Published in final edited form as:

Gen Hosp Psychiatry. 2012 November ; 34(6): 588–597. doi:10.1016/j.genhosppsych.2012.07.004.

Association of Treatment Modality for Depression and Burden of Comorbid Chronic Illness in a Nationally Representative Sample in the United States

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Abstract

Objective—We examined associations between treatment modality for depression and morbidity burden. We hypothesized that patients with higher numbers of co-occurring chronic illness would be more likely to receive recommended treatment for depression both with antidepressant medication and psychotherapy.

Methods—Using a retrospective cross-sectional design, we analyzed data on 165,826 people over 16 years from 2004–2008. Using a single multinomial logistic regression model, we examined the likelihood of treatment modality for depression: no treatment; psychotherapy alone; medication alone; and psychotherapy and medication. We examined the following predictors of therapy 1) morbidity burden, 2) five specific chronic conditions individually: diabetes mellitus II, coronary artery disease, congestive heart failure, hypertension, and chronic obstructive pulmonary disease or asthma, and 3) sociodemographic factors.

Results—The likelihood of any treatment for depression, specifically psychotherapy with medication, increased with the number of co-occurring illnesses. We did not find a clear pattern of association between the five specific conditions and treatment modality; though we identified treatment patterns associated with multiple sociodemographic factors.

Conclusion(s)—This study provides insight into the relationship between multimorbidity and treatment modalities which could prove helpful in developing implementation strategies for the dissemination of evidence-based approaches to depression care.

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Keywords

Depression; Mental Health Services; Comorbidity; Psychotherapy; and Antidepressant Drugs

1. Introduction

The importance of treating depression in patients with medical comorbidities is widely recognized. Depression significantly affects outcomes in patients with other chronic medical illnesses. Patients with both coronary artery disease and depression or diabetes and depression have increased mortality rates when compared to patients without depression. Further, in patients with depression and other chronic illness, treating depression can improve treatment for the co-occurring medical illness. One systematic review showed that treating depression, particularly when treatment includes both psychotherapy and diabetes education, actually improves treatment for diabetes. Thus, when treating patients with chronic illness who also have depression, providers need to address and adequately treat depression.

Treatment patterns for depression need to be understood as a function of the burden of chronic illness and as a function of specific co-occurring chronic conditions in order to inform research and policy to improve care for patient with depression and comorbid medical illness. One recent study which analyzed the influence of the number of clusters of comorbidities (cardiometabolic, respiratory, musculoskeletal) on depression treatment modality did not find a difference in modality of treatment for depression between patients with a single cluster versus multiple clusters of comorbid chronic conditions. Another study that examined national patterns of antidepressant medication use and their association with medical comorbidities found that patients with multiple comorbidities were less likely to receive antidepressant medications. However, a separate study found that hypertension and diabetes, but not heart disease or arthritis, were associated with higher rates of receipt of adequate treatment for depression. Interestingly, Min et al demonstrated an association between multimorbidity and better quality of care scores in elderly patients. Therefore, both the relationship between specific chronic illnesses and the overall burden of multimorbidity and treatment modality for depression remain ambiguous.

For chronic major depressive disorder, a combination of pharmacotherapy and psychotherapy has been found to be the most effective treatment modality. However, from 1998 to 2007, percentages of patients treated with psychotherapy declined. Specifically, treatment with psychotherapy declined in middle-aged patients between 35 and 49 years. However, other studies did not show significant differences in treatment modality by age. Studies have also shown that sociodemographic factors such as older age, non-white race, Hispanic ethnicity, and lack of insurance are all negatively associated with receipt of treatment for depression. For providers, researchers, and policy-makers to improve treatment for depression in patients with chronic illness, they need to understand the current influence of sociodemographic factors in treatment modality for depression.

In order to explore the associations between both overall morbidity burden and individual chronic illness and treatment modality for depression, we conducted a cross-sectional analysis of a nationally-representative sample to examine the likelihood of receipt of different modalities for treatment for depression in patients with increasing numbers of comorbid chronic illnesses as well as with specific chronic illnesses. In previous investigations, higher morbidity scores have been associated with higher concordance with evidence based therapy. Thus, we hypothesized that patients with a higher number of co-occurring chronic illness would be more likely to receive recommended treatment for

depression, both antidepressant medication and psychotherapy. We also examined the association of sociodemographic factors with treatment modality for depression with the hypothesis that age, race, ethnicity, educational status, and income level would be associated with treatment modality for depression.

