Published in final edited form as:

J Am Geriatr Soc. 2010 October ; 58(10): 1941–1945. doi:10.1111/j.1532-5415.2010.03057.x.

Urinary and Fecal Incontinence and Quality of Life in African Americans

Theodore K. Malmstrom, PhD^{*}, Elena M. Andresen, PhD[†], Fredric D. Wolinsky, PhD[‡], Mario Schootman, PhD[§], J. Philip Miller, AB^{||}, and Douglas K. Miller, MD^{#,**}

^{*}Department of Neurology & Psychiatry, School of Medicine, Saint Louis University, St. Louis, Missouri

[†]Department of Epidemiology and Biostatistics, College of Public Health and Health Professions, University of Florida, Gainesville, Florida

[‡]Department of Health Management and Policy, College of Public Health, University of Iowa, Iowa City, Iowa

[§]Department of Medicine and Pediatrics, Washington University, St. Louis, Missouri

^{||}Division of Biostatistics, School of Medicine, Washington University, St. Louis, Missouri

[#]Center For Aging Research, Indiana University, Indianapolis, Indiana

^{**}Regenstrief Institute, Inc., Indianapolis, Indiana

Abstract

Objectives—To investigate associations between quality of life (QoL) and incontinence in a population-based African-American sample.

Design—Cross-sectional survey.

Setting—Metropolitan St. Louis, Missouri.

Participants—Eight hundred fifty-three non-institutionalized African Americans aged 52 to 68 in the African American Health study.

Measurements—Respondents who reported having involuntarily lost urine over the previous month were classified as having urinary incontinence (UI), and respondents who reported having lost control of their bowels or stool over the past year were classified as having fecal incontinence (FI). QoL was measured using the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) and the 11-item Center for Epidemiologic Studies Depression Scale (CES-D).

Address correspondence to Theodore K. Malmstrom, Department of Neurology & Psychiatry, Saint Louis University, 1438 S. Grand Blvd., St. Louis, MO 63104. malmsttk@slu.edu.

Paper presented at the 61st Annual Meeting of the Gerontological Society of America, November 2008.

Conflict of Interest: The editor in chief has reviewed the conflict of interest checklist provided by the authors and has determined that the authors have no financial or any other kind of personal conflicts with this paper.

Author Contributions: Theodore K. Malmstrom, Elena M. Andresen, Fredric D. Wolinsky, Mario Schootman, J. Philip Miller, and Douglas K. Miller: study concept and design; acquisition, analysis, and interpretation of data; preparation of manuscript.

Results—Prevalences of UI and FI were 12.1% (weighted n = 102/841) and 5.0% (weighted n = 42/841). Participants with UI and those with FI had worse SF-36 scores than their referent groups (physical function – 15.5 and – 38.1 points, respectively; role physical –13.2 and –26.5 points; bodily pain –15.7 and –24.5 points; general health perceptions –15.5 and –27.6 points; vitality –15.0 and –16.5 points; social functioning –18.4 and –25.6 points; role emotional –13.2 and –22.1 points; mental health –12.2 and –17.5 points; all P s < .001), adjusting for age, sex, body mass index, and chronic conditions. Proportions with clinically relevant levels of depressive symptoms were also higher in both groups (UI+17.9% P <.001) and FI (+37.2% P <.001) than in their referent groups.

Conclusion—UI and FI were strongly associated with worse health-related QoL as well as symptoms of depression in this population-based sample of African Americans.

Keywords

African Americans; quality of life; health-related quality of life; depressive symptoms; incontinence

Urinary (UI) and fecal (FI) incontinence are common health problems in older adults. Both have far-reaching consequences on individuals' lives, including negative effects on mental and emotional health in addition to physical challenges.¹ UI in particular has frequently been shown to be associated with decreased quality of life (QoL), including higher rates of depressive symptoms.^{2–7} Data are less common for FI, but evidence suggests that its association with poorer QoL, including higher depressive symptoms, is as strong or stronger than that of UI.^{4, 8}

