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Antidepressant Use, Depression, and New Onset Diabetes among Elderly Medicare Beneficiaries

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Abstract

Objective—To examine the association between antidepressant use, diagnosed depression, and new onset diabetes among elderly Medicare beneficiaries.

Materials and Methods—Longitudinal data from merged survey and claims from the nationally representative Medicare Current Beneficiary Survey(MCBS) from 1999–2005 were used. Diabetes incidence was extracted from claims and survey data over a 3-year period. Depression and antidepressant use data were obtained over time. Multivariable logistic regressions were used to examine association between antidepressant use, depression, and new onset diabetes, adjusted for demographic, socioeconomic, and lifestyle risk factors. Analyses accounted for complex design of MCBS.

Results—Incident diabetes rate was 4.8% for those "without depression and without antidepressants" and 9.5% for those with any antidepressant use in all 3-years and diagnosed depression. Compared to Medicare beneficiaries who did not report any antidepressant use, beneficiaries reporting antidepressant use in all 3-years were 50% more likely to have new onset diabetes. However, when diagnosed depression was entered in the model, we did not observe a statistically significant association between long-term antidepressant use and new onset diabetes. Medicare beneficiaries with any depression were twice as likely as those without depression to develop diabetes(AOR = 2.04, [1.51, 2.75).

Conclusion—Depression could independently increase risk of developing diabetes, while there is no evidence of association between antidepressants and new onset diabetes. If replicated, these results have significant clinical implications.

The significant finding of the study—We found increased diabetes risk among Medicare beneficiaries with depression.

This study adds—Long-term use of antidepressants in the absence of depression increases risk of diabetes.

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Keywords

Diabetes; Elderly; Antidepressants; Depression; Epidemiology

INTRODUCTION

Antidepressant medication is the most commonly prescribed medication in the United States, doubling in use from 5.8% in 1996 to 10.1% in 2005.[1] An emerging concern is that antidepressants may increase risk for type 2 diabetes.[2–4] Interestingly, rates of antidepressant use for depressive disorders remained the same during this period, while antidepressant use for those without depression (referred here-after as *other* use) increased,[1] raising questions about the relationship between antidepressants and diabetes incidence among those without depressive disorders.

There is mixed evidence in the literature regarding antidepressant use and the risk of type 2 diabetes. For example, in a clinical trial designed to prevent diabetes, a sub-analysis of data revealed baseline use of antidepressants, either singularly or in combination, was independently and significantly associated with increased risk of developing diabetes.[3] While mechanisms of relationship between incident diabetes and antidepressants were not known from this study, analyses were controlled for a comprehensive list of diabetes-risk factors.[3] In the same study, a second sub-analysis demonstrated elevated depression scores derived from the Beck Depression Inventory at baseline or during the study were not associated with increased diabetes risk, suggesting depression may not have been the causal pathway.

Similar results of association between antidepressant use and the risk of diabetes have been reported in studies with longer follow up periods. For example, a recent study[5] extending the clinical trial reported on above,[3] included a longer follow up period than the previous study (7 years versus 3.2 years) and found that when diabetes-risk factors were controlled for, continuous use of antidepressants was strongly associated with diabetes onset. Similarly, another longitudinal study followed 2,391 individuals diagnosed with depression treated with antidepressants for an average of 4 years and found combined use of selective serotonin reuptake inhibitors(SSRI) and tricyclic antidepressants(TCA) was associated with a significantly increased risk of diabetes(AOR:1.89; 95% CI:1.35–2.65) compared to TCA mono-therapy.[2] It is possible SSRIs may increase serum TCA levels, increasing risk and/or severity of side effects.[6] Additive and/or amplified side effects such as weight gain or somnolence may also contribute to diabetes risk.[7] Combination therapy with an SSRI and a TCA might indicate more severe and/or treatment-resistant depression, thus potentially stronger depression-associated diabetogenic behaviors. Another study reported taking moderate to high daily doses of antidepressants for more than 2 years was associated with an 84% increased risk for diabetes[4]; increased risk was particularly notable for the paroxetine, a SSRI, and amitriptyline, a tricyclic antidepressant. Pan et al.[8] also found antidepressant use was associated with an increased risk of diabetes in 3 cohorts (one consisting of males and two of females) in age-adjusted models (pooled HR 1.68 [95% CI 1.27, 2.23]); both SSRIs and TCAs were associated with the elevated risk of diabetes. Similarly, a recent study found postmenopausal women with depressive symptoms, who were also taking antidepressants, were at a greater risk of developing new onset diabetes.[9] Specifically these researchers found long-term use (i.e. 3 year) of antidepressants demonstrated a more striking elevated risk of new onset diabetes whether or not the risk was present at baseline. However, despite these studies, antidepressant use also been shown to be not been associated with an increased risk of diabetes in other studies,[10, 11] particularly in the elderly. In fact, studies report that depression and its related symptoms constitutes a significant risk factor in the