2. Methods

2.1. Study Design and Data Source

For the current study, we used a retrospective cross-sectional study design using data from the Medical Expenditures Panel Survey (MEPS), a nationally representative survey of the U.S. civilian, non-institutionalized population conducted since 1996 by the Agency for Healthcare Research Quality and the National Center for Health Statistics. A complete description of the MEPS data collection process has been documented previously. Briefly, participants were selected from the National Health Interview Survey, with data gathered into two components, the Household Component (HC) and the Insurance Component (IC). For the MEPS-HC, household members provided data, including demographic information, health conditions, health insurance, and other health related information through household surveys conducted over the course of two full calendar years. The sample design of the MEPS-HC survey included stratification, clustering, multiple stages of selection, and disproportionate sampling. The Medical Provider Component (MPC), a collection of objective information from hospitals, pharmacies, and medical providers such as ICD-9 diagnosis codes, medications, blood pressure, and laboratory data, supplied additional data on responses from the MEPS-HC. The MEPS-IC contained information from private and public sector employers concerning the type of health insurance offered, including detailed questions on benefits. MEPS identified specific diagnoses from medical ICD-9 codes submitted on medical and pharmacy utilization and self-report. In order to provide results representative of the non-institutionalized U.S. population, the MEPS survey used sample weights to adjust for survey design and under-response factors.

2.2. Study sample

The current study sample included living people over 16 years of age as of the end of the year 2008 with a self-reported diagnosis of depression. Our sample consisted of 165,826 MEPS survey respondents from years 2004 to 2008. Participants were surveyed for two consecutive years. The utilization, cost and treatment information was annualized, or expressed in yearly terms, for the MEPS database. We used the annualized data for the present study. We did not have any exclusion criteria for unadjusted analysis. Adjusted analysis was limited to those with a current diagnosis of depression. MEPS uses the following procedure to identify the diagnosis of depression and other medical diagnoses: 1) the participant reports being told they have the condition by a health care professional, 2) professional coders assign fully specified ICD-9 codes based on the text of the participant interviews, 3) self-reported conditions are verified by medical providers or pharmacies, 4) all ICD-9 codes are, then, collapsed into three digit codes for confidentiality purposes. Diagnoses are considered current in MEPS if the condition is linked to a healthcare event, disability, or current symptoms. We used only active diagnoses in the current study. We only had access to the three digit ICD-9 codes. Thus, we defined depression by the ICD-9 code 311. Due to lack of access to the fourth digit of ICD-9 codes, codes specific for major depression (ICD-9: 296.2 and 296.3) and dysthymia/neurotic depression (ICD-9: 300.4) could not be included. Previous researchers have found in preliminary analysis that over 70 percent of patients in MEPS with depression were appropriately identified using the three digit ICD-9 code for Depression (ICD-9: 311).

2.3. Measures

2.3.1. Dependent variables—Using a single multivariate multinomial logistic regression model we examined the dependent variable of four possible treatment modalities for depression: no treatment (referent), psychotherapy only, antidepressant medication only, and both antidepressant medication and psychotherapy. Data regarding treatment modality were obtained from MEPS “Office-Based Medical Provider Visits Files”, “Outpatient Visits Files” and “Prescribed Medicines Files”. Psychotherapy was defined as at least one ambulatory (office based or outpatient) visit with psychotherapy associated with depression (ICD-9: 311). Medication treatment was identified as at least one prescription of antidepressant associated with depression (ICD-9: 311). Antidepressants were identified based on MultumLexicon therapeutic classifications (therapeutic sub-class #1 249).

2.3.2. Key independent variables—Independent variables included 1) morbidity burden and 2) five specific chronic conditions individually: diabetes mellitus (ICD-9: 250), coronary artery disease (ICD-9: 410, 411, 412, or 414), congestive heart failure (ICD-9: 428), hypertension (ICD-9: 401, 402, 403, 404 or 405), and chronic obstructive pulmonary disease or asthma (ICD-9: 491, 492, 493, or 496). The primary independent variable was the morbidity burden, which we defined as the number of chronic conditions, as defined by the modified clinical comorbidity index. Depression and the five specific conditions analyzed separately were not included in the morbidity burden. The individual conditions were chosen because they have been found to have worse outcomes and higher costs when associated with mental illness. These variables were all analyzed as dichotomous (yes/no) variables. We controlled for the number of ambulatory visits excluding visits for psychotherapy.

