

Minor Depression and Health Status Among US Adults With Diabetes Mellitus

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Almost 21 million Americans have diabetes mellitus (DM),¹ and approximately 19 million Americans suffer from depression.² Significant morbidity, mortality, and resource use are associated with each disease. The American Diabetes Association reports that the risk for heart disease and stroke among people with DM is twice that of people without DM.¹ Direct and indirect medical costs associated with DM in 2002 were an estimated \$132 billion, and there were more than 12 million office visits during 2004 for depression.^{3,4} Beyond the clinical and economic impact of each disease on healthcare systems in the United States, DM and comorbid depression present additional healthcare challenges for 2 reasons. First, the estimated prevalence of depression among people with DM is more than twice that among the general population, and second, comorbid DM and depression are associated with poor glycemic control.^{5,6}

Both DM and depression are associated with increased disability. Among people with DM, those with depression have higher levels of work disability or overall functional disability (ie, non-work-related) compared with those without depression.^{7,8} By 2020, major depression is projected to be second only to ischemic heart disease as a cause of disability.⁹ Compared with DM without depression, DM with both major and minor depression is associated with increased work disability/unemployment, inability to go to work 5 or more days in the previous month, or inability to perform tasks while at work.¹⁰ Comorbid major depression and DM are associated with more disability days and increased odds of lost work days compared with DM without depression.¹¹

A synergistic effect between DM and depression in which the presence of both diseases is associated with more functional disability than the presence of either disease alone also has been described.¹²⁻¹⁴ Among people with DM, the presence of depressive symptoms is associated with impairment in activities of daily living (ADLs) and instrumental activities

of daily living (IADLs), and an increased risk of dying compared with those without depressive symptoms.^{12,13}

The presence of both DM and major depression is associated with more functional disability.¹⁴ Adults with DM

Objective: To determine whether diabetes mellitus (DM) with minor depression is associated with poorer levels of mental and physical functioning compared with DM without depression.

Study Design: Retrospective database study.

Methods: US adults participating in the 2001 Medical Expenditure Panel Survey were included in these analyses. Main outcome measures were differences in health status, physical and cognitive limitations, and the Short-Form 12 (SF-12) Mental Component Summary (MCS) and Physical Component Summary (PCS) for US adults with DM stratified by minor depression status and evaluated using univariate and multivariate analyses to control for demographic, behavioral, and clinical covariates.

Results: A total of 1572 respondents with DM were included (1443 without depression, 129 with depression). Compared with people with DM and without depression, those with DM and minor depression were younger ($P = .04$); were more likely to be female, white, and smokers; and to have physical and cognitive limitations and lower SF-12 MCS and PCS scores (all $P < .01$). In multivariate analyses, minor depression was independently associated with lower self-reported health status, MCS scores, and more cognitive limitations.

Conclusion: People with DM and minor depression have lower mental functional scores, more cognitive limitations, and lower self-reported health status scores compared with people with DM and without depression, differences that may adversely affect self-care activities. Primary and DM care providers should screen for and be aware of depression in their patients with DM.

(*Am J Manag Care.* 2007;13:65-72)

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and comorbid major depression have more difficulties maintaining health, diet, and exercise recommendations and are less likely to be adherent with prescribed medications compared with people with DM and without major depression.¹⁵ These studies involved either specific subpopulations (ie, Mexican-Americans)^{12,13} or major depression and DM in the general population.^{14,15}

Diabetes self-management is an essential component necessary for achieving glycemic control and avoidance of DM-related complications. Treatment of DM is multidimensional, involving complex diet, exercise, self-monitoring, and medication regimens. Although associations between major depression and difficulties managing diet, exercise, and medication have been reported,^{14,15} studies investigating similar challenges presented by DM and comorbid minor depression are lacking. The need exists for investigations of the association between minor depression and functional disability in patients with DM in large, nationally representative populations. The current study addresses that need by evaluating associations between comorbid DM and minor depression and functional status. Data for these analyses were obtained from the Medical Expenditure Panel Survey (MEPS), a nationally representative survey of the US civilian noninstitutionalized population.¹⁶ We hypothesized that minor depression among US adults with DM is associated with poorer levels of mental and physical functioning compared with the levels observed in people with DM and without depression.

