NIH Public Access
Author Manuscript
Diabetes Care. Author manuscript; available in PMC 2006 October 10.

Published in final edited form as:
Diabetes Care. 2005 April ; 28(4): 823–829.

Prevalence and Correlates of Depressive Symptoms Among Rural Older African Americans, Native Americans, and Whites With Diabetes

Ronny A. Bell, PhD, MS[1], **Shannon L. Smith, MA**[1], **Thomas A. Arcury, PhD**[2], **Beverly M. Snively, PhD**[1], **Jeanette M. Stafford, MS**[1], and **Sara A. Quandt, PhD**[1]

1*From the Department of Public Health Sciences, Wake Forest University School of Medicine, Winston-Salem, North Carolina*

2*From the Department of Family and Community Medicine, Wake Forest University School of Medicine, Winston-Salem, North Carolina.*

Abstract

OBJECTIVE—Depression is associated with morbidity, mortality, and decreased quality of life and is a well-established complication among people with diabetes. Little is known about the prevalence and correlates of depressive symptoms among older adults living in rural communities, particularly among ethnic minority groups, who are at increased risk of developing diabetes and complications.

RESEARCH DESIGN AND METHODS—Data were analyzed from the ELDER (Evaluating Long-term Diabetes Self-management Among Elder Rural Adults) diabetes study in which face-to-face interviews were conducted with 696 older (≥65 years of age) African-American, Native American, and white men and women in two rural counties in central North Carolina.

RESULTS—Using a criterion of ≥9 on a modified CES-D (Center for Epidemiologic Study of Depression) scale, 15.8% of the sample had depressive symptoms. In bivariate analyses, depressive symptomatology was more common among women and individuals who were unmarried and had less than a high school education, fewer financial resources, more chronic conditions, more prescription medications, and lower physical functioning. In multivariate analyses, sex, education, living arrangement, BMI, number of prescription medications, number of chronic conditions, and physical functioning remained significant.

CONCLUSIONS—These results show that older rural adults with diabetes are at high risk for depressive symptoms, regardless of their ethnic group, and that certain demographic and health characteristics are important factors in this association. These findings add to the limited body of knowledge of comorbid depression in this population. Greater attention should be paid to diagnosing and treating this condition by those who provide care to these populations.

Depression is a common comorbidity among people with diabetes. In a recent meta-analysis, the prevalence of depression among people with diabetes was about twice as high as that among those without diabetes (1). Depression among people with diabetes reduces quality of life and is associated with morbidity, mortality, and health care costs (2-4).

Address correspondence and reprint requests to Ronny A. Bell, PhD, MS, Department of Public Health Sciences, Wake Forest University School of Medicine, Medical Center Blvd., Winston-Salem, NC 27157-1063. E-mail: rbell@wfubmc.edu..

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

The costs of publication of this article were defrayed in part by the payment of page charges. This article must therefore be hereby marked “advertisement” in accordance with 18 U.S.C. Section 1734 solely to indicate this fact.

While there is a substantial body of research on comorbid depression among individuals with diabetes, significant gaps exist in the literature. First, little is known about this association among the rural elderly. This population constitutes >25% of the total U.S. elderly population and has limited access to health care, particularly specialty health care (5), mental health services, and other resources necessary for appropriate chronic disease management (6-8). Second, there is limited information on comorbid depression among ethnic minorities with diabetes, particularly African Americans (9) and Native Americans. Diabetes is more common among ethnic minorities (10), so the public health impact of depression in this population may be substantial.

The current study has two major aims: to assess the prevalence of depressive symptoms among a sample of older African Americans, Native Americans, and whites with diabetes living in rural communities; and to determine the demographic and health characteristics associated with depressive symptoms in this sample. Comparisons of the prevalence and correlates of depressive symptoms in this sample were therefore made to relevant literature.

The ELDER (Evaluating Long-term Diabetes Self-management Among Elder Rural Adults) Study, a 4-year study funded by the National Institute on Aging and the National Center for Minority Health and Health Disparities, is a population-based cross-sectional survey designed to comprehensively assess the self-care strategies of older rural adults (aged ≥65 years) with diagnosed diabetes and the impact of these strategies on diabetes control. Participants for the study were selected from two counties in central North Carolina. These counties were selected because they are largely rural, they have large numbers of ethnic minorities and individuals living below the poverty line, and the investigative team had previously developed strong ties in these communities. The study began in 2001, with recruitment of participants conducted from May through October 2002. The study was approved by the institutional review board of the Wake Forest University School of Medicine.

