

## Depression treatment in individuals with cancer: a comparative analysis with cardio-metabolic conditions

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### Abstract

A clear picture of the current state of nationwide depression treatment practices in individuals with cancer and depression does not exist in the United States (US). Therefore, the primary objective of this study was to examine rates of any depression treatment among individuals with cancer and depression in the US. To better understand the relationship between any treatment for depression and presence of cancer, we used a comparison group of individuals with cardio-metabolic conditions owing to the similar challenges faced in management of depression in individuals with these conditions. We used a retrospective cross-sectional design and data from multiple years of the Medical Expenditure Panel Survey, a nationally representative household-survey on healthcare utilization and expenditures. Study sample consisted of adults aged 21 or older with self-reported depression and cancer (n=528) or self-reported depression and diabetes, heart disease or hypertension (n=1643). Depression treatment comprised of any use of antidepressants and/or any use of mental health counseling services. Treatment rates for depression were 78.0% and 81.7% among individuals with cancer and cardio-metabolic conditions respectively. After controlling for socio-demographic, access-to-care, number of physician-visits, health-status, and lifestyle risk-factors related variables; individuals with cancer were less likely to report any treatment for depression (Adjusted Odds Ratio=0.67; 95% Confidence Interval=0.49, 0.92) compared to individuals with cardio-metabolic conditions ( $P \leq 0.01$ ). Our findings highlight the possibility that competing demands may crowd out treatment for depression and that cancer diagnosis may be a barrier to depression treatment.

### Introduction

Higher rates of co-occurring depression in individuals with chronic physical illnesses compared to their age matched healthy con-

ditions have been well documented. Studies have also documented the negative consequences of depression on health outcomes among such individuals with physical illness and co-occurring depression.<sup>1-3</sup> Co-occurrence of depression and physical illnesses has shown to present challenges in management of depression.<sup>4-6</sup> Symptoms of depression may often be mistaken for symptoms related to the physical illnesses.<sup>7-9</sup> Demands from management of physical illness can compete for clinical attention,<sup>5</sup> which may crowd out the treatment of depression. Clinical trials of individuals with depression and a single chronic condition provide convincing evidence that depression treatment with antidepressants and/or psychotherapy reduces depressive symptoms. However, the extent to which such treatments influence chronic disease outcomes is unclear.<sup>10,11</sup> For example, the multicenter trial Enhancing Recovery in Coronary Heart Disease found that depression treatment did not improve reinfarction-free survival after acute myocardial infarction.<sup>10</sup> Similarly among individuals with diabetes, glycemic control was minimally improved by depression treatment.<sup>11</sup>

As is the case with other physical illnesses, depression care among individuals with cancer can be challenging. Management of depression in cancer which is now considered as a chronic illness is currently a major area of emphasis.<sup>12,13</sup> And with the growing number of cancer survivors, attention is now directed towards improving psychological well-being including treatment for depressive disorders in this population. As in other chronic physical illnesses, the reported prevalence of depression in cancer is high and ranges between 3 to 38% for major depression and between 1.5 to 52% for depression spectrum syndromes.<sup>14</sup> The prevalence rates of depression varies among individuals with cancer, by cancer type and are high for those with pancreatic cancer (ranging 38-50%), breast cancer (ranging 14-40%) and lung cancer (ranging between 4.7-33%).<sup>14</sup>

Depression among individuals with cancer has been associated with a negative impact on patient's quality of life, reduced acceptance of and compliance with treatment plans, prolonged hospitalizations, poor survival, reduced effective coping, or even a desire for early death or suicide.<sup>7,15,16</sup> Recognizing the adverse effects of depression among individuals with cancer, clinical practice guidelines recommend that a combination of psychotherapy and pharmacotherapy should be used for treating depression in individuals with cancer and depression.<sup>17-19</sup> However, it is not known whether these guidelines are widely adopted, due to the paucity of studies on treatment rates for depression among individuals with cancer. In a handful of studies on antidepressant use for depression among individuals with cancer, depression treatment rates varied from 11% to

