Published in final edited form as:

Psychosomatics. 2014 ; 55(6): 548–554. doi:10.1016/j.psych.2014.01.008.

Depression Among Patients with Diabetes Attending a Safety-Net Primary Care Clinic: Relationship to Disease Control

Erik R. Vanderlip, MD¹, Wayne Katon, MD¹, Joan Russo, PhD¹, Dan Lessler, MD MHA², and Paul Ciechanowski, MD MPH¹

¹University of Washington Department of Psychiatry and Behavioral Sciences, 1959 Pacific Street, Box 356560, Seattle, WA 98195

²Washington State Health Care Authority, 626 8th Avenue SE, Box 45502, Olympia, WA 98504

Abstract

Introduction—Depression and diabetes are highly co-morbid, with depression increasing risk of diabetes-related complications and mortality. Few studies have examined the relationship between depression and diabetes in safety-net populations with high rates of trauma exposure, anxiety and substance use disorders.

Methods—Using a cross-sectional survey of 261 patients with diabetes attending safety-net clinics, associations between depression and key diabetes control parameters were examined in bivariate and multivariable analyses adjusting for relevant confounders and significant interactions.

Results—Among participants, 57% were male, 51% were Caucasian, and average age was 57 years. Most respondents were unemployed (81%) and earned < \$10,000 per year (51%). Twenty-eight percent screened positively for depression, with a high overlap of post-traumatic stress (58%) and generalized anxiety (77%) symptoms. After adjustment for socioeconomic and clinical variables, depression was associated with higher mean body-mass-index ($P = 0.01$), severe obesity ($BMI \geq 35 \text{ kg/m}^2$) ($OR\ 2.34$, 95% $CI\ 1.09$ to 5.04 , $P = 0.03$) and uncontrolled diastolic blood pressure ($OR\ 2.49$, 95% $CI\ 1.15$ to 5.39 , $P = 0.02$). There was a non-significant trend for those with depression to have worse control of blood glucose. Associations with depression and diabetes clinical outcomes were not significantly worsened in the presence of co-morbid anxiety disorders.

Conclusions—Within a highly co-morbid safety-net population, significant associations between depression and key diabetes outcomes remained after accounting for relevant covariates. Further research will help elucidate the relationship between depression and diabetes control measures in safety-net populations.

© 2014 Academy of Psychosomatic Medicine. Published by Elsevier Inc. All rights reserved

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Disclosures

Otherwise, the authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article.

Introduction

Numerous studies have demonstrated significantly higher prevalence rates of depression in patients with diabetes [1]. Prevalence rates up to 20% have been reported in clinical samples, approximately double the rates found in the general population [1,2]. Previous research has shown that individuals suffering from co-occurring depression and diabetes have higher somatic symptom burden [3], more disability [4] and higher costs [5]. Additionally, depression has been associated with poorer glucose control [6], more diabetes-related complications [7] and higher risk of mortality [8].

There is a clear association with lower socioeconomic status and prevalence of depression [9], with significantly higher prevalence rates in populations with lower income and less education. Furthermore, depression has been linked with higher risk of obesity and type 2 diabetes, emphasizing the influence of cumulative stress or economic disadvantage on mental and physical health [10]. In spite of this relative wealth of knowledge, very few studies have examined the prevalence and association of depression with medical disease control in community-based safety-net populations with diabetes. Individuals in safety-net populations have multiple chronic stressors that may have direct effects on health, including housing instability, a relative absence of healthy food options, less access to parks and recreation and higher rates of crime.

Trauma exposure is more prevalent in safety-net populations as well, and is highly co-morbid with depression and diabetes in populations with poorer socioeconomic status [11–20]. In prior work, individuals with interpersonal relationship styles that are associated with traumatic experiences and anxiety have been found to have more fragmented, less-engaged care and poorer diabetic outcomes [21,22]. Additionally, those with co-occurring PTSD or anxiety disorders have demonstrated poorer response to depression treatment and had higher rates of co-morbid substance use disorders [23–26], factors which may attenuate efforts to improve coordinated diabetes care.

This study explores the prevalence of major depression within a safety-net population of patients with diabetes and the association of depression with selected clinical diabetic indices and diabetes control. The objective is to better understand the association of depression and key disease control measures in socioeconomically diverse populations with high rates of trauma exposure and generalized anxiety.

