Published in final edited form as:

J Natl Med Assoc. 2012 ; 104(0): 476–486.

HIV Testing Among Deep South Residents With Serious Psychological Distress

Larrell L. Wilkinson, PhD, MSPH, CHES, Lisa Wigfall, PhD, MPH, Ryan C. Lewis, MSPH, Tasha R. Louis-Nance, EdD, MRC, MEd, Neethu Sebastian, Donna L. Richter, EdD, FAAHB, Wayne A. Duffus, MD, PhD, and Sandra H. Glover, PhD, MBA

Institute for Partnerships to Eliminate Health Disparities (Drs Wilkinson, Wigfall, Louis-Nance, and Glover and Ms Sebastian), Department of Health Promotion, Education, and Behavior (Dr Richter), and School of Medicine (Dr Duffus), University of South Carolina, Columbia; Public Health Statistics and Information Services, South Carolina Department of Health and Environmental Control, Columbia (Mr Lewis); South Carolina Department of Health and Environmental Control, Columbia (Dr Duffus). Dr Wilkinson is now with the Department of Human Studies, School of Education, University of Alabama–Birmingham.

Abstract

Objective—To describe the prevalence of serious psychological distress among Deep South residents and human immunodeficiency virus (HIV) testing among Deep South residents with serious psychological distress.

Methods—Data from the 2007 Behavioral Risk Factor Surveillance System (BRFSS) survey from Georgia, Louisiana, Mississippi, and South Carolina were used for this study. Andersen's behavioral model of health care use provided the conceptual framework for the study. The Kessler 6 was used to dichotomize the sample as having or not having serious psychological distress. χ^2 Test and multivariate logistic regression analyses were performed on the weighted data.

Results—Only 5.7% of our sample had experienced serious psychological distress in the past 30 days. A majority proportion of persons with serious psychological distress (54.9%) had been tested for HIV. HIV testing was slightly more prevalent among males with serious psychological distress (63%) than females with serious psychological distress (60%). Predisposing factors (age, race/ethnicity, and urbanization) were confounders of HIV testing among both males and females with serious psychological distress. Enabling factors (income, health care access) were only confounders of HIV testing among males with serious psychological distress.

Conclusion—Future HIV prevention and management efforts should consider the potential role of concurrent serious psychological distress in impacting an individual's daily life and health activities such as self-care, caring for family, and maintaining employment.

Keywords

HIV/AIDS; psychology; mental health

INTRODUCTION

Poor mental health is an underlying cause of adverse outcomes such as lowered work productivity and poor health status among adults in the United States.^{1,2} The National

Health Interview Survey (NHIS) employs the Kessler 6 (K6), a 6-item measurement that assesses signs of mental illness (or nonspecific psychological distress) among noninstitutionalized US adults.³ Some researchers⁴ have suggested that a score of 13 or above on the K6 is indicative that a person may have been experiencing serious psychological distress over the past 30 days. Findings from the NHIS surveys conducted in 2001 and 2004 have shown that the overall prevalence of serious psychological distress between 2001 and 2004 was 3.1% among US adults.³ The prevalence of serious psychological distress was higher among women (3.9%) compared to men (2.4%) during this same time period.³ There was no significant difference between US adults aged 18 to 44 years, 45 to 64 years, and 65 years or more when separated by racial/ethnic groups.³ However, the prevalence of serious psychological distress was much higher among poor respondents (those living below the federal poverty threshold) than among groups at higher incomes, regardless of racial/ethnic classification.³

Poverty has been shown to be associated with poor mental health.⁵ Among Deep South residents (ie, those residing in Alabama, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina), poverty has also been shown to be associated with other poor health outcomes, including human immunodeficiency virus (HIV)/AIDS.^{6,7} There is clinical evidence to suggest that infection with HIV has the potential to affect brain function.⁸ Some researchers⁹ have reported that the neuropsychological performance of persons living with HIV/AIDS was worse than that of uninfected individuals. Of even greater concern, however, was that neuropsychological functioning was worse for those diagnosed with AIDS compared to those individuals with HIV-only disease stage. Other researchers have used the Multicenter AIDS Cohort Study (MACS), a longitudinal study of the natural and treated histories of HIV-1 infection in homosexual and bisexual men, to show that the rapid disease progression from HIV infection to AIDS diagnosis was associated with lower IQ scores, symptoms of dementia, symptoms of depression, and generalized limited intellectual functioning.¹⁰

Neuropsychological impairments can negatively impact daily life activities of people living with HIV/AIDS¹¹ and therefore have a greater potential to adversely impact quality of life. Early diagnosis of HIV infection among persons who are already at risk for having a clinically diagnosable mental illness has the potential to abate further neurological deterioration. Being aware of one's HIV-positive serostatus with the early initiation of and adherence to HIV treatment regimens, changes in risky lifestyle behaviors such as substance abuse and risky sex practices, and other risk behaviors⁸ may result in neurologic preservation.¹² The purpose of this study was to describe the prevalence of serious psychological distress among Deep South residents and to report on the uptake of HIV testing among Deep South residents with serious psychological distress.

