How Trauma, Recent Stressful Events, and PTSD Affect Functional Health Status and Health Utilization in HIV-Infected Patients in the South

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Objective: In addition to biological markers of human immunodeficiency virus (HIV) disease progression, physical functioning, and utilization of health care may also be important indicators of health status in HIV-infected patients. There is insufficient understanding of the psychosocial predictors of health-related physical functioning and use of health services among those with this chronic disease. Therefore, the current study examines how trauma, severe stressful events, posttraumatic stress disorder (PTSD), and depressive symptoms are related to physical functioning and health utilization in HIV-infected men and women living in rural areas of the South. **Methods:** We consecutively sampled patients from 8 rural HIV clinics in 5 southern states, obtaining 611 completed interviews. **Results:** We found that patients with more lifetime trauma, stressful events, and PTSD symptoms reported more bodily pain, and poorer physical, role, and cognitive functioning. Trauma, recent stressful events, and PTSD explained from 12% to 27% of the variance in health-related functioning, over and above that explained by demographic variables. In addition, patients with more trauma, including sexual and physical abuse, and PTSD symptoms were at greater risk for having bed disability, an overnight hospitalization, an emergency room visit, and four or more HIV outpatient clinic visits in the previous 9 months. Patients with a history of abuse had about twice the risk of spending 5 or more days in bed, having an overnight hospital stay, and visiting the emergency room, compared with those without abuse. The effects of trauma and stress were not explained by CD4 lymphocyte count or HIV viral load; however, these effects appear to be largely accounted for by increases in current PTSD symptoms. **Conclusion:** These findings highlight the importance of addressing past trauma, stress, and current PTSD within clinical HIV care. **Key words:** HIV, PTSD, trauma, health-related quality of life, sexual abuse.

PTSD = posttraumatic stress disorder; **HIV** = human immunodeficiency virus; **DSM-IV** = Diagnostic and Statistical Manual of Mental Disorders; **OR** = odds ratio; **CI** = confidence interval; **SD** = standard deviation.

INTRODUCTION

There is a growing body of literature demonstrating the relationship of psychosocial factors, such as stress and depression, with disease progression in human immunodeficiency virus (HIV)-infected persons (1–9). Analyzing 7-year data from the San Francisco Men's Health Study, Mayne and colleagues found that those who had elevated symptoms of depression at every visit had 1.7 times greater risk of mortality compared with those who never had elevated depression (5). In a different 7-year study of HIV-infected women, those with chronic depression were about twice as likely to die compared with those who never experienced depression (6). In a series of analyses of HIV-infected gay men, Leserman and colleagues showed that depressive symptoms measured over time were associated with faster progression to AIDS after 5 years (3) and to clinical AIDS condition after 9 years (2). Despite the association of chronic depressive symptoms with HIV disease markers, it is difficult to determine whether depression puts HIV-infected persons at greater risk for disease progression, or whether changes in disease might be associated with increased risk for depression.

Studies of stressful life events provide less ambiguous evidence for the direction of the relationship between psychosocial factors and changes in HIV disease markers. This is particularly true with "objective" stress assessments that exclude subjects' distress ratings, thereby reducing the possibility that patient's worsening disease might lead to poorer coping and higher stress scores. Using such a stress measure, Leserman and colleagues have consistently shown that stressful life events predict progression to AIDS and an AIDS clinical condition in HIV-infected gay men studied for up to 9 years (2,3,10). Studies have also shown that recent bereavement is associated with loss of CD4 lymphocyte count and other immune decrements (8,11). In the only known study examining the immunological effects of past lifetime trauma (including sexual and physical abuse history), Kimmerling et al. (9) have shown that trauma history, especially in the presence of posttraumatic stress disorder (PTSD), is associated with greater decreases in CD4/CD8 ratio in 67 African American HIV-infected women.

There has been almost an exclusive focus on the impact of psychosocial factors on biological markers of HIV disease progression (e.g., CD4 lymphocytes, HIV viral load, mortality), with little attention to issues of health-related physical functioning and use of health services. However, better physical functioning has been shown to predict improved survival and less development of cytomegalovirus end-organ disease in patients with advanced HIV disease (12). In addition, poor health-related quality of life and greater use of health services has been shown to correlate with lower CD4 lymphocytes and higher viral load (13–15). People live with HIV for many years; the degree to which physical health affects pain, work,

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and other activities should not be overlooked given the possibility of interventions aimed at improving these health outcomes. Thus, patient's use of health services and their assessment of the degree to which their physical health affects daily physical functioning may be important indicators of health status in HIV, and a possible focus for interventions.