METHODS

Data Source

The 2001 MEPS Household Component (MEPS HC) database was used for all analyses. MEPS is cosponsored by the Agency for Healthcare Research and Quality and the National Center for Health Statistics. The sampling frame for the MEPS HC is drawn from respondents to the National Health Interview Survey. The MEPS HC collects data from a subsample of respondents to the previous year's National Health Interview Survey, generating a nationally representative database. For each survey year, MEPS data are collected in 3 rounds that cover the entire year. Therefore, data for diagnoses of medical conditions and prescription use are recorded in the same survey year.

The sample design of the MEPS HC survey includes stratification, clustering, multiple stages of selection, and disproportionate sampling, with sampling weights that reflect adjustments for survey nonresponse and population totals from the Current Population Survey.¹⁷ All analyses were conducted using STATA 8.1 (StataCorp, College Station, Tex) to

account for the complex sampling structure of MEPS, ensuring nationally representative estimates.

Patients

Subjects were identified through use of the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)*.¹⁸ All MEPS participants with ICD-9-CM code 250 (diabetes mellitus) for 2001 who were between the ages of 18 and 89, inclusive years were included in this study. MEPS limits ICD-9-CM codes to 3 digits to ensure privacy for respondents. No differentiation is made in the database with regard to diagnosis of type 1 or type 2 DM for MEPS respondents. For the purpose of these analyses, minor depression was defined as depression not meeting the *Diagnostic and Statistical Manual of Mental Disorders* criteria for major depression (ICD-9-CM code 296).¹⁹ Respondents with ICD-9-CM code 311 (depression not otherwise specified), along with at least 1 prescription for an antidepressant drug (eg, monoamine oxidase inhibitors, tricyclic antidepressants, selective serotonin reuptake inhibitors, serotonin 2 receptor antagonists, α_2 receptor antagonists, and other miscellaneous antidepressants) were defined as having DM and minor depression. To avoid misclassification bias, respondents with a diagnosis code consistent with major depression (ICD-9-CM code 296) and those with a diagnosis code for minor depression (ICD-9-CM code 311) but without an antidepressant medication were excluded from the analyses. The resulting 2 cohorts included people with diabetes: 1 cohort with minor depression and 1 cohort with no depression.

Approval for this study was obtained from the Colorado Multiple Institutional Review Board.

Outcome Measures

Seven outcomes measures related to functioning were available for study in the MEPS database, 3 related to health and functional status and 4 related to limitations in physical or cognitive functioning, ADLs, or IADLs. The health status measures included the Short-Form 12 (SF-12), which was administered to participants of the MEPS survey as part of the Self-Administered Questionnaire (SAQ).²⁰ Components of the SAQ included the 12 questions of the SF-12, compiled into Mental Component Summary (MCS) scores and Physical Component Summary (PCS) scores, and a question asking respondents to estimate their perceived general health status using a visual analog scale (VAS) ranging from 0 ("worst possible health") to 100 ("best possible health"). As a result, VAS scores represent the respondents' perception of their overall health, or their self-rated health status.²¹ The SF-12 is a validated, generic health status measure that provides scores for

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physical and mental condition (SF-12 PCS and SF-12 MCS scores) that are based on each respondent's answers to 12 questions regarding physical and mental health.²⁰

Cognitive limitations were assessed for individual respondents by surveying family members. The variable was coded as yes if an adult in the family was reported to (1) have experienced confusion or memory loss, (2) have problems making decisions, or (3) required supervision for his or her own safety. Physical limitations were assessed using a composite variable that included limitations in walking, activities, seeing, hearing, ADLs, and IADLs. A limitation in any of the categories was coded as a yes to physical limitations, whereas a no in all categories indicated the absence of any physical limitations. Variables for cognitive and physical limitations reflect patient (or family) responses to MEPS questionnaire items.