development of type 2 diabetes and may hasten the onset of diabetes.[12] For example, Eaton el al.[13] report a RR of 2.23, 95% [CI .90–5.55] of antecedent depression and subsequent risk of type 2 diabetes in a large catchment area survey of 1,715 men and women, and Everson-Rose et al[14] report HR: 2.31, 95% [CI: 103–5.20] for depressed African American women in a study of 2,254 middle-aged women. In a prospective study of adults over 65 years, individuals with depressive symptoms were at least twice as likely to develop diabetes as those without depressive symptoms, regardless of antidepressant use.[10, 11] The differences in findings illustrates that the relationship between diabetes incidence and antidepressant use is not clearly established. The variation may be perhaps due in part to differences in study populations; in some studies authors could not assess risk of diabetes in individuals without depression or assess untreated depression,[2, 4] nor could they assess risk of developing diabetes in patients prescribed antidepressants with clinically diagnosed depression;[11]

Studies do not specifically report diabetes incidence and antidepressants in elderly cohorts. Thus, the primary objective of the present study is to analyze the association between antidepressant use, depression, and risk of new onset diabetes using longitudinal data from the Medicare Current Beneficiary Survey (MCBS), a nationally representative survey of elderly individuals enrolled in Medicare.

METHODS

Data

Data are from multiple years of linked interview, self-reported pharmaceutical data, and Medicare claims from MCBS for years 1999 through 2005. Survey information on dispensed prescriptions, demographics, socioeconomic status, access to care, and other patient characteristics were extracted from MCBS Cost and Use (MCBS-CU) files. MCBS is a nationally representative survey with rotating longitudinal design (Medicare beneficiaries interviewed for 12 rounds, 3 times a year and followed over a period of 4 years to obtain 3-years of data). MCBS provides information on health status, healthcare use and expenditures, health insurance coverage, and socioeconomic and demographic characteristics of the entire spectrum of Medicare beneficiaries[15]. MCBS-CU files link Medicare claims to survey-reported events providing complete expenditure and source of payment data on all healthcare services, including those not covered by Medicare.[16] We derived five longitudinal panels(1999–2001; 2000–2002; 2001–2003; 2002–2004; 2003–2005).

Study Sample

The present study included elderly Medicare beneficiaries aged 65 years or older and *who were diabetes-free* at baseline year of each of the longitudinal panels. The study sample was limited to community dwelling individuals who had survey information for all 3-years and who were continuously enrolled in Medicare after the first round of interview. We included only individuals who lived in the community as detailed pharmacy information was collected only for those who completed the interview in the community. Data on individuals who were not followed all 3-years were not included to ensure a uniform observational period and to derive measures of long term antidepressant utilization. We also excluded individuals who developed diabetes in the second year.

Measures

Dependent Variable: Incident Diabetes—For each panel, we combined both Medicare claims and survey data. New onset diabetes was ascertained using International Classification of Diseases, 9th Edition, Clinical Modification codes and from a survey question on whether the doctor has ever told of the presence of diabetes.[17] Calculation of

duration was not possible using self-reported data. Therefore, we didn't use duration models to examine the relationship between antidepressant use and incident diabetes.

Key Independent Variables

Antidepressant use: Antidepressant use was derived from self-reported prescription drug data. To minimize recall bias, MCBS conducts interviews at 4-month intervals. We used drug names to identify antidepressants. Drugs included in the class of antidepressants were selective serotonin reuptake inhibitors (SSRI); serotonin/norepinephrine reuptake inhibitors (SNRI); tricyclics (TCA); tetracyclics; monoamine oxidase inhibitors (MAOI) and others.[18] We didn't use pharmacy claims since Medicare Part D was enacted only in 2006. We measured antidepressant use every year and over time. Individuals who didn't report any antidepressant over all 3-years were considered as having “no antidepressant use”; individuals who reported any antidepressant use in any one or two but not all three years were considered as having “short-term” use and individuals who reported any antidepressant use in all three years were considered as having “long-term” use. Note, when antidepressant use was measured over time, nearly 70% of beneficiaries reported 3 or more prescriptions in each year and the average number of prescriptions was 7.