2.3.3. Covariables—Sociodemographic factors included: age (16–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and 85), region (Northeast, Midwest, South, and West), gender (male, female), race (white, African American, and other), ethnicity (Hispanic, non-Hispanic), self-reported income level (Poor, Near Poor, Low Income, Middle Income, High Income), insurance type (private insurance, public insurance, uninsured), education level (no degree, high school, bachelor, post-graduate), and employment status (employed, unemployed). We included region in the analysis due to the known variation in general healthcare expenditures and specialty care regionally as well as potential differences in use of psychotherapy by rural versus urban location.

2.3.4. Other Variables—Mean scores were calculated for the Short Form Health Survey SF-12 Physical Component Summary (PCS), SF-12 Mental Component Summary (MCS) and Kessler-6 (K-6) scores for each dependent variable, but these scores were not used as covariables in adjusted analysis because they were considered to be in the causal pathway for receiving treatment for depression.

2.4. Statistical techniques

To incorporate adjustment for the complex sample design, the current research used MEPS person-level and variance adjustment weights using STATA 11 (StataCorp. 2009.) in all analyses to ensure nationally representative estimates. Chi-square tests were conducted to test for variation in rates of treatment modality across selected subgroups. Multinomial logistic regression is commonly used when the outcome variable has three or more unordered categorical responses variables. This model breaks the regression up into a series of binary regressions comparing each group to a baseline group. In the current study we observed four mutually exclusive treatment options for patients with Depression: 0 equals no treatment, 1 equals anti-depressant medication only, 2 equals psychotherapy only, and 3 equals both antidepressant medication and psychotherapy. We chose no treatment (0) as the baseline group. Thus, our single multinomial logistic regression model assessed three

independent outcomes: relative risk of antidepressant medication only versus no treatment, the relative risk of psychotherapy only versus no treatment and the relative risk of both antidepressant medication and psychotherapy versus no treatment. With the STRATA multinomial logit model, all of these comparisons were estimated in one model.

This multinomial logistic regression analysis was used to estimate the relative risk ratios of receiving a particular treatment modality as a function of specific chronic medical illnesses, number of chronic illnesses other than depression or the five specific chronic medical illnesses, and population characteristics. Independent variables included the population characteristics described in Table 1, the five specific conditions described above, a modified clinical comorbidity index, and the number of ambulatory visits. The dummy independent variables were constructed to indicate the total numbers of chronic conditions other than those examined separately for each respondent (e.g. one chronic comorbid conditions, two chronic comorbid conditions, and so on up to a maximum of five or more chronic comorbid conditions). The modified clinical comorbidity index was calculated as a count of all chronic medical conditions, excluding depression or the five specified conditions analyzed separately. Relative Risk ratios are presented with 95% confidence intervals to allow a more precise estimation of the potential range of statistical estimates.

3.0 Findings

In pooled data from 2004–2006, 6.8 percent of the participants in the MEPS database had an active diagnosis of depression defined by ICD-9 311. Table 1 reports the rates of treatment modality for depression by specific chronic illnesses, number of chronic illnesses, demographic factors, and SF-12 MCS, PCS and the K-6 summary scores. Of the 11,350 with a diagnosis of depression, 77.3 % were either on no treatment or on medical treatment only.

In unadjusted SF-12 MCS and the K-6 scores, receipt of psychotherapy alone or antidepressant medication and psychotherapy was associated with lower mental health functioning and greater distress. The SF-12 PCS did not indicate a similar pattern for physical functioning.

In adjusted analysis, the number of conditions was significantly associated with the modality of treatment for depression (Figure 1). The likelihood of any treatment for depression increased with increasing numbers of co-occurring illnesses. This association was strongest for the treatment modality of antidepressant medication and psychotherapy. Coronary artery disease was associated with a lower likelihood [RR= 0.60 CI (0.39, 0.94)] of treatment with antidepressant medication and psychotherapy, hypertension was associated with a higher likelihood [RR=1.31 (1.13, 1.51)] of treatment with antidepressant medication only, and asthma or chronic obstructive pulmonary disease was associated with lower likelihood [RR=0.71 (0.50, 0.99)] of treatment with either psychotherapy only. With the exception of these statistically significant findings, presence of any of the five specific chronic illnesses when compared to the absence of these diseases was not associated with specific treatment modalities for depression (Table 2). Age was also significantly associated with the modality of treatment for depression (Figure 2). With increasing age the likelihood of treatment with antidepressant medication only increased, while the likelihood of treatment with psychotherapy only or antidepressant medication and psychotherapy decreased dramatically. Additional visits were positively associated with receiving all treatment modalities: antidepressant medication only [RR=1.02 (1.01, 1.02)], psychotherapy only [RR=1.03 (1.02, 1.04)], and antidepressant medication and psychotherapy [RR=1.03 [1.02, 1.04].

