A Comparison of Depression and Mental Distress Indicators, Rhode Island Behavioral Risk Factor Surveillance System, 2006

Yongwen Jiang, PhD; Jana Earl Hesser, PhD

Introduction
Depression is a public health concern that warrants accurate population estimates. The patient health questionnaire 8 (PHQ-8) offers high sensitivity and specificity for assessing depression but is time-consuming to administer, answer, and score. We sought to determine whether 1 of 3 simpler instruments — the shorter PHQ-2 or 2 single questions from the health-related quality of life (HRQOL) module of the Behavioral Risk Factor Surveillance System (BRFSS) — could offer accuracy comparable to the PHQ-8.

Methods
We compared the depression and mental distress indicators of 2006 Rhode Island BRFSS data by using 4 types of analyses: 1) sensitivity and specificity estimates, 2) prevalence estimates, 3) multivariable logistic regression modeling of the relationship between each of the 4 indicators and 11 demographic and health risk variables, and 4) geographic distribution of prevalence.

Results
Compared with the PHQ-8, the 3 other measures have high levels of specificity but lower sensitivity. Depression prevalence estimates ranged from 8.6% to 10.3%. The adjusted odds ratios from logistic regression modeling were consistent. Each of the indicators was significantly associated with low income, being unable to work, current smoking, and having a disability.

Conclusion
The PHQ-8 indicator is the most sensitive and specific and can assess depression severity. The HRQOL and PHQ-2 indicators are adequate to obtain population prevalence estimates if questionnaire length is limited.
is a telephone survey administered in all 50 states, the District of Columbia, Puerto Rico, the US Virgin Islands, and Guam with funding and specifications from the Centers for Disease Control and Prevention (CDC) (11). The BRFSS monitors the prevalence of behavioral risks for the leading causes of disease and death among adults in the United States (11). A 9-question health-related quality of life (HRQOL) module has been available since 1995 (12). In 2006, a 10-question depression and anxiety (D&A) module was also made available to states. Rhode Island was the only state to include both modules on its 2006 BRFSS questionnaire.

We compared depression and mental distress estimates from the HRQOL and D&A modules using data from Rhode Island’s 2006 BRFSS. Two of the 5 items that are related to mental health in the HRQOL module were used, 1 for sad/blue/depressed and 1 for frequent mental distress. Two measures from the D&A module were used. The D&A module includes the patient health questionnaire-8 (PHQ-8), which is used to create a 5-point scale for depression severity based on an algorithm using responses to 8 questions. Severity scores can be grouped to create a dichotomous variable for current depression (6,9). The first 2 questions of the PHQ-8, called the PHQ-2, is also used to provide a simple measure of current depression (9). Our hypothesis was that either of the HRQOL questions or the PHQ-2 can serve as a proxy for the PHQ-8 on the BRFSS. The objective of this study was to assess whether 1 or 2 questions on depression and mental distress can yield prevalence estimates of depression comparable to those from the PHQ-8, which has a high degree of sensitivity and specificity.

Methods

Study design

We used the 2006 Rhode Island BRFSS for this analysis, as this was the only year to include both the HRQOL and the D&A modules. From January through December 2006, the Rhode Island BRFSS conducted random-digit-dialed telephone interviews with 4,515 Rhode Island adults aged 18 or older. A detailed description of BRFSS methods, including survey design, random sampling, and weighting procedures, is available from the CDC BRFSS website (11). Information about Rhode Island’s 2006 BRFSS is available from the Rhode Island Department of Health’s website (13).

Depression and mental distress indicators

Two depression and mental distress questions are on the HRQOL module. They asked respondents to estimate how many days in the past 30 days they experienced the following: “felt sad, blue, or depressed” (14 or more days = frequent depressive symptoms), and “mental health, which includes stress, depression, and problems with emotions, was not good” (14 or more days = frequent mental distress). The authors selected the 14-day minimum period because clinicians and clinical researchers often use this period as a marker for clinical depression disorders. In addition, most of the publications we reviewed that use the BRFSS HRQOL indicators use the cutoff of 14 or more days (14-23). Adopting this precedent ensured comparability with other studies.