The few available studies examining psychosocial predictors of physical health-related quality of life in HIV have generally been in small samples. This research has shown that previous trauma or stress is associated with poor health-related functioning (16–19). The current cross-sectional study focuses on how past traumatic events, recent stressors, PTSD, and depression are associated with physical health-related functioning and health care utilization in a representative sample of HIV-infected men and women attending HIV clinics in the rural South. It is important to study the rural south because this area of the country has recently experienced the largest proportionate increase in HIV infection in the United States. From 2000 to 2002, AIDS rates increased 27% in the states we studied, while increasing 9% across the rest of the South and less than 1% in the rest of the country (20,21).

We focused on daily functioning due to physical (not emotional) health, because the latter would be redundant with the mental health predictors. We hypothesized that past trauma, recent stress, PTSD, and depression would predict more health-related difficulties (e.g., physical and role dysfunction, pain, cognitive dysfunction, and bed disability) and more health care utilization (e.g., hospitalizations, emergency room visits, and clinic visits).

METHODS

Sample and Procedure

We studied 611 HIV-infected men and women as part of the "Coping with HIV/AIDS in the Southeast" (CHASE) study. We consecutively sampled HIV-infected individuals who received care at one of eight Infectious Diseases clinics in five Southeastern states: North Carolina, South Carolina, Alabama, Georgia, and Louisiana. These states were chosen because they represent locations where the HIV epidemic is demographically similar, and where AIDS had the largest proportional increase in recent years, especially outside the three standard metropolitan statistical areas (e.g., Charlotte, Atlanta, and New Orleans) (20,21). We chose clinics outside these major metropolitan areas that had at least two Infectious Diseases specialists. All clinics had at least 50% of their patients living in rural areas. Clinics were meant to represent the rural areas of the South.

Consecutive sampling of patients was strictly enforced by closely monitoring each site to help make the study group representative of the clinic population. All HIV-infected, English-speaking patients at the eight clinics were eligible to participate if they passed the Short-Portable Mental Status Questionnaire (22), which tested for major cognitive impairment. From December 2001 until April 2002, a total of 789 were approached about participating and 16 were dropped because they did not meet the study requirements of being English-speaking, HIV-positive, or passing the mental status questionnaire. Thus, 773 HIV-positive persons initially agreed to participate in the study at the time they were approached in the clinic (98%) and were alive for the interview. Of the eligible patients, 611 (79%) participated in the survey at the time of administration. The demographics (e.g., race, gender) of the individuals in the study were similar to the demographics of the total populations seen at each of the clinics.

All information from patients was obtained based on extensive interviews that took place in the clinics, nearby locations, or patients' homes. Interviews lasted an average of about 2 hours. Because of the sensitive nature of some of the questions asked in the survey, interviewers engaged in a week-long training on instrument administration followed by certification in the field. In addition to the interviews, we trained health care practitioners to obtain information from the medical charts on CD4 lymphocyte count and HIV RNA viral load.

Measures

Number of Lifetime Traumas was constructed by assigning one point for each of the following 15 traumas, with details about each trauma component described below.

- history of sexual abuse
- history of physical abuse
- moderate or greater childhood physical neglect
- moderate or greater childhood emotional neglect
- presence of seven other types of trauma before the age of 18 (e.g., parental alcohol/drug abuse, subject sent to reform school/prison),
- presence of four lifetime traumas (e.g., murder of close family member, death of a child).

The measure of lifetime sexual and physical abuse history was based on our previous studies (23–25), though originally adapted from other research (26–28). This measure has been shown to correlate with many indicators of poor health (24,25,29). We define sexual abuse to include the following experiences where force or threat of force is used: 1) touching the subject's breasts, pubic area, vagina, or anus with hands, mouth, or objects; 2) making the subject touch the perpetrator's pubic area or anus with hands, mouth, or objects; and 3) making the subject have vaginal or anal intercourse. To meet criteria for adult sexual abuse, there must be clear force or threat of harm; however, in children (<13 years), the threat of force or harm is implied by a 5-year age differential between the victim and perpetrator.