BEHAVIORAL MODEL OF HEALTH SERVICES USE

The behavioral model of health services use suggests that health services use and health outcomes are affected by social and individual determinants of health.¹³⁻¹⁵ Although the model has evolved over time, with revisions such as the addition of vulnerable domains to the traditional domains, as in the behavioral model for vulnerable populations,¹⁶ this did not change the fundamental base of the original Andersen model. In the Andersen model, predisposing, enabling, and need characteristics predict personal health practices, including the use of health services, and, ultimately, health status. *Predisposing characteristics* such as gender, age, race/ethnicity, marital status, education, employment, and rurality describe the propensity of individuals to use health services such as routine medical checkups or explain personal health practices such as substance use. *Enabling characteristics* refer to the individual's ability to gain access to needed health services. *Potential health care access*

issues are related to family resources such as insufficient household income, lack of adequate health insurance coverage, not having a regular source of medical care, and lacking the financial means to pay for health care when needed. *Perceived need for care* is also a component of this model. *Need* includes both self-perception of health status and clinically diagnosed chronic conditions such as asthma, cardiovascular disease, and diabetes. Self-perception of good health may decrease perceived need for and subsequent use of health services. In contrast, patients with actual health needs are likely to have more health care encounters that may result in more opportunities to discuss other preventive health services with their health care provider.

METHODS

This study used publicly available data from the 2007 survey administration of the Behavioral Risk Factor Surveillance System (BRFSS) from 4 of the 6 Deep South states: Georgia, Louisiana, Mississippi, and South Carolina. These 4 states were the only ones of the 6 Deep South states to include the mental illness and stigma optional module in their administration of the 2007 BRFSS survey. Response rates ranged from 34% to 59%. The study sample included 21 364 of the total 32 600 Deep South residents who responded to both the mental illness and stigma questions used in the K6 and the HIV testing question. Respondents aged 65 years and older were not asked questions related to HIV testing and were excluded; therefore, the study sample was between ages 18 and 64 years. Of these 21 364 individuals, 62.1% were non-Hispanic white (NHW), 25.8% were non-Hispanic black (NHB), 5.2% were non-Hispanic other racial group, and 3.5% were Hispanic/Latino.

There were 2 main outcomes of interest: serious psychological distress and HIV testing uptake status. The mental illness and stigma questions ask about the frequency of 6 symptoms of nonspecific psychological distress. Respondents were asked how often over the past 30 days they felt the following: (1) so sad that nothing could cheer you up, (2) nervous, (3) restless or fidgety, (4) hopeless, (5) that everything was an effort, and (6) worthless. Response options were based on a 5-point Likert scale ranging from all (1) to none (5) of the time. Items are reverse-coded and summed to derive a score, with a score of 13 or greater being suggestive of serious psychological distress.⁴ The score from the K6 was used to dichotomize the sample as having serious psychological distress (score ≥ 13) or not having serious psychological distress (score <13). The BRFSS item that asked respondents whether or not they had ever been tested for HIV was used to dichotomize the sample as either tested (response = yes) or not tested (response = no) for HIV.

Covariates were selected based on a review of the scientific literature and variables that were available from the 2007 BRFSS data. Health services utilization (ie, uptake of HIV testing) was operationalized based on Andersen's behavioral model of health service use.¹³⁻¹⁵ The Andersen model components included population characteristics such as predisposing and enabling factors. Predisposing factors included the following sociodemographic characteristics gender, age (18-24 y, 25-34 y, 35-44 y, 45-54 y, 55-64 y), race/ethnicity (NHW, NHB, non-Hispanic other, and Hispanic) education (less than high school, high school/General Education Development (GED), some college, and college graduate), number of adults in household (1, 2, 3), and urbanization (urban, suburban, rural). Enabling factors included household income (<\$15 000, \$15 000-\$24 999, \$25 000-\$34 999, \$35 000-\$49 999, and ≥\$50,000) and health care access, comprised from 3 factors (health insurance [yes/no], personal health providers [yes/no], health care affordable [yes/no]). The health care affordability variable was derived from the question, "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?" Hazardous drinking, characterized as *heavy drinking*, is included in the analysis. *Heavy*

drinker status differs by gender and is defined as 2 or more drinks per day for males and 1 or more drinks per day for females.

SAS v.9.2 survey procedures were used to perform weighted frequency analysis and χ^2 tests on the data to obtain descriptive characteristics and to assess the significance of bivariate relationships between the outcomes of interest (ie, serious psychological distress and HIV testing uptake status) and each covariate. As previous studies have shown the role of age in neurological functioning and uptake of HIV testing,¹⁷⁻²⁰ multivariate logistic regression models were performed using the weighted data to examine associations between HIV testing uptake status and age, which was used as the exposure among gender specific analysis. Variables were removed from the model using backward, stepwise elimination.

RESULTS

Of those Deep South residents who responded to the perceived psychological distress scale items, only 5.7% (95% confidence interval [CI], 5.2-6.2) were considered to have been experiencing serious psychological distress over the past 30 days based on a calculated score of 13 or higher. More than half (53.3%) of the individuals with serious psychological distress were NHW. When examining other sociodemographic characteristics of sampled respondents, 43.6% of individuals with serious psychological distress were married or partnered, 37.8% had completed high school or had a GED, 39.8% resided in urban areas, and 43.1% resided in households with 2 adults. The relationship between serious psychological distress and age was not statistically significant ($p = .2947$). Weighted estimates of serious psychological distress by these sociodemographic characteristics are reported by gender in Table 1 (males) and Table 2 (females). While more than half (54.3%) of persons with serious psychological distress were female, the relationship between serious psychological distress and gender was not statistically significant ($p = .1278$).

