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Estimating ethnic differences in self-reported new use of antidepressant medications: results from the Multi-Ethnic Study of Atherosclerosis

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Abstract

Introduction—There is evidence that the utilization of antidepressant medications (ADM) may vary between different ethnic groups in the United States population.

Methods—The Multi-Ethnic Study of Atherosclerosis is a population-based prospective cohort study of 6,814 US adults from 4 different ethnic groups. After excluding baseline users of ADM, we examined the relation between baseline depression and new use of ADM for 4 different ethnicities: African-Americans (n=1,822), Asians (n=784) Caucasians (n=2,300), and Hispanics (n=1,405). Estimates of the association of ethnicity and ADM use were adjusted for age, study site, gender, Center for Epidemiologic Studies Depression Scale (CES-D), alcohol use, smoking, blood pressure, diabetes, education, and exercise. Non-random loss to follow-up was present and estimates were adjusted using inverse probability of censoring weighting (IPCW).

Results—Of the four ethnicities, Caucasian participants had the highest rate of ADM use (12%) compared with African-American (4%), Asian (2%) and Hispanic (6%) participants. After adjustment, non-Caucasian ethnicity was associated with reduced ADM use: African-American (HR: 0.42; 95% Confidence Interval (CI):0.31– 0.58), Asian (HR: 0.14; 95%CI: 0.08–0.26) and Hispanic (HR: 0.47; 95%CI: 0.31–0.65). Applying IPCW to correct for non-random loss to follow-up among the study participants weakened but did not eliminate these associations: African-American (HR: 0.48; 95%CI: 0.30–0.57), Asian (HR: 0.23; 95% CI: 0.13–0.37) and Hispanic (HR: 0.58; 95%CI: 0.47–0.67).

Conclusion—Non-Caucasian ethnicity is associated with lower rates of new ADM use. After IPCW adjustment, the observed ethnicity differences in ADM use are smaller although still statistically significant.

Keywords

Inverse probability of censoring weighting; ethnicity; antidepressants; drug utilization; Multi-Ethnic Study of Atherosclerosis; non-random loss to follow-up

INTRODUCTION

It has been reported that the use of antidepressant medications varies between different ethnic groups in the United States (US) population [1,2]. Both the National Health and Nutrition Examination Survey and the Medical Expenditure Panel Survey reported a lower rate of antidepressant use among participants with a non-Caucasian ethnicity than among Caucasian

participants [1,2]. It has been suggested by Paulose-Ram and colleagues that this difference in antidepressant utilization might indicate under-utilization of these drugs among non-Caucasian participants [1].

Data from other countries show lower rates of antidepressant use at the population level [3] than the US despite similar levels of depression. There is also evidence that factors other than depressive symptoms (such as age and gender) can be important independent predictors of antidepressant use [4]. So it is possible that some ethnic groups might be systematically over-treated and suffer a higher burden of side effects while other ethnic groups are undertreated.

A careful description of the pattern of use by ethnicity in the US could better inform the debate as to the proper prescribing of these medications. In particular, it is important to test the extent to which different levels of utilization of antidepressant medications in sub-populations might be explained by a higher baseline level of reporting of depressive symptoms. To the extent that underlying difference in the prevalence of these symptoms of depression between ethnic groups do not explain the differences in medication use then these findings may motivate additional research into whether the current level of treatment is optimal for each ethnicity.

The objective of this study was to investigate the rate of new antidepressant use by ethnicity in a multi-ethnic population cohort that is unselected for clinical depression status and unexposed to antidepressant medications at baseline.

MATERIALS AND METHODS

The Multi-Ethnic Study of Atherosclerosis (MESA) is a population-based study intended to determine the risk factors for the development and progression of subclinical and clinical cardiovascular disease [5]. This prospective cohort study consisted of 6,814 participants between the ages of 45 and 84 years of age at baseline. These participants were recruited from six different MESA field centers across the United States: Baltimore, MD; Chicago, IL; Forsyth County, NC; Los Angeles County, CA; New York, NY and St. Paul, MN. MESA was approved by the institutional review boards of the participating study sites and the data coordinating center. The MESA study categorized all participants into four ethnic groups: African-American, Asian (principally Chinese-American), Caucasian, and Hispanic based on the categories from the 2000 census questionnaire [5].