The PHQ-8 contains 8 of the 9 criteria for diagnosis of major depression as defined in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders. These questions ask the respondent to indicate how many days each of the following has occurred in the past 2 weeks: 1) had little interest or pleasure in doing things; 2) felt down, depressed, or hopeless; 3) had trouble falling asleep or staying asleep or sleeping too much; 4) felt tired or had little energy; 5) had a poor appetite or ate too much; 6) felt bad about yourself, or felt that you were a failure or had let yourself or your family down; 7) had trouble concentrating on things, such as reading the newspaper or watching television; 8) moved or spoke so slowly that other people could have noticed, or being so fidgety or restless that you were moving around a lot more than usual. The number of days for each question is converted to points (0-1 day = 0 points; 2-6 days = 1 point; 7-11 days = 2 points; and 12-14 days = 3 points), and the number of points is totaled for the 8 questions to determine a depressive symptoms severity score (6,9). If a response to any of the 8 questions was missing, a score was not calculated. Five severity categories are defined: no, mild, moderate, moderately severe, and severe depression. For the dichotomous variable, a score of 0 to 9 points, which is no and mild depression, was defined as no depression, while a score of 10 to 24 points, which was the other 3 categories, was defined as current depression (6,9,24). The PHQ-2 is the first 2 questions of the PHQ-8 that inquire about depressed mood and anhedonia. A score of 0 to 2 points is defined as no depression; a score of 3 to 6 points is defined as current depression (9). If a response to either of the 2 questions was missing, a score was not calculated. The proportion of records with missing values for the 2 single
HRQOL items was 1.3% and 1.4%; for the PHQ-2, 7.9%; and for the PHQ-8, 11.4%.

Risk factors, health conditions, and demographics

For the analysis, we chose 3 health risk behaviors: current smoking, chronic alcohol use, and no leisure-time physical activity (PA); 4 health conditions: asthma, diabetes, obesity, and physical disability; and 4 demographic measures: age, sex, income, and employment status. We selected these risk and demographic factors based on our earlier work (25). We dichotomized some covariates for the analysis (ie, sex, current smoking, alcohol use, PA, asthma, diabetes, obesity, and disability), and the other covariates had multiple categories (ie, age, income, and employment status). The definitions of the 11 covariates are available in our previous article (25).

Analysis

Multiple imputation has been extensively applied to account for missing data in survey samples (26,27). To maintain maximal sample size and retain all valid data, we simulated missing data for all variables using multiple imputation. In our study, depending on the analytical model, 24% to 30% of the 4,515 records in our data set had missing data for 1 or more of the 11 predictor or 4 outcome variables. Therefore, to retain all records, we imputed missing values for age, sex, race, marital status, education, employment status, health insurance, smoking, drinking, PA, asthma, diabetes, obesity, disability, square-root transformed income, the 5 mental health items in the HRQOL module, and the 10 D&A items. Analyzing the data without imputation did not change our conclusions (25).

Results for these different indicators were compared in 4 ways. First, using the PHQ-8 indicator as the standard, we compared the sensitivity and specificity of the 3 simpler measures. Second, we compared prevalence estimates generated by the 4 measures. Third, using multivariable logistic regression, we compared the relationship between each of the indicators and 11 demographic and health risk variables. Finally, we compared the geographic distribution of prevalence for 2 of the 4 indicators using geographic information system (GIS) mapping.

SAS version 9.1 (SAS Institute, Inc, Cary, North Carolina) was used for all analyses because it can adjust for the BRFSS complex sampling design. We calculated the sensitivity and specificity of the 2 HRQOL indicators and the PHQ-2 indicator, compared with the PHQ-8. Four logistic regression models were used to calculate adjusted odds ratios (AORs) and 95% confidence intervals (CIs) to assess the effect of each of the 11 risk factors for each of the depression indicators. All statistical inferences were based on a significance level of \( P \) (2-sided) < .05 calculated by using the Wald \( \chi^2 \) test. The results of analyses for each of the indicators were compared with one another.

ArcGIS 9.0 (Environmental Systems Research Institute, Inc, Redlands, California) was used to map depression prevalence estimates by cities and towns by zip code. We chose to use the Jenks Optimization (also called Jenks Natural Breaks Classification method) to create the value ranges of sad/blue/depressed and PHQ-8 current depression depicted on the GIS maps.

We chose to use natural breaks rather than defined interval classification as used by others (28,29). Defined interval classification allowed us to specify an interval by which to equally divide a range of attribute values. We wanted to judge whether the distributions depicted in the GIS graphs are consistent with one another. With defined interval classification, similar features can be placed in adjacent classes, or features with widely different values can be put in the same class. The resulting maps can be misleading.

Results

Compared with the PHQ-8, each of the 3 indicators had a high level of specificity, ranging from 94.4% to 96.4%; the PHQ-2 had a slightly higher negative predictive value than the other 2 indicators (Table 1). The sensitivity of the 3 indicators was weaker, ranging from 59.4% to 66.8%. The PHQ-2 had higher sensitivity than HRQOL indicators. The positive predictive values for the PHQ-2 and the sad/blue/depressed indicator were almost identical; the “frequent mental distress” indicator had a lower positive predictive value.