Methods

Sample Population

The Harborview Diabetes Care Study surveyed patients with diabetes attending a Family Medicine or Internal Medicine clinic using a 19-page questionnaire. The recruitment period lasted from September 2007 to March of 2008. Eligible subjects were invited to participate by mail or approached in the waiting room at the time of a healthcare visit and were mailed or handed a copy of the survey to complete and return by mail once written informed consent was obtained. 776 individuals with diabetes were identified as potentially eligible by chart review and sent an invitation and consent in the mail. 325 (42%) were unable to be

reached after two follow-up mailings and attempts to locate them during clinical appointments. A total of 451 surveys were distributed to consenting individuals (Figure 1). Returned data (N=295, response rate 65%) was linked to clinical outcomes metrics via available health records in the 12 month span prior to completion of the survey. The survey instrument consisted of standard demographic variables, diabetic clinical course and outcome measures, the patient's attitudes, behaviors and beliefs surrounding care of their diabetes, and several self-administered mental health screening questionnaires. Thirty-four surveys were removed due to missing data regarding depression status, yielding 261 surveys (58%) for final analysis. The University of Washington Institutional Review Board granted IRB approval.

Selected Clinical Outcomes

Diabetes clinical outcome variables were abstracted from automated data in electronic chart records and included laboratory values (serum cholesterol, glucose, hemoglobin A1c) and anthropomorphic measures (blood pressure, weight, height and body mass index, BMI). Serum cholesterol values were not found for 68 participants (26%), and were therefore not available for analysis. Number of years with diabetes and number of medical co-morbidities were obtained via self-report.

Mental Health Measures

Probable Major Depressive Disorder (hereafter referred to as depression or MDD) was defined as a score greater than or equal to 10 and self-report of significant impairment related to these symptoms on the Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 is a primary care depression screening instrument with a sensitivity for MDD of 73% and a specificity of 98% at a score of 10 as compared with structured clinical interview [27,28]. Probable PTSD (hereafter referred to as PTSD) was identified through use of the Anxiety and Depression Detector [29], a validated safety-net primary care mental health screening instrument with reported sensitivity and specificity for PTSD of 68% and 82% respectively compared to a diagnosis based on a structured psychiatric interview. Probable Generalized Anxiety Disorder (GAD) was identified using the GAD-7, with a validated sensitivity and specificity of 89% and 82% respectively at cut-off of 10 [30]. Smoking and substance use (cocaine, crack, amphetamines or opiates) were based on self-report. Both were dichotomized into use at time of the survey vs. none. Alcohol use was ascertained via the AUDIT-C [31], a 3-item validated self-report measure for primary care populations, and problematic consumption was defined using standard cut-points by gender (4 for men, 3 for women).

Statistical Analysis

For bivariate analyses, independent-group t tests or chi-square tests were used to evaluate associations between relevant demographic, mental health and clinical diabetes-related outcomes. Linear and logistic regression models were used to control for a priori clinically relevant confounders in multi-variable analysis. Associations were examined between the presence of MDD and both continuous and discrete measurements of blood pressure, BMI and hemoglobin A1c (hemoglobin A1c greater than 8%, blood pressure greater than 130 mmHg systolic, 80 mmHg diastolic and BMI greater than 30 kg/m²). All multi-variable

analyses were adjusted for gender, race (white vs. non-white), education (presence of at least some college education vs. none), marital status (married or co-habiting vs. none), employment (current vs. none), insurance status (no insurance vs. public or private), age, years with diabetes, current smoking, drug and alcohol use, PTSD and GAD. All associations were considered significant at the $P < 0.05$ level. Interactions between PTSD and GAD with MDD were examined independently in the multivariable regression models but found to be insignificant. Statistical analysis was performed using SPSS version 19.0 [32].

Results

Demographic and clinical results by depression status are listed in Table 1. Just over half of the respondents were male (57%) and the average age was 57 years. Caucasians comprised 51% of the sample, with African Americans accounting for 25% of total participation. Over one-half of participants (56%) reported attending some college, while fewer than 20% reported employment at the time of the survey and approximately 50% reported earning less than \$10,000 annually.

A total of 73 individuals screened positive for major depressive disorder on the PHQ-9 (28%), 70 screened positive for PTSD on the Anxiety and Depression Detector (27%), and 89 screened positive for GAD (34%) with the GAD-7 (Table 1). The majority of those reporting depression also reported PTSD (58%) or GAD (77%), demonstrating significant overlap between the conditions. Only 7% reported current substance use, compared with 12% of the sample reporting problematic drinking and 26% endorsing current tobacco smoking. Persons with depression were significantly more likely to be younger, unemployed and to report an income less than 10K annually. Depression was also associated with poorer diastolic blood pressure control, obesity (including severe obesity, BMI ≥ 35 kg/m²), PTSD and GAD in bivariate analysis.