Participants with a self-reported history of either prevalent cardiovascular disease or previous surgery for cardiovascular disease were excluded from the MESA study. We also excluded 503 participants from this report due to baseline use of antidepressant medications.

There have been four assessments of the MESA participants to date: a baseline visit and 3 follow-up visits. The baseline occurred between July 2000 and April 2002 and included psychological tests. The first follow-up exam was conducted between September 2002 and January 2004. The second follow-up exam was between March 2004 and July 2005. The third follow-up exam was between September 2005 and June 2007.

Medication use was determined at each assessment using a previously validated medication inventory approach [6]. The method of medication inventory involves transcribing information about drug names and doses from prescription bottles which participants are asked to bring to the interview [6]. Antidepressant medications were grouped into four classes on the basis of transcribed medication name: tricyclic (TCA), selective serotonin reuptake inhibitor (SSRI), selective norepinephrine reuptake inhibitor (SNRI), or "Other" (Bupropion, Mirtazapine, Nefazodone, and Trazadone). The specific medication classes reported by MESA participants over the course of this study are shown in Table 3.

The baseline MESA data included scores from the Center for Epidemiologic Studies Depression Scale (CES-D) on the participants [7]. This is a 20-item self-report questionnaire covering self report of depressed mood, feelings of worthlessness, feelings of hopelessness, poor concentration, loss of appetite, and sleep disturbance. Higher scores on the CES-D suggest more evidence of depression; in previous work, a CES-D score of ≥ 16 was proposed as being an indicator of possible depression [8] consistent with previous validation work [9]. In the MESA study population, the CES-D was administered in English, Spanish, Cantonese, and Mandarin at baseline. In addition to self-reported depression scales, baseline MESA data also included self-reported measures of anger [10] and anxiety [11] using the Spielberger anger and anxiety scores [12]. Of the 6814 participants in the MESA cohort, 6778 had a valid CES-D score. The participants who did not provide this information were either Caucasian (n=15) or African-American (n=21). We chose to use the standard 19-item version of the CES-D score instead of other alternatives to maximize comparability with other cohort studies that have also reported CES-D scores and due to the specific questions asked in the MESA study [13].

Statistical Analysis

A Cox proportional hazards model [14] was used to estimate the hazard ratio (HR) for participants with a non-Caucasian ethnicity starting an antidepressant medication. The cohort was restricted to participants who did not use antidepressant medications at baseline (defined as use within 2 weeks of the baseline exam). We used visit as our time scale for the Cox model. We chose visit as a time scale as this is the scale on which data was collected and visit interval was reasonably uniform between participants. Therefore, the time to event that we are estimating was defined as the number of visits until new use of antidepressant medication was reported. Ties in time to event due to multiple participants reporting new use at the same visit were handled using Breslow's method [15] as exact methods were not available due to the use of weights. Estimates of the HR parameters were adjusted for potential confounders, including baseline age, study site, gender, CES-D, alcohol use (drinks per week), smoking (never, ex-smoker, current smoker), blood pressure, impaired glucose (but not diabetic) or diabetes by the 2003 American Diabetes Association fasting criterion, education (less than high school vs. high school or above), exercise (hours per week, both intentional and unintentional, of any intensity), and ethnicity. We examined the relation between CES-D score and new medication use to verify that this relation was linear on the log scale. As alternative modeling options, we considered (and rejected) quadratic models as well as treating CES-D as a threshold effect. We tested for interactions between ethnicity and time to verify that the proportional hazards assumption was a reasonable approximation; no interaction between ethnicity and time was significant at the $p=0.05$ level.