We define physical abuse (24) as incidents separate from sexual abuse that include: 1) life threat (being physically attacked with or without a weapon, with the intent to kill or seriously injure), and 2) other physical abuse (being beaten, hit, kicked, bit, or burned by another person, incidents outside the range of normal "spanking" or kids fighting).

The Childhood Trauma Questionnaire (30) was used to assess physical and emotional neglect during childhood. Cronbach's reliability has been reported at 0.89 for emotional neglect and 0.66 for physical neglect, and both have substantial test–retest reliability (0.81 and 0.79, respectively). These two scales are each composed of five items and can range between 5 and 25. We used the cutoff suggested by Bernstein and Fink for moderate physical neglect (9 or higher) and moderate emotional neglect (12 or higher) for adding one point each to the total number of lifetime traumas (30).

The interview also included questions concerning a variety of other traumas occurring before the age of 18 and at any time. This list of traumas was adapted from other research (26,31), where more traumatic events have been associated with later poor health outcome (31). Presence of other trauma before the age of 18 included 1) parental alcohol/drug abuse; 2) parental depression or parental suicide or attempted suicide; 3) imprisonment of parent; 4) domestic violence in the home (e.g., beating of mother at least sometimes, mother being threatened with a weapon at least once); 5) subject sent to reform school, prison, foster care or adopted; 6) death of immediate family member (mother/father/sibling); and 7) subject having a life-threatening illness or injury not HIV related. Lifetime trauma included 1) murder of close family member, 2) death of a child, 3) death of a spouse/partner, and 4) other similar trauma written in by the subject.

Recent stressful life events were measured using a modified version of the Life Events Survey (LES) (32,33) that assessed the presence of stressful events during the 9 months before the baseline assessment. The list was modified to include only those events that were considered moderate to severely stressful based on our previous studies with interviewer-based objectively rated stresses (2,3,34). This objective rating was shown to be consistently related to immune decline and HIV disease progression (2,3,34). For the current analysis, we examined only severe stresses, including: divorce or separation from mate/partner in committed relationship, death or serious illness of immediate family member (e.g., partner, child, parent, sibling), major financial problems (e.g., foreclosure, not enough money for basic

necessities), physical or sexual assault, more than a week in prison, and other similarly severe stresses. To avoid confounding patient's mood with ratings of their health, we count the number of events, ignoring patient ratings of distress. We also omitted any health-related stresses. Number of recent severe stresses varied between 0 and 5 (note that we truncated the scores for 3 outliers above 5).

Post-Traumatic Stress Disorder (PTSD) symptoms were measured with the PTSD checklist (35,36) for the 9 months before baseline interview. This 17-item instrument is based on DSM-IV criteria that include re-experiencing a traumatic event, numbing/avoiding, and hyperarousal symptoms. This scale has strong reported reliability, and has been shown to correlate highly with a clinician-administered PTSD measure (35,36). Scores can range between 0 and 5, with a higher score indicating more PTSD symptoms. PTSD diagnosis was made using the scoring that follows DSM-IV symptom criteria (37). We also examined subscales of PTSD including: re-experiencing symptoms (alpha = 0.89), numbing/avoidance symptoms (alpha = 0.87), and hyperarousal symptoms (alpha = 0.79).

The Brief Symptom Inventory (BSI) (38), an assessment of psychological symptoms, is a shortened version of the well-validated Symptom Checklist-90. For the current analysis, we focused on the depression subscale of the BSI. The depression subscale has previously been shown to have adequate internal consistency (Cronbach's alpha = 0.85) and test–retest reliability (0.84) (38). The six-item depression scale can range between 0 and 4, with a higher score indicating more depressive symptoms.

Health-related physical functioning was measured with several subscales of the Rand 36-Item Health Survey (SF-36) (39), a standard tool with one added scale for HIV populations. We focused on the following physical health subscales: 1) healthy physical functioning (e.g., degree to which health interferes with walking and lifting), 2) functioning without bodily pain, and 3) healthy role functioning (e.g., extent to which health limits work and activities). We also examined the one scale developed for HIV: healthy cognitive function (e.g., degree of difficulty with reasoning, thinking, concentrating). Cronbach's alpha reliability has ranged above 0.80 for all scales (39). All scales range from 0 (poor functioning) to 100 (good functioning).