The association between incontinence and QoL in African Americans has not been widely studied, and in extant population-based studies of African Americans, measures of QoL have been limited to depressive symptoms^{2, 4} or psychological distress⁹ and to UI^{9, 10} or urine leakage.² Only one population-based study was found that investigated the association between UI and FI and QoL (depressive symptoms) in African Americans.⁴

The objective of this study was to investigate the association between QoL (depressive symptoms and health-related QoL (HRQoL)) and incontinence (UI and FI) in a representative population of African-American adults. Data from the African American Health (AAH) project, a community-based study of late-middle-aged and older African Americans from two distinct geographic and socioeconomic strata (inner city and near northwestern suburbs) in metropolitan St. Louis, Missouri, were used. The overall purpose of AAH is to identify factors that cause excess disability and frailty or decrease QoL in African Americans living in metropolitan St. Louis, Missouri. In this article, the association between incontinence and QoL in the AAH cohort is investigated and the prevalence of UI and FI in AAH is reported.

Methods

Participants

AAH recruitment and sampling procedures are provided in detail in a previous article.¹¹ In brief, AAH is a population-based panel study of African Americans born in 1936 to 1950 from two distinct geographic and socioeconomic strata (inner city and near northwestern suburbs) in metropolitan St. Louis, Missouri. Sampling weights were determined, and when they are applied, AAH represents the noninstitutionalized black population in the two areas at the time of the 2000 census. Eligibility criteria were self-reported African-American or black race, a Mini-Mental State Examination (MMSE) score of 16 or greater,¹² and willingness to sign informed consent. Nine hundred ninety-eight of 1,320 persons agreed to take part in AAH, for a 76% response rate. AAH participants were contacted annually in Years 1 to 5 for in-home interviews and assessments (Years 1 and 4) or telephone interviews (Years 2, 3, and 5). UI and FI questions were included in the Year 4, in-home interview, and therefore, the eligible sample for this cross-sectional study includes the 853 continuing participants assessed during Year 4 of AAH. The retention rate (excluding 51 decedents) at Year 4 was 90% (853/947). In multivariable modeling, the only differences associated with attrition were diagnoses of cancer (adjusted odds ratio (AOR) = 2.97) and heart disease (AOR = 0.48) and greater visual acuity (AOR = 0.90 per point on a 3-item scale ranging from 3 (excellent) to 15 (poor)).

Health-Related QoL

HRQoL was measured using Version 2.0 of the Medical Outcomes Study 36-item Short Form Health Survey (SF-36).^{13, 14} The eight SF-36 scales are based on 35 of the 36 items: physical function (10 items), role physical (4 items), bodily pain (2 items), general health perceptions (5 items), vitality (4 items), social functioning (2 items), role emotional (3 items), and mental health (5 items). The remaining item not used in any of the scales asks about any health changes in the past year. Scores on each SF-36 scale are imputed as the average of valid items when at least half of the items on a scale are complete. Raw score data transformations (0 = worst health to 100 = best health) of all eight SF-36 scales are computed to facilitate HRQoL comparisons across SF-36 scales. The psychometrics properties of the SF-36 in AAH have been described previously.^{5, 16}

Depressive Symptoms

The 11-item Center for Epidemiologic Studies Depression Scale (CESD-11) was used to measure depressive symptoms. CESD-11 scores of 9 or greater represent clinically relevant levels of depressive symptoms.^{17–19}

Incontinence

The UI and FI questions included in AAH are from the Health and Retirement Study (HRS), a nationally representative longitudinal study of older Americans.²⁰ UI was classified as positive when respondents answered “yes” to the question, “This might not be easy to talk about, but during the last 12 months, have you lost any amount of urine beyond your control?” and reported the occurrence as 1 or more days to the follow-on question, “On

about how many days in the last month have you lost any urine?" FI, in turn, was classified as positive when respondents answered "yes" to the question, "This also might be difficult to talk about, but during the last 12 months, have you lost control of your bowel or stool?"