As depressed participants may be more likely to be lost to follow-up, inverse probability of censoring weighting (IPCW) was used to account for non-random loss to follow-up [16–17]. The IPCW model was developed from a logistic regression model with censoring over the course of the MESA study as the dependent variable. The independent variables were all candidate risk factors for the outcome (new use of an antidepressant medication) and thus intended to correct for imbalances in risk factor distribution between those who were censored and those who were not. Estimates that are not corrected for IPCW assume that participants who are lost to follow-up are lost at random [14]; this assumption can create bias if participants who are either at high or low risk of the outcome are more likely to be lost to follow-up as it is inappropriate to estimate their risk of the outcome as being the cohort average risk. The IPCW technique does depend on the assumption that the observations are missing at random and that missingness, itself, does not depend on censoring status [17]. The decision to develop the probability of censoring models using variables that were predictors of the outcome (new antidepressant use) was due to concerns that, in analogy to examples seen with inverse probability of treatment weighting, including pure predictors of censoring could decrease the

accuracy of the estimates [18]. The less than 1% of missing baseline data was handled using multiple imputation [19] which has been previously recommended as an alternative to inverse probability weighting for missing covariate data (as opposed to loss to follow-up) in longitudinal studies [20]. Interaction terms were used to test for interactions between sex or ethnicity and CES-D score. All statistical tests were two-sided and considered to be significant at the $p=0.05$ level. All analyses were done in SAS version 9.1.3.

RESULTS

Table 1 reports the characteristics of the 6311 MESA participants who did not report antidepressant medication use at study baseline. The mean level of CES-D score among the study participants was 7.3 with a range from 0 to 53. Approximately 7% of participants reported taking an antidepressant medication during follow-up. In addition, 22% of participants did not complete all exams during the MESA study and were treated as lost to follow-up. This rate is higher than the 13% lost to follow-up rate in the overall MESA study, due to single missed visits and deaths.

Table 2 shows that there were some differences in loss to follow-up among different ethnicities. Hispanic and African American participants were more likely to be lost to follow-up than Asian and Caucasian participants. Of the four ethnicities, the highest level of baseline depression as measured by CES-D score was among Hispanic participants (8.9) with lower scores for African-American (7.0), Asian (6.2) and Caucasian (6.3) participants. Mean CES-D scores of participants lost to follow-up were higher: African-American (7.8), Asian (6.2), Caucasian (7.7) and Hispanic (10.2).

Table 3 shows the distribution of antidepressant medication types in this new user population. The most commonly prescribed agents were: Sertraline (18%), Escitalopram (14%) and Amitriptyline (10%) while the most commonly prescribed class of antidepressants was SSRIs (55%). While it is difficult to determine the association between ethnicity and specific antidepressant class, the absence of Bupropion (often prescribed for smoking cessation [21]) among Asian participants is interesting. Table 4 shows that CES-D score at baseline and ethnicity are each separately associated with loss to follow-up in the MESA study. Because of these associations, the estimates presented in Table 5 were adjusted for non-random loss to follow-up.

Table 5 shows the association between ethnicity and new use of antidepressant medications, both before and after applying corrections using IPCW for known predictors of the outcome in this population (the IPCW model included all variables listed in Table 4). Male gender was associated with a lower rate of new use of antidepressant medications (HR: 0.59; 95% Confidence Interval (CI): 0.51 to 0.79). Non-Caucasian participants are also less likely to be new users of antidepressant medications with lower hazards seen for African-American (HR: 0.48; 95% CI: 0.30 to 0.57), Asian (HR: 0.23; 95% CI: 0.13 to 0.37) and Hispanic (HR: 0.58; 0.47 to 0.67) participants. It is notable that using IPCW to correct for non-random loss to follow-up led to a slight weakening of the relation between ethnicity and antidepressant use; this shift in estimates was most notable among Asian participants where the estimate changed from HR: 0.14 to HR: 0.23 (a 32% change in the log-hazard ratio) and Hispanic participants where the estimate changed from HR: 0.48 to HR: 0.58 (a 31% change in the log hazard ratio). An elevated baseline CES-D score was also an important predictor of future antidepressant exposure. Participants with a clinically significant difference of 16 points in CES-D score had a much higher rate of new use (HR: 1.78; 95% CI: 1.41 to 2.23).