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77%.<sup>7,20,21</sup> Using data from community oncology practices in the United States (US), one study reported that antidepressant treatment for depression was initiated only in a minority of individuals (16%), and among those with colon cancer it was even lower with only 11% being prescribed antidepressants.<sup>7</sup> Among individuals with cancer seeking healthcare in a primary care settings (n=1513), only one-third of individuals with cancer received a full dose of medication.<sup>20</sup> In this study, use of antidepressants varied from 64% in individuals with cancer and other comorbidities to 77% among individuals with cancer and without comorbidities.<sup>20</sup> And although women are twice as likely as men to have depression,<sup>22</sup> in another study conducted among low-income ethnic minority women with breast/gynecologic cancers and major depression receiving care at an urban public medical center; it was found that only 12% reported receiving antidepressant medication and 5% reported seeking psychotherapy.<sup>21</sup> These variations in depression treatment rates can be partially explained by differential settings, provider types, and types of cancer. While most of these studies documented low rates of depression treatment among individuals with cancer, they do not provide a clear picture of the current state of nation-wide depression treatment practices in the US.

Therefore, the primary objective of the study is to examine rates of any depression treatment that includes use of antidepressants and/or psychotherapy, among individuals with cancer and depression in the US. To better understand the relationship between any treatment for depression and presence of cancer, we used a comparison group of individuals with cardio-metabolic conditions. This comparison group was chosen due to the similar challenges faced in management of depression between individuals with cancer and cardio-metabolic conditions. Both groups have high prevalence of diagnosed depression,<sup>9,14,23,24</sup> for example, the prevalence of depression in individuals with diabetes mellitus ranges from 9 to 26% and from 7 to 63% in those with heart failure.<sup>24,25</sup> Individuals from the both groups suffer similar negative impact of depression on health outcomes.<sup>4,7,9,15,16,24,26</sup> In addition, there has been a lack of robust evidence from clinical trials on the effectiveness of depression treatment on physical illness outcomes in both cancer and cardio-metabolic conditions.<sup>4,8,27</sup> Furthermore, in both groups, competing demands in clinical care encounters may be a barrier to depression treatment.<sup>5</sup>

Treating depression in individuals with cancer can be even more challenging when compared to treating depression in individuals with other physical illnesses such as diabetes, heart disease, and hypertension. Cancer is often considered as a clinically dominant condition that consumes all the attention of healthcare providers, as the limited patient-physician interaction in clinical settings is usually spent focusing on the treatment of cancer.<sup>8,28,29</sup> Depression may often be considered as a *sequelae* of cancer or cancer diagnosis and treatment.<sup>30</sup> Very few (17%) individuals with cancer discuss their mental health concerns after a cancer diagnosis and this may also affect depression care.<sup>31</sup> It is a possibility that depression treatment may be less likely among individuals with cancer compared to those with cardio-metabolic conditions. On the other hand, management of depression among individuals with cancer has been recognized as a critical component of cancer care in recent years.<sup>17-19</sup> Additionally, physicians may also consider use of antidepressants among individuals with cancer and depression, due to their other beneficial effects in terms of relieving common symptoms associated with cancer such as chronic and neuropathic pain.<sup>8</sup> Therefore, it is also possible that individuals with cancer are as likely to receive depression treatment as compared to those with cardio-metabolic conditions. Thus, the association between any depression treatment and presence of cancer diagnosis remains poorly understood. The current study uses a nationally representative data on individuals with cancer and depression to further elucidate this relationship.

## Materials and Methods

### Study design

We used a cross-sectional study design and data from multiple years of the Medical Expenditure Panel Survey (MEPS) for the current study. MEPS is a nationally representative survey of the US non-institutionalized civilian population sponsored by the Agency for Healthcare Research and Quality. The MEPS collects detailed information for each person in the household from the sampling frame on demographic, socio-economic, chronic conditions, healthcare utilization, expenditures and health status information. Information is reported by a single household respondent and collected by MEPS via computer assisted personal interviews in a series of five interviews covering two full calendar years. Each year a new MEPS annual sample referred as *panel* is selected and followed for a period of two years.<sup>32</sup> For purposes of this study, we only used cross-sectional calendar year data.

### Data

In this study, we pooled MEPS files for multiple years 2006, 2007 and 2008. We derived data by merging files on household characteristics, medical conditions, prescribed medicines, outpatient visits, and office-based medical provider visits. There were a total of 93,209 individuals (32,577 from year 2006; 29,370 from year 2007; and 31,262 from year 2008) included in MEPS for the three years.