Based on our previous studies (24), we also included one item to assess number of days patients spent more than half the day in bed due to illness or injury in the past 9 months. Because of extreme outliers and skewness, this variable was grouped into low (0–4 days in bed) and high (5 or more days in bed) for all analyses.

To assess health care utilization in the past 9 months, we asked about 1) having an overnight stay in the hospital, 2) having a hospital emergency room visit not including overnight stay, and 3) number of clinic visits for HIV (coded <4 and ≥ 4) because up to three visits would be recommended for most patients during the 9-month interval.

To control for possible sociodemographic variation based on clinic attended, a binary variable was created that defines a clinic as being located in a poor county if 18% or more of the county's population lives in poverty. We realize that this variable is limited because it is not specific to the individual during childhood; however, when we control for this variable, site differences are eliminated for gender, race, age, education, employment status, income, poverty, religion, and spirituality.

Statistical Analyses

To test the primary hypotheses of this study, we used linear multiple regression for continuous outcome variables (e.g., health-related functioning) and logistic regression for binary outcomes (e.g., disability days, health utilization variables). We used a stepwise analysis strategy, entering variables into equations in the following order: 1) demographic variables [age, education, race (white/nonwhite), gender, and income], anti-retroviral medication use, and a control variable for site differences based on attending a clinic in a poor versus less poor county; 2) number of lifetime traumas or history of sexual and/or physical abuse; 3) number of severe stresses in the previous 9 months; and 4) current symptoms of PTSD or depression. Trauma is entered into equations before recent severe stresses and PTSD because the vast majority of the traumatic events occurred many years before the study. Recent severe stresses are entered before PTSD because the former is more likely to affect the latter than vice versa. Because abuse history is included in lifetime trauma, these variables were run separately in equations. PTSD and depressive symptoms were also run separately because of multicollinearity. We used $p < .05$ as the significance level for entry into the model.

We were able to obtain CD4 lymphocyte count and HIV RNA viral load data from the medical charts on 387 (63.3%) of our patients. Multiple measures of CD4 and of viral load from the year before the baseline visit were logged (base 10) and averaged to create two HIV disease-specific measures. We reran all equations described above, entering average CD4 and average viral load in the first step to control for disease stage.

RESULTS

Description of the Sample

Descriptive information about the sample is shown in Table 1. The sample of 611 persons included patients ranging in age from 20 to 71, with the vast majority between 20 and 50 (89.2%). More than two thirds of the sample was male, with most (80%) having at least a high school education. Most (83.3%) earned below $20,000 per year. About two thirds of the sample was nonwhite (64.1% black). Most patients (77.7%) were using at least one anti-retroviral medication at the time of the baseline interview.

The sample had substantial lifetime trauma, with 72.5% having at least two such experiences. Included in total lifetime trauma was 34.0% with sexual abuse history, 37.8% with physical abuse history, 53.5% with sexual and/or physical abuse, 26.0% with moderate or greater childhood physical neglect, 23.2% with moderate or more childhood emotional neglect, and 51.4% with two or more other types of trauma (e.g., problems with primary caretakers, major events happening to the subject or to close relatives). Most of the patients (about 90%) had all their traumatic events occur more than 2 years before the study. Mean number of recent severe stresses in the past 9 months was 1.27 (SD = 1.08). Sixteen percent met DSM-IV criteria for PTSD. Note that the average on the depression scale (0.71) is much higher than a normative sample of nonpatients (mean = 0.36, SD = 0.44) (40).

The median CD4 lymphocyte count was 378 and the median viral load was 981 in the patients for whom this data were available. The raw mean and SD scores on physical health-related functioning were as follows: physical functioning

TABLE 1. Descriptive Information About the Sample

Characteristic	Mean (SD) or %[a]
Age (years)	40.24 ± 8.74
Education (years)	12.41 ± 2.03
Gender (male)	68.7%
Race (non-white)	67.9%
Marital status (married or living with partner)	30.0%
Income (monthly median in dollars)	679
Clinic in poor county	50.0%
Using anti-retroviral medication	77.7%
Number of lifetime traumas	3.13 ± 2.36
Sexual and/or physical abuse history	53.5%
Number of severe stresses	1.27 ± 1.08
PTSD	1.82 ± 0.77
Depressive symptoms	0.71 ± 0.85

[a]Continuous variables are reported as means ± standard deviations; categorical variables are listed as percentages.