There was variation in the association of CES-D score with new antidepressant medication use among the different ethnic groups: African-American (HR: 2.30; 95% CI: 1.46 to 3.63), Asian

(HR: 3.72; 95% CI: 1.13 to 12.28), Caucasian (HR: 1.47; 95% CI: 1.02 to 2.52) and Hispanic (HR: 1.66; 95% CI: 1.07 to 2.58). Figure 1 shows differences in rates of new use of antidepressant medication based on whether participants had a baseline CES-D score of 16; these variations in utilization are quite apparent. However, statistical tests for an interaction between ethnicity and CES-D score were non-significant: African-American ($p=0.86$), Asian ($p=0.20$) or Hispanic ($p=0.94$) when compared with Caucasian participants. The mean CES-D score at baseline for new users of antidepressant medications was: African-American 11.1, Asian 9.3, Caucasian 8.9, and Hispanic 13.4.

There was an observed interaction between gender and CES-D score ($p<0.01$). This interaction meant that the effect of a 16 point change in CES-D score had a stronger association with new antidepressant medication use in male participants (HR: 2.15; 95% CI: 1.42 to 3.23) than female participants (HR: 1.63; 95% CI: 1.22 to 2.17). However, male participants are still much less likely to report antidepressant use as compared to female participants. This difference, with male being a protective main effect but with a positive interaction between male and CES-D score, suggests that the observed interaction may be principally due to the higher levels of treatment among female participants with a lower CES-D score. Measures of lower socio-economic status such as low income, low education, and lack of health insurance were not statistically significantly associated (at the $p=0.05$ level) with initiating antidepressant therapy, as seen in Table 5.

DISCUSSION

The main finding of this report is that the self-reported rate of starting antidepressant medications varies among several ethnic groups in a US-based, prospective cohort that was unselected for baseline depression. The MESA cohort was formed to look at subclinical cardiovascular disease and the assessment of depression was done as part of an overall assessment of possible cardiovascular risk factors. Using the MESA cohort to study depression is an important strength of this report as it removes any potential stigma for participation in a study targeted at depression (and any such stigma could be reasonably differential by ethnic group).

Of the four ethnicities, Caucasian participants had the highest rate of antidepressant medication use compared with African-American, Asian, and Hispanic participants even after adjusting for differences in depressive symptoms at baseline. This association also persisted after adjusting for differences in loss to follow-up between different ethnicities.

There was evidence of non-random loss to follow up among the MESA participants. It is reasonable to use IPCW estimates as the gold standard for estimating the size of the association as IPCW adjusted estimates are generally less biased in the presence of non-random loss to follow-up than estimates that assume random censoring [16–17]. Given this reasonable assumption, we have a percent difference in the log hazard ratio of 17% for African-American participants, 32% for Asian participants, and 31% for Hispanic participants. These are non-ignorable changes in the estimates of the association between ethnicity and new use of antidepressant medications, passing the informal threshold of a 10% change in the estimates that is often used. While the IPCW corrected HRs do not affect the inference involved, they do provide a more accurate estimate of the size of the association.

The reason for this difference in utilization of antidepressant medications between different ethnic groups in the US is unknown. The extent to which these differing levels of antidepressant medication use represent under-treatment, over-treatment or the correct level of treatment is also an open question [1,2]. It is worth noting that Caucasian participants in the MESA study have more users of antidepressant medications at lower levels of CES-D score, but this evidence

is not strong enough to enable a clear interpretation as to appropriate or inappropriate treatment. Various explanations have been offered to attempt to explain this difference in utilization between ethnic groups, including differential quality of care [22] or differential stigma associated with the treatment of depression in different ethnic groups [23].

We cannot distinguish whether the treatments given were appropriate as the CES-D is not able to definitively diagnose clinical depression [7] and high scores are considered to be an indicator of possible depression rather than conclusive evidence [8]. Given the high rate of off-label use of antidepressant medications in US populations [24], it is likely that some of this antidepressant use may be for indications other than for clinical depression. These off-label uses often include conditions such as headaches, smoking cessation, chronic pain, insomnia, or premenstrual syndrome [25], the prevalence of which could not be evaluated using the information available from the MESA study. While some of these differences in antidepressant use could be attributed to off-label indications, off-label uses are unlikely to fully explain these large differences. It is also plausible that there could be under-treatment among participants with high CES-D scores while there is over-treatment among participants with low CES-D scores.

