# Post-traumatic Stress Disorder Symptoms and Mental Health over Time among Low-Income Women at Increased Risk of HIV in the U.S

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## Abstract

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Women living in poverty suffer more post-traumatic stress disorder (PTSD) symptoms than do members of the general population; however we know little about factors associated with changes in their PTSD symptoms over time. Using data from HPTN 064, a cohort of women from low-income, high-HIV-prevalence communities across six eastern states (n=1,860), we assessed the prevalence of and changes in PTSD symptoms over 12 months and the effect of potential predictors on symptom acquisition and remission (via the Primary Care-PTSD symptoms scale). Forty-three percent screened positive for PTSD symptoms. Those reporting food insecurity, ongoing abuse, depressive symptoms, or binge drinking were more likely to acquire PTSD symptoms. Those with ongoing abuse or depressive symptoms were less likely to experience PTSD symptom remission. Findings suggest a need to integrate programs to reduce abuse, depression, and economic hardship with those that address sexual health risks among women living in low-income, high-HIV-prevalence neighborhoods.

## Keywords

Women; HIV/ AIDS; mental health; poverty

Women living in poverty experience extremely high rates of mental illness, particularly depression, anxiety disorders, and post-traumatic stress disorder (PTSD), relative to the general population.[1–5] Notably, PTSD, now defined as comprising four distinct clusters of symptoms (re-experiencing, avoidance, negative cognitions and mood, and arousal) that develop after experiencing or witnessing a traumatic, often life-threatening event; symptoms can include severe nightmares, flashbacks, memories, self-blaming, hyper-arousal, sleep disturbances, difficulty concentrating, and irritability.[6] Studies have noted the high co-occurring rates of depression and substance abuse in individuals diagnosed with PTSD.[7–11]

Post-traumatic stress disorder is an extremely serious and debilitating health condition in itself. In addition, studies have shown that women who suffer from PTSD experience other serious health consequences, including greater risk of or worsening chronic diseases (e.g., diabetes and heart disease),[12–14] functional impairment,[15] and increased risk of acquiring human immunodeficiency virus (HIV) infection.[16,17]

While it is well known that PTSD is more prevalent among low-income women, and has been associated with other conditions that affect health and well-being, a clearer understanding of whether and how PTSD symptoms remit or persist over time among this population is needed. Although PTSD symptoms are known typically to decline eventually after traumatic exposure,[18] women living in economically disadvantaged neighborhoods may suffer from ongoing exposure to stressors which trigger recurrent symptoms.[19] The pathways through which poverty influences mental well-being among women are complex.[20] Living in economically disadvantaged areas may increase women's exposure to personal and neighborhood violence and food insecurity and provide fewer opportunities for employment and education. These effects may individually and collectively increase experiences of life stressors.[20,21] Low-income women living in economically disadvantaged, disordered neighborhoods with continued exposure to stressors; lacking social support; and

having histories of past personal violence are least likely to experience improvements in PTSD symptoms.[4,22,23]

Understanding the factors associated with these longitudinal trends may inform the development of future interventions designed to improve mental health among women living in high-poverty areas in the United States. We therefore conducted a secondary analysis, using data from HIV Prevention Trials Network (HPTN) 064, to assess the prevalence and incidence of PTSD symptoms as well as associated factors among women at enhanced risk of HIV acquisition residing in 10 high-poverty, high-HIV-prevalence communities across six U.S. geographic areas. Of note, the annual HIV incidence in the HPTN 064 cohort was found to be elevated at 0.32%, a rate five times higher than the estimated rate for the general population of African American women.[9,24]

This study is informed by the Social Cognitive Theory, which posits that an individual's characteristics, social and physical environment, and health-maintaining behaviors influence one another.[25–27] We hypothesized that women living in low-income neighborhoods would have a higher prevalence of PTSD symptoms than that of the general population. Further, we hypothesized that the acquisition of PTSD symptoms would be associated with ongoing violence, lack of social support, and food insecurity and that remission of PTSD symptoms would be associated with social support, lack of ongoing violence, and lack of food insecurity.