The study recruited a random sample of community-dwelling older adults with diabetes, including African-American, Native-American, and white men and women. A sampling frame was selected using claims records from the Centers for Medicare and Medicaid Services (CMS). Individuals were included in the sampling frame if they were ≥65 years of age, a resident of one of the study counties, and had at least two outpatient claims for diabetes (coded 250 [diabetes] in the International Classification of Diseases, 9th Revision) in 1998–2000. Random samples of men and women were selected. Letters were sent from CMS and from the study team requesting participation in the study. The letters were followed with a phone call or a personal home visit from an interviewer on the study team to further assess eligibility (confirming diabetes status and residence in study counties and that the individual is physically and mentally able to participate in the survey) and willingness to participate in the study.

The final sample consisted of 701 individuals. Of the 1,222 people contacted, 313 were disqualified because they reported that they did not have diabetes (n = 118), lived out of the study counties (n = 51), lived in a nursing home (n = 84), were not ≥65 years of age (n = 2), did not speak English (n = 1), or failed the Mini-Mental State Exam (n = 5), and 52 were deceased. We were unable to assess the eligibility of an additional 122 people because a surrogate refused participation in study (n = 48), they were physically (n = 8) or mentally (n = 14) unable to respond to eligibility questions, or they could not be located (n = 52). For those who met the eligibility criteria after contact, 86 were not interviewed because they refused participation (n = 74) or study staff determined that the participant was physically (n = 6) or mentally (n = 6) unable to participate. The overall response rate for known eligible participants was 89% (701 of 787). A total of 696 participants were used for this analysis. Three participants who did not fit the ethnic categories and an additional two for whom the Center for Epidemiologic Study of Depression (CES-D) scale score could not be calculated due to missing data were excluded. Because of missing data on specific interview items, the sample sizes for some analyses are reduced.

Face-to-face interviews were conducted by local, trained interviewers. Participation in the study involved a 1.5-h interview. Interview data were recorded on paper forms, entered into EpiInfo (version 6.0; Centers for Disease Control and Prevention, Atlanta, GA), and analyzed using SAS statistical software (version 8.2; SAS Institute, Cary, NC). The survey instrument included well-established standardized scales as well as items developed and pilot tested by the investigators. Variables used in this report included sex, ethnicity, age, marital status, highest level of formal education, annual household income, Medicaid status, number of people living in the home, duration of diabetes, BMI, glycemic control (HbA_{1c}), current use of diabetes medications, total number of prescription medications, and history of chronic health conditions. The quality of life measure was the Physical Component Summary (PCS) score sub-scale of the SF-12 (11). Higher scores for this measure indicate higher physical functioning. Glycemic control was assessed by measurement of HbA_{1c} from fingerstick blood samples collected in a capillary tube, stored in the AccuBase A1c kit (Diabetes Technologies, Thomasville, GA), and shipped to Premiere Laboratories (Kansas City, MO) for HbA_{1c} assessment. A second tube was collected on a random sample of 10% of participants for quality control. The intraclass coefficient for this analysis was 0.996 (95% CI 0.994-0.998, n = 68).

The outcome variable was assessed by the CES-D, a 20-item self-report depressive symptoms scale (12). The version of the CES-D scale used was validated in the Duke Established Populations for Epidemiological Studies of the Elderly (EPESE) (13), in which the response categories for symptoms experienced in the previous week were modified from the original Likert scale (all of the time, most of the time, some of the time, and none of the time) to “yes” and “no” responses. This approach was chosen by the investigative team after careful consideration of the difficulty experienced by older adults, particularly those with low levels of formal education, in responding to Likert-type questions. Because the Duke EPESE cohort is very similar to the one in the current study (half rural and over half African American), the CES-D modification validated in this major study of elderly was judged to be appropriate. “Yes” responses were scored as 1 and “no” responses were scored as 0, with a range of scores from 0 to 20. A value ≥9 was used to define the threshold for significant depressive symptoms. This has been determined by Blazer et al. (13) (through comparisons with the Yale EPESE sample and the Iowa 65+ Rural Health Study) to be equivalent to the cut point of ≥16 traditionally used with the original scoring method, which produces scores of 0–60.