Sociodemographic factors also influenced the likelihood of receipt of different therapy modalities for depression. Non-white race and Hispanic ethnicity were less likely to receive

any therapy for depression. When compared to poor patients, patients with high income were more likely to receive antidepressant medication only [RR=1.73(1.10, 2.70)] and antidepressant medication and psychotherapy [RR=1.40 [1.05, 1.88]. When compared to patients with private insurance, those with public insurance were more likely to receive antidepressant medication and psychotherapy [RR=1.32 (1.03, 1.70)] and those with no insurance were less likely to receive any treatment for depression: antidepressant medication only [RR=0.48 (0.38, 0.61)], psychotherapy only [RR=0.47 (0.30, 0.72)], and antidepressant medication and psychotherapy [RR=0.57 (0.42, 0.78)]. Post-graduate education also increased the likelihood of treatment with psychotherapy only [RR=2.12 (1.24, 3.65)] and antidepressant medication and psychotherapy [RR=2.02 (1.29, 3.15)] when compared to respondents with no degree. Further, employed respondents were less likely to receive treatment with antidepressant medication and psychotherapy [RR=0.70 (0.56, 0.86)] than unemployed respondents.

4.0 Discussion

In this nationally representative sample of patients with a diagnosis of depression from 2004 to 2008, we found a strong association between treatment modality and the morbidity burden. The likelihood of any treatment for depression increased with the number of co-occurring illnesses. This association was strongest for the treatment modality psychotherapy and antidepressant medication. In contrast, when looking at the association of treatment modality with specific chronic illnesses that are known to have worse outcomes when co-occurring with depression, we did not find a clear pattern of association between these illnesses and treatment modality. We did find distinct treatment patterns for depression by age. With increasing age the likelihood of treatment with antidepressant medication only increased, while the likelihood of treatment with either psychotherapy only or antidepressant medication with psychotherapy decreased dramatically. In our analysis of geographic regions, we found that patients in regions outside of the Northeast were less likely to receive psychotherapy either with or without antidepressant medication. We also found that the sociodemographic factors of race, income, insurance status, and income influenced the likelihood of receiving any treatment modality.

Our analysis of treatment modality as a function of morbidity burden uniquely contributes to the developing understanding of the influence of multimorbidity on depression care. Our finding of no pattern of association between specific chronic illnesses and treatment modality for depression reinforced those of a recent study that found no association between treatment modality for depression and co-occurring disease clusters. However, our observation of the increased likelihood of any treatment and particularly treatment with antidepressant medication and psychotherapy as the number of chronic illnesses increased, conflicts with prior findings of a lack of a relationship between multimorbidity and treatment for depression. This finding supports research in the elderly by Min et al that higher morbidity has actually been associated with higher quality scores. Although we did not control for the number of total health care visits, the previous finding by Min were independent of number of office visits. The authors of that study suggested that physician perception of a greater need for improved care offered a possible explanation for improved concordance with evidence-based recommendations in patients with higher morbidity. Additionally, patients with multimorbidity may have been accustomed to seeking care from multiple sources and may have had a higher level of comfort with both medical and specialty mental health treatment.

The finding that increasing numbers of chronic medical illnesses increased the likelihood of receiving psychotherapy also has important clinical implications. This association potentially contradicts previous findings that “competing demands” from medical illnesses

lead to less intensive treatment of depression. We included number of visits in our analysis, as we thought that this finding possibly resulted solely from increased visits for patients with increasing numbers of chronic illnesses. Although the number of ambulatory visits was related to the likelihood of receiving any treatment for depression, the number of visits did not explain the association of multimorbidity and treatment with psychotherapy.

Our finding that use of psychotherapy either with or without medical treatment declined with increased age contributes to the current knowledge regarding treatment of depression in older adults. While previous studies have shown decreased use of psychotherapy in older adults, two previous studies of the MEPS database, published in 2004 and 2011, found no statistical difference between elderly and non-elderly adults in use of psychotherapy. However, they both showed a trend toward less use of psychotherapy. Both of these studies used only one year of MEPS data and combined data from all patients older than 64 into one category. By analyzing patients 65–74, 75–84, and greater than age 85 separately, we were able to further elucidate the dramatic trend for decreased psychotherapy use and increased medical management of depression with increasing age. Patients in the age groups most vulnerable to medication side effects were almost solely treated with medical therapy for depression and were more than twice as likely to be treated with medical therapy alone than patients 25–34 years old. Since patients over age 65 have Medicare insurance, the decrease in use of psychotherapy likely reflects patient or provider preferences rather than access issues.