### Study sample

Our analytical sample was based on living adults over 21 years of age and who were alive during the calendar years and reported having depression. We defined depression in the current study as presence of major depressive disorder (single and recurrent episodes), dysthymic disorder, and mood disorder. Among these adults with depression, we limited our sample to those who reported cancer or one of the cardio-metabolic conditions (*i.e.* diabetes or heart disease or hypertension). Thus our final sample consisted of 2171 adults with depression and cancer (n=528) and adults with depression and cardio-metabolic conditions (n=1643).

### Identification of individuals with depression, cancer and cardio-metabolic conditions

We identified individuals with depression, cancer and cardio-metabolic conditions from the MEPS medical conditions file using a combination of ICD-9-CM codes and the clinical classification codes (See Appendix). In MEPS, the medical condition file contains an observation for every self-reported medical condition

the individual experienced during the year. Information on acute and chronic medical conditions is collected from the household respondents by querying whether: i) the person has been diagnosed with specific conditions, ii) the person had any conditions which were linked with medical events such as emergency visits and others, iii) the person had conditions which caused them any disability, and iv) the person had chronic conditions which bothered them during a specific reference period (in terms of the time of the interview). Information on self-reported medical conditions is collected verbatim and first converted into International Classification of Diseases, Clinical Modification, 9<sup>th</sup> edition (ICD-9 codes), which are then converted into clinical classification codes by professional coders. The codes are routinely verified and error rates have not been found to exceed 2.5% for any coders in the past.<sup>32</sup>

Individuals with depression were classified in two groups: i) those with cancer and ii) those with any cardio-metabolic condition and without cancer. The rationale for this grouping is based on the framework provided by Piette and Kerr.<sup>29</sup> In their conceptual framework, Piette and Kerr listed cancer as a clinically dominant condition that eclipses the management of other health problems. Therefore, we categorized individuals with cancer regardless of presence of any other chronic conditions including cardio-metabolic conditions, into one group (*i.e.* those with cancer). Cardio-metabolic conditions consisting of chronic physical illnesses such as diabetes-mellitus, heart problems or hypertension were grouped together because they can be considered as concordant chronic conditions which share a similar risk profile and synergistic treatment goals. These conditions have similarly been clustered together in previous studies.<sup>33</sup>

### Measures

#### *Dependent variable, any treatment for depression*

The two therapeutic modalities for depression treatment are: antidepressants and psychotherapy.<sup>34</sup> Therefore, we included both antidepressant use and psychotherapy as our measure of depression treatment.

*Antidepressants:* in the MEPS prescribed medicine files, therapeutic classes and subclasses are assigned to different prescribed medicines through linkage with the Multum Lexicon database.<sup>32,35</sup> We identified antidepressants using the therapeutic subclass class code (249). Depression treatment with antidepressants was defined in our study, as any reported prescription drug event for antidepressants during each calendar year.

*Psychotherapy:* data on psychotherapy/counseling visits was derived from the MEPS outpa-

tient visits file and the office-based medical provider visits file for calendar years 2006, 2007 and 2008; which provided information on the types of treatments, procedures, and services during each self-reported visit in this period. Individuals with at least one visit on record for psychotherapy/counseling were considered as receiving psychotherapy for depression in our study. Psychotherapy has similarly been identified in the past, in studies that used the MEPS data.<sup>6,36</sup>

We then combined the use of antidepressants and/or psychotherapy to classify depression treatment into two categories: i) received no depression treatment and ii) received any depression treatment (as we did not have a large sample size for psychotherapy alone, see Appendix).

### Independent variables

We included demographic characteristics such as gender (female, male), race/ethnicity (White, African American, Latino, Other); age (categorized as 22-39 years, 40-49 years, 50-64 years, 64 years and above); marital status (married, widowed, separated/divorced, never married) and metropolitan status (categorized as metropolitan/non-metropolitan) as independent variables in our analysis. The US Census bureau defines geographical regions as having a *metro* or metropolitan status when they have a relatively high population density at its core and has a high degree of social and economic ties throughout the area. We also looked at socioeconomic characteristics such as their level of education (categorized as less than high school, high school, more than high school); employment status (employed, not employed) and family poverty status (categorized as poor, near poor, middle income, high income). We assessed access to health care by the type of insurance coverage (private, public, uninsured). Additionally, we looked at the number of visits to either office-based provider or outpatient hospital clinics (categorized into quintiles) as a proxy for contact with the health care system. We assessed perceived physical health and mental health status of these individuals (both categorized as excellent/very good, good, fair/poor). We also included variables related to the individual's lifestyle risk factors such as current smoking status (current smoker, other); physical exercise (3 times a week, no exercise) and body mass index (under-weight/normal, over-weight, obese). As 5.8% of individuals had missing data on current smoking, we included a missing indicator for this variable. Results for the missing indicator are not presented in the tables.