HIV testing uptake status was reported for 1262 of the 1306 persons with serious psychological distress, and more than half (54.9%) reported that they had been tested for HIV. Among all BRFSS respondents who reported on HIV testing status, only 44.8% had received a test. While χ^2 tests did not show a significant relationship between gender and serious psychological distress ($p = .1278$), there was a significant difference between genders and HIV testing uptake ($p = .0026$). Therefore, it was necessary to compare gender differences in HIV testing uptake among persons with serious psychological distress in this study.

Of the 393 males with serious psychological distress whose HIV testing uptake status was known, 54.6% reported that they had been tested for HIV, whereas a slightly higher proportion (55.1%) of their female counterparts reported that they had been tested for HIV (Table 3). Among males with serious psychological distress, the greatest proportions of HIV testing uptake appear to be associated with residing in urban areas and being able to afford health care if it was needed in the past year. A higher proportion of males with serious psychological distress who resided in urban areas (45.2%) and those who encountered problems accessing health care because of cost (55.0%) reported that they had been tested for HIV (Table 4). Neither of these predisposing (ie, rurality) or enabling (ie, ability to afford needed health care) factors were significantly associated with uptake of HIV testing among females with serious psychological distress. However, unlike their male counterparts, χ^2 tests for females with serious psychological distress showed significant difference between uptake of HIV testing and both race/ethnicity and age. More than half of the females with serious psychological distress who had been tested for HIV were NHW (51.6%). Nearly a third (32.2%) were between 35 and 44 years old (Table 5).

Separate logistic regression models were performed for males and females with serious psychological distress. Age was the main independent variable of interest used for both models. After controlling for race/ethnicity, income, urbanization, and being able to afford health care, 25- to 34-year-old males with serious psychological distress were about 3 times more likely to have been tested for HIV than the referent group, 55- to 64-year-old males with serious psychological distress (adjusted odds ratio [AOR], 3.282; 95% CI, 1.246-8.646). Among females with serious psychological distress, statistically significant differences were observed between 55- to 64-year-old females with serious psychological distress and all age other groups except for those 45 to 54 years old (AOR, 0.733; 95% CI, 0.485-1.108). When compared to 55- to 64-year-old females with serious psychological distress, their younger counterparts were about 2 times more likely to have been tested for HIV after controlling for race/ethnicity and urbanization: 18- to 24-year-olds (AOR, 2.671; 95% CI, 1.148-6.214); 25- to 34-year-olds (AOR, 2.086; 95% CI, 1.107-3.931); and 35- to 44-year-olds (AOR, 1.665; 95% CI, 1.056-2.627). These data are reported in Table 6 (males) and Table 7 (females).

DISCUSSION

AIDS-related mortality has drastically declined as a result of medical advances such as highly active antiretroviral therapy (HAART) with reports of people living with HIV/AIDS for 20 years or longer.^{21,22} Because persons diagnosed with HIV/AIDS in the post-HAART era are living longer than those who were diagnosed with HIV/AIDS pre HAART, there has been a changed paradigm towards HIV/AIDS as a manageable chronic illness. This has resulted in an increased emphasis on addressing other health issues in people living with HIV/AIDS beyond the clinical management of their HIV/AIDS infection. These efforts have targeted aspects of physical health such as diet and exercise, as well as mental health, and the management of stress. Several studies have shown that increasing aerobic exercise has resulted in improvements in physical health (ie, decreases in body fat, total cholesterol, and triglycerides and increases in high-density lipids) and mental health (such as decreased anxiety, depression (including depressive symptoms and depressed mood) and perceived stress).²³⁻²⁸

The neurological effect of HIV/AIDS on psychological functioning has been documented in the scientific literature.^{10,29} Early diagnosis of HIV infection is important as persons with late diagnosis of AIDS disease stage have been shown to have worse mental health outcomes.^{10,29} Our study sought to examine the HIV testing behaviors of persons with serious psychological distress. The observation that persons with serious psychological distress have an increased likelihood of having 1 or more clinically diagnosable mental illnesses, combined with the increased risk of neurological impairment among HIV-infected persons that have progressed to AIDS, suggests that poor mental health could be a predisposing factor for neuropsychological outcomes among people living with HIV/AIDS, especially among those who were initially diagnosed with AIDS and those whose progression from HIV infection to AIDS was more rapid.^{10,29}

The Centers for Disease Control and Prevention (CDC) guidelines recommend routine HIV testing for all persons between 13 and 64 years old seen in health care settings, as part of other routine screening and diagnostic procedures.³⁰ Some have shown that prior to³¹ and even after the release of the CDC's revised HIV testing recommendations,^{20,32} the number of persons who have been tested for HIV has been suboptimal given our nation's goal that all adolescents and adults through 13 to 64 years of age will know their HIV serostatus. These findings are alarming, considering CDC reporting at the end of 2006 showed an estimated 232 700 persons infected with HIV were unaware of their HIV-positive serostatus.³³

According to information drawn from the 2007 administration of the BRFSS, the uptake of HIV testing among our subsample of Deep South male adults with serious psychological distress (54.6%) and female adults with serious psychological distress (55.1%) was much higher than those without serious psychological distress, among males and females that completed the BRFSS, respectively. Whereas this finding was unexpected and encouraging, it is important that these data be interpreted within context: (1) about two-thirds of our study sample (62.1%) were NHW, and (2) more than half (53.3%) of the participants in this study with serious psychological distress were NHW. Although race/ethnicity was a potential confounder in the relationship between serious psychological distress and uptake of HIV testing for both males and females, it should be noted that there is a high prevalence of HIV/AIDS among African Americans and that mental illness is heavily stigmatized in the black community. Accordingly, it is possible that the lower prevalence of serious psychological distress reported in our study among NHBs could at least be attributed to the stigma associated with mental illness or the lack of awareness of potential signs of mental illness in this community. These contextual factors become increasingly important because the highest concentration of the African American population resides in the Deep South, and the disproportionate burden of HIV/AIDS is among those individuals residing in the southeastern region of the United States.