Table 2 shows that after adjustment for covariates, depression was found to be significantly associated with a higher average BMI (5.12 kg/m², 95% CI 1.83 to 8.54, $P = 0.01$) and those with depression were also over twice as likely to be severely obese (BMI greater than 35 kg/m²). Persons with depression also had poorer control of diastolic blood pressure after adjustment (OR: 2.49, 95% CI: 1.15 to 5.39, $P = 0.02$).

Depression was not associated with systolic blood pressure control. There were non-significant trends for those with depression to have higher average Hemoglobin A1c and for that A1c to be above 8% (Tables 1 and 2). The addition of PTSD and GAD to multivariable regression models did not significantly alter the association of depression and the selected disease outcomes.

Discussion

This analysis demonstrates that after adjustment for multiple covariates, depression was independently associated with several important risk factors for poor diabetes outcomes including poorer control of diastolic blood pressure and higher rates of severe obesity. While cross-sectional in nature, this analysis is in line with previous findings that major depression

is significantly associated with adverse health risk behaviors and measures of diabetes disease control [7,33,34]. Obesity has been the leading risk factor for development of adult-onset diabetes, and higher levels of obesity have been correlated with poor diabetes-related outcomes and mortality [35]. Depressed individuals may lack the motivation, energy and belief they can affect change in their weight, leading to worsening body image, worsening depressive symptoms and weight gain resulting in a dangerous downward spiral [36]. Furthermore, overeating is often a maladaptive coping behavior frequent in persons with depressive disorders.

Depression has been associated with changes to the hypothalamus-pituitary-adrenal (HPA) axis with increased levels of cortisol (stress hormones) which may account for higher than normal rates of hypertension and obesity with chronically low mood [37]. Previous studies have identified uncontrolled diastolic hypertension as a leading factor in cardiovascular mortality among patients with diabetes [38]. Low levels of medication adherence, poor self-care and low health literacy may also account for higher rates of uncontrolled hypertension, but our models accounted for some of the factors contributing to these alternative explanations (income, marital status, education) and found depression to still be significantly associated with obesity and diastolic hypertension.

Additionally, there was a non-significant trend for those with depression to have higher average glycated hemoglobin levels. In our analysis, the unadjusted mean difference in Hemoglobin A1c for the depressed versus the non-depressed individuals was 0.31%, comparable in size to prior reports [6]. A meta-analysis of the effect size of depression on mean Hemoglobin A1c provided an estimate that depression was associated with 3% of variance in glycated hemoglobin levels, which would be approximately 0.21% higher A1c attributable to depression, consistent with our findings [39]. Our relatively small sample may have precluded finding a statistically significant difference between depressed and non-depressed glycated hemoglobin levels.

We found no significant interactions between depression and PTSD or GAD on any outcome measures in multi-variable analyses, in spite of a high prevalence for all three conditions. Those with depression and either comorbid PTSD or GAD were not found to have consistently worse disease control across all domains. Depression in the context of repeated traumatic stressors or generalized anxiety may be more treatment resistant, with some arguing that it is a different form of depression altogether [24,26,40]. The presence of mental health co-morbidities in safety-net populations may complicate diabetes control via more treatment-resistant depression. Further information is needed to elucidate the complex interaction of depression and anxiety co-morbidity on diabetes-related clinical outcomes.

This study has several limitations. The self-report nature and cross-sectional design subject the data to potential recall bias and limit the ability to infer causality between associations. Additionally, this analysis may have been unable to detect significant differences in hemoglobin A1c or significant interactions with anxiety disorders and depression due to sample size. Finally, a lack of ability to obtain demographic or clinical outcomes on survey non-responders may skew our results via selection bias such that our effects could underestimate the magnitude of associations given that those with mental health co-

morbidities may have been less likely to participate in survey research. The inclusion of demographic and clinical covariates may help mitigate some of the potential sample bias induced from differential survey response.

This analysis supports previous associations between depression and diabetes-related disease control and extends those findings to an underserved safety-net population. Further research will help to shed light on the relationship between anxiety, depression and health outcomes in underserved populations.

Acknowledgments

The lead author was supported by the NIMH training-grant T32MH020021-16.