(mean = 73.7, SD = 27.9), role limitations (mean = 74.5, SD = 29.8), bodily pain (mean = 65.9, SD = 29.2), and cognitive function (mean = 78.4, SD = 24.8). Standardizing these scores indicates that our sample is at about the 25th percentile below the median score for the general population (39). Median number of days spent in bed due to illness during the past nine months was two with 66.6% of the sample having less than five days in bed. Health utilization during the previous nine months included 26.3% having at least one overnight hospital visit, 39.2% having at least one emergency room visit, and 45.4% having four or more HIV-related clinic visits.

Relationship Between Predictor Variables

Number of lifetime traumas and recent stressful events were moderately correlated ($r = 0.27$, $p < .0001$). Number of lifetime traumas and stressful events were somewhat more correlated with PTSD ($r = 0.39$, $p < .0001$; $r = 0.36$, $p < .0001$, respectively) than with depression ($r = 0.30$, $p < .0001$; $r = 0.23$, $p < .0001$, respectively). Depression and PTSD symptoms were highly correlated ($r = 0.70$, $p < .0001$).

Relationship of Trauma, Stress, and PTSD with Health Functioning

Regression analyses showed moderate relationships of trauma variables, stress, and PTSD with health-related functioning (Table 2). More lifetime trauma and greater number of recent severe stressful events were related to less healthy functioning in terms of bodily pain and physical, role, and cognitive (e.g., memory, concentration) performance. Trauma and recent severe stress explained from 4% to 13% of the variance in health-related functioning, over and above that explained by demographic variables. Similar findings result when abuse (sexual and/or physical) is entered into equations rather than lifetime trauma, although abuse explains somewhat less variance. In addition, the effects of lifetime trauma were the same with or without patients who had experienced a trauma within the 2 years preceding the study.

Symptoms of PTSD were related to worse health functioning on all measures, explaining 7% to 17% of the variance above that of demographic, trauma, and stress variables. The effects of lifetime trauma and recent stress were largely explained by PTSD symptoms. Depressive symptoms and PTSD symptoms could not be entered into equations simultaneously due to multicollinearity. The findings with depression substituted for PTSD are virtually the same as those shown in Table 2. All three PTSD subscales (e.g., re-experiencing, numbing, and hyperarousal) were significantly related to health-related functioning when examined separately ($p < .0001$), a necessity due to multicollinearity. Hyperarousal symptoms, however, was the subscale most consistently and strongly related to poor health-related functioning.

Note that those with higher education tended to have better health-related functioning, and younger participants had better physical functioning and less pain. Although females report slightly worse physical functioning on one scale, and white participants tended to report slightly worse pain and cognitive functioning, these small differences are not likely to be mean-

TABLE 2. Regression of Health-Related Functioning With Demographic Variables[a], Number of Lifetime Traumas, Number of Recent Stresses, Depression and PTSD

	Healthy Physical Functioning				Healthy Role Functioning			
	Std. β	Std. β	Std. β	Std. β	Std. β	Std. β	Std. β	Std. β
Education	0.18*	0.15**	0.15**	0.15**	0.08***	0.04	0.04	0.04
Age	−0.20*	-0.21*	−0.21*	−0.24*				
Gender	−0.10***	−0.09***	−0.09***	−0.08***				
# Lifetime Traumas		−0.18*	−0.16*	−0.06		−0.21*	−0.17*	−0.07
# Recent Stresses			−0.08***	0.01			−0.14**	−0.06
PTSD				−0.33*				−0.30*
R^2	0.08	0.11	0.12	0.20	0.01	0.05	0.07	0.14
	Functioning Without Pain				Healthy Cognitive Functioning			
	Std. β	Std. β	Std. β	Std. β	Std. β	Std. β	Std. β	Std. β
Education	0.11***	0.06	0.06	0.06	0.16*	0.10***	0.11***	0.10***
Age	−0.09***	−0.10***	−0.11***	−0.13**				
Race	0.09***	0.05	0.08***	0.06	0.12***	0.07	0.09***	0.05
Clinic in poor county					−0.08***	−0.08***	−0.08	−0.05
# Lifetime Traumas		−0.27*	−0.21*	−0.10***		−0.30*	−0.27*	−0.12***
# Recent Stresses			−0.24*	−0.15**			−0.13**	0.00
PTSD				−0.34*				−0.47*
R^2	0.02	0.09	0.15	0.23	0.04	0.13	0.14	0.31

*$p < .0001$, ** $p < .001$, ***$p < .05$.