Because poverty has been associated with both mental illness and HIV/AIDS,³⁴ and the rural South is often characterized as not only being poor but largely African American–concentrated, our finding that rural residents with serious psychological distress were less likely to have been tested for HIV underscores the importance of efforts to increase HIV prevention efforts among nonurban residents and to raise awareness about mental illness in the black community. Whereas only predisposing factors (ie, race/ethnicity, urbanization) were demonstrated to be potential confounders of the uptake of HIV testing among females with serious psychological distress, other potential confounders for their male counterparts included enabling factors such as income and health care access. Despite these barriers, more males (63%) than females (60%) with serious psychological distress reported that they had been tested for HIV, which was surprising, as we expected a higher prevalence of HIV testing among females because of long-standing recommendations for prenatal HIV testing.^{35,36}

Neurological functioning declines with increasing age as evidenced by the increasing number of older adults with dementia and other diseases such as Alzheimer's.^{17,18} Increasing age has been shown to be inversely associated with uptake of HIV testing^{19,20} and a positive predictor of late-diagnosed HIV infection (a diagnosis of AIDS within 1 year of the first positive HIV test).³¹ Among adults in this study who report serious psychological distress, those individuals who are younger in age were more likely to report that they had been tested for HIV. Regarding gender and age, significant differences were only observed between 55- to 64-year-old and 25- to 34-year-old males with serious psychological distress, the latter of which were about 3 times more likely to report that they had been tested for HIV. At a minimum, one would expect that the youngest males (18-24 years old) with serious psychological distress would have been significantly more likely to have been tested than the oldest males (55-64 years old) with serious psychological distress. In contrast, there were significant differences in HIV testing between the females with serious psychological distress who were of childbearing age (ie, <45 years old) and the oldest females (55-64 years old). These age and gender differences underscore the need to further explore not only the higher prevalence of HIV testing among persons with serious psychological distress, but particularly males with serious psychological distress.

STUDY LIMITATIONS AND STRENGTHS

There were a few limitations to this study. First, the reason(s) for having had an HIV test was not known, and we therefore are unable to explain the differences observed in this study as attributable to patient, provider, or institutional policy. Second, the BRFSS data set did not comprehensively address the prevalence of HIV risk behaviors among persons with serious psychological distress as well as the role that engaging in HIV risk behaviors played in uptake of HIV testing. Third, data about family structure in terms of household composition and the home environment were not available, but these likely contribute to an individual's emotional well-being. Fourth, as with any study in which data were collected via self-report, there is the potential of recall bias as individuals may not remember if HIV testing was conducted at the time health care was accessed. Additionally, even if an individual responded affirmatively to ever being tested, a yes response did not assume that the respondent currently knew their HIV status, and therefore results should be construed for HIV testing only. Fifth, because both HIV/AIDS and mental illness are heavily stigmatized, there is also a possibility that our study's participants could have reported socially desirable responses. However, because the BRFSS is administered via telephone, this should reduce the validity threat as the participant is not face-to-face with the person administering the survey. Finally, another limitation is the low response rate for the 2007 BRFSS survey. Because the 2007 BRFSS was administered to residents with land-based telephone lines, the growing number of persons who are only using mobile telephones has been a growing concern for persons responsible for overseeing the data collection activities of the BRFSS survey. It is likely that persons with only mobile phones are younger adults, who are also more likely to have been tested for HIV. Taking all of these limitations into account, there is a good likelihood that both serious psychological distress and HIV testing are underreported in our study.

Despite these limitations, the BRFSS is one of a few population-based studies that can be used to estimate the prevalence of both serious psychological distress and HIV testing uptake. Because HIV testing uptake and negative test results are not routinely reported by all organizations where HIV testing may be performed, this makes the BRFSS a valuable resource that can be used to estimate the prevalence of HIV testing and to describe both the characteristics of persons who have been tested for HIV and those individuals who have never been tested for HIV. Whereas there have been numerous studies that have examined anxiety during HIV testing,³⁷ as well as mental health outcomes among people living with HIV/AIDS,^{10,29} to our knowledge, our study is the only one to date that has examined the uptake of HIV testing among persons experiencing serious psychological distress in terms of predisposing and enabling factors associated with having been tested for HIV.