In the HRQOL module, the prevalence of frequent mental distress among Rhode Island adults was 10.3% and of sad/blue/depressed was 8.9% (Table 2). In the PHQ-2 and PHQ-8, the prevalence of current depression was 9.8% and 8.6%, respectively. Results of tests for significance for sad/blue/depressed and for PHQ-8 were consistent for the 11 demographic and risk variables with the exception of
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

results for age. Results of tests for significance for PHQ-2 and for PHQ-8 were consistent for the 11 demographic and risk variables with the exception of results for age and sex. Results of tests for significance for frequent mental distress and for PHQ-8 were consistent for all of the 11 demographic and risk variables. Prevalence estimates for the 11 demographic and risk variables for each of the indicators were comparable with one another.

We used the area under receiver operating curves (AUC) to assess model discrimination. The AUC for frequent mental distress, sad/blue/depressed, PHQ-2, and PHQ-8 were 0.74, 0.80, 0.78, and 0.83, respectively. The AORs for sad/blue/depressed and for PHQ-8 (Table 3) were consistent with one another for 6 predictors. Both indicate increased odds of depression for women, annual income less than $25,000, unable to work, current smoker, no leisure-time PA, and disability. The AORs for PHQ-2 and for PHQ-8 are consistent with one another for 6 predictors. Both indicate increased odds of depression for younger adults, annual income less than $25,000, unable to work, current smoker, no leisure time PA, and disability. The AORs for frequent mental distress and for PHQ-8 are consistent with one another for 8 predictors. Both indicate increased odds of depression for adults aged 18 to 44 years and 45 to 64 years, annual income less than $25,000, unable to work, current smoker, asthma, obesity, and disability.

The prevalence of sad/blue/depressed in Providence (excluding the affluent east side), West Warwick, and Warwick ranged from 11.7% to 13.6%, higher than the rest of the state (Figure 1). The prevalence in Woonsocket, Central Falls, Pawtucket, North Providence, Johnston, Rumford, East Providence, Cranston, and Riverside ranged from 7.3% to 11.6%. These areas with higher depression rates include the more urban areas of the state, which have a higher proportion of low-income households than do the suburban and rural areas.

The prevalence of current depression in Providence (excluding the affluent east side), Central Falls, Pawtucket, Warwick, and West Warwick ranged from 11.3% to 15.5% (Figure 2). The first 3 cities are urban with a high proportion of low-income and minority residents. The prevalence in Woonsocket, East Providence, Coventry, Greene, West Greenwich, and East Greenwich ranged from 7.8% to 11.2%. Other than East Providence, these are suburban areas. The remainder of the state, with the lowest rates for current depression, is largely suburban and rural.

Discussion

Our analysis showed that any of the 3 shorter items provide results comparable with those of the PHQ-8 in estimating overall prevalence of depression and mental distress, identifying high-risk populations, and identifying significant associations with risk variables. We recommend use of any of the 3 shorter items as a proxy on the BRFSS or similar population-based surveys to obtain a population estimate of depression prevalence. Any one of the 3 is adequate for use in descriptive analyses of population data. They provide an efficient means of assessing
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Depression prevalence in adult populations when survey efficiency precludes use of the longer PHQ-8. However, the PHQ-8 should be preferred for surveys requiring a high level of sensitivity as well as specificity, accuracy in reliably assigning depression severity status to specific respondents, or requiring assessment over time of population changes in depression severity.

The strengths of the PHQ-8 are its high degree of both sensitivity (88%) and specificity (88%) for major depression (6,9), its adequacy for diagnosis, its ability to assess severity of depression, and its validation in the general population (6,9,10). The weakness of the PHQ-8 is its length, which makes it time-consuming to administer and answer, and its complex scoring algorithm. Although the simple question measures of depression are inadequate for diagnosis (9), they are useful for screening for depression. Sad/blue/depressed and frequent mental distress are single questions, very easy to answer and administer, with few training requirements. The PHQ-2 is easy to answer and administer, and the scoring algorithm is simple (9).

The test characteristics and the test performance of the PHQ-2 were more sensitive than the 2 HRQOL indicators. Frequent mental distress was more concordant with the PHQ-8 than was the PHQ-2 in distinguishing demographic groups and risk factors with higher prevalence of depression. Based on the AUC, sad/blue/depressed is better than frequent mental distress and the PHQ-2. The proportion of records with missing values was lower for the 2 single HRQOL items than for the PHQ-2 or the PHQ-8. No measure was better than the others in all respects.

Both the sad/blue/depressed and the PHQ-8 maps showed that the prevalence of depression was highest in the core urban areas of the state and lowest in the more suburban and rural areas. The differences between the 2 distributions may reflect the greater power of the PHQ-8 to discriminate between cities and towns. This discriminatory power may also be reflected in the wider range of values resulting from the PHQ-8 measure than from the sad/blue/depressed measure.

Rhode Island is a small state, so the study population is homogeneous compared with populations of other states. Our analyses went beyond simple comparisons of test characteristics and test performance to include distinguishing levels of demographic characteristics and risk factors as well as within-state geographic comparisons.