Statistical analysis

Demographic and health characteristics and CES-D scores were summarized using counts and percentages. Age was treated as a continuous variable. Marital status was dichotomized as married or not married. Education was categorized as less than high school, a high school degree, or at least some college. Poverty status was categorized into three groups: receiving Medicaid, not receiving Medicaid and annual household income <$25,000/year, and not receiving Medicaid and annual household income ≥$25,000. Number of people in the household was classified as one, two, or three or more. Because of the collinearity between marital status and number of people in the household, these variables were combined to form a living arrangement variable: living alone, living with others and unmarried, and living with others and married. Duration of diabetes was treated as a continuous variable. Diabetes medication was categorized as none, on oral agents, or on insulin with or without oral agents. The total number of prescription medications and chronic conditions were dichotomized as above or below the median value in the sample for each variable (≤5 or >5 for both variables). The physical component score was treated as a continuous variable. CES-D scores were dichotomized as 0–8 and 9–20 (depressive symptoms) based on the previous classification of Blazer et al. (13).

Associations between CES-D and independent variables were evaluated for statistical significance using regression modeling. Multiple logistic regression models were used to evaluate potential predictors of CES-D. Significance tests were performed for sex × ethnicity interactions, controlling for sex, ethnicity, age, level of education, living arrangement, poverty status, diabetes duration (decades), BMI, HbA_{1c}, diabetes medication group, number of prescription medications, number of chronic conditions, and physical functioning (PCS ÷ 10). If a sex × ethnicity term was significant ($P \leq 0.05$), then significance tests were performed among the three ethnic groups for all pairwise comparisons of odds ratios (ORs) for practitioner use in women versus men. If a sex × ethnicity term was nonsignificant, then the interaction term was dropped from the model and significance tests were performed for main effects of sex and ethnicity. If an ethnicity term was significant, then significance tests were performed for all pairwise comparisons among the three ethnic groups. Pairwise comparison results for the effects of potential predictors having more than two groups were evaluated using Bonferroni's method.

RESULTS

Demographic and health characteristics of the sample are presented in Table 1. The sample was equally represented by African Americans, whites, and Native Americans; by men and women; and by married and unmarried individuals. The mean age of the sample was 74 years, with the majority being between the ages of 65 and 74 years. The majority of the sample had not completed high school and had two or more people living in the home. Over 80% of the sample was either on Medicaid or was not on Medicaid but had an annual household income <$25,000. Most were on oral medications to treat their diabetes, were on more than five prescription medications, and had five or fewer chronic health conditions. The mean duration of diagnosed diabetes was 12.4 years, and half had been diagnosed with diabetes for ≥10 years. The mean BMI was 29.6 kg/m^2, and the mean HbA_{1c} was 6.8%. Approximately 84% of the sample had a SF-12 PCS of <50, and 15.8% of the sample had CES-D scores ≥9. The scores ranged from 0 (10.3% of all scores) to 17. The 50th and 90th percentile scores were 3 and 10, respectively.

Table 2 summarizes bivariate associations between CES-D scores and demographic and health characteristics. Rates of CES-D scores above the criterion were greater for women versus men ($P = 0.0005$), unmarried versus married ($P = 0.013$), less than a high school education versus a high school education or greater ($P < 0.0001$), on Medicaid versus not on Medicaid ($P = 0.0019$), more than five versus five or fewer prescription medications ($P < 0.0001$), and more than five versus five or fewer chronic conditions ($P < 0.0001$). PCS scores were higher for individuals with CES-D scores ≥9 versus <9 ($P < 0.0001$). CES-D scores above the criterion were higher for Native Americans (21.0%) compared with African Americans (14.6%) and whites (13.6%), but the difference was not statistically significant ($P = 0.08$).