The use of IPCW to correct for loss to follow in cohort studies is an established technique used to account for known predictors of non-random loss to follow-up [16–18]. Accounting for non-random loss to follow-up is important in the context of this particular outcome as loss to follow-up is associated with both ethnicity and depression. However, the overall effect of the IPCW adjustment did not change the statistical inference suggesting that differential loss to follow-up was not sufficient to explain the observed differences between ethnicity conditional on the covariates observed [16–18]. Of course, measurement error and misspecification of the censoring model continue to be threats to study validity even after applying an IPCW correction.

Due to cultural variations, CES-D score distributions can be expected to vary by ethnicity due to different expressions of depression in different ethnicities [26–29]. This assumption that the meaning of a given CES-D score is comparable between different ethnic groups underlies the use of this score to correct for different levels of depressive symptoms, and studies that use the score in this manner make this assumption [12]. While this assumption may not be strictly true, we do not believe that making it in this context poses a major threat to the validity of the study results. The actual effect that these ethnic differences in expression of depression symptoms could have on subsequent antidepressant use is currently unknown. As there are known links between depression and both anxiety [30] and anger [31], we included anger and anxiety scales in the analysis. These parameters are correlated with CES-D score in our population: CESD and anger score ($r=0.32$) and CESD and anxiety ($r=0.62$). However, neither the anger or anxiety scale had a statistically significant association with increased utilization of antidepressants when CES-D score was also included in the statistical model.

There are limitations to this study that should be considered when interpreting these results. We did not have longitudinal information on depression scores; ideally we would have treated CES-D score as a time-varying confounder instead of a baseline confounder. Our definition of antidepressant medication use relies on a combination of self-report and a medication inventory. It is possible that there could be some degree of under-reporting of medication use by some of the participants in the study. In addition, alternative treatments, such as behavioral activation or cognitive therapy, can show comparable effectiveness to antidepressant use [32] and differential use of these treatment options by ethnicity could also partially explain some of the observed differences.

This association between ethnicity and antidepressant medication utilization among MESA participants provides further evidence that antidepressant use varies by ethnicity independent of CES-D score and other known risk factors. This appears to be an especially strong among the Asian participants in the study, matching previous findings that the lowest utilization of antidepressant drugs in the United States is among persons of Asian ethnic origin [2]. However, the strength of this association is likely to be overestimated in prospective cohort studies if non-random loss to follow-up is not considered.

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Figure 1. Comparison of participants with high vs. normal baseline scores on the Center for Epidemiologic Studies Depression Scale (CES-D) and rates of new use of antidepressant medications. Data are from the Multi-Ethnic Study of Atherosclerosis (2000–2007).

Table 1

Descriptive statistics for the 6311 study participants: means or proportion. All participants reported no use of antidepressants at baseline. Data are from the Multi-Ethnic Study of Atherosclerosis (2000–2007).

	Mean [Standard Deviation] or %
Demographics	
<i>Age (years)</i>	62.3 [10.26]
<i>Male Gender</i>	49%
Health Status	
<i>Hypertension</i>	45%
<i>Diabetes</i>	14%
<i>Impaired Glucose (but not diabetic)</i>	28%
Ethnicity (Caucasian as reference)	
<i>African-American</i>	29%
<i>Asian</i>	12%
<i>Hispanic</i>	22%
Lifestyle	
<i>Cigarette Smoker- current</i>	13%
<i>- ever</i>	36%
<i>Alcoholic Drinks (per week)</i>	3.9 [8.22]
<i>Exercise Hours (per week)</i>	25.8 [38.85]
<i>Body Mass Index(kg/m²)</i>	28.3 [5.42]
Psychological	
<i>Spielberger Anger Score</i>	14.7 [3.63]
<i>Spielberger Anxiety Score</i>	15.7 [4.40]
<i>Center for Epidemiologic Studies Depression Scale</i>	7.3 [7.30]
Socioeconomic	
<i>No health insurance</i>	9%
<i>Low Education (less than High School)</i>	37%
<i>Income (< \$5,000)</i>	2%
<i>\$5,000–15,999</i>	16%
<i>\$16,000–29,999</i>	18%
<i>\$30,000–39,999</i>	13%
<i>\$40,000–74,999</i>	27%
<i>\$75,000–99,999</i>	9%
<i>\$100,000+</i>	14%
Study Outcomes	
<i>Any New Antidepressant Prescription</i>	7%
<i>% lost to follow-up *</i>	22%