### Statistical techniques

We conducted chi-square analyses to examine the unadjusted association between depression treatment and presence of cancer

compared to cardio-metabolic conditions. We tested the differences in any depression treatment received between cancer and cardio-metabolic groups for each level of the independent variables. For example, among all women, the relationship between any depression treatment and cancer was examined with cardio-metabolic condition group as the reference group. Similarly among all men, the relationship between any depression treatment and cancer was examined using cardio-metabolic condition group as the reference group. Results were summarized in terms of odds ratios (OR) and 95% confidence intervals (CI). Such approaches have been used in testing subgroup differences.<sup>37</sup> We then adjusted for the independent variables listed above within a framework of multivariable logistic regression to analyze the independent relationship between depression treatment and cancer. Here, the dependent variable consisted of: i) any depression treatment received and ii) no depression treatment received which was used as a reference category. The independent variables such as gender, race/ethnicity, marital status, metro status, level of education, family poverty status, employment status, type of health insurance, perceived physical and mental health status, current smoking, physical exercise, body mass index and number of visits to office-based provider or outpatient hospital clinics were entered in blocks in the regression model and several models were tested. The cardio-metabolic group served as a reference group in all these models. We transformed the parameter estimates derived from the logistic regression to adjusted odds ratios (AORs), and their corresponding 95% CI. We used the appropriate weights and strata provided in the MEPS data, to control for the clustering and the unequal probability design. All the analyses were conducted using the survey procedures in SAS 9.2.

## Results

The description of our study sample of 2,171 individuals, aged 21 years and older, with depression and cancer or cardio-metabolic conditions is summarized in Table 1 (for additional description of the study sample, please see Appendix). Our study sample comprised of 528 adults with depression and cancer, and 1643 adults with depression and cardio-metabolic conditions. Based on chi-square tests, statistically significant differences in some characteristics were observed among individuals with cancer and cardio-metabolic conditions. Higher percentages (86.6% *versus* 78.3%) of individuals of white race/ethnicity were found in the cancer group as compared to the cardio-metabolic group. In terms of age, a

higher percentage of elderly aged 65 years and above were found in the cancer group (46.6% *versus* 30%) as compared to the cardio-metabolic group. And a higher percentage of individuals with cancer belonged to the high income group (41.5% *versus* 31.4%) as compared to those from the cardio-metabolic group. Fewer individuals (4.4%) from the cancer group were uninsured as compared to those from the cardio-metabolic group (7.4%). Also, there were more individuals in the cancer group in comparison to the cardio-metabolic group who had a higher number of visits to office-based provider or outpatient hospital clinics (28.7% *versus* 18.2% in the fifth quintile, and 22% *versus* 20.8% in the fourth quintile respectively). More individuals with cancer reported their general health (26.5%) to be excellent/very good in comparison to those with cardio-metabolic conditions (17.2%). There were fewer individuals in the cancer group compared to the cardio-metabolic group, who currently smoked (17.2% *versus* 23.6%), who were obese (33.8% *versus* 54.1%), and who did not exercise (62.7% *versus* 67.5%). Thus, not only did the individuals from the cancer group exhibit a higher socio-economic status and better health profile, but they also reported to be practicing healthier lifestyle, as compared to the individuals from the cardio-metabolic group. No statistically significant differences were observed between the two condition groups for characteristics such as marital status, metropolitan status, level of education, and employment status.

Group differences in any depression treatment across the two groups are summarized in Table 2. We present weighted percentages with depression treatment across the two groups. Overall, individuals with cancer were less likely to receive depression treatment, with 78% receiving treatment for depression as compared to 81.7% of those with depression and cardio-metabolic conditions. This overall difference was not found to be statistically significant. However, statistically significant differences in depression treatment were observed in some subgroups: African Americans, younger adults in the age group 22-39 years and those who were in the higher quintile groups of number of visits to the physician. In all these subgroups, fewer individuals from the cancer group received any depression treatment as compared to their counter-parts from the cardio-metabolic group (Table 2). We also looked at unadjusted OR from logistic regressions on depression treatment in which cardio-metabolic condition group served as the reference category for each level of the subgroups. Results similar to our chi-square analysis were noticed. For example, fewer younger individuals aged 22-39 years (54.2%) in the cancer group received depression treatment as compared to their counter-parts in the cardio-metabolic group (75.8%) and

the unadjusted OR was 0.38 with 95% CI=(0.15, 0.95). In terms of number of visits to the physician which were categorized in quintiles, fewer individuals from the cancer group received depression treatment as compared to their counter-parts from the other group across all the five quintiles for example, 90.5% versus 83.5% [with OR=0.56, 95% CI=(0.30, 1.05)] in the fourth quintile and 52.2% versus 70%