[a]The following control variables were tested in regression equations: education, age, gender, race, income, clinic in poor county, and anti-retroviral medication use. Only those shown in the Table were significant at $p < .05$. $N = 607$ to 608 depending on missing data.

ingful or reliable. Females did not score higher on PTSD or depression, as one might expect in other populations; females had only a slight tendency to have more total trauma ($F = 4.38$, $p = .04$), after controlling for other demographic variables.

None of the results in Table 2 were changed with the inclusion of CD4 and viral load as control variables, although those with higher viral load tended to have slightly worse bodily pain (Std. $\beta = -0.16$, $p = .007$).

Table 3 shows logistic regression equations predicting bed disability (spending 5 or more days in bed due to illness or injury during the previous 9 months) with number of lifetime traumas or sexual and/or physical abuse history, number of recent severe stresses, and PTSD symptoms. Because sexual and/or physical abuse history is included in lifetime trauma, these variables were run separately in the equations. Note that demographic variables did not significantly predict bed disability. Experiencing sexual or physical abuse during one's lifetime was associated with a two-fold increased risk of spending 5 or more days in bed. Among those with sexual and/or physical abuse history, 40.4% reported spending five or more days in bed, as compared with 25.3% of those not abused. For every 4-point increase in number of lifetime traumas, there was about a 65% increased risk being categorized with bed disability, as compared with having no trauma. For every 2-point increase in recent severe stress, there was a 63% increased risk of disability. Note that 36.5% of patients reported four or more lifetime traumas and 34.5% of patients report having two or more recent severe stresses. Each 1-point increase in PTSD symptoms was associated with a 67% increased risk of disability. Higher PTSD scores largely explained the effects of lifetime trauma, abuse and recent severe stress on disability. Furthermore, although all three subscales of PTSD were related to bed disability (p ranging from .001 to $<.0001$), the hyperarousal subscale was the strongest predictor of disability. Controlling for CD4 and viral load did not alter the relationship of trauma, stress, and PTSD with bed disability; however, higher viral load was associated with higher risk of disability (OR = 1.40, CI = 1.13–1.74, $p = .002$).

Relationship of Trauma, Stress, and PTSD With Health Utilization

Table 4 shows the logistic regression equations predicting health utilization variables with demographic variables, number of lifetime traumas or sexual/physical abuse history, and PTSD symptoms. Sexual and/or physical abuse history is run separately in equations from lifetime trauma. HIV-infected persons having more lifetime trauma were more likely to stay overnight in a hospital, have a hospital emergency room visit, and have four or more HIV-related outpatient clinic visits during the previous 9 months. For every 4-point increase in number of lifetime traumas, there was about a 50% increased risk for having an overnight stay in the hospital, an emergency room visit, and four or more HIV-related clinic visits during the past 9 months, as compared with those with no trauma. In addition, those with sexual and/or physical abuse history had greater health care utilization during the past 9 months. Specifically, abuse history was associated with almost twice the risk of having an emergency room visit and 78% increased risk of being a patient overnight in the hospital. Recent severe stressful events were not associated with any health utilization variables.

PTSD symptoms were somewhat associated with being a hospital inpatient and visiting an emergency room. Inclusion of PTSD in the equations somewhat reduced the association of trauma and abuse with health utilization variables. Depression showed a similar association with health utilization variables compared with PTSD when included without the latter in statistical models. Only the subscales of numbing/avoidance and hyperarousal were significantly related to hospitalization and having an emergency room visit ($p < .05$).

For the demographic variables, patients seen in clinics from poor counties were somewhat more likely to have an inpatient hospital visit (OR = 1.57, CI = 1.09–2.26, $p = .02$) than those from wealthier counties. Younger patients (OR = 0.98, CI = 0.96–1.0, $p = .03$), less educated patients (OR = 0.89, CI = 0.82–0.97, $p = .008$), and females (OR = 1.72, CI = 1.20–2.46, $p = .003$) had greater likelihood of having an emergency room visit in the past 9 months. No other demo-

TABLE 3. Logistic Regression of Bed Disability With Number of Lifetime Traumas or Sexual/Physical Abuse History, Number of Recent Stresses and PTSD[a]

	Bed Disability During the Past Nine Months (<5 or ≥5 Days)					
	OR	CI	OR	CI	OR	CI
# Lifetime Traumas	1.13*	1.06 to 1.22	1.10**	1.02 to 1.19	1.05	0.96 to 1.13
Sexual/physical abuse	2.01*	1.41 to 2.86	1.78**	1.24 to 2.56	1.53***	1.05 to 2.22
# Recent Stresses			1.28**	1.08 to 1.51	1.16	0.97 to 1.38
PTSD					1.67*	1.30 to 2.14

*$p < .001$, **$p < .01$, ***$p < .05$.