Prior research has shown regional variations in healthcare spending and in use of specialty care explained largely by inpatient-based and specialist practice patterns. Studies examining differences in use of mental health services have focused on associations with rural versus urban settings rather than regional differences. These studies have shown mixed results in terms of the importance of urban versus rural setting. In large secondary database analyses, Kessler et al showed a lack of association with receipt of any modality of treatment for mental disorders by setting type, while Wang et al showed a negative association of receipt of treatment for depression with non-urban settings. In our analysis of regional variation, we found that participants were less likely to receive psychotherapy in all regions outside of the Northeast. This finding may be explained by the preponderance of urban settings in the Northeast compared to other regions of the United States and improved access to psychotherapy in urban settings. However, further research is required to determine the causes of these regional variations.

Similar to our ability to differentiate between small age groups, the large patient population also allowed us to examine education in smaller categories. The 2011 study discussed above did show a significant lower odds of receiving psychotherapy in participants with a high school degree when compared to those with education beyond high school but the authors did not differentiate differences in post-high school education. Our analysis demonstrated a trend in the association between educational level and depression treatment with the likelihood of receiving psychotherapy either with or without medical treatment increasing with educational level. Specifically, patients with post-graduate education were over twice as likely as patients without a high school education to receive psychotherapy. We did not look at insurance status by educational levels for patients in this study.

Similar to other studies, non-white, Hispanic, lower income, and uninsured patients were less likely to receive any treatment for depression. Interestingly, studies looking at racial differences in treatment for depression in patients over 65 years old did not find this same disparity in black patients. Our study was not designed to assess the specific reasons for sociodemographic factors related to receipt of treatment modalities for depression. However,

these differences in modality of treatment for depression likely resulted in differing degrees from patient preference, provider preference, and access to care.

The principal strength of this study is the excellent external validity provided by the nationally representative population-based sampling techniques used in the MEPS database. Our results are also subject to some limitations. First, since we did not have access to the confidential data set that includes the fourth digit of the ICD-9 codes, we defined depression using only its three digit ICD-9 code (ICD-9: 311). We did not include the ICD-9 codes for major depressive disorder (ICD-9: 296.2, 296.3) or dysthymia/neurotic depression (ICD-9: 300.4). As a result, our sample was likely less severely depressed than if major depressive disorder had been included. The less specific ICD-9 codes may have also biased the sample toward patients treated by generalists rather than mental health specialists. However, our research focus on the effects of comorbid chronic medical illness on treatment modality for depression is highly relevant for patients treated by generalists. The lack of public availability for the fourth digit of the ICD-9 codes and the relevance of our research to generalist treating depression justify our choice to use the three digit ICD-9 code for depression (ICD-9: 311). The specificity of the comorbid medical illnesses would also be improved with the fourth digit of the ICD-9 codes.

Second, our definitions of psychotherapy and antidepressant medication did not include lengths of therapy. Treatment with psychotherapy or antidepressant medication was defined respectively as one ambulatory visit for psychotherapy associated with depression or one prescription filled for an antidepressant associated with depression. Thus, these definitions may have led to an overestimation of participants receiving evidence-based treatment for depression. Similarly, we also could not assess effectiveness of treatment for depression. In order to assess the adequacy or effectiveness of treatment, patients would need to be followed over time.

Third, many of the variables are based on self-report, including the diagnosis of depression. Depression is commonly under diagnosed. Previous data have shown that some conditions, particularly mental health conditions, may be under-reported in the household component of the MEPS dataset.

4.1 Conclusion

This nuanced exploration of the relationship between morbidity burden and depression treatment modality in a nationally-representative sample, provides new insight into the relationship between multimorbidity and physician adherence to evidence based treatment strategies. Our finding that multimorbidity was associated with higher rates of combination medical therapy and psychotherapy for depression supports the idea that physician compliance with evidence-based treatments may also be associated with multimorbidity. This finding points to the need for providers to pay particular attention to the possibility of under treatment of depression in persons with few or no comorbidities. Further, this analysis could prove helpful in developing implementation strategies for dissemination of evidence-based approaches to depression care. Some of the demographic differences in treatment modality may relate to issues with access, such as income level and insurance status. Although further research is needed to clarify the exact explanation for therapy modality in individual patients, other differences seem more attributable to patient or provider preference, such as the decrease in use of psychotherapy as age increases. These differences point to the need to take patient preferences as well as access issues into account when implementing evidence-based approaches to care.