References

1. Anderson R, Freedland K, Clouse R, Lustman P. The Prevalence of Comorbid Depression in Adults with Diabetes. *Diabetes Care*. 2001; 24:1069–1078. [PubMed: 11375373]
2. Ali S, Stone Ma, Peters JL, Davies MJ, Khunti K. The prevalence of co-morbid depression in adults with Type 2 diabetes: a systematic review and meta-analysis. *Diabet Med*. 2006 Nov.23:1165–1173. [PubMed: 17054590]
3. Ludman E, Katon W, Russo J. Depression and diabetes symptom burden. *Gen Hosp*. 2004; 26:430–436.
4. Korff, MVon; Katon, W. Potentially modifiable factors associated with disability among people with diabetes. *Psychosom*. 2005; 67:233–240.
5. Egede L, Zheng D, Simpson K. Comorbid depression is associated with increased health care use and expenditures in individuals with diabetes. *Diabetes Care*. 2002; 25:464–470. [PubMed: 11874931]
6. Katon W, Korff M Von, Ciechanowski P. Behavioral and clinical factors associated with depression among individuals with diabetes. *Diabetes*. 2004; 27:914–920.
7. De Groot M, Anderson R, Freedland KE, Clouse RE, Lustman PJ. Association of depression and diabetes complications: a meta-analysis. *Psychosom Med*. 2001; 63:619–630. [PubMed: 11485116]
8. Park M, Katon WJ, Wolf FM. Depression and risk of mortality in individuals with diabetes: a meta-analysis and systematic review. *Gen Hosp Psychiatry*. 2013; 35:217–225. [PubMed: 23415577]
9. Lorant V. Socioeconomic Inequalities in Depression: A Meta-Analysis. *Am J Epidemiol*. 2003 Jan 15.157:98–112. [PubMed: 12522017]
10. Everson, Sa; Maty, SC.; Lynch, JW.; Kaplan, Ga. Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and diabetes. *J Psychosom Res*. 2002 Oct.53:891–895. [PubMed: 12377299]
11. Sareen J, Cox BJ, Stein MB, Afifi TO, Fleet C, Asmundson GJG. Physical and mental comorbidity, disability, and suicidal behavior associated with posttraumatic stress disorder in a large community sample. *Psychosom Med*. 2007 Apr.69:242–248. [PubMed: 17401056]
12. Perkonig A, Owashi T, Stein MB, Kirschbaum C, Wittchen H-U. Posttraumatic stress disorder and obesity: evidence for a risk association. *Am J Prev Med*. 2009 Jan.36:1–8. [PubMed: 18976880]
13. Miller, Sa; Mancuso, Ca; Boutin-Foster, C.; Michelen, W.; McLean-Long, C.; Foote, B., et al. Associations between posttraumatic stress disorder and hemoglobin A1(C) in low-income minority patients with diabetes. *Gen Hosp Psychiatry*. 2011; 33:116–122. [PubMed: 21596204]
14. Goodwin RD, Davidson JR. Self-reported diabetes and posttraumatic stress disorder among adults in the community. *Prev Med (Baltim)*. 2005 May.40:570–574.
15. Lukaschek K, Baumert J, Kruse J, Emeny RT, Lacruz ME, Huth C, et al. Relationship between posttraumatic stress disorder and Type 2 Diabetes in a population-based cross-sectional study with 2970 participants. *J Psychosom Res*. 2013 Apr.74:340–345. [PubMed: 23497837]