Depression: For each year individual, for each year of observation, we defined depression based on ICD-9-CM codes recorded in medical claims. The ICD-9-CM codes we used were 296.2 (major depressive disorder, single episode), 296.3 (major depressive disorder, recurrent episode), 300.4 (neurotic depression), 309.1 (prolonged depressive reaction), and 311 (depression, not elsewhere classified). These codes were used to identify diagnosed depression in a prior published study.[19] For the purposes of current analysis, we combined depression diagnosis in all the years and defined presence or absence of depression in any of the observations years.

Combined Measure of Antidepressant Use and Depression—Using diagnosed depression and long-term use of antidepressants we derived 6 categories for measuring the interaction between depression and antidepressant use. These were: (1) No depression over a 3 year period and no antidepressant use over a 3-year period; (2) No depression over a 3-year period and short-term antidepressant use; (3) No depression over a 3-year period and long-term antidepressant use; (4) Depression and no antidepressant use; (5) Depression with short-term antidepressant use; and (6) Depression with long-term antidepressant use.

Other Independent Variables

Included individuals' demographic, socioeconomic, insurance coverage, health status, and other characteristics. Information from administrative files was used to determine gender of participants. Age: categorized into four groups: less than 65 years, 65–69 years, 70–74 years, and 75 and older. Race/ethnicity: categorized into White, African American, Latino, and other. Socioeconomic characteristics consisted of education, insurance (pharmacy) coverage, and poverty status. Poverty status was expressed in terms of federal poverty lines. Individuals with incomes below 200% of the poverty line were defined as “low income”. Prescription drug insurance coverage was derived from survey responses on drug coverage in addition to Medicare. These included five possible private plans, Medicaid, and other public plans. For each year, if the individual had any one of these plans, an indicator variable was created to reflect any prescription drug coverage during the year. Health perceptions were obtained by a standard self-reported health item. Physical functional status was measured by participation levels in activities of daily living tasks (ADLs) and instrumental activities of daily living (IADLs). Lifestyle risk factors were measured by presence of heart disease, hypertension, body mass index (BMI) categories and current smoking status. A BMI of less than 25 kg/m^2 indicates the individual is underweight or

normal; a BMI in the range of 25 to 29.9 kg/m^2 indicates the individual is overweight; and a BMI greater than 30 kg/m^2 indicates the individual is obese.[20] Smoking status was categorized into current smoker, past smoker, and never smoked.

Statistical analyses

Chi-square statistics were used to compare new onset diabetes rates among antidepressant use/depression groups. Multivariable logistic regression analyses were conducted to examine the relationship between antidepressant use/depression and incident diabetes. In these regression analyses, independent variables were entered in blocks: in the first block we used antidepressant use as the only independent variable (model 1a); in the second block antidepressant use and diagnosed depression were independent variables (model 1b) and in the third block we additionally entered gender, race/ethnicity education, poverty status, prescription drug insurance, health status, functional status, body mass index, smoking, presence of heart disease and hypertension (model 1c). Parameter estimates from the logistic regression analyses were converted to adjusted odds ratios (AOR) and their associated 95% confidence intervals. In all our analyses, we considered p-values less than 0.05 as statistically significant.

It has to be noted for disease incidence greater than 10%, the AOR may not accurately represent the risk ratio.[21] However, conversion of our AORs to risk ratios using the methods given by Zhang and colleagues[21] suggest our AORs approximate risk ratio. Therefore, in our discussion, we use AOR and relative risk (comparison of the probabilities of diabetes incidence in two groups) interchangeably. For each longitudinal panel, we used the weight in the baseline year. All analyses accounted for the complex survey design and were conducted using SAS 9.2.[22]

RESULTS

Table 1 describes the study sample characteristics. There were 58.8% women; 83.5% were whites; 6.6% were African Americans; and 6.0% were Latino. Nearly one-third (31.9%) were in the age group 65–69 years. Only 20.2% perceived their health status as excellent. A majority of the elderly sample was either overweight or obese.