[a]Demographic variables were tested but none significantly predicted bed disability. The variables of lifetime trauma and sexual/physical abuse were added to equations separately since abuse is included in the definition of lifetime trauma. Values for number of recent stresses and PTSD are shown after controlling for number of lifetime traumas.

OR = odds ratio; CI = 95% Wald confidence interval; $N = 587$.

TABLE 4. Logistic Regression of Health Utilization With Demographic Variables, Number of Lifetime Traumas or Sexual/Physical Abuse History, and PTSD[a]

	Overnight Hospital Patient		Emergency Room Visit		HIV Related Outpatient Clinic Visits (<4 or ≥4)	
	OR	CI	OR	CI	OR	CI
# Lifetime Traumas	1.12**	1.04 to 1.20	1.11**	1.03 to 1.19	1.09***	1.02 to 1.17
Sexual/physical abuse	1.78**	1.23 to 2.59	1.90*	1.35 to 2.67	1.40***	1.01 to 1.94
PTSD	1.35***	1.06 to 1.73	1.47**	1.16 to 1.87	1.08	0.86 to 1.36

*$p < .001$, **$p < .01$, ***$p < .05$.

[a]All equations control for significant demographic variables as follows: 1) hospital overnight controls for clinic in poor county, 2) emergency room visit controls for age, education and gender, and 3) HIV clinic visits (<4 or ≥4) has no significant controls. The variables of lifetime trauma and sexual/physical abuse were added to equations separately since abuse is included in the definition of lifetime trauma. PTSD values are shown after controlling for number of lifetime traumas and appropriate demographic variables.

OR = odds ratio; CI = 95% Wald confidence interval; $N = 586$ to 609 depending on missing data.

graphic variable was significant in predicting health utilization variables. As in other analyses, CD4 and viral load did not alter the effects of trauma, abuse, or PTSD with health utilization variables, however, lower CD4 was associated with a greater risk of having an overnight hospital visit (OR = 0.45, CI = −0.24–0.85, $p = .01$), and having four or more HIV clinic visits (OR = 0.46, CI = 0.25–0.84, $p = .01$).

DISCUSSION

In this sample of patients seeking HIV health care in the rural South, we found high levels of previous trauma, with 72.5% having at least two types of traumatic events during their lifetime. More than half of the patients (53.5%) endorsed having experienced sexual and/or physical abuse history in their lifetime. About one third had at least moderate childhood physical neglect and/or emotional neglect. Patients had on average about one recent severe stressor, 16% met DSM-IV criteria for PTSD, and patients scored considerably higher on depressive symptoms as compared with nonpatient norms. Thus, in a sample of HIV-infected men and women from the rural South, an area of the country with the largest proportionate increase in HIV infection (20,21), we found high rates of trauma, PTSD, and depressive symptoms. The high rates of depressive symptoms and PTSD found in our study are in line with estimates from a national probability survey of HIV-infected persons (41).

As hypothesized, we found that previous trauma (mostly occurring many years before the study) was associated with poor health-related physical functioning. Specifically, more trauma was related to worse health-related physical functioning (e.g., interference with walking and lifting), role functioning (limitations on work and activities), pain, and cognitive functioning (difficulty with reasoning, thinking, and concentrating). Total lifetime trauma, as well as sexual and/or physical abuse history, was shown to increase the risk of bed disability and health care utilization during the past 9 months. Those with abuse history had about twice the risk of spending 5 or more days in bed, having an overnight hospital stay, and visiting the emergency room compared with those without abuse. An increase in four traumas was associated with a two-thirds increased risk in bed disability, and a 50% increased risk of a hospital stay, an emergency room visit, and having four or more clinic visits. Having more recent severe stressful events was also associated with increased risk of poor health-related functioning and bed disability.