Covariates

To determine the net effects of UI and FI on the SF-36 and the CES-D, the analyses adjusted for age, sex, body mass index (BMI), and a summary marker of seven chronic diseases (diabetes mellitus, chronic heart disease, congestive heart failure, hypertension, stroke, arthritis, and cancer). The chronic disease marker was computed as the total number (0–7) of positive responses to the questions, "Did a doctor ever tell you that you had [list of 7 chronic conditions]?" BMI was computed using self-reported height and weight (kg/m²).

Data Analysis

Analyses were conducted using SPSS, version 15.0 (SPSS, Inc., Chicago, IL). Descriptive statistics are reported as means $\pm$ standard deviations or percentages. Analysis of variance (ANOVA) adjusting for covariates (age, sex, BMI, and chronic diseases) was applied to investigate the association between UI and FI and the SF-36 scales. Separate ANOVAs were computed for each SF-36 scale (physical function, role physical, bodily pain, general health perceptions, vitality, social functioning, role emotional, and mental health) separately with UI and then with FI. Binary logistic regression adjusting for age, sex, BMI, and chronic diseases was used to investigate the association between clinically relevant levels of depressive symptoms and UI and FI. Adjusted odds ratios (AORs) and 95% confidence intervals were computed. Data are weighted to the represented population based on the 2000 Census.

Sensitivity analyses included examining UI according to occurrence over past year (instead of past month), excluding participants with dual incontinence (DI; $n = 14$), and excluding participants with baseline MMSE scores less than 24.

Results

The analytical sample included continuing participants in Year 4 of AAH with complete data on all variables included in the analyses (weighted $n = 841$). The 1-month and 12-month prevalences of UI were 12.1% (weighted $n = 102/841$) and 14.6% (weighted $n = 123/841$), respectively, and the 12-month prevalence of FI was 5.0% (weighted $n = 42/841$). Table 1 provides selected characteristics (age, sex, BMI, chronic diseases) of participants with UI or FI. BMI was higher for those with UI than those without, and the average number of chronic conditions was higher for those with FI than those without.

Means $\pm$ standard deviations for UI and FI for each SF-36 scale and percentages for the CES-D are reported in Table 2. Scores on all of the SF-36 scales were lower in participants with UI (all $P < .001$) and FI (all $P < .01$), independent of age, sex, BMI, and chronic diseases (diabetes mellitus, chronic heart disease, congestive heart failure, hypertension, stroke, arthritis, cancer). UI (AOR = 3.27, $P < .001$) and FI (AOR = 5.66, $P < .001$) were also strongly associated with the presence of clinically relevant levels of depressive symptoms on the CES-D, independent of age, sex, BMI, and chronic diseases.

The sensitivity analyses did not appreciably change the pattern of results relative to those shown in Table 2. When UI was defined with an anchor point of 12 months, all effects were in the same direction, and all were statistically significant. Exclusion of DI cases ($n = 14$) did not alter the direction of any UI or FI effects. All UI and QoL differences were statistically significant without DI cases included in the analyses. Seven of nine FI differences noted in Table 2 were statistically significant without DI cases included in the analyses, and the point estimates changed only slightly; it is likely that reduced power contributed to this change relative to the results reported in Table 2. When cases with MMSE scores less than 24 were excluded from the analyses, all effects were in the same direction for UI and FI with QoL, and all were statistically significant.