## Methods

### Study design

As previously described,[9] the parent HPTN 064 study was designed to assess HIV incidence among U.S. women at risk for HIV. It was a multi-site, longitudinal cohort study that enrolled eligible women between May 2009 and July 2010 from 10 communities identified as having high prevalence of both poverty and HIV in six geographic areas in the Northeastern and Southeastern U.S. (Atlanta, Georgia; Baltimore, Maryland; New York City, New York; Newark, New Jersey; Raleigh/ Durham, North Carolina; Washington, District of Columbia). Venue-based sampling was used to recruit women who attended specific locations (e.g., retail stores, beauty parlors, parks) within the pre-defined geographic areas.[28] Because we sought a sample of adult women at high HIV risk, eligible individuals were 18 to 44 years of age, self-identified as women (transgender individuals were eligible), reported at least one episode of unprotected vaginal and/or anal sex with a man in the six months before enrollment, and had one or more self-reported personal or partner HIV risk characteristics (e.g., participant or partner in the last six months with a sexually transmitted infection, illicit drug use, binge alcohol drinking or dependence, sex exchange). Participants also had to be willing to undergo HIV rapid testing and receive HIV test results. Women were followed for six or 12 months, depending on time of enrollment.

Participants underwent HIV testing and completed audio computer-assisted self-interviews (ACASI) at entry to the study and at six-month intervals for up to 12 months. The baseline, six and 12 month ACASI, which collected demographic and psychosocial data (operationally defined below and including PTSD symptoms, general health status, food

insecurity, forgone medical care, emotional and tangible social support, history of childhood abuse, ongoing physical, emotional or sexual violence experienced in the last six months, depression, and information concerning sexual behaviors and drug use) were the data sources for this analysis.

The HPTN 064 study was approved by institutional review boards at each of the study sites and collaborating institutions. A Certificate of Confidentiality was obtained for the study. Informed consent was obtained prior to the initiation of study procedures. Participants received compensation for in-person visits and phone locator update calls. The amount of compensation varied by site, as approved by local IRBs but ranged from $35 to $50 for in-person visits and $10 to $15 for phone updates.

### Primary outcome measure: PTSD symptoms

Post-traumatic stress symptoms were assessed using the Primary Care PTSD (PC-PTSD) scale, a four-item screen (with a score ranging from 0–4) developed to screen for DSM-IV PTSD in busy primary care settings.[29] The PC-PTSD has been validated as the gold standard for use in primary care settings and has also been validated with substance users and in women specifically. It focuses on meaningful, empirically-derived symptom clusters of PTSD as defined in the DSM-IV: re-experiencing, numbing, avoidance, and hyperarousal.[6,30–32] The optimally efficient cutoff score in the original validation study is 3, which was associated with a sensitivity of 0.78 and a specificity of 0.87 and good test-retest reliability. The four items of the PC-PTSD correspond to the four factors demonstrated in factor analyses found to be specific to the PTSD construct (i.e., re-experiencing, avoidance, hyperarousal, and numbing) yet not confounded by general psychological distress. Participants are asked to endorse items using a *yes / no* format asking, *Have you ever had an experience that was so frightening, horrible, or upsetting, that in the last six months, you*: 1) *have had nightmares about it or thought about it when you did not want to?* 2) *tried hard not to think about it or went out of your way to avoid situations that reminded you of it?* 3) *were constantly on guard, watchful, or easily startled?* 4) *felt numb or detached from others, activities, or your surroundings?* All four items were summed to create the PTSD symptom score at each study visit, and then each score was dichotomized at the pre-determined standardized cut-off of 3 points or more to create a variable representing a positive screen for PTSD symptoms for each time point. Cronbach's alpha was 0.79 in this sample.