We also found that PTSD symptoms were moderately associated with poor health-related quality of life, and somewhat increased risk of bed disability, having a hospital stay, and visiting the emergency room. PTSD, trauma and severe stressful events explained from 12% to 27% of the variance in health-related functioning. PTSD symptoms largely explained the effects of trauma and recent stressful events on health status measures. However, trauma and stress maintained an impact on all of the health-related variables in the study when controlling for HIV disease-specific measures of CD4 and viral load. Thus, it is possible that the effects of trauma and stress on poor health-related functioning and higher use of health services may be more a function of increased psychological distress (e.g., PTSD symptoms such as hyperarousal) resulting from trauma than from changes in HIV disease markers. This is consistent with a huge literature suggesting that in other populations, previous abuse history, lifetime trauma, and PTSD are associated with more pain and medical symptoms (31,42–44), more health care visits (43,45), poorer health habits and risky behavior (31,46), and other indicators of poor health and poor physical functioning (44,47–49). The largest probability study of HIV-infected persons also found that PTSD and major depression were associated with higher pain reporting, even after controlling for disease stage (50). Thus, the negative effects of trauma and stress on greater health dysfunction and use of health services seen in the current cross-sectional study might be more likely to reflect non-HIV-related health changes associated with PTSD and depression (e.g., somatic symptoms, pain disorders) than alterations in CD4 and viral load. These non-HIV-related health problems may nonetheless have a devastating impact on quality of life and the need for health services.

The strongest evidence of a relationship of stressful events and depression with HIV disease progression come from long-term longitudinal studies (1–8). As we follow our cohort over

time, we will be able to examine the impact of past trauma and recent stressors on changes in CD4 count and viral load.

Older patients and less educated patients tended to have worse health-related quality of life and were more likely to visit an emergency room. Those from poor counties had poorer cognitive functioning, and increased risk of an inpatient hospital visit, perhaps due to lack of primary care. Thus, there is some evidence that the less educated patients and those attending the most rural and poorest clinics had worse functional status and more health care use. The effects of education are somewhat diminished by the inclusion of trauma in the equations, indicating that greater trauma in those less educated ($r = -0.17, p < .0001$) might somewhat account for their poor health functioning.

In the general population, females tend to have more PTSD, depression, and report worse health and more utilization of health services. In this sample, females tended to have only slightly more total trauma (due to greater sexual abuse) and emergency room visits, but equivalent PTSD and depression. This later finding is consistent with the HIV Cost and Services Utilization Study, a national probability sample of HIV-infected persons, showing no gender differences in anxiety and depression (51). Persons who contract HIV tend to have high levels of trauma and dysphoria, regardless of gender.

Interpretation of our study findings must be balanced against a number of limitations in the current study design. First, without longitudinal data it is difficult to determine the causal nature of the relationships. It is possible that being in worse current health leads patients to report more childhood trauma and more stressful events. Using discrete events rather than patients' ratings of their stress, and measuring trauma from many years before the study help to reduce this possibility. Also, most of the trauma occurred many years before the study and results were unchanged when removing subjects with recent (past 2 years) trauma. Second, it is possible that some uncontrolled variables might account for our findings, despite controlling for many demographic and background characteristics. Third, it is possible that our sample is not representative of HIV clinics in the rural South or even the clinics themselves, given that consecutive sampling tends to oversample high health care utilizers. Our good response rate and the similarity of our sample to clinic demographic characteristics, however, support the representativeness of the sample. In addition, our study is one of the first to attempt a representative sample of HIV-infected persons living in the rural south, an area of the country where the HIV epidemic is sharply increasing (20,21).

Past trauma, including sexual and physical abuse history, recent severe stressful events, and PTSD symptoms were associated with worse health-related quality of life in terms of poorer physical functioning, higher risk of bed disability, and greater use of health services. These findings underscore the importance of addressing past trauma and stress within the medical setting, and providing psychological referrals for patients exhibiting symptoms of PTSD such as hyperarousal (52). Based on national data of HIV-infected persons, many patients are not receiving appropriate mental health services, despite high levels of psychiatric disorders in this population (53). Case managers may help to satisfy these unmet needs for HIV-infected clients, including access to mental health counseling (54). HIV treatment often focuses exclusively on monitoring the fluctuation of numbers, such as CD4 lymphocyte count and viral load. Although certainly these measures are critical to HIV care, the current study points to the clinical importance of monitoring health-related functional status and the psychological factors that may affect it.

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