[OR=0.47, 95% CI=(0.25, 0.88)] in the first quintile.

AORs and 95% CIs from the multivariable logistic regressions are presented in Table 3. As mentioned previously, the referent category for the dependent variable was *no depression treatment*. Although in our bivariate analysis, individuals with cancer were found to be less likely to receive depression treatment as compared to

those with depression and cardio-metabolic conditions, this relationship was not found to be statistically significant. This relationship continued to stay non-significant in our initial regression model which controlled for demographic, socioeconomic, access to care, health status, and lifestyle risk factors related variables; individuals with cancer were less likely to report treatment for depression [AOR=0.75; 95% CI=(0.55,

**Table 1. Description of study sample characteristics among individuals with Depression and Cancer or Cardio-metabolic conditions. Medical Expenditure Panel Survey, 2006-2008.**

	Cancer		Cardio-Metabolic		Sig
	N	Wt%	N	Wt%	
All	528	100	1643	100	
Gender					
Women	346	64.9	1143	67.7	
Men	182	35.1	500	32.3	
Race/ethnicity					***
White	414	86.6	1056	78.3	
African American	40	3.7	223	8.4	
Latino	46	4.3	288	8.9	
Other	28	5.4	76	4.4	
Age in years					***
22-39	48	9.3	168	10.3	
40-49	75	12	289	16.1	
50-64	175	32.1	732	43.5	
65 years and above	230	46.6	454	30.1	
Poverty status					***
Poor	83	10	396	16.3	
Near poor	127	22.5	424	23.4	
Middle income	138	26	420	28.9	
High income	180	41.5	403	31.4	
Health insurance					**
Private	311	67.4	812	58.8	
Public	189	28.2	673	33.8	
Uninsured	28	4.4	158	7.4	
Perceived general health					***
Excellent/very good	127	26.5	237	17.2	
Good	132	24.4	513	33.1	
Fair/poor	269	49.1	893	49.7	
Perceived mental health					
Excellent/very good	163	32.5	425	29.2	
Good	186	35.2	601	37.5	
Fair/poor	179	32.2	617	33.2	
Current smoking					*
Current smoker	103	17.2	402	23.6	
Other	391	76.5	1149	71.1	
Physical activity					***
3 times/week	195	36	528	32.5	
No exercise	329	62.7	1114	67.5	
Body mass index					***
Underweight/normal	166	32	291	18.4	
Overweight	158	30.4	426	25.7	
Obese	189	33.8	893	54.1	
Number of visits to the physician					***
Quintile 5	152	28.7	299	18.2	
Quintile 4	117	22.1	343	20.8	
Quintile 3	95	17.9	295	18	
Quintile 2	94	17.8	354	21.5	
Quintile 1	70	13.2	352	21.4	

Based on 2171 living adults over age 21 who were alive during the calendar years, with self-reported depression and cancer or cardio-metabolic condition from MEPS data in years 2006,2007 and 2008. Asterisks represent significant differences between cancer and cardio-metabolic group based on chi-square tests. Number and percent of those with missing data for current smoking status, physical activity, and body mass index are not reported. Sig, Significance. \*\*\* P<0.001; \*\*0.001<P<0.01; \*0.01<P<0.05

1.04)]. However this relationship became statistically significant with the AOR of 0.67 with 95% CI=(0.49, 0.92) in our final regression model (Table 3) which also controlled for the total number of visits to the physician in addition to all other variables described above in our other model. In our final model, women were more likely than men to receive depression treatment [AOR=1.53; 95% CI=(1.13,2.08)] among the

individuals with cancer and depression. Racial/ethnicity groups other than whites were also found to less likely to receive any depression treatment. As compared to whites, the AOR for African Americans were 0.38 [95% CI=(0.25,0.58)] and the AOR for Latinos were 0.41 [95% CI=(0.29,0.58)]. Also among adults with cancer and depression, adults aged 65 years and above were 73% more likely than those who

were in the 22-39 years to receive any depression treatment with AOR=1.73 and 95% CI=(1.03,2.92). And as compared to individuals who had lower number of physician visits, individuals in the groups quintile 5 and 4 had higher odds of receiving any depression treatment [the AOR for quintile 5 as compared to quintile 1 was 4.15 with 95% CI=(2.64,6.53) and for quintile 4 was 3 with 95% CI=(1.98,1.71)].