### Trajectory of PTSD symptoms

As indicated below, there are eight possible combinations of PTSD symptom screen status (positive or negative) that could logically occur over the three study visit time points (baseline, six months, 12 months). Using these eight possible categories and PTSD screen status data for each woman for each time point, we tabulated to which of these eight categories each woman belonged. We then created a flow diagram (Figure 1) to represent PTSD symptom change over time and to indicate how many women were in each category. This schematic tool represents each of eight potential trajectories into which a woman could be categorized (using the cut-off of 3 or more):

| Baseline | | Six Months | | 12 Months |
|---|---|---|---|---|
| 1. Negative | → | Negative | → | Negative |
| 2. Negative | → | Negative | → | **Positive** |
| 3. Negative | → | **Positive** | → | **Positive** |
| 4. Negative | → | **Positive** | → | Negative |
| 5. **Positive** | → | **Positive** | → | **Positive** |
| 6. **Positive** | → | **Positive** | → | Negative |
| 7. **Positive** | → | Negative | → | Negative |
| 8.**Positive** | → | Negative | → | **Positive** |

## Independent variable measures

**Emotional social support**—The ACASI was utilized to assess how many close friends or relatives participants thought would be willing to help them deal with feelings or emotional problems. Response options were *0, 1, 2, 3 or more*, or *don't know/ not sure*. Based on the distribution, we dichotomized this variable at 3 or more.

**Food Insecurity (binary)**—The ACASI asked participants to answer *yes* or *no* to the question, *In the past 6 months, have you been concerned about having enough food for you and/or your family?*

**History of Childhood Abuse (binary)**—The ACASI asked participants to answer yes or no to the question, *As a child (less than 18 years of age), were you abused physically, emotionally, or sexually?*

**Ongoing violence**—The ACASI asked, *In the last six months have you* a) *been hit, slapped, kicked, or physically hurt by someone important to you?* b) *been emotionally abused by your partner or someone important to you?* c) *lived with, or been in a relationship with, someone who made you feel unsafe?* d) *been forced to have any type of sex?* We created a dichotomous variable indicating ongoing violence for women who responded yes to any one of these four questions.

**Binge drinking and illicit substance use**—Based on standard Center for Disease Control and Prevention (CDC) definitions of binge drinking, the ACASI assessed, *How often do you have four or more drinks on one occasion?* Response options were: *Never, Less than monthly, Monthly, Two to three times per week*, or *Four or more times a week*. Participants were considered binge drinkers if they reported consuming four or more drinks on one occasion at least once a month. We used a modified version of the validated ASSIST instrument[33] to assess whether participants had ever used each of six illicit substances (cocaine, amphetamine-type stimulants, inhalants, sedatives, hallucinogens-excluding cannabis, opioids). For each substance ever used, women were asked how often they had done so in the last six months. We created a dichotomous variable indicating if women reported any use of at least one of the illicit substances in the last six months.

**Symptoms of depression—**Depressive symptoms were measured using the Center for Epidemiologic Studies—Depression Scale (CES-D), a previously validated shortened eight-item version of the standard 21-item four-point (ranging from 0–3 per item) scale which has been used previously in young African American women.[34] A score of 7 or more out of 24 was indicative of psychological distress or depressive symptoms. Cronbach's alpha was 0.91 in this sample.

### Data management and statistical analysis

The main analytic sample used to assess factors associated with remission and acquisition of PTSD over a six month period was restricted to the 1,860 women with available PTSD symptom data at baseline and six months. Counts and percentages were used to describe the characteristics of this sample at baseline and to assess the frequency of women who screened positive for PTSD symptoms at each time point. To describe the frequencies of women in each of eight trajectories of PTSD symptom status (described above), we assessed the 1,404 women who had PTSD data available at all three time points.

A multivariate log-binomial regression analysis of factors associated with screening positive for PTSD symptoms at baseline was conducted using backward selection to create our final model. For consistency with the analyses of change in PTSD symptoms over time, only women with data at both baseline and six months were included in this analysis. Potential variables for the model were selected based on the conceptual model. To assess the effect of the interaction between childhood abuse and ongoing abuse on screening positive for PTSD symptoms at baseline, these two factors and their interaction term were included in the final model. To assess factors predicting PTSD symptom acquisition or remission at six months, we conducted two additional log regression models of factors associated with: 1) PTSD symptom acquisition among those who did not screen positive for PTSD symptoms at baseline; 2) PTSD symptom remission among those who screened positive at baseline. Mediation analysis with each of the two models assessed whether depression mediated any of the effect of social support on PTSD symptom acquisition or remission.[35] All analyses were conducted using SAS version 9.2 (SAS Inc., NC).