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Figure 1. Adjusted Relative Risk of Treatment Modality for Depression by Number of Comorbid Chronic Conditions

Note: Based on multinomial logistic regression using survey results of 10,270 participants over 16 years old with a diagnosis of depression in the Medical Expenditure Survey, adjusting specific comorbid chronic illnesses (diabetes mellitus, coronary artery disease, congestive heart failure, hypertension, and asthma or chronic obstructive pulmonary disease), number of ambulatory visits (excluding psychotherapy visits), gender, age, geographic region, race, ethnicity, marital status, income level, insurance type, education level, and employment status. AD, antidepressant; PsycTx, psychotherapy.

Figure 2. Adjusted Relative Risk of Treatment Modality for Depression by Age

Note: Based on multinomial logistic regression using survey results of 10,270 participants greater than 16 with a diagnosis of depression in the Medical Expenditure Survey, adjusting specific comorbid illnesses (diabetes mellitus, coronary artery disease, congestive heart failure, hypertension, and asthma or chronic obstructive pulmonary disease), number of other comorbid conditions, number of ambulatory visits (excluding psychotherapy visits), gender, geographic region, race, ethnicity, marital status, income level, insurance type, education level, and employment status. AD, antidepressant; Psyc Tx, psychotherapy.

Table 1

Sample Characteristics of Patients with Depression by Treatment Modality

Characteristics	Depression Treatment Modality			
	No Treatment	AD Only	Psyc Tx Only	AD and Psyc Tx
Total Patients with Depression, N (%)	3927 (32.1)	4880 (45.2)	759 (6.7)	1784 (16.0)
Specific Comorbid Chronic Condition				
Diabetes Mellitus, N (%)	416 (21.4)	957 (57.9)	71 (9.8)	277 (14.2)
Coronary Artery Disease, N (%)	98 (20.5)	292 (65.0)	17 (4.2)	57 (10.4)
Congestive Heart Failure, N (%)	55 (18.0)	142 (65.5)	5 (3.3)	29 (13.2)
Hypertension, N (%)	943 (23.4)	2024 (57.9)	155 (4.1)	533 (14.6)
Asthma or COPD, N (%)	457 (27.4)	753 (50.7)	86 (5.0)	277 (16.9)
Number of Comorbid Chronic Conditions other than Depression, Mean (SE)	2.0 (0.1)	3.4 (0.1)	2.3 (0.11)	3.4 (0.1)
Outpatient Visits, Mean N (SE)	6.5 (0.2)	11.6 (0.3)	10.9 (0.8)	14.5 (0.6)
Female, N (%)	2564 (29.7)	3527 (48.1)	482 (6.1)	1228 (16.1)
Age				
16–24	570 (44.8)	258 (24.1)	154 (15.4)	186 (15.7)
25–34	626 (40.3)	469 (32.7)	120 (8.6)	249 (18.4)
35–44	746 (35.7)	767 (39.7)	122 (6.4)	340 (18.2)
45–54	806 (28.5)	1174 (47.9)	144 (5.2)	470 (18.5)
55–64	558 (26.5)	1049 (53.6)	85 (4.5)	317 (15.4)
65–74	237 (22.8)	598 (63.0)	25 (2.6)	113 (11.5)
75–84	117 (29.1)	401 (63.3)	15 (2.4)	35 (5.2)
85	53 (21.2)	145 (72.9)	1 (0)	12 (6.0)
Race				
White, N (%)	3008 (30.0)	4226 (47.6)	577 (6.4)	1481 (16.1)
Black, N (%)	624 (46.3)	437 (29.8)	121 (7.9)	210 (16.0)
Asian, N (%)	100 (54.8)	55 (24.8)	18 (10.3)	25 (10.1)
Other, N (%)	195 (43.5)	162 (32.5)	43 (9.4)	68 (14.6)
Hispanic Ethnicity, N (%)	979 (45.7)	649 (29.5)	166 (9.2)	283 (15.7)
Income Level				
Poor, N (%)	1087 (39.0)	951 (36.1)	219 (7.5)	463 (17.4)
Near Poor, N (%)	315 (35.2)	310 (42.7)	52 (7.0)	136 (15.1)
Low Income, N (%)	680 (33.4)	762 (44.5)	116 (6.0)	289 (16.02)
Middle Income, N (%)	1040 (32.3)	1425 (47.7)	172 (5.6)	417 (14.4)
High Income, N (%)	805 (27.5)	1432 (48.3)	200 (7.4)	479 (16.8)
Insurance Type				
Private Insurance, N (%)	1918 (29.2)	2927 (48.3)	394 (6.8)	946 (15.7)
Public Insurance, N (%)	1175 (29.7)	1560 (44.9)	288 (6.9)	679 (18.5)
Uninsured, N (%)	834 (55.4)	393 (27.9)	77 (5.3)	159 (11.5)
Education Level				
No Degree, N (%)	1055 (39.5)	1050 (42.7)	133 (5.3)	331 (12.5)