CONCLUSION

Although the CDC has released guidelines promoting routine HIV testing in health care settings and recommendations for testing certain populations at increased risk of transmitting HIV to others, such as pregnant women and incarcerated populations, to date, there has not been an emphasis on routinely testing persons for HIV in mental health settings. Our data suggest a relationship between poor mental health and HIV disease that needs further investigation to explore if routine testing is feasible and acceptable. The interaction of HIV/AIDS and neuropsychological functioning underscores the importance of early diagnosis of HIV/AIDS among individuals already experiencing serious psychological distress as a late diagnosis of HIV infection is likely to negatively impact mental illness and thus increase the amount of anxiety associated with finding out one's HIV serostatus.

It is imperative that future HIV prevention efforts consider the potential role of concurrent serious psychological distress and a late diagnosis of HIV infection impacting an individual's daily life activities such as self-care, caring for family, and maintaining employment. The outcome has significant implications for HIV transmission and health care access and should be addressed in any new health care reform policy. Among rural residents, this becomes increasingly important, as most of these geographical areas of the Deep South are also characterized as medically underserved areas, further exacerbating poverty and health care access issues.

REFERENCES

1. Wu EQ, Birnbaum HG, Shi LZ, et al. The economic burden of schizophrenia in the United States in 2002. *J Clin Psychiatr.* 2005; 66(9):1122–1129.
2. Greenberg PE, Birnbaum HG. The economic burden of depression in the US: societal and patient perspectives. *Expert Opin Pharmacother.* 2005; 6(3):369–376. [PubMed: 15794728]
3. Pratt LA, Dey AN, Cohen AJ. Characteristics of adults with serious psychological distress as measured by the K6 scale: United States, 2001–2004. *Adv Dat.* 2007; 382:1–18.
4. Kessler RC, Andrews G, Colpe LJ, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med.* 2002; 32(6):959–976. [PubMed: 12214795]
5. Adler NE, Boyce T, Chesney MA, et al. Socioeconomic status and health. The challenge of the gradient. *Am Psychol.* 1994; 49(1):15–24. [PubMed: 8122813]
6. Reif S, Geonnoti KL, Whetten K. HIV infection and AIDS in the Deep South. *Am J Publ Health.* 2006; 96(6):970–973.
7. Whetten K, Reif S. Overview: HIV/AIDS in the deep south region of the United States. *AIDS Care.* 2006; 18(suppl 1):1S–5S.
8. Sullivan EV. Special section of Neuropsychology Review on HIV/ NeuroAIDS. *Neuropsychol Rev.* 2009; 19(2):143. [PubMed: 19466594]
9. Skorszewski MJ, Ball JD, Mikulka P. Neuropsychological functioning of HIV-infected males. *J Clin Exp Neuropsychol.* 1991; 13(2):278–290. [PubMed: 1830887]
10. Farinpour R, Miller EN, Satz P, et al. Psychosocial risk factors of HIV morbidity and mortality: findings from the Multicenter AIDS Cohort Study (MACS). *J Clin Exp Neuropsychol.* 2003; 25(5):654–670. [PubMed: 12815503]
11. Gorman AA, Foley JM, Ettenhofer ML, Hinkin CH, van Gorp WG. Functional consequences of HIV-associated neuropsychological impairment. *Neuropsychol Rev.* 2009; 19(2):186–203. [PubMed: 19472057]
12. Marks G, Crepaz N, Senterfitt JW, Janssen RS. Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: implications for HIV prevention programs. *J Acquir Immune Defic Syndr.* 2005; 39(4):446–453. [PubMed: 16010168]
13. Aday LA, Andersen R. A framework for the study of access to medical care. *Health Serv Res.* 1974; 9(3):208–220. [PubMed: 4436074]
14. Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. *Milbank Mem Fund Q Health Soc.* 1973; 51(1):95–124. [PubMed: 4198894]
15. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav.* 1995; 36(1):1–10. [PubMed: 7738325]
16. Gelberg L, Andersen RM, Leake BD. The Behavioral Model for Vulnerable Populations: application to medical care use and outcomes for homeless people. *Health Serv Res.* 2000; 34(6):1273–1302. [PubMed: 10654830]
17. Snowdon DA. Aging and Alzheimer's disease: lessons from the Nun Study. *Gerontologist.* 1997; 37(2):150–156. [PubMed: 9127971]
18. Plassman BL, Langa KM, Fisher GG, et al. Prevalence of dementia in the United States: the aging, demographics, and memory study. *Neuroepidemiology.* 2007; 29:125–132. [PubMed: 17975326]