Table 1 also summarizes characteristics of the study sample by antidepressant use status. Over a 3-year period, 81.5% didn't report any antidepressant use; 10.3% reported use in one or two years and 8.3% reported use in all three years. There were statistically significant differences in antidepressant use by all independent variables (except age and education) included in the study (e.g., gender, race/ethnicity, prescription drug coverage, and others). When we examined antidepressant use and depression, in absence of depression, 13.6% beneficiaries reported antidepressant use; 8.2% beneficiaries reported some years use of antidepressants and 5.4% beneficiaries reported using antidepressants in all three years of the observation period. Among those with depression, 31.4% reported not using any antidepressants, 30.9% in some years, and 37.6% reported using any antidepressants in all 3 years.

Overall, by the end of 3-years, 5.7% either reported or were newly diagnosed with diabetes (Table 2). Analysis of diabetes incidence by various measures of antidepressant use and depression indicated a significantly higher proportion of Medicare beneficiaries with antidepressant use or with depression had incident diabetes compared to those without antidepressant use or depression. For example, compared to those without any antidepressant use in year 1 (5.2%), a higher percentage of individuals with antidepressant use had incident diabetes (6.1%), which was not statistically significant (p = 0.096). For those with antidepressants in years 2 and 3, a higher proportion of elderly Medicare

beneficiaries had new onset diabetes compared to those without any antidepressant use (5.0% versus 6.7% in year 2 and 5.0% versus 6.7% in year 3).

Those who reported depression in year 1 had higher rate of incident diabetes (4.8%) compared to those with no depression in any of the 3-years (9.7%). We observed similar findings for years 2 and 3.

When we combined antidepressant use with any depression, we found diabetes incidence was 4.8% for those with no antidepressant use and no depression and highest among those with short-term antidepressant use with depression (10.7%) followed by those with long-term antidepressant use without depression (9.5%); 8.9% for those with depression no antidepressant use.

The odds ratios (OR), adjusted odds ratios (AOR) and 95% confidence intervals (CI) from logistic regressions on incident diabetes and alternative specifications of antidepressant use and self-reported depression are summarized in Table 3. In the unadjusted model, elderly Medicare beneficiaries with long-term use of antidepressants were 50% more likely to have incident diabetes (OR=1.50; 95% CI=1.12, 2.00) compared to beneficiaries without any antidepressant use. When we entered diagnosed depression during the follow up period, the relationship between antidepressant use and new onset diabetes was no longer statistically significant. However, depression was independently associated with new onset diabetes (AOR = 2.07; 95% CI = 1.53,2.80).When we controlled for all other independent variables: gender, race/ethnicity, age, education, poverty status, functional status, health status, body mass index categories, smoking, and medical history of hypertension, the findings remained similar. Individuals who reported depression twice as likely as those without depression to have incident diabetes (AOR=2.04, 95%CI=1.51, 2.75).

Logistic regression with combined antidepressant use over time and depression over time showed individuals with depression regardless of antidepressant use were more likely to develop new onset diabetes. The AORs for depression with no antidepressant use, short-term antidepressant use and long-term antidepressant use were 1.81, and 2.22. All the AORs were statistically significant at 5% level.

DISCUSSION

As stated in the introduction, the relationship between antidepressant use and incident diabetes is not clearly established. Three previous studies have demonstrated antidepressant medication may increase risk new onset diabetes.[2–4] As the rates of *other* antidepressant use increase,[1, 23] it is critical to understand the role of combined versus an independent effect of depression status and antidepressant medication use on the risk of incident diabetes. Our study presents new data through our examination of interactive effects between reported depression and antidepressant use. By using alternative classification schemes of depression and antidepressant use over time, we were able to analyze the independent effect of long-term use of antidepressants and depression on incident diabetes.

A potential clinically significant finding is the increased diabetes risk among Medicare beneficiaries with depression. We found this was robust in alternative specifications of the models. In terms of unadjusted rates, these individuals had a 9.7% incidence of new onset diabetes as compared with 4.8% of those without depression. This is clearly a large, clinically meaningful increase in new onset diabetes. However, due to sample size limitation, we were unable to further examine type of antidepressant medications to determine whether there is some variation in new onset diabetes related to chronic depression.