16. Lauterbach D, Vora R, Rakow M. The relationship between posttraumatic stress disorder and self-reported health problems. *Psychosom Med*. 2005; 67:939–947. [PubMed: 16314599]
17. Scott KM, McGee Ma, Wells JE, Oakley Browne Ma. Obesity and mental disorders in the adult general population. *J Psychosom Res*. 2008 Jan;64:97–105. [PubMed: 18158005]
18. Spitzer C, Barnow S, Völzke H, John U, Freyberger HJ, Grabe HJ. Trauma, posttraumatic stress disorder, and physical illness: findings from the general population. *Psychosom Med*. 2009 Nov. 71:1012–1017. [PubMed: 19834051]
19. Qureshi S, Pyne J, Magruder K. The link between post-traumatic stress disorder and physical comorbidities: a systematic review. *Psychiatr Q*. 2009; 80:87–97. [PubMed: 19291401]
20. Breslau N, Davis G. Traumatic events and posttraumatic stress disorder in an urban population of young adults. *Arch Gen*. 1991; 48:216–222.
21. Ciechanowski PS, Katon WJ, Russo JE, Walker Ea. The patient-provider relationship: attachment theory and adherence to treatment in diabetes. *Am J Psychiatry*. 2001 Jan;158:29–35. [PubMed: 11136630]
22. Ciechanowski P, Russo J. Relationship styles and mortality in patients with diabetes. *Diabetes Care*. 2010; 33:539–544. [PubMed: 20007946]
23. Ouimette P, Brown P, Najavits L. Course and treatment of patients with both substance use and posttraumatic stress disorders. *Addict Behav*. 1998; 23:785–795. [PubMed: 9801716]
24. Breslau N, Davis GC, Peterson EL, Schultz LR. A second look at comorbidity in victims of trauma: the posttraumatic stress disorder-major depression connection. *Biol Psychiatry*. 2000 Nov 1;48:902–909. [PubMed: 11074228]
25. Kaplan M, Klinetob N. Childhood emotional trauma and chronic posttraumatic stress disorder in adult outpatients with treatment-resistant depression. *J Nerv Ment Dis*. 2000; 188:596–601. [PubMed: 11009333]
26. Bruce S, Yonkers K, Otto M. Influence of psychiatric comorbidity on recovery and recurrence in generalized anxiety disorder, social phobia, and panic disorder: a 12-year prospective. *J psychiatry*. 2005; 162:1179–1187.
27. Arroll B, Goodyear-Smith F. Validation of PHQ-2 and PHQ-9 to screen for major depression in the primary care population. *Ann*. 2010:348–353.
28. Spitzer R, Kroenke K, Williams J. Validation and utility of a self-report version of PRIME-MD. *JAMA J*. 1999; 282:1737–1744.
29. Means-Christensen AJ, Sherbourne CD, Roy-Byrne PP, Craske MG, Stein MB. Using five questions to screen for five common mental disorders in primary care: diagnostic accuracy of the Anxiety and Depression Detector. *Gen Hosp Psychiatry*. 2006; 28:108–118. [PubMed: 16516060]
30. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006 May 22;166:1092–1097. [PubMed: 16717171]
31. Frank D, DeBenedetti AF, Volk RJ, Williams EC, Kivlahan DR, Bradley Ka. Effectiveness of the AUDIT-C as a screening test for alcohol misuse in three race/ethnic groups. *J Gen Intern Med*. 2008 Jun;23:781–787. [PubMed: 18421511]
32. IBM SPSS Statistics for Windows. 2010
33. Pan A, Lucas M, Sun Q, van Dam RM, Franco OH, Willett WC, et al. Increased mortality risk in women with depression and diabetes mellitus. *Arch Gen Psychiatry*. 2011 Jan;68:42–50. [PubMed: 21199964]
34. Pirraglia P, Gupta S. The interaction of depression and diabetes: a review. *Curr Diabetes Rev*. 2007; 3:249–251. [PubMed: 18220682]
35. Buchwald H, Estok R, Fährbach K, Banel D, Jensen MD, Pories WJ, et al. Weight and type 2 diabetes after bariatric surgery: systematic review and meta-analysis. *Am J Med*. 2009 Mar. 122:248–256.e5. [PubMed: 19272486]
36. Luppino F, Wit Lde, Bouvy P. Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Arch Gen*. 2010; 67:220–229.
37. Vreeburg S, Hoogendijk W, van Pelt J, DeRijk R. Major Depressive Disorder and Hypothalamic-Pituitary-Adrenal Axis Activity. *Arch Gen Psychiatry*. 2013; 66:617–626. [PubMed: 19487626]

38. Hansson L, Zanchetti A, Carruthers S. intensive blood-pressure lowering and low-dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment (HOT) randomised trial. *Lancet*. 1998 Oct.17:843–844.
39. Lustman PJ, Anderson RJ, Freedland KE, de Groot M, Carney RM, Clouse RE. Depression and poor glycemic control: a meta-analytic review of the literature. *Diabetes Care*. 2000 Jul.23:934–942. [PubMed: 10895843]
40. O'Donnell ML, Creamer M, Pattison P. Posttraumatic stress disorder and depression following trauma: understanding comorbidity. *Am J Psychiatry*. 2004 Aug.161:1390–1396. [PubMed: 15285964]

Figure 1.
Survey Response Diagram

Table 1
Bivariate Associations of Probable Major Depression vs. Selected Covariates and Disease Control Measures