Characteristics	Depression Treatment Modality			
	No Treatment	AD Only	Psyc Tx Only	AD and Psyc Tx
High School, N (%)	1785 (31.0)	2522 (49.2)	296 (5.2)	799 (14.6)
Other Degree, N (%)	256 (28.6)	395 (48.0)	46 (6.0)	799 (14.6)
Bachelor, N (%)	371 (30.9)	570 (44.4)	84 (7.1)	227 (17.6)
Post-Graduate, N (%)	188 (27.0)	278 (43.0)	54 (8.4)	147 (21.6)
Employed, N (%)	1525 (34.1)	1784 (45.0)	234 (6.3)	549 (14.6)
Unemployed, N (%)	2040 (29.7)	2920 (47.9)	379 (5.7)	1094 (16.7)
SF 12 Physical Summary Score, Mean [CI]	47.6 [46.9, 48.2]	43.0 [42.4, 43.6]	48.2 [46.9, 49.6]	45.0 [44.1, 45.9]
SF 12 Mental Summary Score, Mean [CI]	42.7 [42.1, 43.2]	42.5 [42.1, 43.0]	39.2 [37.9, 40.6]	37.1 [36.3, 37.9]
K-6 Summary Score, Mean [CI]	7.1 [6.8, 7.3]	7.2 [7.0, 7.4]	8.0 [7.4, 8.6]	9.4 [0.0, 9.8]

Note: Based on 11,350 people surveyed over 16 years old from 2004–2008 who reported having depression. All analyses accounted for complex survey design of the Medical Expenditure Panel Survey. Tx, treatment; AD, antidepressants; Psyc Tx, psychotherapy; %, percent of patients within subpopulation of patients with depression; N, number; CI, confidence interval; SE, standard error; COPD, chronic obstructive pulmonary disease; SF 12, Short Form 12; and K-6, Kessler 6.

Table 2

Association of Comorbid Chronic Conditions and Demographic Factors with Treatment Modality for Depression *

Characteristics	Depression Treatment Modality		
	AD Only RRR [CI]	Psyc Tx Only RRR [CI]	AD and Psyc Tx RRR [CI]
Specific Comorbid Chronic Condition[†]			
Diabetes Mellitus	1.20 [0.98,1.46]	1.23 [0.80,1.87]	1.15 [0.87,1.52]
Coronary Artery Disease	1.06 [0.74,1.52]	1.03 [0.50,2.12]	0.60 [0.39,0.94]
Congestive Heart Failure	1.23 [0.73,2.02]	1.07 [0.24,4.87]	1.04 [0.52,2.10]
Hypertension	1.31 [1.13,1.51]	1.05 [0.80,1.39]	1.06 [0.87,1.29]
Asthma or COPD	0.97 [0.79,1.19]	0.71 [0.50,0.99]	0.80 [0.63,1.04]
Number of Comorbid Chronic Conditions			
None	Reference	Reference	Reference
1	1.59 [1.32,1.91]	1.47 [1.11,1.96]	1.78 [1.38,2.29]
2	2.01 [1.67,2.41]	2.21 [1.59,3.09]	2.77 [2.06,3.74]
3	2.14 [1.70,2.69]	1.97 [1.32,2.92]	3.33 [2.36,4.70]
4	3.06 [2.32,4.04]	2.68 [1.70,4.23]	6.04 [4.15,8.80]
5	2.98 [2.20,4.04]	2.62 [1.57,4.38]	6.80 [4.60,10.06]
Number of Ambulatory Visits (excluding Psyc Tx Visits)	1.02 [1.01,1.02]	1.03 [1.02,1.04]	1.03 [1.02,1.04]
Male	Reference	Reference	Reference
Female	1.37 [1.19,1.57]	0.86 [0.68,1.09]	1.07 [0.90,1.27]
Age			
16–24	0.84 [0.63,1.13]	1.67 [1.10,2.55]	0.70 [0.47,1.03]
25–34	Reference	Reference	Reference
35–44	1.18 [0.95,1.47]	0.74 [0.52,1.04]	1.03 [0.77,1.39]
45–54	1.44 [1.14,1.81]	0.59 [0.42,0.85]	1.01 [0.76,1.33]
55–64	1.36 [1.06,1.75]	0.42 [0.27,0.67]	0.68 [0.49,0.94]
65–74	1.53 [1.08,2.17]	0.22 [0.11,0.44]	0.46 [0.28,0.74]
75–84	1.23 [0.85,1.80]	0.17 [0.08,0.35]	0.17 [0.09,0.32]
85	2.24 [1.33,3.75]	--	0.26 [0.10,0.68]
Region			
Northeast	Reference	Reference	Reference
Midwest	0.95 [0.74,1.21]	0.47 [0.32,0.68]	0.72 [0.54,0.95]
South	1.13 [0.90,1.43]	0.52 [0.36,0.75]	0.65 [0.50,0.84]
West	0.84 [0.65,1.08]	0.54 [0.38,0.76]	0.54 [0.40,0.74]
Race			
White	Reference	Reference	Reference
Black	0.43 [0.35,0.54]	0.76 [0.53,1.07]	0.61 [0.46,0.81]
Asian	0.34 [0.21,0.54]	0.72 [0.34,1.50]	0.47 [0.25,0.87]
Other	0.55 [0.39,0.80]	0.93 [0.56,1.454]	0.53 [0.35,0.80]
Non-Hispanic Ethnicity	Reference	Reference	Reference