**Table 2. Weighted Percent of receipt of any depression treatment for individuals with Depression and Cancer or Cardio-metabolic condition. Medical Expenditure Panel Survey, 2006-2008.**

Characteristics	Cancer Wt%	Cardio-metabolic Wt%	P-value	Sig
All	78	81.7	0.139	
Gender				
Women	78.2	83.3	0.045	*
Men	77.7	78.4	0.836	
Race/ethnicity				
White	81.8	85	0.192	
African American	53.8	70.6	0.003	**
Latino	73.3	69	0.539	
Other	36.8	71.7	0.00	***
Age in years				
22-39	54.2	75.8	0.00	***
40-49	72.5	74.3	0.626	
50-64	80.5	84	0.267	
65 years and above	82.4	84.5	0.444	
Poverty status				
Poor	78	75.7	0.463	
Near poor	77.9	84.3	0.014	*
Middle income	78.9	80.8	0.572	
High income	77.5	83.9	0.068	
Health insurance				
Private	78	83.6	0.046	*
Public	80.8	82.9	0.435	
Uninsured	59.8	61.3	0.738	
Perceived general health				
Excellent/very good	75.3	80.8	0.024	*
Good	73.9	81.3	0.027	*
Fair/poor	81.5	82.4	0.767	
Perceived mental health				
Excellent/very good	76	80.2	0.219	
Good	78.3	82	0.227	
Fair/poor	79.8	82.8	0.423	
Current smoking				
Current smoker	77	76.7	0.936	
Other	80.2	83.7	0.104	
Physical activity				
3 times/week	76.2	79	0.424	
No exercise	80.6	83.1	0.328	
Body mass index				
Underweight/normal	78.6	78.9	0.906	
Overweight	77.7	80	0.455	
Obese	80.6	83.1	0.367	
Number of visits to the physician				
Quintile 5	90.5	91.3	0.00	***
Quintile 4	83.5	90	0.00	***
Quintile 3	81.9	80.3	0.634	
Quintile 2	66.6	77.9	0.022	*
Quintile 1	52.2	70	0.758	

Based on 2171 living adults over age 21 who were alive during the calendar years, aged 21 years older, with self-reported depression and cancer or cardio-metabolic condition from MEPS data in years 2006, 2007 and 2008. Asterisks represent significant group differences by receipt of any depression treatment in each of the two condition groups using chi-square tests. Sig, Significance. \*\*\*P<0.001; \*\*0.001≤P<0.01; \*0.01≤P<0.05

**Table 3. Adjusted odds ratios and 95% confidence interval from logistic regressions on receipt of any depression treatment among individuals with depression and cancer or cardio-metabolic condition. Medical Expenditure Panel Survey, 2006-2008.**