Covariate or Outcome	Total		Depression (N=73, 28%)		No Depression (N=188, 72%)		Chi-Square Test ^a / T-test ^b	P-Value
	Mean/Count	(%) or STD	Mean/Count	(%) or STD	Mean/Count	(%) or STD		
Age (yrs)	57.03	11.05	54.88	11.01	57.86	10.98	1.97	0.050
Male (%)	148	57%	40	55%	108	57%	.151	.698
Caucasian (%)	133	51%	32	44%	101	54%	11.611	.071
Some College Education (%)	145	56%	36	49%	109	58%	1.598	.206
Married ^c (%)	79	31%	21	30%	58	31%	.062	.803
Annual Income ^c >\$10K (%) (250)	124	50%	28	39%	96	54%	4.097	.043
Employed (%)	49	19%	7	10%	42	22%	5.607	.018
Have Insurance (%)	44	17%	13	18%	31	16%	.065	.798
Current Substance Use (%)	18	7%	5	7%	13	7%	.000	.998
Current Alcohol Use (%)	31	12%	10	14%	21	11%	.321	.571
Current Smoking (%)	67	26%	23	31%	44	23%	1.809	.179
PTSD (%)	70	27%	42	58%	28	15%	47.596	.000
GAD (%)	89	34%	56	77%	33	18%	81.36	.000
A1c ^c (%)	8.01	1.73	8.22	1.90	7.92	1.65	-1.201	.231
A1c ^c Greater than 8% (%)	94	43%	34	52%	60	39%	3.46	0.063
Systolic BP ^c (mmHg)	131.2	13.1	131.8	14.4	130.9	12.6	-.484	.629
SBP ^c Greater than 130 mmHg	111 (228)	49%	33	51%	78	48%	0.158	0.691
Diastolic BP ^c (mmHg)	74.5	9.8	77.5	10.2	73.3	9.4	-2.940	.004
DBP ^c Greater than 80 mmHg	61	27%	25	31%	36	22%	6.359	0.012
BMI ^c (kg/m ²)	35.51	9.59	38.34	11.44	34.39	8.54	-2.851	.005
BMI ^c Greater than 30 (kg/m ²)	159	70%	51	78%	108	66%	3.279	0.07

Covariate or Outcome	Total		Depression (N=73, 28%)		No Depression (N=188, 72%)		Chi-Square Test ^a / T-test ^b	P-Value
	Mean/Count	(%) or STD	Mean / Count	(%) or STD	Mean/Count	(%) or STD		
BMI ^c Greater than 35 (kg/m ²)	113	43%	39	53%	74	39%	4.236	.051

STD; Standard deviation, BMI; Body Mass Index (kg/m²), A1c; percent glycated hemoglobin, PTSD; Post-traumatic Stress Disorder, SBP; Systolic blood pressure, DBP; Diastolic blood pressure

^a Chi-squared DF = 1

^b Assumes independent groups.

^c Valid denominator-N ranged from 220 (84%, A1c) to 257 (98%, Marital Status), otherwise percentages calculated on N=261.

Table 2

Regression Analyses of Major Depressive Disorder and Diabetes Disease Control

		Regression^{a, b}			
		Probable Depression	95% CI		
Outcome		OR or beta^c	Lower	Upper	Sig
A1c Average		.199 ^c	−0.44	0.84	0.54
A1c > 8%		1.91	0.85	4.29	0.12
SBP Average		4.002 ^c	−0.87	8.87	0.11
SBP Uncontrolled (>130 mmHg)		1.514	0.69	3.33	0.30
DBP Average		3.679^c	0.66	6.70	0.02
DBP Uncontrolled (> 80 mmHg)		2.491	1.15	5.39	0.02
BMI Average (kg/m ²)		5.118^c	1.83	8.54	0.01
Obese (BMI > 30 kg/m ²)		2.102	0.91	4.87	0.08
Severe Obesity (BMI ≥ 35 kg/m ²)		2.340	1.09	5.04	0.03

^aRegression covariates include gender, race (Caucasian), presence of college education, marital status, employment, insurance status, income, age and years with diabetes, current substance, smoking, and alcohol use, PTSD and GAD.

^bSample size for regression models range from N=205 to N=213 after the addition of covariates.

^cIndicates linear regression model, beta estimate for major depression.

OR; Odds Ratio, A1c; percent glycated hemoglobin, SBP; Systolic blood pressure, DBP; Diastolic blood pressure, BMI; Body Mass Index (kg/m²)