The variables corresponding to ADLs and IADLs also were examined separately. Difficulties with ADLs indicated problems with the ability to perform daily tasks such as bathing, dressing, eating, walking across a room, getting in/out of bed, and using a toilet independently.²² Difficulties with IADLs indicated problems with the ability to perform instrumental tasks such as preparing meals, shopping, managing money, using the telephone, and taking medications independently.²³ Responses for ADL and IADL questions were compiled into a dichotomous variable where yes indicated the presence of at least 1 limitation and no indicated the absence of all limitations.

Data Analysis

Univariate analyses used the *t* test, the χ^2 test, or Fischer's exact test as appropriate to determine differences between people with DM and comorbid depression and people with DM and without comorbid depression for each demographic and outcome variable. Multivariate analyses examined associations between comorbid depression and the 7 outcome measures (SF-12 MCS and PCS scores, the VAS health status measure, ADL and IADL disabilities, any limitations, and cognitive limitations). Analyses were adjusted for demographic variables significant in univariate analyses or representing potential confounders, including age, race/ethnicity, patient sex, education level in years, and body mass index, a measure based on height and weight.²⁴ Income was defined relative to the federal poverty level (FPL) as follows: poor (less than 100% FPL), near poor (100% to less than 125% FPL), low income (125% to less than 200% FPL), middle income (200% to less than 400% FPL), and high income (greater than or equal to 400% FPL).

Linear regression methods were used to evaluate continuous outcome variables (SF-12 MCS and PCS and VAS self-

perceived health status scores), and logistic regression methods were used for dichotomous outcome variables (presence or absence of physical or cognitive limitations or limitations in ADLs or IADLs). In univariate and multivariate analyses, a level of .05 was used to determine statistical significance.

Risk adjustment for comorbidities in multivariate analyses was addressed using diagnosis codes available for MEPS participants.²⁵⁻²⁷ Use of ICD-9-CM codes allowed counting of individual diagnoses even if the patient was not treated by prescription medication, and avoided the problem of undercounting comorbid conditions when 1 drug was used to treat 2 conditions. Data management and analyses were conducted using SAS version 8.2 (SAS Institute, Cary, NC) and STATA version 8.1 STATA software was used for univariate and multivariate analyses as it allowed for adjustments required by the use of MEPS sampling weights.

RESULTS

A total of 1572 respondents with DM were identified from the 2001 MEPS database. As this database is a nationally representative sample, this cohort represents 11 645 231 people in the US noninstitutionalized civilian population. The study sample of people with DM included 1443 without depression and 129 with depression. People with DM and comorbid depression were significantly more likely to be younger, female, and have more comorbidities than those with DM and without depression (**Table 1**).

Univariate analyses of functional status outcome measures indicated that DM with comorbid depression was associated with deficits in both physical and mental health status (**Table 2**). Mean SF-12 PCS and MCS scores both were lower for those with depression compared with those not diagnosed with depression, 35.8 versus 40.4 ($P = .001$) and 41.6 versus 50.1 ($P < .001$), respectively. People with DM and depression self-rated their own health status significantly lower than those with DM and without depression. The mean VAS score for those with depression was 55.2, whereas the mean VAS score for those without depression was 68.2 ($P < .001$). People with depression reported significantly more cognitive and physical limitations than their counterparts without depression (both $P < .001$). Significant differences in ADLs and IADLs were identified only for IADLs. People with depression reported having difficulty with 1 or more IADLs more frequently than those with no depression ($P = .002$).

In the adjusted analyses, the presence of comorbid depression among people with DM was significantly associated with lower mental functioning (SF-12 MCS scores) and lower self-perceived health status (VAS scores) (both $P < .001$)

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(Table 3). Depression versus no depression also was associated with having a higher likelihood of cognitive limitations (odds ratio [OR] = 2.42, 95% confidence interval [CI] = 2.01-2.91; Table 4). When adjusted for covariates, comorbid depression compared with no depression was not significantly associated with physical functioning, the presence of physical limitations, or limitations in either ADLs or IADLs.