	AOR	95%CI	P-value	Sig
<b>Condition</b>				
Cancer	0.67	[0.49,0.92]	0.0132	*
Cardio-metabolic	Ref			
<b>Gender</b>				
Women	1.53	[1.13,2.08]	0.0065	**
Men	Ref			
<b>Race/ethnicity</b>				
African American	0.38	[0.25,0.58]	<0.0001	***
Latino	0.41	[0.29,0.58]	<0.0001	***
Other	0.34	[0.20,0.57]	<0.0001	***
White	Ref			
<b>Age</b>				
65 years and above	1.73	[1.03,2.92]	0.0387	*
50-64 years	1.74	[1.08,2.82]	0.0233	*
40-49 years	1.08	[0.67,1.74]	0.7495	
22-39 years	Ref			
<b>Marital status</b>				
Widow	0.44	[0.28,0.67]	0.0002	***
Separated or divorced	0.65	[0.46,0.93]	0.0175	*
Never married	0.73	[0.45,1.19]	0.2048	
Married	Ref			
<b>Metropolitan status</b>				
Non-metro	1.16	[0.81,1.67]	0.4236	
Metro	Ref			
<b>Education</b>				
Less than High school	0.97	[0.67,1.40]	0.8624	
High school	0.97	[0.70,1.34]	0.8697	
Above High school	Ref			
<b>Employment status</b>				
Not employed	1.08	[0.76,1.54]	0.6762	
Employed	Ref			
<b>Poverty status</b>				
Poor	1.01	[0.61,1.69]	0.9612	
Near poor	1.42	[0.95,2.12]	0.0904	
Middle income	0.99	[0.70,1.41]	0.9589	
High income	Ref			
<b>Health insurance</b>				
Public insurance	1.19	[0.83,1.71]	0.346	
Uninsured	0.55	[0.37,0.81]	0.003	**
Private insurance	Ref			
<b>Perceived general health</b>				
Fair/poor	0.75	[0.51,1.09]	0.275	
Good	0.79	[0.52,1.20]	0.1352	
Excellent /Very good	Ref			
<b>Perceived mental health</b>				
Fair/poor	1.41	[0.98,2.02]	0.1951	
Good	1.23	[0.90,1.67]	0.0636	
Excellent/very good	Ref			
<b>Current smoking status</b>				
Current smoker	0.83	[0.62,1.11]	0.2118	
Other	Ref			
<b>Physical activity</b>				
No exercise/week	1.25	[0.96,1.63]	0.1032	
Exercise 3 times/week	Ref			
<b>Body mass index</b>				
Over-weight	1	[0.69,1.44]	0.9973	
Obese	1.25	[0.92,1.71]	0.1539	
Underweight/normal weight	Ref			
<b>Number of visits to the physician</b>				
Quintile 5	4.15	[2.64,6.53]	<0.0001	***
Quintile 4	3	[1.98,4.55]	<0.0001	***
Quintile 3	1.62	[1.11,2.36]	0.013	*
Quintile 2	1.33	[0.97,1.82]	0.0763	
Quintile 1	Ref			

Based on 2171 living adults over age 21 who were alive during the calendar years with self-reported depression and cancer or cardio-metabolic condition from MEPS data in years 2006, 2007 and 2008. Asterisks represent significant relationship between any depression treatment and the subgroup compared to the reference group based on multiple variable logistic regressions. The reference groups in the regression model were the cardio-metabolic condition, men, white race/ethnicity, age group 22-39years, married, metro region, above high school education, employed group, high income group, privately insured, excellent/very good general health, excellent/very good mental, underweight/normal group, and number of physician visits-quintile. The regressions also include intercept terms. AOR, Adjusted Odds Ratio; Ref, Reference group; Sig, Significance; \*\*\*P<0.001; \*\*0.001<P<0.01; \*0.01<P<0.05.

## Discussion

The current study was set out to examine the association between any depression treatment (antidepressants and/or psychotherapy) and presence of cancer diagnosis, using a comparative group of individuals with cardio-metabolic conditions; who may be similar in terms of depression prevalence, the negative association between depression and health outcomes and competing demands of clinical care. We found that among adults with depression, those with cancer were less likely to receive any treatment for depression compared to those cardio-metabolic conditions. As we mentioned before, this relationship was initially not statistically significant in a multivariate regression model which controlled for socio-demographic, access to care, health status, and lifestyle risk factors related variables. However this relationship became statistically significant when number of physician visits (which could serve as an important indicator of the individual's contact with the healthcare system) was added to the model, suggesting that it may be an important predictor of the relationship between any depression treatment received and presence of cancer. These findings need to be placed in the context of increased recognition of depression management among individuals with cancer as a critical component of cancer care and the development of the subspecialty discipline *psycho-oncology* to provide *holistic cancer and mental health* treatment for individuals with cancer.<sup>17,18,38</sup>

An examination of the association between any depression treatment and demographic characteristics, socio-economic status, access to care, health status, and lifestyle risk factors among individuals with cancer revealed some interesting findings. The racial/ethnic disparities in depression care found in our study also mirror those found in the general population, where an overwhelming majority of studies on racial disparities in diagnosis and depression treatment rates revealed that African Americans and Latinos were less likely to receive depression treatment.<sup>39</sup> As in the general population, among individuals with cancer and depression racial minorities compared to whites were less likely to receive any depression treatment even after controlling for access to care, socioeconomic, health status and lifestyle risk factors. These findings suggest that racial/ethnic disparities persist despite the continued efforts to eliminate the same.