Findings from our study also extend prior literature in the association between depression and incident diabetes. The link between depression and diabetes has been reportedly bidirectional. A recent meta-analysis of studies examining this link concluded that while depression is associated with a 60% increased risk of type 2 diabetes; type 2 diabetes was associated with only modest increased risk of depression.[24] Our study findings are consistent with recently published article by Campayo and colleagues who reported incident diabetes was associated with persistent depression.[10] Our findings of a statistically significant relationship between depression and new onset diabetes highlights the importance of monitoring individuals with depression for long periods of time to early diagnosis of incident diabetes. Preventing depression may not only deter onset of diabetes but also reduce the overall burden as persistent depression can be highly debilitating.[25]

Strengths of our study include the use of nationally representative data on a large number of elderly Medicare beneficiaries, comprehensive information obtained from the survey and Medicare claims, a large number of relevant covariates and longitudinal cohorts with 3-years data. However, a number of study limitations need consideration. This was not a prospective experimental study and therefore suffers from limitations of a retrospective observational design. For example, antidepressant users may be different from non users in both observed and unobserved characteristics. Therefore, we could not rule out the effect of unmeasured selection bias and access to care differences between users and non-of antidepressants. Furthermore, the data were not collected for the purpose of identifying the link between antidepressant use, depression, and incident diabetes. Many of the variables were collected through self-reports and highly prone to recall bias. For example, prescription drug use was derived from self-reports and these have been shown to be vulnerable to under reporting.[26] Although efforts were taken to minimize bias in self-reported pharmacy data, preliminary results from a validation study suggest that there is an underreporting rate of approximately 15 –18% in MCBS.[26]

We were unable to quantify depressive symptoms scores to distinguish between treatment resistant and low grade depression. Although we could not exclude those with type-1 diabetes, we expect most of new incidence of diabetes to be type 2 diabetes because we focused only on elderly aged 65 years or older, participants with prevalent diabetes at baseline were also excluded. Also, antidepressant use was aggregated for the whole year and was not linked to episodes of depression. Significant under-treatment of depression has been shown in non-institutionalized elderly Medicaid population, especially among African Americans. This would be meaningful given differences in diabetes prevalence across racial-ethnic groups.[27] Even with extensive controls for access to care (supplemental insurance, prescription drug coverage), it is possible “no antidepressant use” may reflect access-to-care problems leading to undiagnosed diabetes and lower rates of diabetes in those without antidepressant use.

Despite these limitations, our study adds to literature that has begun to explore the relationship between antidepressant use and its unintended consequences. Findings suggest depression with or without antidepressant use may be associated with risk of new diabetes in a sample of older Medicare beneficiaries, most of who reported their health at baseline was good or excellent. Currently, the relationship between incident diabetes and antidepressant use is unclear and studies have not conclusively demonstrated a negative relationship between antidepressant use and incident diabetes due to differing populations, methods, and measures. Our study was conducted among beneficiaries seeking care in “real world” settings; future studies are needed to validate our study findings.

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Table 1

Description of Sample Characteristics by Antidepressant Use Medicare Current Beneficiary Survey, 2001–2005

	Total Sample		Antidepressant Use			
			No	Short-term	Long-Term	Sig
	N	Wt %	Wt%	Wt%	W%	
ALL	**10,134**	**100.0**	**81.5**	**10.3**	**8.3**	
General Health						***
Excellent	1,954	20.2	89.4	6.7	3.9	
Very good	3,226	32.8	84.8	8.9	6.2	
Good	3,230	31.3	80.8	10.3	8.9	
Fair	1,336	12.4	68.7	15.9	15.3	
Poor	349	3.2	53.6	24.1	22.3	
Functional Status: ADL [a]						***
Not limited	7,719	78.7	84.6	8.8	6.6	
1–2	1,739	15.7	72.1	14.5	13.4	
3 and above	667	5.6	63.5	19.3	17.2	
Body Mass Index Category						**
Under/Normal	4,540	43.5	81.1	11.1	7.7	
Overweight	3,951	39.8	82.7	9.2	8.1	
Obesity	1,578	16.7	79.2	10.7	10.1	
Smoking Status						
Current smoker	1,116	11.8	79.4	12.1	8.5	
Past smoker	4,761	47.2	82.1	9.7	8.2	
Never smoked	4,243	41.0	81.4	10.4	8.2	
Hypertension						***
No	4,701	47.6	84.3	9.3	6.3	
Yes	5,433	52.4	78.8	11.1	10.1	
Depression						***
No	9,191	91.1	86.4	8.2	5.4	
Yes	625	5.8	31.4	30.9	37.6	

Note: Analytic sample consists of Medicare beneficiaries who were followed for 3-years and were first interviewed either in 1999, or 2000 or,2001 or 2002 or 2003, lived in the community.