Characteristics	Depression Treatment Modality		
	AD Only RRR [CI]	Psyc Tx Only RRR [CI]	AD and Psyc Tx RRR [CI]
Hispanic Ethnicity	0.55 [0.45,0.67]	0.96 [0.66,1.40]	0.86 [0.68,1.13]
Marital Status			
Married	Reference	Reference	Reference
Divorced	0.70 [0.58,0.85]	1.51 [1.09,2.09]	1.10 [0.84,1.42]
Separated	0.65 [0.48,0.89]	1.19 [0.66,2.15]	1.41 [0.93,2.15]
Widowed	0.54 [0.42,0.69]	1.26 [0.72,2.21]	0.52 [0.35,0.78]
Never Married	0.69 [0.56,0.85]	1.24 [0.87,1.77]	1.29 [1.00,1.67]
Income Level			
Poor	Reference	Reference	Reference
Near Poor	1.48 [0.92,2.39]	1.49 [0.92,2.42]	1.37 [1.02,1.84]
Low Income	1.28 [0.83,1.98]	1.30 [0.86,2.00]	1.37 [1.04,1.81]
Middle Income	1.15 [0.75,1.76]	1.10 [0.73,1.65]	1.14 [0.88,1.48]
High Income	1.73 [1.10,2.70]	1.55 [1.00,2.40]	1.40 [1.05,1.88]
Insurance Type			
Private Insurance	Reference	Reference	Reference
Public Insurance	1.08 [0.91,1.28]	1.25 [0.90,1.74]	1.32 [1.03,1.70]
Uninsured	0.48 [0.38,0.61]	0.47 [0.30,0.72]	0.57 [0.42,0.78]
Education Level			
No Degree	Reference	Reference	Reference
High School	1.21 [1.00,1.45]	1.26 [0.91,1.74]	1.34 [1.05,1.71]
Other Degree	1.22 [0.90,1.62]	1.60 [1.01,2.54]	1.64 [1.41,2.36]
Bachelor	1.06 [0.81,1.39]	1.69 [1.02,2.81]	1.69 [1.20,2.37]
Post-Graduate	0.96 [0.70,1.32]	2.13 [1.24,3.65]	2.02 [1.29,3.15]
Unemployed	Reference	Reference	Reference
Employed	0.98 [0.83, 1.16]	0.80 [0.60,1.07]	0.70 [0.56,0.86]

Note: Based on 10,270 people surveyed over 16 years old from 2004–2008 who reported having depression. Patients with missing variables were excluded from the analysis. Tx, treatment; AD, antidepressants; Psyc Tx, psychotherapy; RRR, relative risk ratio; N, number; CI, confidence interval; SE, standard error; COPD, chronic obstructive pulmonary disease.

* Relative risk ratios were determined from a single multinomial logistic regression analysis. The single regression model considered treatment group (antidepressant only, psychotherapy only, antidepressant and psychotherapy, no treatment) as a categorical variable where 'no treatment' served as the reference group.

† Reference for each chronic illness is no diagnosis of each chronic illness