Some limitations of this analysis should be noted. First, the HRQOL indicators are based on a 30-day recall period, while the PHQ-2 and PHQ-8 are based on a 14-day recall period. We have no way to assess the effect of this difference in recall periods. Second, both sets of questions (the HRQOL and the PHQ-8) were asked in the same interview session (ie, they were not context-independent). We have no way to assess the effect of this. Finally, because the calculation of PHQ-8 and PHQ-2 scores require responses to all questions used in calculating scores, it was necessary to impute missing values. In the future, we need to vary the
cut points of the 2 single-question screeners and the PHQ-2 to optimize their performance against the PHQ-8 (30).

We conclude that, for Rhode Island, any of the 3 short screeners is sufficiently specific and sensitive to provide population prevalence estimates of depression and can be used for descriptive analyses of our population survey data. Mapping of these depression estimates also indicates localities where the need for mental health services is greatest. To validate the generalizability of our findings, it will be important to replicate them in other states’ BRFSS surveys.

Acknowledgments

We thank our colleagues in the Rhode Island Department of Health for their comments and Steve Sawyer for his GIS technical assistance. This work and the 2006 Rhode Island BRFSS were supported in part by the National Center for Chronic Disease Prevention and Health Promotion, CDC, cooperative agreement U58/CCU122791. The D&A module added to Rhode Island’s 2006 BRFSS was supported in part by the Mental Health Data Infrastructure Grant no. 1 HR1 SM56659-01.

Author Information

Corresponding Author: Yongwen Jiang, PhD, Center for Health Data and Analysis, Rhode Island Department of Health, 3 Capitol Hill, Providence, RI 02908. Telephone: 401-222-5797. E-mail: Yongwen.Jiang@health.ri.gov. Dr Jiang is also affiliated with the Department of Community Health, The Warren Alpert Medical School of Brown University, Providence, Rhode Island.

Author Affiliations: Jana Earl Hesser, Center for Health Data and Analysis, Rhode Island Department of Health, Providence, Rhode Island, and Department of Community Health, The Warren Alpert Medical School of Brown University, Providence, Rhode Island.