Table 3 shows results of the multivariate analyses with pairwise comparisons where appropriate. In the multivariate model, sex (OR 1.8, $P = 0.048$), education level ($P < 0.0001$), number of prescription medications (2.3, $P = 0.0036$), and number of chronic conditions (2.4, $P = 0.0012$) remained significant in the direction observed in the bivariate model. Having a high school education versus having less than a high school education resulted in significantly lower odds of having a high CES-D score (0.3, $P = 0.0007$). Similarly, having at least some college education versus having less than a high school education resulted in significantly lower odds of having a high CES-D score (0.1, $P = 0.0003$). Having some college education was not significantly different from having a high school education (0.2, $P = 0.058$). “Living arrangement" was significant overall ($P = 0.049$). Individuals living with others and unmarried had higher CES-D scores than individuals living alone (2.3, $P = 0.014$). Living with others and married was not statistically different from living alone ($P = 0.24$) or living with others and unmarried ($P = 0.21$). BMI (0.9, $P = 0.019$) and PCS scores (0.7, $P = 0.021$) were inversely associated with CES-D scores above the criteria. In the case of PCS scores, the OR indicates that after adjusting for other covariates in the model, for every 10-unit increase in participants' PCS score, the relative odds of having a CES-D score ≥9 is 0.7.

Ethnicity was not significantly associated with CES-D scores. To determine whether there was an influence of socioeconomic status on the relationship between ethnicity and depressive symptoms, the multivariate analysis was rerun without formal education and poverty status in the model. Ethnicity was still nonsignificant ($P = 0.47$) without these variables in the model.

CONCLUSIONS

Depression is a well-established common comorbid condition among people with diabetes. While prevalence estimates vary depending on the population under investigation and the assessment criteria, a meta-analysis of 42 controlled and uncontrolled studies estimated the prevalence of major depression and elevated depressive symptoms to be 11 and 31%, respectively. It is also generally recognized that diabetes doubles the risk of depression (1), although more recent studies have shown that the risk is not quite that high (14,15). Furthermore, depression among people with diabetes is related to poor health outcomes and quality of life (2-4).

In this multiethnic sample of rural older adults with diabetes, the prevalence of depressive symptoms assessed by high CES-D scores was ~16%, somewhat higher than rates observed in other studies. For example, using data from the Rancho Bernardo, California, cohort of adults ages ≥50 years, Palinkas et al. (16) observed a prevalence of depressive symptoms of 13.6% among women and 8.8% among men. Amato et al. (17) showed a prevalence of depressive symptoms of 13.6% in a community-dwelling sample of older adults in southern Italy. Black et al. (4) showed a prevalence of minimal depression (CES-D of 1–15 on a scale of 0–60) of 13.1% and minor depression (CES-D of ≥16) of 6.6% among older Mexican Americans.

The association between aging and depression and depressive symptoms is not well understood. Higher rates of depression and depressive symptoms may be related to other factors associated with aging, including social isolation, limited resources, poor physical health, and cognitive dysfunction (13,18). However, not all studies have shown higher rates of depression and depressive symptoms among older adults with diabetes. For example, Egede and Zheng (15), using data from the 1999 National Health Interview Survey (NHIS), showed much lower rates of depression (4.5%) among adults >65 years with diabetes compared with all other age-groups. However, the instrument used in the NHIS is more specific for major depressive disorders than the CES-D.

The present study was conducted among older adults in rural communities. To our knowledge, this is the first study of depression and diabetes in older adults that focuses on rural residents. Other studies of rural adult health have identified depression as a common and frequently untreated health condition (19). Rural communities have, relative to urban and suburban communities, limited access to mental health services (7,8). Even when mental health services are present, a variety of studies have shown low rates of utilization by rural elders (20). While this may reflect income and transportation issues for access, it may also be linked to a rural value system that stresses "making do," sees use of assistance as a sign of weakness, and stigmatizes mental illness (21). Rural primary health care providers need to be alert to the possibility of depression in their patients with diabetes.

In this study, women were at much greater risk of having depressive symptoms than men, a finding similar to other studies (1,13,16,22). African Americans had similar rates of depressive symptoms compared with whites, a finding that is consistent with other studies in the general population (13,23) and among people with diabetes (15,22). In a recent study among men with type 2 diabetes by Fisher et al. (24), white and African-American men had lower depressive symptoms than Hispanic- and Chinese-American men, but these differences were not statistically significant after adjusting for income and education. In our analysis, ethnicity was not significantly associated with CES-D scores above the cutoff regardless of whether formal education and poverty status were in the multivariate model.