Discussion

Prevalence rates for UI in community-dwelling older adults vary widely in the literature, in general increasing with age and ranging from 15% to 35% in older persons, with higher rates in women.^{21–23} There are a few reports from the nationally representative HRS that have investigated UI in women using the same operational definition as AAH.^{24–26} For example, one study²⁴ reported a UI prevalence rate over the past month of 15.9% for women aged 50 to 69 in HRS; the UI prevalence rate over the past month of 12.2% for women aged 52 to 68 in AAH is somewhat lower than the rate in the previous study. With respect to sex, the UI prevalence rates in AAH for women (12.2%) and men (11.9%) are similar, which is unexpected because prevalence rates for UI are generally higher in women. It is difficult to reconcile this finding with other literature because of the lack of directly comparable studies using the AAH UI questions (e.g., UI prevalence in men in HRS has not been published), but the similar rates may be related to the greater health and disability observed in the AAH cohort than in other national studies of age-matched non-Hispanic white and African-American people.¹¹ It also is noteworthy that the operational definitions of UI used to collect prevalence data in epidemiological studies such as AAH and others^{2, 24} differ from the UI definition of the International Continence Society (ICS), which includes measurement of actual urine leakage.²⁷ For the most part, epidemiological studies cannot measure UI according to ICS standards because the clinically invasive measures required to do this would negatively affect study response rates and thereby lower external validity, yet AAH and other epidemiological studies such as the Boston Area Community Health Survey² and HRS²³ provide important UI prevalence data from population-based samples of adults. Nonetheless, urodynamic techniques remain the criterion standard for UI measurement, and further validation of self-reported UI is warranted, especially in men.²⁸

Prevalence rates for FI in community-dwelling older adults also increase with age (range 2–17%) and may be higher in women.^{1, 29, 30} The prevalence rate for FI (5.0%) in AAH is on the lower end but within the range of other community-based studies. To the authors' knowledge, there are no published reports that have investigated the prevalence of FI in men and women based on the same operational definitions employed in AAH. The UI and, in particular, FI prevalence data reported here provide important health information in a unique, population-based cohort of African Americans; further investigations of UI and FI in AAH are planned after new data are collected and will include investigating incidence rates for incontinence.

This study is also among the few that have examined incontinence and QoL in a representative sample of African Americans and, to the authors' knowledge, is the first to do so using the comprehensive, reliable, and valid SF-36.¹⁵ Unlike many previous studies, the study reported here included measures of UI and FI in men and women. UI and FI were strongly associated with worse values on all of the SF-36 scales, as well as higher prevalence of clinically relevant levels of depressive symptoms. Findings were similar for participants with UI and those with FI. QoL in AAH is robustly associated with UI and FI. AAH participants who reported UI in the past month had consistently worse scores on all eight SF-36 scales and more depressive symptoms on the CES-D. The difference between those with and without FI were similar to those for UI, except, overall, the absolute point estimates for the SF-36 scales were lower and the presence of clinically relevant levels of depressive symptoms was markedly higher in those with FI than in those with UI.

The association between higher depressive symptoms and incontinence is consistent with prior investigations in population studies of African Americans.^{2, 4} This study adds the SF-36 as another QoL measure to aid in investigation of the physical and social effect of UI and FI in older African Americans. Robust associations were found between incontinence and general QoL, as measured according to the SF-36, in a population of African Americans with high levels of disability and health issues, even when controlling for the presence of other important health conditions. In particular, QoL was much lower in African American men and women with FI.

There are a number of study limitations, including the use of only cross-sectional data and a sample limited to African Americans in a single geographic area. Reliability data for the UI and FI questions in the AAH cohort were not collected. There are also multiple ways to define incontinence, and this study used only a few questions from a similar population health study (HRS), and the results may have differed from those from another incontinence measure (e.g., an instrument based on International Continence Society standards). The absence of a condition-specific measure of QoL is also a significant study limitation. Furthermore, UI and FI are complex health conditions influenced by many factors, including life course and bodily changes (e.g., pregnancy in women and prostatic hyperplasia in men) and chronic disease severity, which were not controlled for in this study.

Even though prevalence rates for UI and FI may be generally lower in men than women, the robust associations between QoL and incontinence in AAH in men and the similar prevalence rates for UI and FI in men and women in AAH highlight the need for clinicians and other health professionals in geriatrics to recognize the important association between incontinence and poor QoL for African-American men and women with incontinence.

Overall, these data highlight for practicing clinicians (e.g., physicians, nurses, therapists, and social workers) the social and emotional QoL importance of UI and FI. Practicing clinicians should be encouraged to identify UI and FI in their patients (African American and other races and ethnicities) and to pursue effective ways to treat these conditions, because these efforts may help to improve their patients' QoL.

Acknowledgments

This research was supported by Grant R01 AG-10436 from the National Institute on Aging to Dr. D. K. Miller.