References

1. Fan AZ, Strine TW, Huang Y, Murray MR, Musingo S, Jiles R, et al. Self-rated depression and physician-diagnosed depression and anxiety in Florida adults: Behavioral Risk Factor Surveillance System, 2006. Prev Chronic Dis 2009;6(1). http://www.cdc.gov/pcd/issues/2009/jan/07_0227.htm. Accessed April 19, 2010.
2. Moussavi S, Chatterji S, Verdes E, Tandon A, Patel V, Ustun B. Depression, chronic diseases, and decrements in health: results from the World Health Surveys. Lancet 2007;370(9590):851-8.
3. Andrews G, Sanderson K, Corry J, Lapsley HM. Using epidemiological data to model efficiency in reducing the burden of depression. J Ment Health Policy Econ 2000;3(4):175-86.
4. Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication [erratum appears in Arch Gen Psychiatr 2005;62(7):709]. Arch Gen Psychiatry 2005;62(6):617-27.
5. van Gool CH, Kempen GI, Bosma H, van Boxtel MP, Jolles J, van Eijk JT. Associations between lifestyle and depressed mood: longitudinal results from the Maastricht Aging Study. Am J Public Health 2007;97(5):870-94.
6. Strine TW, Mokdad AH, Dube SR, Balluz LS, Gonzalez O, Berry JT, et al. The association of depression and anxiety with obesity and unhealthy behaviors among community-dwelling US adults. Gen Hosp Psychiatry 2008;30(2):127-37.
7. De Moor MH, Beem AL, Stubbe JH, Boomsma DI, De Geus EJ. Regular exercise, anxiety, depression and personality: a population-based study. Prev Med 2006;42(4):273-9.
8. Dalton SO, Mellemkjaer L, Olsen JH, Mortensen PB, Johansen C. Depression and cancer risk: a register-based study of patients hospitalized with affective disorders, Denmark, 1969-1993. Am J Epidemiol 2002;155(12):1088-95.
9. Kroenke K, Spitzer RL. The PHQ-9: a new depression diagnostic and severity measure. Psychiatr Ann 2002;32:1-7.
10. Linde JA, Jeffery RW, Finch EA, Simon GE, Ludman EJ, Operskalski BH, et al. Relation of body mass index to depression and weighing frequency in overweight women. Prev Med 2007;45(1):75-9.
11. Behavioral Risk Factor Surveillance System. Atlanta (GA): Centers for Disease Control and Prevention. http://www.cdc.gov/brfss/. Accessed April 19, 2010.
12. Centers for Disease Control and Prevention. Health-related quality of life and activity limitation — eight states, 1995. MMWR Morb Mortal Wkly Rep 1998;47(7):134-40.
13. Health data and statistics. Rhode Island Department of Health. http://www.health.ri.gov/data/behaviorriskfactorsurvey/. Accessed April 19, 2010.
14. Ahluwalia IB, Holtzman D, Mack KA, Mokdad A. Health-related quality of life among women of reproductive age: Behavioral Risk Factor Surveillance System (BRFSS), 1998-2001. J Womens Health (Larchmt) 2003;12(1):5-9.
15. Barrett DH, Boehmer TK, Boothe VL, Flanders WD, Barrett DH. Health-related quality of life of U.S. military personnel: a population-based study. Mil Med 2003;168(11):941-7.
16. Brown DW, Balluz LS, Ford ES, Giles WH, Strine TW, Moriarty DG, et al. Associations between short- and long-term unemployment and frequent mental distress among a national sample of men and women. J Occup Environ Med 2003;45(11):1159-66.
17. Brown DW, Balluz LS, Heath GW, Moriarty DG, Ford ES, Giles WH, et al. Associations between recommended levels of physical activity and health-related quality of life. Findings from the 2001 Behavioral Risk Factor Surveillance System (BRFSS) survey. Prev Med 2003;37(5):520-8.
18. Centers for Disease Control and Prevention. Self-reported frequent mental distress among adults — United States, 1993-2001. MMWR Morb Mortal Wkly Rep 2004;53(41):963-6.
19. Ford ES, Mannino DM, Homa DM, Gwynn C, Redd SC, Moriarty DG, et al. Self-reported asthma and health-related quality of life: findings from the Behavioral Risk Factor Surveillance System. Chest 2003;123(1):119-27.
20. Ford ES, Moriarty DG, Zack MM, Mokdad AH, Chapman DP. Self-reported body mass index and health-related quality of life: findings from the Behavioral Risk Factor Surveillance System. Obes Res 2001;9(1):21-31.
21. Hassan MK, Joshi AV, Madhavan SS, Amonkar MM. Obesity and health-related quality of life: a cross-sectional analysis of the US population. Int J Obes Relat Metab Disord 2003;27(10):1227-32.
22. Okoro CA, Brewer RD, Naimi TS, Moriarty DG, Giles WH, Mokdad AH. Binge drinking and health-related quality of life: do popular perceptions match reality? Am J Prev Med 2004;26(3):230-3.
23. Strine TW, Balluz L, Chapman DP, Moriarty DG, Owens M, Mokdad AH. Risk behaviors and healthcare coverage among adults by frequent mental distress status, 2001. Am J Prev Med 2004;26(3):213-6.
24. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med 2001;16(9):606-13.
25. Jiang Y, Hesser JE. Associations between health-related quality of life and demographics and health risks. Results from Rhode Island’s 2002 Behavioral Risk Factor Survey. Health Qual Life Outcomes 2006;4:14.
26. Rubin DB. Multiple imputation after 18+ years. J Am Stat Assoc 1996;91(434):473-89.
27. Schafer JL. Multiple imputation: a primer. Stat Methods Med Res 1999;8(1):3-15.
28. Strine T. Training: analyzing and interpreting data from the Depression and Anxiety Module with an emphasis on the Patient Health Questionnaires. Presented at: 24th Annual Behavioral Risk Factor Surveillance System Conference; March 24-28, 2007; Decatur, Georgia.
29. Mokdad AH. BRFSS and mental health: past, present, and future. Paper presented at: 24th Annual Behavioral Risk Factor Surveillance System Conference; March 24-28, 2007; Decatur, Georgia.
30. Bossarte RM, He H, Claassen CA, Knox K, Tu X. Development and validation of a 6-day standard for the identification of frequent mental distress. Soc Psychiatry Psychiatr Epidemiol 2010 Apr 17.
Tables

Table 1. Comparison of Test Characteristics and Test Performance of 3 Indicators Against PHQ-8, Rhode Island, 2006

| Measures                  | HRQOL | D&A Module |
|---------------------------|-------|------------|
|                           | Frequent Mental Distress, % (95% CI) | Sad/Blue/Depressed, % (95% CI) | PHQ-2, % (95% CI) |
| Sensitivity               | 59.4 (51.9-66.9)                  | 59.7 (52.2-67.3)                  | 66.8 (59.4-74.1)  |
| Specificity               | 94.4 (93.3-95.6)                  | 96.4 (95.7-97.2)                  | 96.1 (95.1-97.0)  |
| Positive predictive value | 50.0 (42.7-57.3)                  | 60.7 (53.6-67.7)                  | 61.4 (54.0-68.8)  |
| Negative predictive value | 96.1 (95.3-97.0)                  | 96.3 (95.4-97.1)                  | 96.9 (96.0-97.7)  |

Abbreviations: PHQ, patient health questionnaire; HRQOL, health-related quality of life; D&A, depression and anxiety; CI, confidence interval.