We also found that overall individuals with cancer had greater outpatient visits as compared to those with cardio-metabolic conditions. However, individuals with cancer and depression were less likely to receive any treatment for depression despite such increased contact with healthcare system as compared to

those with cardio-metabolic conditions and depression. Evidence from prior research suggests that depression treatment may be neglected due to competing demands of other conditions such as cancer.<sup>5,40</sup> Also, cancer has often been considered a clinically dominant condition consuming the attention of the medical care providers and eclipsing the management of other co-occurring conditions including depression.<sup>28,29</sup> Taken together our findings and prior literature, it can be speculated that the presence of cancer may *crowd out* of attention to depression management.

We also found that among individuals with cancer, approximately one-quarter (22%) did not receive any depression treatment, which is consistent with published literature in cancer.<sup>20</sup> Depression has been reported to be undertreated in individuals with cancer.<sup>41,42</sup> Some physicians may consider cancer as a priority condition or perceive depression as a natural reaction to the diagnosis of cancer. They may even be skeptical about their expertise in treating depression in individuals with cancer.<sup>30</sup> Indeed, some physicians have reported the presence of cancer as one of the reasons for overruling guidelines for depression treatment.<sup>43</sup> A survey of healthcare professionals from Canada indicated that 29% of primary care providers and 23% oncologists indicated that they may not adopt clinical guidelines in their practices.<sup>17</sup> In another survey of European and American oncologists conducted as a quality improvement program, 41% agreed that most oncologists they know are not experts in managing psychological symptoms in advanced care; and between 17-22% oncologists said that they had never worked in collaboration with any psychologists or psychiatrists.<sup>44</sup>

Despite increased awareness of depression, lack of robust evidence on the effectiveness of depression treatment among individuals with cancer may discourage healthcare providers in initiating depression treatment. A systematic review of few randomized controlled trials of antidepressant and psychotherapy among individuals with cancer concluded that the efficacy and tolerability of antidepressants and psychotherapeutic interventions are questionable.<sup>27</sup> Also, none of the randomized clinical trials support the effectiveness of psychotherapy for diagnosed depression among individuals with cancer.<sup>45</sup> Future research is needed to document the effectiveness of depression treatment in terms of both the cancer and non-cancer related outcomes in the real-world practice setting.

Strengths and limitations of the current study have to be taken into account while interpreting the findings from the study. The strengths include use of nationally representative data, availability of a comprehensive list of variables that may affect depression treatment, and availability of an appropriate com-

parison group. There were some limitations to our study. All data for the study is derived from self-reports and thus are subject to recall bias. However, upon collecting the information from the household survey respondents, MEPS contacts a sample of medical providers by telephone to obtain and/or confirm the information which the respondents cannot accurately provide. And information on the MEPS household reported medical condition data has been compared with provider reported data, and it has been found to be reliable in published literature.<sup>46</sup> We could only identify associations, and causality could not be determined here due to the cross-sectional and retrospective nature of our study design. Presence of depression in our study population was based on self-report only and no diagnostic instrument was used by MEPS to validate the depression diagnosis. We could not assess the severity and the duration of the diseases, which may have shed light on the role of the clinical characteristics on use of depression treatment. We also did not analyze treatment rates stratified by the cancer site due to the limited sample size. Although we had sufficient number of individuals with depression, we could not separately analyze psychotherapy and antidepressant due to small sample sizes with psychotherapy use (Appendix). We only measured general psychotherapy and could not distinguish between types of psychotherapies. We also could not determine patient preferences in terms of choosing between psychotherapy and prescription antidepressants, which may be important in determining appropriate care. Lastly, our analysis was restricted to only patient-level factors, and we did not consider characteristics of the health-care provider; which may influence depression treatment among individuals with cancer.

Our study extends the prior literature and provides information on nation-wide depression treatment practices in real-world settings in the US, in spite of the limitations. By documenting a lower-likelihood of depression treatment among individuals with cancer despite increased contact with the healthcare system, our study highlights the possibility that competing demands may crowd out treatment for depression. The association between depression treatment and presence or diagnosis of cancer remains poorly understood and further research is needed to probe the reasons for non-treatment of depression. Designing and implementing appropriate interventions to impart knowledge and skills related to screening, assessment and management of depression among individuals with cancer is essential. And recognition of importance of depression treatment by cancer healthcare professionals or better integration of depression treatment in routine cancer care is recommended.

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