* Loss to follow-up occurs at first missed visit, withdrawal or death

Table 2

Incidence of new use of antidepressant medications, Center for Epidemiologic Studies Depression Scale scores and loss to follow-up among participants in the Multi-Ethnic Study of Atherosclerosis (2000–2007) who were naive to antidepressants at baseline.

Men	African-American (n=828)	Asian (n=386)	Caucasian (n=1166)	Hispanic (n=683)
<i>Any Antidepressant Prescription</i>	4%	1%	7%	5%
<i>Center for Epidemiologic Studies Depression Scale (Mean [Standard Deviation])</i>	6.0 [6.2]	5.4 [5.6]	5.7 [5.7]	7.6 [7.5]
<i>% lost to follow-up *</i>	26%	22%	18%	27%
Women	African-American (n=994)	Asian (n=398)	Caucasian (n=1134)	Hispanic (n=722)
<i>Any Antidepressant Prescription</i>	5%	3%	13%	7%
<i>Center for Epidemiologic Studies Depression Scale (Mean [Standard Deviation])</i>	8.1 [7.7]	7.0 [7.1]	7.4 [7.0]	10.8 [9.6]
<i>% lost to follow-up *</i>	26%	23%	17%	25%

* Loss to follow-up occurs at first missed visit, withdrawal or death

Table 3

Distribution of what antidepressant medication is used among new users of antidepressants by specific agent and class of antidepressant. Data are from the Multi-Ethnic Study of Atherosclerosis (2000–2007).

Antidepressant Medication	African-American	Asian	Caucasian	Hispanic	All
Tricyclic class (TCA) antidepressants					
Any	17%	12%	12%	18%	14%
Amitriptyline	11%	4%	7%	14%	8%
Clomipramine	1%	0%	1%	0%	<1%
Doxepin	1%	0%	2%	2%	1%
Imipramine	<1%	2%	1%	0%	1%
Nortriptyline	5%	6%	2%	3%	3%
Selective serotonin reuptake inhibitor (SSRI) antidepressants					
Any	52%	61%	55%	59%	55%
Citalopram	8%	4%	7%	11%	8%
Escitalopram	10%	6%	10%	7%	9%
Fluoxetine	5%	12%	13%	10%	11%
Fluvoxamine	<1%	0%	1%	0%	<1%
Paroxetine	9%	16%	9%	17%	11%
Sertraline	21%	23%	15%	14%	16%
Selective norepinephrine reuptake inhibitor (SNRI) antidepressants					
Any	4%	10%	10%	8%	9%
Duloxetine	1%	2%	1%	0%	1%
Venlafaxine	4%	8%	9%	8%	8%
Other antidepressants					
Any	26%	16%	23%	15%	22%
Bupropion	11%	0%	12%	5%	10%
Mirtazapine	2%	6%	2%	2%	2%
Nefazodone	<1%	<1%	0%	0%	<1%
Trazadone	13%	10%	9%	9%	10%

Table 4

Logistic regression model estimating strength of the association between selected predictors and censoring (loss to follow-up). Data are from baseline information in the Multi-Ethnic Study of Atherosclerosis (2000–2007). [Outcome: Participant is censored during follow-up by missing at least one follow-up visit]