Income level was associated with higher SF-12 MCS and PCS scores as well as higher self-perceived health status (VAS scores). Being poor (vs having a low, middle, or high income) was also associated with a greater likelihood of having physical or cognitive limitations. Relative to being poor, all other income levels were associated with a lower risk of having problems with ADLs. Middle- and high-income respondents (relative to poor respondents) were less likely to have problems with instrumental ADLs. Increased age was associated with lower SF-12 PCS scores and higher risk for any type of limitation (Tables 3 and 4). Fewer years of education were sig-

nificantly associated with poor functioning in all outcome measures with the exception of limitations in ADLs. Significant associations between other variables and outcomes measures are presented in Tables 3 and 4.

DISCUSSION

In analyses evaluating physical and mental health, functional status, and self-perceived health status among US adults with DM, comorbid minor depression versus no depression was associated with lower physical and mental health status, lower self-perceived health, more cognitive and physical limitations, and more difficulties with IADLs such as preparing meals, shopping, managing money, using the telephone, and taking medications independently. When controlling for age, sex, race/ethnicity, income, education, other comorbid conditions, and body mass index, minor depression compared with no depression remained significantly associated with

decreased mental functioning, lower self-rated health status, and a higher likelihood of having cognitive limitations. These difficulties with mental and cognitive functioning, as well as the perceived lower overall health status, are likely to present greater challenges for disease self-management for people with DM and depression versus those with DM and without depression. Considering the importance of self-care in the control of DM, specifically the management of complex diet, exercise, self-monitoring, and medication regimens, the results of this study indicate US adults with diabetes and minor depression may be at risk for poor outcomes as a result of lower health status.

Other factors associated with poorer functioning and health status among people with DM and minor depression are low income and a higher number of comorbid conditions. Education level (ie, fewer years of education) is associated with poorer outcomes (with the exception of limitations in

■ **Table 1.** Demographics of the 2001 MEPS Study Population With Diabetes With and Without Depression

Variable	No Depression	Depression*	P
Mean age, y (SE)	60.6 (0.5)	57.0 (1.6)	.03 [†]
Male, n (% , SE)	691 (52.4, 0.02)	44 (33.7, 0.02)	<.001 [†]
Race/ethnicity, n (% , SE)			
White	752 (65.8, 0.03)	94 (82.9, 0.03)	<.001 [†]
Black	318 (18.8, 0.01)	10 (5.4, 0.01)	
Hispanic	330 (12.7, 0.02)	22 (8.9, 0.03)	
Other	43 (2.7, 0.01)	3 (2.8, 0.02)	
Education, mean y (SE)	11.5 (0.1)	11.7 (0.4)	.7 [†]
Income level, n (% , SE) [§]			
Poor	242 (12.8, 0.01)	26 (15.5, 0.03)	.3 [‡]
Near poor	106 (6.3, 0.01)	4 (2.6, 0.01)	
Low income	297 (17.2, 0.01)	29 (20.0, 0.05)	
Middle income	419 (31.7, 0.01)	39 (29.9, 0.04)	
High income	379 (31.9, 0.02)	31 (32.1, 0.03)	
Mean BMI (SE)	30.6 (0.2)	31.7 (0.7)	.1 [†]
Comorbidities, mean n (SE)	6.4 (0.1)	11.9 (0.8)	<.001 [†]

*Defined by ICD-9-CM code 311 plus ≥1 prescription for an antidepressant medication.

[†]Indicates *t* test.

[‡]Indicates χ^2 test.

[§]Poor was defined as less than 100% of the FPL; near poor, 100% to less than 125% of the FPL; low income, 125% to less than 200% of the FPL; middle income, 200% to less than 400% of the FPL; and high income, greater than or equal to 400% of the FPL.

^{||}Based on the number of ICD-9-CM codes.

MEPS indicates Medical Expenditure Panel Survey; BMI, body mass index; ICD-9-CM, *International Classification of Diseases, Ninth Revision, Clinical Modification*; FPL, federal poverty level.