19. Wigfall LT, Duffus WA, Annang L, et al. Pap test and HIV testing behaviors of South Carolina women 18–64 years old. *J S C Med Assoc.* 2009; 105(7):274–280. [PubMed: 20108718]
20. Wigfall LT, Williams EM, Sebastian N, Glover SH. HIV testing among Deep South residents 50 to 64 years old with cardiovascular disease and/or diabetes. *J Natl Med Assoc.* 2010; 102(12):1150–1157. [PubMed: 21287895]
21. Palella FJ Jr, Delaney KM, Moorman AC, et al. Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. HIV Outpatient Study Investigators. *N Engl J Med.* 1998; 338(13):853–860. [PubMed: 9516219]
22. Schackman BR, Gebo KA, Walensky RP, et al. The lifetime cost of current human immunodeficiency virus care in the United States. *Med Care.* 2006; 44(11):990–997. [PubMed: 17063130]
23. Neidig JL, Smith BA, Brashers DE. Aerobic exercise training for depressive symptom management in adults living with HIV infection. *J Assoc Nurses AIDS Care.* 2003; 14(2):30–40. [PubMed: 12698764]
24. Smith BA, Neidig JL, Nickel JT, Mitchell GL, Para MF, Fass RJ. Aerobic exercise: effects on parameters related to fatigue, dyspnea, weight and body composition in HIV-infected adults. *AIDS.* 2001; 15(6):693–701. [PubMed: 11371683]
25. MacArthur RD, Levine SD, Birk TJ. Supervised exercise training improves cardiopulmonary fitness in HIV-infected persons. *Med Sci Sports Exerc.* 1993; 25(6):684–688. [PubMed: 8100607]
26. LaPerriere AR, Antoni MH, Schneiderman N, et al. Exercise intervention attenuates emotional distress and natural killer cell decrements following notification of positive serologic status for HIV-1. *Biofeedback Self Regul.* 1990; 15(3):229–242. [PubMed: 2223891]
27. Terry L, Sprinz E, Stein R, Medeiros NB, Oliveira J, Ribeiro JP. Exercise training in HIV-1-infected individuals with dyslipidemia and lipodystrophy. *Med Sci Sports Exerc.* 2006; 38(3):411–417. [PubMed: 16540826]
28. Thoni GJ, Fedou C, Brun JF, et al. Reduction of fat accumulation and lipid disorders by individualized light aerobic training in human immunodeficiency virus infected patients with lipodystrophy and/or dyslipidemia. *Diabetes Metabol.* 2002; 28(5):397–404.
29. Mikulka PJ, Thomas D, Vannetti E. Transfer of training of the biofeedback-assisted control of hand temperature. *Percept Mot Skills.* 1991; 72(1):163–170. [PubMed: 2038511]
30. Centers for Disease Control and Prevention. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *MMWR Recomm Rep.* 2006; 55(RR-14):1–17.
31. Centers for Disease Control and Prevention. Missed opportunities for earlier diagnosis of HIV infection—South Carolina, 1997–2005. *MMWR.* 2006; 55(47):1269–1272. [PubMed: 17136020]
32. Wigfall L, Duffus WA, Annang L, et al. Pap test and HIV testing behaviors of South Carolina women 18–64 years old. *J S C Med Assoc.* 2009; 105(7):274–280. [PubMed: 20108718]
33. Centers for Disease Control and Prevention. HIV prevalence estimates —United States, 2006. *MMWR.* 2008; 57(39):1073–1076. [PubMed: 18830210]
34. Baston TB, Shacham E, Reece M. Symptoms of psychological distress : a comparison of rural and urban individuals enrolled in HIV-related mental health care. *AIDS Patient Care STDS.* 2009; 23(12):1053–1057. [PubMed: 20025514]
35. Jamieson DJ, Clark J, Kourtis AP, et al. Recommendations for human immunodeficiency virus screening, prophylaxis, and treatment for pregnant women in the United States. *Am J Obstet Gynecol.* 2007; 197(suppl 3):26S–32S.
36. Fernandez MI, Wilson TE, Ethier KA, Walter EB, Gay CL, Moore J. Acceptance of HIV testing during prenatal care. Perinatal Guidelines Evaluation Project. *Public Health Rep.* 2000; 115(5):460–468. [PubMed: 11236018]
37. Delaney E, O'Brien WH. The effects of monitoring and ability to achieve cognitive structure on the psychological distress during HIV testing. *Psychol Health.* 2009; 24(8):909–917. [PubMed: 20205035]

Table 1

Population Characteristics and Health Behaviors of Deep South Males Aged 18-64 Years (n = 7496) by Serious Psychological Distress^a

Andersen Model Covariates	Serious Psychological Distress		No Serious Psychological Distress		P Value
	(Kessler Score ≥13)		(Kessler Score <13)		
	N ^b	% ^c	N ^b	% ^c	
Total	398	5.3	7,098	94.7	
Predisposing					
Race/ethnicity					.0283
Non-Hispanic white	268	51.2	5328	63.6	
Non-Hispanic black	97	34.5	1349	24.6	
Non-Hispanic other	18	5.6	281	7.2	
Hispanic	15	8.7	140	4.5	
Age, y					.0918
18-24	26	13.0	378	12.2	
25-34	53	28.4	924	21.9	
35-44	65	19.0	1564	28.1	
45-54	127	20.9	2119	21.6	
55-64	137	18.6	2177	16.2	
Marital status					<.0001
Never married	97	38.9	1137	22.3	
Married/partnered	162	37.8	4828	67.9	
Separated/divorced	125	21.1	1043	8.8	
Widowed	24	2.2	135	0.9	
Household size (No. of adults)					<.0001
1	152	17.8	1653	11.6	
2	181	38.5	4332	58.4	
3	75	43.8	1177	30.0	
Education					<.0001
Less than high school	122	28.1	661	10.0	
High school/Gen Educ Developmnt	152	35.9	2047	28.1	
Some college	79	23.1	1794	25.4	
College graduate	53	13.0	2653	36.6	
Urbanization					.0140
Urban	136	39.4	3145	48.9	
Suburban	82	24.3	1471	25.9	
Rural	190	36.4	2546	25.2	
Enabling					
Income					<.0001
<\$15 000	123	28.1	407	5.7	
\$15 000-\$24 999	109	32.0	720	10.9	