This is only the second population-based study to assess the prevalence of depressive symptoms among Native Americans with diabetes. The Strong Heart Study, conducted among Native Americans 45–74 years of age in Oklahoma, Arizona, and North and South Dakota, found prevalence rates of depression of 17.2% in men and 20.2% in women (25). Rates among Native Americans in our study were similar to those observed in the Strong Heart Study. Unlike the Strong Heart Study, our study allowed ethnic comparisons, showing that Native Americans had rates of depressive symptoms similar to whites and African Americans. Rates of depressive symptoms were highest among Native Americans compared with the other ethnic groups in our study, but this difference was not statistically significant.

Other factors associated with depressive symptoms in this sample include poorer health and lower levels of education and socioeconomic status, findings that are consistent with other studies (13,22,26). In contrast to other studies (27), individuals living with others and unmarried were at greater risk for having depressive symptoms than individuals living alone. This was not the case for those living with others and married versus those living alone or those living with others unmarried versus married. It is possible that this finding is related to socioeconomic status rather than by choice, since people experiencing financial hardships (especially those who are not married) may be living in multigenerational homes to share resources and ease economic burden. This line of reasoning is supported by the finding in our study that poverty status is related to depression in the bivariate analysis (Table 2) but not in the multivariate model that includes living arrangement (Table 3).

Study limitations need to be considered. First, these data are cross-sectional, so definitive conclusions about cause-and-effect relationships between diabetes and depressive symptoms and its covariates cannot be made. However, these findings are generally consistent with those of other studies in older adults. Second, this study relies on self-reported data and not clinical interview-based assessments of depression. The instrument used in this study, the CES-D scale, is recognized as valid for the assessment of depressive symptoms in community-based epidemiologic studies and has been used in a variety of populations. Prevalence of depressive symptoms is generally much higher using self-report than using standardized diagnostic interviews, which may be indicative of the assessment of a broader range of depressive disorders using self-report methodologies (1).

The response format and scoring system for the assessment of depressive symptoms (CES-D ≥9) used in the present study differ from those in other studies that use the CES-D scale. This version was chosen to minimize respondent burden and to maximize response rate. In our previous experience in this population of older adults (28,29), those with limited formal education have considerable difficulty responding to Likert-type questions, producing high rates of missing data. While there may be some degree of misinterpretation in the results of this study compared with those of studies using the original scoring system, the careful validation of this scoring system (13) and establishment of the ≥9 threshold for significant depression through comparison of responses to both the Likert and dichotomous responses in an ethnically and socioeconomically similar population support our results.

Also, there may be some concern that modifying the Likert response options may lead to overestimation of depressive symptoms. The dichotomous response categories were used in the second wave of the Health and Retirement Study. It was suggested that the observed increased prevalence of depressive symptoms relative to the first wave may have been attributable to the use of the yes/no responses (30,31). However, the modification of the CES-D in that study also included shortening the form from 20 to 8 items, so it is difficult to fully attribute changes in prevalence to the response format.

Despite these limitations, this study adds to the limited body of knowledge on diabetes and depression and depressive symptoms among older rural adults, particularly studies in ethnic minority populations. Given that this is a population with large numbers of people with diabetes and with limited access to health care services, these findings provide important evidence for the need for appropriate identification and management of depression as part of regular diabetes care. For individuals with diabetes, depression may be an additional barrier to achieving effective self-care behaviors (32,33). As a modifiable risk factor, depression treatments could decrease the risk of diabetes-related complications (34). Thus, effective detection and treatment of depression and depressive symptoms for patients with diabetes must be addressed in the primary care setting in rural communities. Depression, however, is often undiagnosed due to lack of training for primary care providers. In addition, treatment of depression is difficult because of comorbid conditions and the potential for drug interactions (35). Further research is needed to more closely examine the association between depression and depressive symptoms and health outcomes among rural ethnic minority older adults with diabetes.

Acknowledgments

Funding was provided by a grant from the National Institute on Aging and the National Center on Minority Health and Health Disparities (AG17587).

Abbreviations

CES-D, Center for Epidemiologic Study of Depression; PCS, Physical Component Summary.