Asterisks represent significant group differences between antidepressant use and subject characteristics based on chi-square tests. Long-term use represents antidepressant prescriptions reported for all 3-years; short-term use represents antidepressant prescriptions reported in one or two years.

Wt: Weighted. HS: High School

[a]ADL: Activities of daily living;

***p < .001;

**.001 ≤ p < .01;

*.01 ≤ p < .05

Table 2

Percent with Incident Diabetes by Antidepressant Use and Depression Measures Medicare Current Beneficiary Survey, 2001– 2005

	N	Wt%	Sig
ALL	**385**	**5.7**	
Antidepressants Over Time			*
None	408	4.9	
Short term use	68	6.2	
Long term use	59	7.0	
Depression Year 1			
No	507	5.2	
Yes	28	6.1	
Depression Year 2			***
No	496	5.0	
Yes	39	10.2	
Depression Year 3			*
No	486	5.0	
Yes	49	10.1	
Depression Over Time			***
No	448	4.8	
Yes	87	9.7	
Antidepressants (AD) & Depression Over Time			***
No depression and no AD use	382	4.8	
No depression and short-term AD use	38	4.6	
No depression and long-term AD use	28	5.3	
Depression and no AD use	26	8.9	
Depression and short-term AD use	30	10.7	
Depression and long-term AD use	31	9.5	

Note: Based on 10,134 elderly Medicare beneficiaries aged 65 or older and who were followed for 3-years and were first interviewed either in 1999 or 2000 or 2001 or 2002 or 2003 and lived in the community. Asterisks represent significant group differences between antidepressant use and subject characteristics based on chi-square tests. Long-term use represents antidepressant prescriptions reported for all 3-years; short-term use represents antidepressant prescriptions reported in one or two years. Depression overtime represents presence of depression in any one of the 3 years.

AD: Antidepressants; Wt: Weighted.

*** $p < .001$;

** $.001 \leq p < .01$;

* $.01 \leq p < .05$

$.05 \leq p < .10$

Table 3

Adjusted Odds Ratios and 95% Confidence Intervals from Multiple Logistic Regressions on Incident Diabetes Medicare Current Beneficiaries Survey, 2001 – 2005

	Model 1: Separate Variables for Antidepressant Use and Depression								
	Model la			Model lb			Model lc		
	OR	95% CI	Sig	AOR	95% CI	Sig	AOR	95% CI	Sig
Antidepressants Use									
None (Reference Group)		-			-				
Short-term	1.28	[0.97, 1.69]		1.04	[0.77, 1.39]		0.95	[0.71, 1.27]	
Long-term	1.50	[1.12, 2.00]	**	1.09	[0.79, 1.51]		0.91	[0.66, 1.26]	
Depression									
No (Reference Group)		-						-	
Yes				2.07	[1.53, 2.80]	***	2.04	[1.51, 2.75]	***
MODEL 2: Combined Antidepressant Use and Depression									
No depression and no Antidepressant Use (Reference Group)	-								
No depression and short-term									
Antidepressant Use No Depression and long-term							0.84	[0.57, 1.25]	
Antidepressant use Depression and no							0.95	[0.63, 1.43]	
Antidepressant use							1.81	[1.12, 2.94]	*
Depression and short-term Antidepressant use							2.22	[1.50, 3.28]	***
Depression and long-term Antidepressant use							1.76	[1.18, 2.64]	**

Note: Based on 10,134 elderly Medicare beneficiaries aged 65 or older and who were followed for 3-years and were first interviewed either in 1999 or 2000 or 2001 or 2002 or 2003 and lived in the community. Asterisks represent significant group differences between the reference group and other groups.

Model 1a is an unadjusted model with only antidepressant use as the independent variable.

Model 1b included antidepressant use and diagnosed depression as the independent variables.

Model 1c included additionally controlled for gender, race/ethnicity education, poverty status, prescription drug insurance, health status, functional status, body mass index, smoking, presence of heart disease and hypertension.

Model 2 is ?

All logistic regression models included intercepts.

Long-term use represents antidepressant prescriptions reported for all 3-years; short-term use represents antidepressant prescriptions reported in one or two years. Depression represents presence of depression in one or more years.

OR : Odds ratio; AOR: Adjusted odds ratio

*** p <.001;

** .001 ≤ p < .01;

* .01 ≤ p < .05