Andersen Model Covariates	Serious Psychological Distress		No Serious Psychological Distress		P Value
	(Kessler Score ≥13)		(Kessler Score <13)		
	N ^b	% ^c	N ^b	% ^c	
\$25 000-\$34 999	46	16.5	706	10.9	
\$35 000-\$49 999	34	8.1	1067	16.2	
\$50 000	53	15.3	3580	56.4	
Health insurance					<.0001
Yes	262	54.8	5961	79.9	
No	143	45.2	1180	20.1	
Personal health provider(s)					.1176
Yes	301	65.3	5570	72.1	
No	100	34.7	1574	27.9	
Affordable health care					<.0001
Yes	173	47.3	785	12.6	
No	232	52.7	6362	87.4	
Alcohol consumption: heavy drinker ^d					.1183
Yes	357	90.5	6514	93.6	
No	33	9.5	426	6.4	

^{*a*}2007 Behavioral Risk Factor Surveillance System Survey Data.

^{*b*}Having >1 drink/day

^{*c*}Unweighted frequencies.

^{*d*}Weighted percents.

Table 2

Population Characteristics and Health Behaviors of Deep South Females Aged 18-64 Years (n = 13 660) by Serious Psychological Distress^a

Andersen Model Covariates	Serious Psychological Distress		No Serious Psychological Distress		P Value
	(Kessler Score ≥13)		(Kessler Score <13)		
	N ^a	% ^b	N ^a	% ^b	
Total	886		12,774		
Predisposing					
Race/ethnicity					.0169
Non-Hispanic white	557	55.0	8858	64.1	
Non-Hispanic black	270	35.2	3274	28.0	
Non-Hispanic other	31	4.9	390	4.7	
Hispanic	28	4.9	252	3.3	
Age, y					.4609
18-24	42	10.1	555	9.0	
25-34	109	20.2	1904	22.4	
35-44	187	27.5	2858	28.9	
45-54	299	26.3	3732	22.3	
55-64	261	15.9	3847	17.2	
Marital status					<.0001
Never married	141	20.2	1717	16.6	
Married/partnered	354	48.4	7844	66.3	
Separated/divorced	307	25.8	2510	13.9	
Widowed	91	5.5	778	3.3	
Household size (No. of adults)					<.0001
1	372	23.3	3818	16.0	
2	395	47.0	7225	59.1	
3	131	29.7	1853	24.9	
Education					<.0001
Less than high school	234	25.1	1020	7.2	
High school/Gen Educ Developmnt	338	39.4	3751	27.7	
Some college	222	24.7	3608	28.2	
College graduate	103	10.7	4498	36.9	
Urbanization					.0365
Urban	324	40.2	5353	46.7	
Suburban	169	25.8	2573	25.4	
Rural	405	34.0	4970	28.0	
Enabling					
Income					<.0001
<\$15 000	306	31.1	1173	8.0	
\$15 000-\$24 999	207	28.2	1815	14.7	

Andersen Model Covariates	Serious Psychological Distress		No Serious Psychological Distress		P Value
	(Kessler Score ≥ 13)		(Kessler Score <13)		
	N ^a	% ^b	N ^a	% ^b	
\$25 000-\$34 999	92	14.4	1344	11.4	
\$35 000-\$49 999	75	12.5	1862	16.3	
\$50 000	107	13.8	5158	49.6	
Health insurance					<.0001
Yes	633	67.4	10 710	82.3	
No	264	32.6	2155	17.7	
Personal health provider(s)					<.0001
Yes	722	74.4	11 163	84.5	
No	172	25.6	1712	15.5	
Affordable health care					<.0001
Yes	475	57.9	2380	19.3	
No	419	42.1	10 484	80.7	
Alcohol consumption: heavy drinker ¹					.2480
Yes	846	95.5	12 234	96.7	
No	37	4.5	442	3.3	

^c Unweighted frequencies.

^d Weighted percents.

^a 2007 Behavioral Risk Factor Surveillance System Survey Data.

^b Having >1 drink/day

Table 3

Male and Female HIV Testing Status by Serious Psychological Distress, N = 869

Have You Ever Been Tested for HIV?	Serious Psychological Distress		No Serious Psychological Distress		P Value
	(Kessler Score ≥13)		(Kessler Score <13)		
	N ^a	% ^b	N ^a	% ^b	
Males					.0027
Yes	195	54.6	2533	41.9	
No	198	45.4	4441	58.1	
Total	393		6974		
Females					.0004
Yes	427	55.1	4843	45.5	
No	442	44.9	7736	54.5	
Total	869		12 579		

Abbreviations: HIV, human immunodeficiency virus.

^aUnweighted frequencies.^bWeighted percents.