References

1. Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. The prevalence of comorbid depression in adults with diabetes. Diabetes Care 2001;24:1069–1078. [PubMed: 11375373]
2. Goldney RD, Phillips PJ, Fisher LJ, Wilson DH. Diabetes, depression, and quality of life. Diabetes Care 2004;27:1066–1070. [PubMed: 15111522]
3. Egede LE, 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]
4. Black SA, Markides KS, Ray LA. Depression predicts increased incidence of adverse health outcomes in older Mexican Americans with type 2 diabetes. Diabetes Care 2003;26:2822–2828. [PubMed: 14514586]
5. Bell RA, Quandt SA, Arcury TA, Snively BM, Stafford J, Smith SL, Skelly AH. Primary and specialty medical care among ethnically diverse, older rural adults with type 2 diabetes: the ELDER diabetes study. J Rural Health. In press
6. Coon P, Zulkowski K. Adherence to American Diabetes Association standards of care by rural health care providers. Diabetes Care 2002;25:2224–2229. [PubMed: 12453965]
7. Neese JB, Abraham IL, Buckwalter KC. Utilization of mental services among rural elderly. Arch Psychiatr Nurs 1999;13:30–40. [PubMed: 10069100]
8. Fortney J, Rost K, Zhang M, Warren J. The impact of geographic accessibility on the intensity and quality of depression treatment. Med Care 1999;37:884–893. [PubMed: 10493467]
9. de Groot M, Lustman PJ. Depression among African Americans with diabetes: a dearth of studies (Letter). Diabetes Care 2001;24:407–408. [PubMed: 11213901]

10. Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2003. U.S. Department of Health and Human Services, CDC; Atlanta, GA: 2004. Rev ed.
11. Ware, JE.; Kosinski, M.; Keller, SD. SF-12: How to Score the SF-12 Physical and Mental Health Summary Scales. QualityMetric; Lincoln, RI: 1998.
12. Radloff LS. The CES-D scale: a self-report depression scale for research in general populations. Appl Psychol Meas 1977;1:385–40.
13. Blazer D, Burchette B, Service C, George LK. The association of age and depression among the elderly: an epidemiologic exploration. J Gerontol 1991;46:M210–M215. [PubMed: 1834726]
14. Nichols GA, Brown JB. Unadjusted and adjusted prevalence of diagnosed depression in type 2 diabetes. Diabetes Care 2003;26:744–749. [PubMed: 12610032]
15. Egede LE, Zheng D. Independent factors associated with major depressive disorder in a national sample of individuals with diabetes. Diabetes Care 2003;26:104–111. [PubMed: 12502665]
16. Palinkas LA, Barrett-Connor E, Wingard DL. Type 2 diabetes and depressive symptoms in older adults: a population-based study. Diabet Med 1991;8:532–539. [PubMed: 1832352]
17. Amato L, Paolisso G, Cacciatore F, Ferrara N, Canonico S, Rengo F, Varricchio M. Non-insulin dependent diabetes mellitus is associated with a greater prevalence of depression in the elderly. Diabetes Metab 1996;22:314–318. [PubMed: 8896992]
18. Swenson CJ, Baxter J, Shetterly SM, Scarbro SL, Hamman RF. Depressive symptoms in Hispanic and non-Hispanic white rural elderly. Am J Epidemiol 2000;152:1048–1055. [PubMed: 11117614]
19. Huttlinger K, Schaller-Ayers J, Lawson T. Health care in Appalachia: a population-based approach. Public Health Nurs 2004;21:103–110. [PubMed: 14987209]
20. Office of Technology Assessment. Health Care in Rural America. U.S. Government Printing Office; Washington, DC: 1990. Rep. no. OTAH0434
21. Quandt, SA.; Arcury, TA. The rural elderly. In: Lesnoff-Caravaglia, G., editor. Aging and Public Health: Technology and Demography–Parallel Evolutions. Charles C. Thomas; Springfield, IL: 2001. p. 124-146.
22. Katon W, von Korff M, Ciechanowski P, Russo J, Lin E, Simon G, Ludman E, Walker E, Bush T, Young B. Behavioral and clinical factors associated with depression among individuals with diabetes. Diabetes Care 2004;27:914–920. [PubMed: 15047648]
23. Blazer D, Landerman L, Hays J, Simonsick E, Saunders W. Symptoms of depression among community-dwelling elderly African American and white older adults. Psychol Med 1998;28:1311–1320. [PubMed: 9854272]
24. Fisher L, Laurencin G, Chesla CA, Skaff MM, Mullan JT, Gardiner PS, Chun KM. Depressive affect among four ethnic groups of male patients with type 2 diabetes. Diabetes Spectrum 2004;17:215–219.
25. Singh PK, Looker HC, Hanson RL, Krakoff J, Bennett PH, Knowler WC. Depression, diabetes, and glycemic control in Pima Indians (Letter). Diabetes Care 2004;27:618–619. [PubMed: 14747253]
26. Thomas J, Jones G, Scarinci I, Brantley P. A descriptive and comparative study of the prevalence of depressive and anxiety disorders in low-income adults with type 2 diabetes and other chronic illnesses. Diabetes Care 2003;26:2311–2317. [PubMed: 12882854]
27. Schulman E, Gairola G, Kuder L, McCulloch J. Depression and associated characteristics among community-based elderly people. J Allied Health 2002;31:140–146. [PubMed: 12227264]
28. Bell RA, Quandt SA, Arcury TA, McDonald J, Vitolins MZ. Health behaviors of rural white, African American and Native American elders. Am J Health Behav 2000;24:349–360.
29. Bell RA, Quandt SA, Arcury TA, McDonald J, Vitolins MZ. Health locus of control among rural older adults: associations with preventive health behaviors. Gerontol and Geriatr Educ 2002;22:69–89.
30. Steffick, DE. Documentation of affective functioning measures in the Health and Retirement Study: HRS/AHEAD Documentation Report, DR-005 [article online]. Available from http://hrsonline.isr.umich.edu/docs/userg/dr-005.pdfAccessed 1 December 2004
31. Turvey CL, Wallace RB, Herzog R. A revised CES-D measure of depressive symptoms and a DSM-based measure of major depressive episodes in the Elderly. Int Psychogeriatr 1999;11:139–148. [PubMed: 11475428]