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Table 2. Univariate Analyses for Outcome Measures, Comparing People With Diabetes Stratified by Depression Status

Variable	No Depression*	Minor Depression*	P
SF-12 MCS, mean (SE)	50.1 (0.4)	41.6 (1.5)	<.00 [†]
SF-12 MCS score <40, n (% , SE)	273 (18.4, 0.01)	61 (50.6, 0.04)	<.001 [‡]
SF-12 PCS, mean (SE)	40.4 (0.4)	35.8 (1.4)	.001 [†]
SF-12 PCS score <40, n (% , SE)	630 (45.0, 0.02)	77 (61.5, 0.05)	.003 [‡]
Self-reported health status, mean (SE) [§]	68.2 (0.9)	55.2 (2.5)	<.001 [†]
Physical limitations, n (% yes, SE)	772 (54.9, 0.02)	99 (78.0, 0.03)	<.001 [†]
ADL limitations, n (% yes, SE)	161 (9.6, 0.01)	26 (13.8, 0.03)	.26 [‡]
IADL limitations, n (% yes, SE)	260 (16.3, 0.01)	42 (29.6, 0.05)	.002 [‡]
Cognitive limitations, n (% yes, SE)	221 (14.2, 0.01)	51 (34.1, 0.02)	<.001 [†]

*Defined by ICD-9-CM code 311 plus ≥1 prescription for an antidepressant medication.
[†]Indicates t test.
[‡]Indicates χ^2 test.
[§]Determined using a visual analog scale, with a range of 0 (worst possible health) to 100 (best possible health).
^{||}Any limitation in ADLs, IADLs, walking, physical activity, seeing, or hearing.
 SF-12 MCS indicates Short Form 12 Mental Component Summary; SF-12 PCS, Short Form 12 Physical Component Summary; ADL, activities of daily living; IADL, instrumental activities of daily living; ICD-9-CM, *International Classification of Diseases, Ninth Revision, Clinical Modification*.

ADLs), and older age is associated with lower SF-12 MCS scores and the presence of cognitive and functional limitations in people who have diabetes and minor depression compared with people who have DM without depression. These findings are generalizable to the US adult population with DM and build on previous studies reporting increased physical disability among people with both DM and major depression compared with neither disease.¹⁴

Of note here is the finding that comorbid minor depression among people with DM was associated with younger age in both univariate and multivariate analyses. These results are consistent with those reported by Katon et al in a study that showed that major and minor depression were associated with younger age in people with DM.²⁸ The authors suggested a survivorship effect in that patients with DM and comorbid depression who do not engage successfully in self-care behaviors have a shorter life expectancy. The existence of a survivorship effect is further supported by a recent study in which the presence of depressive symptoms was associated with higher mortality risk among people with DM but not among people without DM.²⁹ The increased risk associated with comorbid depression in the DM population was observed in both unadjusted and adjusted analyses that controlled for demographic, lifestyle, and health status variables. These results indicate that the relationships between depression, self-care, and mortality represent important areas for future study.

Other findings of interest were the associations between comorbid depression and diabetes and physical functional status, physical limitations, and IADLs. Although comparisons of these outcomes between adults with DM with and without depression were not statistically significant, these issues may warrant attention in clinical settings.

The potential clinical implications of these findings may be far-reaching in a disease that requires effective daily self-care. Previous studies support an association between comorbid depression, higher glycosylated hemoglobin levels, and increased resource utilization.^{6,30,31} Links also have been established between depression, poor functional status, and limitations in DM self-care. In an observational study, 367 patients with type 1 or 2 DM in a managed care organization were surveyed for depressive symptoms and assessed for functioning using the SF-12 Health Survey.^{20,32} Patients who had high levels of depressive symptoms compared with low levels were significantly more likely to have poorer mental and physical functioning scores, and were more likely to be nonadherent to diet and exercise regimens than patients with DM and without depression. In an observational study (n = 276) at a university-affiliated DM care center, DM with comorbid depression was associated with poorer physical functioning as well as significantly lower adherence to diet and exercise regimens than DM without depression.³³ A cross-sectional study involving 168 patients with type 2 DM reported an association between higher compared with lower depressive symp-

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■ **Table 3.** Multivariate Linear Regression Coefficients of Mental and Physical Health Status, and Self-reported Health Status Using a VAS