Table 4

Male Population Characteristics and Health Behaviors Among Deep South Residents Aged 18-64 Years With Serious Psychological Distress (n = 384) by HIV Testing Status

Andersen Model Covariates	Tested		Not Tested		P Value
	N ^a	% ^b	N ^a	% ^b	
Total	189	54.6	195	45.4	
Predisposing					
Race/Ethnicity					.3564
Non-Hispanic white	116	45.0	140	59.7	
Non-Hispanic black	58	37.6	38	28.2	
Non-Hispanic other	8	5.3	9	6.4	
Hispanic	7	12.1	8	5.7	
Age, y					.3235
18-24	11	13.1	15	14.2	
25-34	36	31.7	15	20.2	
35-44	40	21.6	25	17.8	
45-54	60	19.8	64	24.0	
55-64	48	13.8	79	23.7	
Marital status					.5757
Never married	49	37.3	45	38.5	
Married/partnered	79	42.1	78	34.0	
Separated/divorced	56	18.7	64	25.1	
Widowed	11	2.0	11	2.4	
Household size (No. of adults)					.4120
1	69	16.0	76	20.6	
2	84	36.9	92	41.8	
3	42	47.2	30	37.6	
Education					.7723
Less than high school	54	28.7	65	29.8	
High school/General Education Development	67	33.3	78	40.0	
Some college	43	23.1	32	18.7	
College graduate	31	15.0	21	11.5	
Urbanization					.0009
Urban	71	45.2	61	34.4	
Suburban	31	12.1	49	35.0	
Rural	93	42.7	88	30.6	
Enabling					
Income					.3908
<\$15 000	53	22.8	62	35.2	
\$15 000-\$24 999	59	35.1	50	31.6	
\$25 000-\$34 999	23	17.3	19	9.6	
\$35 000-\$49 999	17	8.4	16	8.1	

Andersen Model Covariates	Tested		Not Tested		P Value
	N ^a	% ^b	N ^a	% ^b	
>\$50 000	27	16.4	26	15.5	
Health insurance					.7357
Yes	121	55.1	132	57.9	
No	73	44.9	64	42.1	
Personal health provider(s)					.1543
Yes	134	58.5	153	71.2	
No	56	41.5	43	28.8	
Affordable health care					.0034
Yes	90	55.0	78	34.3	
No	104	45.0	118	65.7	
Alcohol consumption: heavy drinker ^c					.3978
Yes	169	91.9	174	88.0	
No	16	8.1	16	12.0	

^a Unweighted frequencies.

^b Weighted percents.

^c Having >1 drink/day.

Table 5

Female Population Characteristics and Health Behaviors among Deep South Residents Aged 18-64 Years With Serious Psychological Distress (n = 859) by HIV Testing Status

Andersen Model Covariates	Tested		Not Tested		P value
	N ^a	% ^b	N ^a	% ^b	
Totals	424	55.1	435	44.9	
Predisposing					
Race/ethnicity					.0114
Non-Hispanic white	256	51.6	284	58.9	
Non-Hispanic black	133	37.8	130	32.3	
Non-Hispanic other	16	3.3	15	7.1	
Hispanic	19	7.3	6	1.7	
Age, y					<.0001
18-24	27	13.1	14	6.7	
25-34	72	25.7	36	14.2	
35-44	114	32.2	70	22.7	
45-54	137	19.9	151	33.2	
55-64	77	9.0	171	23.1	
Marital status					.2734
Never married	74	20.9	64	19.7	
Married/partnered	166	50.2	175	46.6	
Separated/divorced	157	25.3	141	25.7	
Widowed	29	3.6	60	8.0	
Household Size (No. of adults)					.6766
1	175	21.4	186	25.0	
2	190	47.7	190	45.7	
3	62	30.9	66	29.3	
Education					.0873
Less than high school	97	21.6	126	29.1	
High school/Gen Educ Developmnt	165	44.9	163	33.0	
Some college	109	23.7	109	25.9	
College graduate	55	9.8	44	12.0	
Urbanization					.2251
Urban	161	42.3	154	37.5	
Suburban	83	27.7	82	23.7	
Rural	183	30.0	206	38.8	
Enabling					
Income					.3844
<\$15 000	150	32.1	145	28.4	
\$15 000-\$24 999	100	27.0	105	30.4	
\$25 000-\$34 999	49	16.9	40	11.5	
\$35 000-\$49 999	31	12.8	41	12.2	

Andersen Model Covariates	Tested		Not Tested		P value
	N ^a	% ^b	N ^a	% ^b	
\$50 000	50	11.2	55	17.5	
Health insurance					.1420
Yes	294	63.8	317	71.2	
No	132	36.2	125	28.8	
Personal health provider(s)					.2150
Yes	329	71.5	368	77.7	
No	96	28.5	72	22.3	
Affordable health care					.6762
Yes	234	58.9	227	56.7	
No	192	41.1	212	43.3	
Alcohol consumption: heavy drinker ^c					.9492
Yes	398	95.5	421	95.3	
No	20	4.5	16	4.7	

^a Unweighted frequencies.

^b Weighted percents.

^c Having >1 drink/day.

Table 6

Adjusted Odds of Males With Serious Psychological Distress Having Been Tested for HIV, N = 172

Exposure (Age, y)	N	Adjusted Odds Ratio	95% confidence Interval
Males ^a	6611		
18-24		1.367	0.477 – 3.916
25-34		3.282	1.246 – 8.646
35-44		1.797	0.788 – 4.095
45-54		1.524	0.762 – 3.049
55-64		1.000	REF

^a After controlling for race/ethnicity, income, urbanization, and being able to afford needed health care.

Table 7

Adjusted Odds of Females With Serious Psychological Distress Having Been Tested for HIV, N = 424

Exposure (Age, y)	N	Adjusted Odds Ratio	95% confidence Interval
Females ^a	13 321		
18-24		2.671	1.148 – 6.214
25-34		2.086	1.107 – 3.931
35-44		1.665	1.056 – 2.627
45-54		0.733	0.485 – 1.108
55-64		1.000	REF

^a After controlling for race/ethnicity and urbanization.