32. McKellar JD, Humphreys K, Piette JD. Depression increases diabetes symptoms by complicating patients' self-care adherence. Diabetes Educ 2004;30:485–492. [PubMed: 15208846]
33. Lin EHB, Katon W, von Korff M, Rutter C, Simon GE, Oliver M, Ciechanowski P, Ludman EJ, Bush T, Young B. Relationship of depression and diabetes self-care, medication adherence, and preventive care. Diabetes Care 2004;27:2154–2160. [PubMed: 15333477]
34. Clouse RE, Lustman PJ, Freedland KE, Griffith LS, McGill JB, Carney RM. Depression and coronary heart disease in women with diabetes. Psychosom Med 2003;65:376–383. [PubMed: 12764210]
35. Lustman PJ, Clouse RE. Practical considerations in the management of depression in diabetes. Diabetes Spectrum 2004;17:160–166.

Table 1

Demographic and health characteristics of ELDER participants, overall

N	696
Ethnicity	
African American	220 (31.6)
White	295 (42.4)
Native American	181 (26.0)
Demographic	
Female	343 (49.3)
Married	348 (50.0)
Age (years)	74.1 ± 5.41
Formal education (*n* = 695)	
Less than high school	451 (64.9)
High school	145 (20.9)
At least some college	99 (14.2)
Number of people in home	
1	213 (30.6)
2	339 (48.7)
≥3	144 (20.7)
Poverty status (*n* = 666)	
On Medicaid	235 (35.3)
No Medicaid, household income <$25,000	303 (45.5)
No Medicaid, household income ≥$25,000	128 (19.2)
Health/diabetes therapy	
No medication	86 (12.4)
Oral agent only	418 (60.1)
Insulin with or without oral agents	192 (27.6)
Number of prescription medications >5	368 (53.3)
Number of chronic conditions >5	220 (31.6)
Diabetes duration (years)	12.4 ± 10.98
BMI (kg/m^2)(*n* = 664)	29.6 ± 5.88
HbA_{1c} (%) (*n* = 691)	6.8 ± 1.32
SF-12 physical component score (*n* = 664)	35.1 ± 11.37
CES-D ≥9	110 (15.8)

Data are *n* (%) or means ± SD unless otherwise indicated.