## Results

### Demographic and clinical characteristics of the sample (n = 1,860)

Of the 2,099 women enrolled between May 2009 and August 2010, PTSD symptom screening data were available from 2,047 at baseline; 1,860 at both baseline and month six; and 1,404 at baseline, month six, and month 12. It should be noted that fewer women were available at month 12 due to study design (some women were enrolled for only six months follow-up). Comparison of the 1,440 women without follow-up data (and therefore not included in the sample) with the 1,860 participants making up the study sample yielded no statistically significant differences (using t-tests for continuous measures and chi-square tests for categorical measures) on any of the variables included in the analyses. Of the 1,860 women, at baseline 16% reported being in fair or poor health, 45% reported a history of childhood abuse, and 39% reported some type of abuse (physical, emotional, sexual) during the six months preceding enrollment. Further, 34% of participants reported symptoms

indicative of clinical depression in the last week, 21% reported illicit drug use (excluding cannabis) in the six months preceding study entry, and 23% reported binge drinking (Table 1). Comparison of those included in the sample with those lost to follow-up found no statistically significant differences in age, race, ethnicity, depression, food insecurity, or other features, except that those lost to follow-up had higher levels of substance abuse and PTSD symptoms at baseline. All women lived in areas with prevalent poverty by virtue of the study design.[9,28]

### Baseline and change in PTSD symptoms over time (n = 1,404)

Figure 1 depicts the frequency of participants in each of eight PTSD symptoms screen trajectory categories from baseline to the 12-month follow-up. The prevalence of PTSD symptoms decreased from 29% at baseline to 20% at six months and 20% at 12 months, respectively. Forty three percent of women screened positive for PTSD symptoms at least once during study follow-up. Thirteen percent of women screened positive for PTSD symptoms at both baseline and six-month follow-up; 16% had baseline PTSD symptoms that resolved at the six-month follow-up (most [75%] of whom remained PTSD symptom-negative at 12 months). Even among those whose symptoms had not remitted by six months, nearly half screened negative at 12 months so that 61% of those screening positive for PTSD symptoms at baseline screened negative at study exit. The vast majority of women who screened negative at baseline remained negative at six months; however, among those remaining negative at six months, a small proportion developed symptoms later, screening positive at the 12-month follow-up. Therefore, nearly the same proportion of initially symptom free participants had PTSD symptoms at 12 months (7%) as at six months (9%).

### Factors associated with baseline PTSD symptoms (n = 1,860)

In multivariate analyses, women with food insecurity had about 34% greater odds (RR: 1.337; 95% CI: 1.108, 1.615), with childhood abuse 72% greater odds (RR: 1.719; 95% CI: 1.417, 2.085), ongoing abuse 46% greater odds (RR: 1.461; 95% CI: 1.208, 1.768), and forgone medical care 27% greater odds (RR: 1.270; 95% CI: 1.048, 1.539) of screening positive for PTSD symptoms at baseline. Additionally, those who were depressed, were nearly 2.4 times as likely to screen positive for PTSD symptoms. (RR: 2.414; 95% CI: 1.987, 2.933) and there was a positive dose-response relationship between frequency of binge drinking and the odds of screening positive for PTSD symptoms; compared with those binge drinking monthly or less frequently, the more frequent the binge drinking, the greater the odds of PTSD symptoms (for 2–3 time weekly: RR: 1.199 [95% CI: 0.961; 1.495], and for more than 4 times weekly: RR: 1.353 [95% CI: 1.046, 1.75]. There was no statistically significant interaction effect of ongoing abuse and childhood abuse on baseline PTSD symptoms (p = .90).