Variable	SF-12 MCS	SF-12 PCS	VAS
Comorbid depression*			
Yes vs no	-6.10 [†]	0.87	-5.28 [†]
Female	-0.11	-0.16	1.82
Income level [‡]			
Near poor vs poor	5.92 [†]	3.64 [§]	9.91 [†]
Low income vs poor	3.38	3.96 [†]	5.12 [§]
Middle income vs poor	5.21 [†]	3.85	6.16 [§]
High income vs poor	6.31 [†]	6.31 [†]	12.57 [†]
Age, y	0.07	-0.17 [†]	0.005
BMI	-0.09	-0.18 [†]	-0.09
Education, y	0.39 [†]	0.53 [†]	0.91 [†]
No. of comorbidities [¶]	-0.35	-1.08 [†]	-1.54 [†]
Race/ethnicity			
Black, not Hispanic vs white, not Hispanic	-0.71	-0.26	-2.61
Hispanic vs white, not Hispanic	0.56	2.16 [†]	0.23
Other vs white, not Hispanic	-1.34	-0.18	-1.48

*Defined by ICD-9-CM code 311 plus ≥1 prescription for an antidepressant medication.

[†]P < .001.

[‡]For definitions of income level, see Table 1, footnote 5.

[§]P < .05.

^{||}P < .01.

[¶]Determined by the number of ICD-9-CM codes.

SF-12 MCS indicates Short Form 12 Mental Component Summary; SF-12 PCS, Short Form 12 Physical Component Summary; VAS = visual analog scale; BMI, body mass index; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification.

such as the Center for Epidemiologic Studies Depression Scale³⁶ or the SF-12 survey.²⁰ Once identified, issues such as depression or functional problems should then be addressed appropriately, with the goal of optimizing each patient's ability to engage in effective self-care behaviors. This type of approach is consistent with the American Diabetes Association Standards of Medical Care, which recommend that patients with DM be screened for psychosocial issues that may affect the management of DM.³⁷ The standards also stress that any treatment plan should recognize self-management (including diet, exercise, and blood glucose monitoring) as an integral component of care. Clearly, the ability of people with diabetes to engage in self-care activities is essential to successful treatment and control of their DM. To that end, these findings support further research to elucidate more fully the relationships between comorbid depression,

tom scores and poorer adherence to diet regimens and poorer participation in DM education programs.³⁴ As described earlier, results from a study conducted in a large health management organization demonstrated that major depression with DM was associated with lower adherence to medication regimens, poor diet, and lower levels of physical activity compared with DM without depression.¹⁵ Finally, cognitive limitations in people with DM 65 years of age or older were associated with more self-care limitations.³⁵ In that study, subjects with DM and cognitive limitations were more likely to require assistance with self-management behaviors and have lower ADL scores compared with people with DM but without cognitive limitations.

The findings reported here support the use of procedures to screen for factors that may adversely affect diabetes self-management. Patient assessments might include evaluations for depression, functional and/or cognitive limitations, and poor health status. These screenings could be accomplished in the ambulatory care setting using efficient, validated instruments

functioning, and self-care abilities among people with DM.

The present study has several limitations, including the use of self-reported data. DM was diagnosed through self-report, which was then verified against patient medical records. However, medical records for respondents who did not report ever having been diagnosed with DM were not reviewed. The result is that some MEPS respondents with diabetes may have been excluded from the analyses due to the lack of a diabetes ICD-9-CM code. The impact of this limitation is expected to be minimal given that the total estimated population included here (~12 million people) approximates the prevalence of diagnosed diabetes in 2001. Classification of depression was based on ICD-9-CM code 311, reflecting the presence of depressive symptoms not meeting criteria for severe depression. The possibility exists that some MEPS respondents with depressive symptoms did not have the diagnosis code 311 in their records and were subsequently defined as not having depression. The impact of this limitation is to bias our analyses toward the null hypothesis. Therefore, the findings report-

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Table 4. Multivariate Logistic Regression Analyses of Physical and Cognitive Limitations, and Limitations in ADLs and IADLs in People With Diabetes With and Without Depression