Sponsor's Role: None

References

1. Landefeld CS, Bowers BJ, Feld AD, et al. National Institutes of Health state-of-the-science conference statement: Prevention of fecal and urinary incontinence in adults. *Ann Intern Med.* 2008; 148:449–458. [PubMed: 18268289]
2. Tennstedt SL, Link CL, Steers WD, et al. Prevalence of and risk factors for urine leakage in a racially and ethnically diverse population of adults. The Boston Area Community Health (BACH) survey. *Am J Epidemiol.* 2008; 167:390–399. [PubMed: 18182376]
3. Ragins AI, Shan J, Thom DH, et al. Effects of urinary incontinence, comorbidity and race on quality of life outcomes in women. *J Urol.* 2008; 179:651–655. [PubMed: 18082212]
4. Markland AD, Goode PS, Burgio KL, et al. Correlates of urinary, fecal, and dual incontinence in older African-American and white men and women. *J Am Geriatr Soc.* 2008; 56:285–290. [PubMed: 18070007]
5. Araki I, Beppu M, Kajiura M, et al. Prevalence and impact on generic quality of life of urinary incontinence in Japanese working women: Assessment by ICI questionnaire and SF-36 health survey. *Urology.* 2005; 66:88–93. [PubMed: 15992871]
6. Stewart WF, Van Rooyen JB, Cundiff GW, et al. Prevalence and burden of overactive bladder in the United States. *World J Urol.* 2003; 20:327–336. [PubMed: 12811491]
7. Dugan E, Cohen SJ, Bland DR, et al. The association of depressive symptoms and urinary incontinence among older adults. *J Am Geriatr Soc.* 2000; 48:413–416. [PubMed: 10798468]
8. Edwards NI, Jones D. The prevalence of faecal incontinence in older people living at home. *Age Ageing.* 2001; 30:503–507. [PubMed: 11742780]
9. Bogner HR. Urinary incontinence and psychological distress in community-dwelling older African Americans and whites. *J Am Geriatr Soc.* 2004; 52:1870–1874. [PubMed: 15507064]
10. Waetjen LE, Liao S, Johnson WO, et al. Factors associated with prevalent and incident urinary incontinence in a cohort of midlife women: A longitudinal analysis of data. *Am J Epidemiol.* 2007; 165:309–318. [PubMed: 17132698]
11. Miller DK, Wolinsky FD, Malmstrom TK, et al. Inner city, middle-aged African Americans have excess frank and subclinical disability. *J Gerontol A Biol Sci Med Sci.* 2005; 60A:207–212. [PubMed: 15814864]
12. Folstein MF, Folstein SE, McHugh PR. 'Mini-mental state.' A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975; 12:189–198. [PubMed: 1202204]
13. Ware, JE.; Kosinski, M.; Dewey, JE. How to score Version 2 of the SF-36 Health Survey. Boston: Quality Metric; 2000.
14. Ware JE, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36): I. Conceptual framework and item selection. *Med Care.* 1992; 30:473–486. [PubMed: 1593914]
15. Wolinsky FD, Miller DK, Andresen EM, et al. Health-related quality of life in middle-aged African Americans. *J Gerontol Psychol Sci Soc Sci.* 2004; 59B:118–123.
16. Wolinsky FD, Malmstrom TK, Miller JP, et al. Antecedents of global decline in health-related quality of life among middle-aged African Americans. *J Gerontol Psychol Sci Soc Sci.* 2009; 64B: 290–295.
17. Miller DK, Malmstrom TK, Joshi S, et al. Clinically relevant levels of depressive symptoms in community-dwelling middle-aged African Americans. *J Am Geriatr Soc.* 2004; 52:741–748. [PubMed: 15086655]
18. Kohout FJ, Berkman LF, Evans DA, et al. Two shorter forms of the CES-D depression symptoms index. *J Aging Health.* 1993; 5:179–193. [PubMed: 10125443]