### Acquisition of PTSD symptoms during follow-up (n = 1,008)

Using a multivariate model, excluding depression, to analyze participants who screened negatively for PTSD symptoms at baseline, we found that, women with greater social support were less likely (RR: 0.710; 95% CI: 0.508–0.991) to acquire PTSD symptoms, whereas those who reported food insecurity, ongoing abuse, or binge drinking four or more times per week were statistically significantly more likely to acquire PTSD symptoms (Table

2). When depression was added to the model, social support was no longer negatively associated with PTSD symptom acquisition (RR: 0.850; 95% CI: 0.606–1.193), but depressive symptoms (RR: 4.708; 95% CI: 3.287–6.742), food insecurity (RR: 1.640; 95% CI: 1.157–2.324), binge drinking (RR: 1.88; 95% CI: 1.056–3.37), and ongoing abuse (RR: 1.739; 95% CI: 1.221, 2.476) were. Mediation analysis, however, did not confirm depression as a mediator of social support on PTSD symptom acquisition because social support did not predict depression (RR 0.940; 95% CI 0.845–1.046).

### Remission of PTSD symptoms during follow-up (n = 396)

In multivariate analyses, being depressed (RR: 0.517; 95% CI: 0.401–0.668) and experiencing ongoing abuse (RR: 0.736; 95% CI: 0.566–0.957) were associated with a decreased likelihood of PTSD symptom remission (Table 2). There was a trend for women who had a history of childhood abuse to be less likely to have their symptoms remit than those who did not (RR: 0.791; 95% CI: 0.618–1.012). Those with greater social support were not significantly more likely to experience remission at six months with or without depression in the model.

## Discussion

This study found an extremely high rate of PTSD symptoms among this cohort of women living in areas of high poverty. Nearly a third of women in this study screened positive for active PTSD symptoms at baseline, and 43% screened positive for PTSD symptoms at least once in 12 months. This rate is higher than the rate among post-war veterans and five times as high as the lifetime prevalence in the general population.[36] Within the 12-month follow-up period of this study, 13% of women who began with no PTSD symptoms developed them at some point. These findings highlight not only the prevalence, but also the high level of annual incidence, of PTSD, reflecting the significant impact of ongoing exposure to stress experienced by women living in poverty.

Factors that put an individual at risk of PTSD vary for women compared with men in complex ways. Although women and girls are nearly twofold as likely as men and boys to meet criteria for PTSD, a meta-analysis of PTSD gender differences has shown that this elevation appears to be related to differences in both the types of trauma experienced and the underlying vulnerability to developing PTSD symptoms.[37] In particular, male participants were more likely to report a history of traumatic experiences, while female participants were more likely to report experiencing sexual assault and childhood sexual abuse and less likely to report accidents, nonsexual assault, combat or war, disaster or fire, or witnessing death or injury. In addition, studies have shown that upon experiencing the same type of traumatic exposure, women were still more likely to meet criteria for PTSD and reported greater severity of PTSD than male participants. [23,36,37] These findings suggest that women, in addition to experiencing more sexual trauma such as that identified in this cohort, have increased vulnerability to PTSD, or are more attuned to report such symptoms, compared with men.[38–40] That said, studies have shown that men living in urban areas with a history of childhood abuse, including childhood sexual abuse, can also suffer PTSD symptoms when they are exposed to additional violence as an adult.[41]

Not only do women living in poverty experience extremely high rates of depression, anxiety disorders, and PTSD compared with the general population, these conditions often co-exist with one another.[1–5] Researchers have noted elevated rates of depression and substance abuse among women diagnosed with PTSD.[7] In addition to the stress of having highly constrained financial resources, other factors that occur at disproportionate rates among low-income individuals, such as exposure to personal and neighborhood violence, have been shown to contribute to psychological distress. Studies suggest that the combined negative effects of exposure to personal violence and poverty may act synergistically to impair low-income women's mental health. The environment, responsibilities, lack of opportunities, and personal encounters many low-income women experience on a daily basis conspire to interfere with their opportunities to maintain mental well-being.[42–44] Thus, it was not surprising to note from our study that depression was significantly associated with baseline PTSD symptoms. However, a novel finding from this study is that participants were almost five times as likely to acquire PTSD symptoms and were half as likely to have their PTSD symptoms remit if they reported depression at baseline. While causality cannot be assumed, these findings suggest that treatment of depression might have a role to play in preventing or alleviating PTSD symptoms, and this possibility warrants further study.