Predictors of censoring	Odds Ratio *	95% Confidence Interval
Ethnicity (Caucasian as reference)		
<i>African-American</i>	1.33	1.11 to 1.58
<i>Asian</i>	1.19	0.91 to 1.55
<i>Hispanic</i>	1.25	1.01 to 1.56
Demographics		
<i>Age (per 10 years)</i>	1.18	1.09 to 1.27
<i>Male Gender</i>	1.15	1.00 to 1.32
Health Status		
<i>Hypertension</i>	0.98	0.86 to 1.13
<i>Diabetes</i>	1.38	1.15 to 1.66
<i>Impaired Glucose (but not diabetic)</i>	1.07	0.92 to 1.25
Lifestyle		
<i>Cigarette Smoker (ever)</i>	1.16	1.05 to 1.27
<i>Alcoholic Drinks per week</i>	1.00	0.99 to 1.01
<i>Above Median Exercise</i>	0.94	0.83 to 1.07
<i>Body Mass Index</i>	1.00	0.98 to 1.01
Psychological		
<i>Spielberger Anger Score (1 point)</i>	0.99	0.97 to 1.01
<i>Spielberger Anxiety Score (1 point)</i>	1.00	0.98 to 1.02
<i>Center for Epidemiologic Studies Depression Scale (16 points)</i>	1.37	1.15 to 1.63
Socioeconomic		
<i>No health insurance</i>	1.65	1.33 to 2.04
<i>Low Education (less than High School)</i>	1.09	0.94 to 1.27
<i>Income (ordinal) **</i>	0.94	0.92 to 0.96

* Odds ratios are also adjusted for study center (data not shown)

** per change in income category as defined in Table 1

Table 5

Cox Proportional Hazards Model weighted for Inverse Probability of Censoring Weighting (IPCW) estimating the association between selected predictors and new use of antidepressant medication. Data are from the Multi-Ethnic Study of Atherosclerosis (2000–2007). Estimates are Hazard Ratios (HR).

Predictors of exposure to any antidepressant agent	Original HR *	IPCW HR *	95% Confidence Interval	p-value
Ethnicity (Caucasian as reference)				
<i>African-American</i>	0.42	0.48	0.30 to 0.57	<0.0001
<i>Asian</i>	0.14	0.23	0.13 to 0.37	<0.0001
<i>Hispanic</i>	0.47	0.58	0.47 to 0.67	0.0009
Demographics				
<i>Age (per 10 years)</i>	0.85	0.92	0.82 to 1.03	0.1588
<i>Male Gender</i>	0.59	0.64	0.51 to 0.79	<0.0001
Health Status				
<i>Hypertension</i>	1.29	1.23	0.99 to 1.52	0.0658
<i>Diabetes</i>	1.37	1.18	0.88 to 1.60	0.2749
<i>Impaired Glucose (but not diabetic)</i>	1.03	0.93	0.73 to 1.19	0.5674
Lifestyle				
<i>Cigarette Smoker (ever)</i>	1.19	1.19	1.04 to 1.37	0.0118
<i>Alcoholic Drinks per week (per 5)</i>	1.04	1.06	1.00 to 1.11	0.0352
<i>Exercise Hours (per 27 per week)</i>	1.04	1.05	0.98 to 1.11	0.1505
<i>Body Mass Index(per kg/m²)</i>	0.99	0.99	0.97 to 1.01	0.4869
Psychological				
<i>Spielberger Anger Score (1 point)</i>	1.01	1.02	0.99 to 1.04	0.2930
<i>Spielberger Anxiety Score (1 point)</i>	1.02	1.02	0.99 to 1.05	0.1722
<i>Center for Epidemiologic Studies Depression Scale (per 16 points)</i>	1.78	1.78	1.41 to 2.23	<0.0001
Socioeconomic				
<i>No health insurance</i>	0.79	0.79	0.53 to 1.17	0.2395
<i>Low Education (less than High School)</i>	0.93	0.91	0.72 to 1.15	0.4203
<i>Income (ordinal) **</i>	0.98	0.98	0.94 to 1.01	0.2270

* Hazard Ratios are also adjusted for study center (data not shown)

** per change in income category as defined in Table 1