19. Wolinsky FD, Mahncke HW, Vander Weg MW, et al. The ACTIVE cognitive training interventions and the onset of and recovery from suspected clinical depression. *J Gerontol B Psychol Sci Soc Sci.* 2009; 64B:577–585. [PubMed: 19617456]
20. The Institute for Social Research. Codebook. Ann Arbor, MI: University of Michigan; Health and Retirement Study, 1996 Core, Final Version. Available at <http://hrsonline.isr.umich.edu> [Accessed January 14, 2010]
21. Wilson MG. Urinary incontinence: Bridging the gender gap. *J Gerontol A Biol Sci Med Sci.* 2003; 58A:752–755. [PubMed: 12902535]
22. Griebing TL. Urinary incontinence in the elderly. *Clin Geriatr Med.* 2009; 25:445–457. [PubMed: 19765492]
23. Nygaard I, Barber MD, Burgio KL, et al. Prevalence of symptomatic pelvic floor disorders in US women. *JAMA.* 2008; 300:1311–1316. [PubMed: 18799443]
24. Nygaard I, Turvey C, Burns TL, et al. Urinary incontinence and depression in middle-aged United States women. *Obstet Gynecol.* 2003; 101:149–156. [PubMed: 12517660]
25. Lee PG, Cigolle C, Blaum C. The co-occurrence of chronic diseases and geriatric syndromes: The Health and Retirement Study. *J Am Geriatr Soc.* 2009; 57:511–516. [PubMed: 19187416]
26. Melville JL, Fan MY, Rau H, et al. Major depression and urinary incontinence in women: Temporal associations in an epidemiologic sample. *Am J Obstet Gynecol.* 2009; 201:490.e1–490.e7. [PubMed: 19716547]
27. Abrams P, Cardozo L, Fall M, et al. The standardisation of terminology in lower urinary tract function: Report from the standardisation sub-committee of the International Continence Society. *Urology.* 2003; 61:37–49.
28. Tennstedt SL, Link CL, Steers WD, et al. Tennstedt et al. respond to “BACH and the epidemiology of urinary incontinence”. *Am J Epidemiol.* 2008; 167:404–405.
29. Roach M, Christie JA. Fecal incontinence in the elderly. *Geriatrics.* 2008; 63:13–22. [PubMed: 18312019]
30. Nelson R, Norton N, Cautley E, et al. Community-based prevalence of anal incontinence. *JAMA.* 1995; 274:559–561. [PubMed: 7629985]

Table 1
Selected Characteristics of African-American Health Sample (Weighted N = 841)

Characteristic	Urinary Incontinence		P-Value *	Fecal Incontinence		P-Value *
	Yes (12.1%; n = 102)	No (87.9%; n = 739)		Yes (5.0%; n = 42)	No (95.0%; n = 799)	
Age, mean $\pm$ SD	59.3 $\pm$ 4.3	59.6 $\pm$ 4.4	.49	60.0 $\pm$ 4.9	59.6 $\pm$ 4.4	.54
Sex, %			.89			.07
Female	12.2	87.8		6.1	93.9	
Male	11.9	88.1		3.4	96.6	
Body mass index, kg/m ² , mean $\pm$ SD	32.1 $\pm$ 7.9	29.9 $\pm$ 6.3	.001	30.8 $\pm$ 8.1	30.1 $\pm$ 6.4	.51
Chronic diseases, mean $\pm$ SD [†]	2.0 $\pm$ 1.4	1.8 $\pm$ 1.3	.15	2.8 $\pm$ 1.6	1.81 $\pm$ 1.2	<.001

Date weighted to represented population.

* *T*-tests for continuous data and chi-square tests for discrete data.

[†]Total number of chronic diseases from the following: diabetes mellitus, chronic heart disease, congestive heart failure, hypertension, stroke, arthritis, cancer.
SD = standard deviation.