Table 2

Bivariate associations between CES-D–defined depressive symptoms and demographic and health characteristics

	CES-D <9	**CES-D ≥9**	***P* value**
Categorical characteristics			
Ethnic group			
White		40 (13.6)	0.080
African American		32 (14.6)	
Native American		38 (21.0)	
Sex			
Female		71 (20.7)	0.0005
Male		39 (11.1)	
Marital status			
Not married		67 (19.3)	0.013
Married		43 (12.4)	
Formal education (*n* = 695)			
Less than high school		95 (21.1)	<0.0001
High school		13 (9.0)	
At least some college		2 (2.0)	
Poverty status (*n* = 666)			
On Medicaid		52 (22.1)	0.0019
No Medicaid, household income <$25,000		43 (14.2)	
No Medicaid, household income >$25,000		11 (8.6)	
Number in household			
1		30 (14.1)	0.17
2		50 (14.8)	
≥3		30 (20.8)	
Diabetes therapy			
No medication		17 (19.8)	0.54
Oral agent only		65 (15.6)	
Insulin with or without oral agents		28 (14.6)	
Number of prescription medications (*n* = 691)			
≤5		28 (8.7)	<0.0001
>5		81 (22.0)	
Number of chronic conditions			
≤5		51 (10.7)	<0.0001
>5		59 (26.8)	
Continuous characteristics			
Age (years)	74.1 ± 5.32	74.1 ± 5.87	0.96
Diabetes duration (years)	12.5 ± 10.99	12.4 ± 10.98	0.95
BMI (kg/m^2)(*n* = 664)	29.6 ± 5.88	29.5 ± 5.94	0.85
HbA_{1c} (%) (*n* = 691)	6.8 ± 1.31	6.8 ± 1.41	0.55
SF-12 physical component score (*n* = 664)	36.2 ± 11.59	29.5 ± 8.16	<0.0001

Data are *n* (%) or means ± SD.

Table 3

Multivariate associations between CES-D–defined depressive symptoms and demographic and health characteristics (n = 606)

Variables	OR (95% CI)	*P* value
Ethnicity*		0.95
African American vs. white	1.0 (0.5–1.9)	0.99
Native American vs. white	0.9 (0.5–1.7)	0.79
African American vs. Native American	1.1 (0.6–2.1)	0.79
Sex (female vs. male)	1.8 (1.0–3.1)	0.048
Age (years)	1.0 (0.9–1.0)	0.28
Formal education		<0.0001
High school vs. less than high school	0.3 (0.1–0.6)	0.0007
At least some college vs. less than high school	0.1 (0.0–0.3)	0.0003
At least some college vs. high school	0.2 (0.0–1.1)	0.058
Poverty status		0.73
No Medicaid, <$25,000 vs. on Medicaid	1.1 (0.6–2.0)	0.71
No Medicaid, ≥$25,000 vs. on Medicaid	1.4 (0.6–3.5)	0.43
No Medicaid, <$25,000 vs. no Medicaid, ≥$25,000	0.8 (0.3–1.8)	0.54
Living arrangement		0.049
Living with others and unmarried vs. living alone	2.3 (1.2–4.3)	0.014
Living with others and married vs. living alone	1.5 (0.8–2.9)	0.24
Living with others: unmarried vs. married	1.5 (0.8–2.9)	0.21
Diabetes duration (decades)	1.0 (0.8–1.3)	0.90
BMI (kg/m^2)	0.9 (0.9–1.0)	0.019
HbA_{1c} (%)	1.0 (0.8–1.2)	0.92
Diabetes therapy		0.35
Oral agent only vs. no medication	0.8 (0.4–1.7)	0.54
Insulin with or without oral agents vs. no medication	0.5 (0.2–1.3)	0.18
Oral agent only vs. insulin with or without oral agents	1.5 (0.8–2.7)	0.22
Number of prescription medications (>5 vs. ≤5)	2.3 (1.3–4.1)	0.0036
Number of chronic conditions (>5 vs. ≤5)	2.4 (1.4–4.1)	0.0012
PCS (÷10)	0.7 (0.6–1.0)	0.021

* Ethnicity remains nonsignificant (*P* value = 0.47) after dropping formal education and poverty status as covariates.