Table 2. Percentage of Depression and Mental Distress Indicators for Selected Demographic Characteristics and Risk Factors (n = 4,515), Rhode Island Adults, 2006

| Demographic Characteristics and Risk Factors | No. (%) | HRQOL | D&A Module |
|---------------------------------------------|---------|-------|------------|
|                                             |         | Frequent Mental Distress (%) (95% CI) | Sad/Blue/Depressed (%) (95% CI) | Current Depression (PHQ-2) (%) (95% CI) | Current Depression (PHQ-8) (%) (95% CI) |
|                                             |         | <14 days/month | <14 days/month | <14 days/month | <14 days/month |
| Age, y                                      |         | P = .003 | P = .37 | P = .07 | P = .001 |
| 18-44                                       | 1,485 (49.6) | 11.5 (9.2-13.8) | 8.4 (6.4-10.4) | 11.0 (8.7-13.4) | 9.7 (7.5-11.9) |
| 45-64                                       | 1,719 (32.2) | 10.7 (9.0-12.3) | 10.0 (8.5-11.6) | 9.2 (7.7-10.8) | 9.2 (7.6-10.7) |
| ≥65                                         | 1,255 (18.3) | 6.5 (4.9-8.0) | 8.8 (7.0-10.6) | 7.8 (6.0-9.7) | 4.5 (3.0-5.9) |
| Sex                                         |         | P = .01 | P = .002 | P = .05 | P < .001 |
| Men                                         | 1,652 (47.5) | 8.4 (6.5-10.4) | 6.9 (5.3-8.6) | 8.4 (6.3-10.4) | 6.2 (4.5-7.9) |
| Women                                       | 2,863 (52.5) | 11.9 (10.2-13.7) | 10.8 (9.2-12.3) | 11.1 (9.4-12.8) | 10.7 (8.9-12.4) |
| Annual income, $                            |         | P < .001 | P < .001 | P < .001 | P < .001 |
| <25,000                                     | 954 (19.3) | 21.6 (17.5-25.8) | 24.1 (19.8-28.4) | 23.0 (18.8-27.2) | 21.9 (17.4-26.4) |
| 25,000-49,999                               | 996 (25.1) | 10.5 (7.5-13.5) | 8.4 (6.3-10.5) | 11.4 (8.4-14.4) | 8.6 (6.3-10.8) |
| ≥50,000                                     | 1,843 (55.6) | 6.2 (4.8-7.7) | 3.9 (2.7-5.0) | 4.6 (3.1-6.0) | 4.4 (3.1-5.7) |

Abbreviations: HRQOL, health-related quality of life; D&A, depression and anxiety; CI, confidence interval; PHQ, patient health questionnaire.

Table 2 (Continued)

| Demographic Characteristics and Risk Factors | No. (%) | HRQOL | D&A Module |
|---------------------------------------------|---------|-------|------------|
|                                             |         | Frequent Mental Distress (%) (95% CI) | Sad/Blue/Depressed (%) (95% CI) | Current Depression (PHQ-2) (%) (95% CI) | Current Depression (PHQ-8) (%) (95% CI) |
|                                             |         | <14 days/month | <14 days/month | <14 days/month | <14 days/month |
| Obesity                                     |         | P < .001 | P < .001 | P < .001 | P < .001 |
| Obesity was defined as body mass index >30 kg/m².

(Continued on next page)
Table 2. (continued) Percentage of Depression and Mental Distress Indicators for Selected Demographic Characteristics and Risk Factors (n = 4,515), Rhode Island Adults, 2006