Table 2
Health-Related Quality of Life in Individuals with Urinary or Fecal Incontinence (Weighted N = 841)

Scale	Urinary Incontinence		P-Value	Fecal Incontinence		P-Value
	Yes (12.1%; n = 102)	No (87.9%; n = 739)		Yes (5.0%; n = 42)	No (95.0%; n = 799)	
Medical Outcomes Study 36-item Short-Form Survey score, mean ± standard deviation ^{*,†}						
Physical function	65.7 ± 31.1	81.2 ± 25.7	<.001	42.4 ± 38.4	80.5 ± 25.5	<.001
Role physical	65.7 ± 31.7	78.9 ± 26.8	<.001	51.7 ± 29.0	78.2 ± 27.3	<.001
Bodily pain	52.0 ± 29.6	67.7 ± 25.2	<.001	42.0 ± 23.2	66.5 ± 26.0	<.001
General health perceptions	52.2 ± 28.3	67.6 ± 22.1	<.001	39.0 ± 26.0	66.6 ± 22.9	<.001
Vitality	50.2 ± 23.4	65.3 ± 22.3	<.001	47.4 ± 23.9	63.9 ± 22.7	.002
Social functioning	65.6 ± 33.4	83.9 ± 23.4	<.001	56.9 ± 31.3	82.5 ± 25.0	<.001
Role emotional	73.0 ± 26.9	86.3 ± 22.9	<.001	63.2 ± 30.6	85.4 ± 23.2	<.001
Mental health	67.6 ± 21.7	79.8 ± 19.3	<.001	61.4 ± 23.4	78.9 ± 19.6	.001
11-item Center for Epidemiologic Studies Depression Scale [‡]						
Depressive symptoms, %	38.8	20.9	<.001	59.4	22.2	<.001
Adjusted odds ratio (95% confidence interval) for depressive symptoms	3.27 (2.06–5.19)	1.00 (Reference)		5.66 (2.45–13.08)	1.00 (Reference)	

Data weighted to represented population.

^a Analysis of variance controlling for age, sex, body mass index, and chronic diseases (diabetes mellitus, chronic heart disease, congestive heart failure, hypertension, stroke, arthritis, cancer).

[†] Physical function scale includes 10 items (vigorous activities; moderate activities; lift and carry groceries; climb stairs; bend, kneel, and stoop; walk more than a mile; walk several hundred yards; walk 100 yards; bathe and dress) rated according to how one's health limits (none, a little, or a lot) each activity. Role physical scale includes four items (reduced time spent on work and activities, accomplished less than desired, limited in type of work activities, difficulty performing work and activities) rated according to how much time (all, most, some, little, none) over past 4 weeks one's physical health has resulted in these problems. Bodily pain scale includes two items: amount of bodily pain in past 4 weeks (none, very mild, moderate, severe, and very severe) and degree to which pain has interfered with work over past 4 weeks (none, little, moderate, a lot, extreme). General health perception includes four true-or-false items (get sick more than others, as healthy as other, expect health to decline, health is excellent) rated as definitely true, mostly true, don't know, mostly false, and definitely false and one item that rates general health (excellent, very good, good, fair, poor). Vitality scale includes four items (feel full of life, have energy, feel worn out, feel tired) each rated (all, most, some, a little, none) as occurring over past 4 weeks. Social functioning scale includes two items: extent to which physical and emotional problems have interfered with social activities over past 4 weeks (none, some, moderate, a lot, extremely) and how much time over past 4 weeks (all, most, some, little, none) physical and emotional problems have interrupted social activities. Role emotional scale includes three items (reduced time spent on work and activities, accomplished less than wanted, did work and activities less carefully than usual) rated according to frequency of occurrence over past 4 weeks (always, mostly, some, little, none) because of emotional problems. Mental health scales includes five items (been nervous, felt down, felt calm or peaceful, been happy) rated according to frequency of occurrence over past 4 weeks (always, mostly, some, little, none) because of emotional problems. Mental health scales includes five items (been nervous, felt down, felt calm or peaceful, been happy) rated according to frequency of occurrence over past 4 weeks (always, mostly, some, little, none), 13, 14

[‡] Logistic regression controlling for age, sex, body mass index, and chronic diseases (diabetes mellitus, chronic heart disease, congestive heart failure, hypertension, stroke, arthritis, cancer).