Variable	Physical Limitations		Cognitive Limitations		ADLs		IADLs	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Female sex	0.99	0.79, 1.23	0.99	0.75, 1.32	1.23	0.88, 1.72	0.88	0.64, 1.21
Depression*								
Yes vs no	1.41	0.94, 2.13	2.42 [†]	2.01, 2.91	1.21	0.72, 2.03	1.22	0.98, 1.52
Income level [‡]								
Near poor vs poor	0.96	0.58, 1.57	0.72	0.41, 1.27	0.44 [§]	0.21, 0.90	0.44	0.18, 1.10
Low income vs poor	0.57 [§]	0.34, 0.93	0.57	0.41, 0.79	0.46	0.29, 0.70	0.89	0.60, 1.32
Middle income vs poor	0.36 [†]	0.26, 0.49	0.27 [†]	0.18, 0.40	0.61 [§]	0.38, 0.99	0.49	0.27, 0.88
High income vs poor	0.26 [†]	0.18, 0.38	0.29 [†]	0.20, 0.41	0.47	0.27, 0.81	0.31 [†]	0.22, 0.43
Age, y	1.03 [†]	1.02, 1.05	1.02 [§]	1.01, 1.05	1.04 [†]	1.02, 1.06	1.03	1.01, 1.05
BMI	1.00	0.98, 1.03	0.98	0.96, 1.00	1.01	0.98, 1.03	0.98	0.94, 1.03
Education, y	0.92	0.86, 0.98	0.89 [†]	0.86, 0.92	0.93	0.86, 1.00	0.89	0.83, 0.95
No. of comorbidities [¶]	1.27 [†]	1.22, 1.31	1.13 [†]	1.08, 1.19	1.10	1.04, 1.18	1.19 [†]	1.15, 1.23
Race/ethnicity								
Black, not Hispanic vs white	0.85	0.65, 1.12	1.14	0.81, 1.61	1.68	0.82, 3.42	1.20	0.81, 1.78
Hispanic vs white	0.42 [†]	0.32, 0.56	0.73	0.51, 1.02	0.95	0.62, 1.46	0.69 [§]	0.48, 0.99
Other vs white	0.56	0.16, 1.89	0.70	0.22, 2.24	1.02	0.17, 6.10	0.69	0.23, 2.06

*Defined by ICD-9-CM code 311 plus ≥1 prescription for an antidepressant medication.
[†]P < .001.
[‡]For definitions of income levels, see Table 1, footnote 5.
[§]P < .05.
^{||}P < .01.
[¶]Determined by the number of ICD-9-CM codes.
 OR indicates odds ratio; CI, confidence interval; ADLs, activities of daily living; IADLs, instrumental activities of daily living; BMI, body mass index; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification.

ed here are conservative estimates of the associations between depression and functional status in DM. Finally, no direct assessment of patient self-care activities was conducted, and the implications discussed here regarding depression and self-care abilities are potential, not conclusive.

The emphasis in healthcare has been gradually shifting from acute care to ambulatory care of chronic diseases and disease prevention. This change in focus has placed a large demand on healthcare systems to decrease costs while maintaining or improving quality. The need to provide quality care for chronic diseases while staying within budget constraints has led to the development of new approaches to patient care. For managed care organizations, continued support at all policy and decision-making levels for cost-effective, multi-disciplinary DM care programs is essential. A systemwide commitment is needed to implement comprehensive DM patient care programs that assess for and treat factors such as depression that may complicate treatment, limit control of

DM, and lead to more serious DM complications. Once these programs are implemented, ongoing program evaluation must be conducted by healthcare system personnel with appropriate experience in health services or outcomes research.

CONCLUSION

DM continues to be poorly controlled in the United States despite extensive knowledge of treatment options and the development and promotion of national guidelines.³⁸ The interaction between minor depression, DM, and mental and self-reported health status in US adults with diabetes, along with other factors that affect DM control and self-care ability, is relevant to healthcare systems providing care to people with DM.

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Take-away Points

- Depression is estimated to be twice as prevalent among people with DM than among the general population.
- Patients with DM should be screened for depression and other psychosocial issues that may affect the management of their DM.
- Self-management is an integral component of DM care.
- Even minor depression may adversely affect diabetes self-care activities, leading to poorer outcomes.

Funding Source: This research was funded by the American College of Clinical Pharmacy, project number HO-4.

Presented in part at the American College of Clinical Pharmacy Spring Practice and Research Forum, Myrtle Beach, SC, April 2005.

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