| Demographic Characteristics and Risk Factors | No. (%) | HRQOL | D&A Module | Current Depression (PHQ-2) (n = 404), % (95% CI) | Current Depression (PHQ-9) (n = 339), % (95% CI) |
|---------------------------------------------|--------|-------|------------|-----------------------------------------------|-----------------------------------------------|
| Employment status                           |        |       |            |                                               |                                               |
| Employed                                    | 2,581 (64.0) | 7.7 (6.3-9.0) | 5.4 (4.4-6.5) | 6.8 (5.5-8.2) | 6.1 (4.9-7.3) |
| Retired                                     | 1,121 (16.5) | 6.2 (4.5-7.8) | 6.6 (5.0-8.2) | 7.4 (5.6-9.2) | 4.3 (2.9-5.7) |
| Homemaker/student                           | 362 (10.4)  | 13.9 (7.8-20.0) | 12.8 (7.7-18.0) | 9.6 (4.3-14.9) | 7.0 (3.0-10.9) |
| Unemployed                                   | 171 (4.8)   | 21.8 (11.4-32.3) | 20.6 (10.4-30.8) | 21.4 (10.5-32.2) | 25.8 (13.3-38.3) |
| Unable to work                               | 261 (4.4)   | 43.5 (35.7-51.2) | 47.9 (40.2-55.7) | 50.9 (42.8-59.1) | 50.4 (41.8-59.0) |
| Current smoker                              |          |       |            |                                               |                                               |
| No                                          | 3,731 (80.8) | 8.1 (6.8-9.3) | 7.2 (6.1-8.4) | 7.6 (6.4-8.9) | 6.3 (5.1-7.4) |
| Yes                                         | 762 (19.2)  | 19.8 (15.8-23.9) | 16.3 (12.6-19.9) | 19.1 (14.9-23.2) | 18.4 (14.1-22.6) |
| Chronic drinker                             |          |       |            |                                               |                                               |
| No                                          | 4,174 (94.0) | 10.0 (8.7-11.3) | 8.7 (7.6-9.8) | 9.9 (8.5-11.2) | 8.4 (7.2-9.7) |
| Yes                                         | 226 (6.0)   | 15.2 (7.0-23.5) | 14.8 (6.4-23.2) | 9.5 (2.9-16.2) | 10.9 (3.3-18.4) |
| Leisure-time physical activity               |          |       |            |                                               |                                               |
| No                                          | 3,282 (75.3) | 8.4 (6.9-9.9) | 6.0 (4.9-7.2) | 7.3 (6.0-8.7) | 6.1 (4.8-7.3) |
| Yes                                         | 1,227 (24.7) | 16.1 (13.3-18.9) | 17.9 (15.0-20.7) | 17.5 (14.4-20.6) | 16.5 (13.3-19.8) |
| Asthma                                      |          |       |            |                                               |                                               |
| No                                          | 4,008 (89.5) | 9.1 (7.8-10.3) | 8.2 (7.0-9.3) | 8.8 (7.5-10.1) | 7.1 (6.0-8.2) |
| Yes                                         | 479 (10.5)  | 21.1 (15.5-26.8) | 15.8 (10.9-20.6) | 18.9 (13.4-24.4) | 22.1 (15.6-28.6) |
| Diabetes                                    |          |       |            |                                               |                                               |
| No                                          | 4,091 (92.6) | 10.0 (8.6-11.3) | 8.4 (7.2-9.6) | 9.3 (7.9-10.6) | 8.0 (6.7-9.3) |
| Yes                                         | 421 (7.4)   | 14.5 (10.3-18.7) | 15.8 (11.6-19.9) | 16.6 (12.0-21.2) | 15.5 (10.9-20.2) |
| Obesity<sup>d</sup>                          |          |       |            |                                               |                                               |
| No                                          | 3,281 (78.6) | 9.2 (7.7-10.7) | 8.1 (6.7-9.4) | 9.3 (7.7-10.9) | 7.1 (5.7-8.5) |
| Yes                                         | 973 (21.4)  | 15.0 (12.1-17.9) | 12.0 (9.6-14.4) | 12.3 (9.7-14.9) | 14.6 (11.3-17.9) |
| Disability                                  |          |       |            |                                               |                                               |
| No                                          | 3,357 (80.2) | 6.9 (5.6-8.2) | 4.8 (3.8-5.8) | 6.0 (4.7-7.2) | 4.3 (3.2-5.4) |
| Yes                                         | 1,073 (19.8) | 19.5 (16.0-23.1) | 21.4 (17.8-25.0) | 21.5 (17.8-25.2) | 21.7 (17.8-25.6) |

Abbreviations: HRQOL, health-related quality of life; D&A, depression and anxiety; CI, confidence interval; PHQ, patient health questionnaire.

<sup>a</sup> Data are reported as weighted percentages. P values calculated by using the χ² test.
<sup>b</sup> Numbers may not equal total because of missing data.
<sup>c</sup> Reported this indicator for ≥14 days/month. See Methods section for complete variable description.
<sup>d</sup> Obesity was defined as body mass index >30 kg/m².
Table 3. Depression and Mental Distress Indicators, by Demographic Characteristics and Risk Factors, Rhode Island Adults, 2006a

