2010, and 2012).

Abbreviations --- Dep Tx: Depression Treatment; SSRI: Selective Serotonin Reuptake Inhibitor; SNRI: Serotonin–Norepinephrine Reuptake Inhibitor; TCA: Tricyclic Antidepressants; PPAZ: Phenylpiperazine Antidepressants; Tetra Cyc: Tetracyclic Antidepressants; Misc ADP: Miscellaneous Antidepressants; Wt%: Weighted percentage (nationally representative).

Total number of individual antidepressant classes may not add up to 100% due to intra-class polypharmacy.

Denominator for Wt.% calculations for individual types of antidepressant classes was the total analytic sample (Unweighted N = 173).

Table 3
Multinomial Logistic Regression among Elderly with Dementia and
Co-occurring Depression in terms of Depression Treatment
Medical Expenditure Panel Survey (2002-2012)

	AD only				AD & Psych			
	AOR	95% CI	Wald χ^2	p-value	AOR	95% CI	Wald χ^2	p-value
Predisposing factors								
Age								
75,+ years	0.53	[0.33,0.86]	6.5839	0.0103*	0.06	[0.03,0.11]	85.0059	<0.0001*
65-74 years	Ref				Ref			
Sex								
Female	1.30	[0.53,3.15]	0.3293	0.57	2.20	[0.78,6.25]	2.2064	0.14
Male	Ref				Ref			
Race/Ethnicity								
White	3.10	[1.23,7.82]	5.7351	0.017*	4.93	[2.30,10.5]	16.8052	<0.0001*
Others	Ref				Ref			
Enabling factors								
Marital Status								
Married	1.05	[0.45,2.46]	0.0117	0.91	2.79	[1.18,6.61]	5.4517	0.019*
Others	Ref				Ref			
Education								
LT HS	0.97	[0.36,2.62]	0.0030	0.957	0.47	[0.12,1.81]	1.2073	0.27
HS	1.23	[0.50,3.03]	0.2056	0.650	0.25	[0.11,0.57]	11.0329	0.0009*
> HS	Ref				Ref			
Insurance								
Public	0.98	[0.44,2.20]	0.0019	0.97	1.04	[0.39,2.74]	0.0059	0.94
Others	Ref				Ref			
Need factors								
Pain								
Pain	1.09	[0.51,2.33]	0.0495	0.82	6.66	[1.69,26.2]	7.3509	0.0067*
No pain at all	Ref				Ref			
Perceived Physical Health Status								
Fair/Poor	1.03	[0.34,3.11]	0.0023	0.96	[0.21,1.89]	[0.21,1.84]	0.6779	0.41
Excellent/Very good/Good	Ref				Ref			

(Contd.)

Table 3
Multinomial Logistic Regression among Elderly with Dementia and
Co-occurring Depression in terms of Depression Treatment
Medical Expenditure Panel Survey (2002-2012)

	AD only				AD & Psych			
	AOR	95% CI	Wald χ^2	p-value	AOR	95% CI	Wald χ^2	p-value
Perceived Mental Health Status								
Fair/Poor	4.30	[1.15,16.0]	4.7136	0.0299*	2.30	[0.61,8.70]	1.5102	0.22
Excellent/Very good/Good	Ref				Ref			
ADL Limitations								
Yes	0.68	[0.36,1.31]	1.3182	0.25	1.03	[0.51,2.09]	0.0064	0.94
No	Ref				Ref			
IADL Limitations								
Yes	0.57	[0.11,2.90]	0.4562	0.50	0.15	[0.03,0.76]	5.2970	0.0214*
No	Ref				Ref			
Functional Disability								
Yes	0.98	[0.50,1.93]	0.0030	0.96	0.96	[0.32,2.83]	0.0067	0.93
No	Ref				Ref			
Activities Disability								
Yes	0.89	[0.26,3.04]	0.0325	0.86	0.43	[0.13,1.42]	1.9171	0.17
No	Ref				Ref			
Total number of chronic conditions								
	1.12	[0.87,1.44]	0.7934	0.37	0.85	[0.65,1.11]	1.4435	0.23
Personal Health Practices factors								
BMI								
Overweight/Obese	1.71	[0.92,3.17]	2.9248	0.09	1.05	[0.29,3.73]	0.0053	0.94
Underweight/Normal	Ref				Ref			
External Environmental factors								
Metropolitan								
Metropolitan	0.64	[0.26,1.61]	0.8836	0.347	0.93	[0.31,2.82]	0.0159	0.90
Rural	Ref				Ref			
Region								
South	0.80	[0.40,1.60]	0.3907	0.532	0.41	[0.17,1.02]	3.7000	0.05
Others	Ref				Ref			

Note: Based on 173 elderly (age ≥ 65 years) individuals with dementia and depression who were alive during the calendar year (2002, 2004, 2006, 2008, 2010, and 2012).

Abbreviations --- AD only: Antidepressants only; AD & Psych: Antidepressants with Psychotherapy; CI: Confidence Interval; LT HS: Less than High School; HS: High School; ADL: Activity of Daily Living; IADL: Instrumental Activity of Daily Living; BMI: Body Mass Index; AOR: Adjusted odds ratio.

Asterisks represent statistically significant group differences by type of treatment compared to the reference group based on multinomial logistic regression at α level of 0.05. The reference group for the dependent variable in the multinomial logistic regression was “No Depression Treatment”.

Global Wald chi-square was significant, $\chi^2_{(36)} = 3973.45$, $p < 0.0001$.