| Demographic Characteristics and Risk Factors | HRQOL | D&A Module |
|---------------------------------------------|-------|------------|
|                                            | Frequent Mental Distress, a AOR (95% CI) | Sad/Blue/Depressed, a AOR (95% CI) | Current Depression (PHQ-2), AOR (95% CI) | Current Depression (PHQ-8), AOR (95% CI) |
| Age, y                                      |       |            |                            |                                          |
| 18-44                                       | 2.3 (1.5-3.6) | 1.2 (0.8-2.0) | 2.4 (1.5-3.9) | 3.9 (2.2-6.8) |
| 45-64                                       | 1.9 (1.3-2.8) | 1.3 (0.8-1.9) | 1.5 (1.0-2.4) | 2.8 (1.7-4.6) |
| ≥65                                         | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Sex                                         |       |            |                            |                                          |
| Men                                         | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Women                                       | 1.3 (0.9-1.8) | 1.4 (1.0-2.0) | 1.2 (0.9-1.7) | 1.7 (1.2-2.5) |
| Annual income, $                            |       |            |                            |                                          |
| <25,000                                     | 2.6 (1.8-3.8) | 4.0 (2.6-6.3) | 3.4 (2.2-5.4) | 3.4 (2.1-5.5) |
| 25,000-49,999                               | 1.4 (0.9-2.2) | 1.8 (1.2-2.7) | 2.0 (1.3-3.2) | 1.6 (1.0-2.6) |
| ≥50,000                                     | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Employment status                           |       |            |                            |                                          |
| Employed                                    | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Retired                                      | 0.9 (0.6-1.4) | 0.6 (0.4-1.0) | 1.0 (0.7-1.6) | 0.9 (0.6-1.6) |
| Homemaker/student                            | 1.7 (1.0-3.0) | 1.8 (1.1-3.0) | 1.1 (0.5-2.1) | 1.0 (0.5-1.8) |
| Unemployed                                   | 1.8 (0.9-3.5) | 2.0 (0.9-4.2) | 1.7 (0.8-3.6) | 2.1 (1.0-4.7) |
| Unable to work                               | 2.7 (1.7-4.4) | 3.0 (1.9-4.9) | 3.4 (2.2-5.5) | 3.1 (1.8-5.1) |
| Current smoker                              |       |            |                            |                                          |
| No                                          | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Yes                                         | 2.1 (1.5-3.0) | 1.8 (1.2-2.5) | 2.0 (1.4-2.9) | 2.3 (1.6-3.2) |
| Chronic drinker                             |       |            |                            |                                          |
| No                                          | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Yes                                         | 1.9 (0.9-3.7) | 2.6 (1.3-5.3) | 1.1 (0.5-2.5) | 1.6 (0.7-3.4) |
| Leisure-time physical activity               |       |            |                            |                                          |
| Yes                                         | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| No                                          | 1.2 (0.9-1.7) | 1.8 (1.3-2.5) | 1.5 (1.0-2.1) | 1.7 (1.2-2.4) |

Abbreviations: HRQOL, health-related quality of life; D&A, depression and anxiety; AOR, adjusted odds ratio; CI, confidence interval; PHQ, patient health questionnaire.

a Data are reported as AORs by all other variables in the model after multiple imputation to account for missing data in survey samples (26,27). AOR is considered significant if its confidence interval does not include 1.

b Defined as reporting this indicator for 1 or more days per month. See Methods section for complete variable description.

c Obesity was defined as body mass index >30 kg/m².

(Continued on next page)
Table 3. (continued) Depression and Mental Distress Indicators, by Demographic Characteristics and Risk Factors, Rhode Island Adults, 2006

| Demographic Characteristics and Risk Factors | HRQOL | D&A Module |
|---------------------------------------------|-------|------------|
|                                             | Frequent Mental Distress, AOR (95% CI) | Sad/Blue/Depressed, AOR (95% CI) | Current Depression (PHQ-2), AOR (95% CI) | Current Depression (PHQ-8), AOR (95% CI) |
| Asthma                                       |       |            |                |                                                |
| No                                           | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Yes                                          | 1.6 (1.0-2.4) | 1.0 (0.7-1.7) | 1.3 (0.8-1.9) | 1.7 (1.0-2.7) |
| Diabetes                                     |       |            |                |                                                |
| No                                           | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Yes                                          | 1.0 (0.7-1.6) | 1.2 (0.8-1.8) | 1.2 (0.8-1.8) | 1.1 (0.7-1.8) |
| Obesity                                       |       |            |                |                                                |
| No                                           | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Yes                                          | 1.4 (1.0-2.0) | 1.1 (0.8-1.6) | 1.0 (0.7-1.4) | 1.5 (1.0-2.2) |
| Disability                                    |       |            |                |                                                |
| No                                           | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Yes                                          | 2.5 (1.8-3.7) | 3.5 (2.5-5.0) | 2.9 (2.1-4.1) | 4.5 (3.0-6.7) |

Abbreviations: HRQOL, health-related quality of life; D&A, depression and anxiety; AOR, adjusted odds ratio; CI, confidence interval; PHQ, patient health questionnaire.

* Data are reported as AORs by all other variables in the model after multiple imputation to account for missing data in survey samples (26,27). AOR is considered significant if its confidence interval does not include 1.

* Defined as reporting this indicator for 1 or more days per month. See Methods section for complete variable description.

* Obesity was defined as body mass index >30 kg/m².