Contextualizing women's exposure to characteristic conditions of poverty in order to understand changes in their mental health over time can shed light on the complex interplay of these processes. Untangling these complicated relationships is a first step to developing interventions that consider a realistic view of these women's lives. Consistent with other studies,[2,17,22] we found that, not only were participants who reported ongoing physical, emotional, or sexual abuse more likely to have PTSD symptoms at baseline, but also those with no baseline PTSD symptoms were more likely to acquire PTSD symptoms at six months and those with baseline PTSD symptoms were less likely to remit if they were among the relatively large number who reported ongoing abuse.

While we had expected childhood abuse would be strongly associated both with screening positive for PTSD symptoms at baseline and with increased likelihood of developing new PTSD symptoms over time, it was only strongly associated with baseline levels. These findings suggest that the effects of ongoing violence may override those of past violence in the development of new symptoms. There was an interesting trend, however, toward PTSD symptoms being less likely to remit when they occurred among women who were abused as children, controlling for other factors, including depression. When we explored whether a history of childhood abuse and ongoing abuse interacted with each other synergistically to increase the likelihood of having PTSD, we found no such interaction, suggesting that these two factors acted independently. In a study by Schumm et al.,[45] women who reported both childhood abuse and ongoing sexual abuse had an exponentially higher marginal mean predicted PTSD severity score compared with those having only one or the other.

Study findings are consistent with, but go beyond, studies among the general population that have found that both having a low income[3,22] and living in a low-income neighborhood[4] independently increase risk of PTSD. Even among this sample of low-income women living in low-income neighborhoods, for those participants who screened negatively for PTSD symptoms at baseline, food insecurity was shown to increase the risk of acquiring PTSD

symptoms during the six-month observation period to 1.6 times the risk among women who did not experience food insecurity. This finding supports the assertion that exposure to harsh economic hardship, such as worrying about having enough food, constitutes serious trauma that can be associated with the development of PTSD symptoms,[42,46] highlighting the importance of providers screening for PTSD and food insecurity among low-income women.

Several studies have explored protective factors, such as social support that lend resiliency to women living in stressful, low-income conditions.[18,45,47] In this study, the lack of association of emotional social support with PTSD symptoms acquisition and remission after depression was entered into the model and lack of mediation were surprising because several studies have shown a protective effect of social support in both cross-sectional and longitudinal studies.[18,45,47] Perhaps our measure was not robust enough to capture aspects of social support beyond those that were confounded by depression. It is also possible that social support is protective in certain types of abuse and not others. For example, Schumm et al.[45] found that higher levels of social support predicted lower PTSD severity for women who reported both childhood abuse and adult rape but not for women who reported only one of these traumas. Future studies are needed to explore the mechanism by which social support and other resiliency factors may affect PTSD independent of depression.

These findings are also notable because this cohort was characterized not only by their low incomes, but also by an elevated HIV incidence. The relationships among factors that place women at increased risk of both poor psychological health and poor sexual health are complex. Studies have noted that the high co-occurrence of depression and substance abuse among individuals diagnosed with PTSD, as was seen in this study, are individual risk factors for elevated sexual health risks,[1–5] including HIV acquisition.[7–11] The combination of daily challenges many low-income women experience can hinder their preservation not only of mental well-being, but also of healthy sexual relationships.[42–44] The burden of acquired immune deficiency syndrome (AIDS) in women in the U.S. has grown substantially over the past 30 years, rising from 8% of the first 50,000 newly diagnosed AIDS cases reported to the CDC between 1981–1987 to more than 23% of 46,268 annual cases in 2010.[48,49] An emerging line of evidence indicates that low socioeconomic status is a risk factor for HIV in U.S. populations.[50,51] Neighborhood poverty is associated with higher neighborhood prevalence of HIV and other sexually transmitted infections, less condom use, and partner risk characteristics.[52–57] Symptoms of PTSD are associated with an increased risk of acquiring HIV.[16,17,58] Among the HPTN 064 cohort, we previously documented that, at baseline, 82% of the cohort had unprotected sex at their last sexual encounter, 40% reported concurrent sexual partnerships, 37% had exchanged sex for money in the last six months, and 38% reported anal sex in the last six months (for 80% of these cases, the anal sex was unprotected).[59] Controlling for other factors, women in HPTN 064 who suffered food insecurity and depression at baseline were 1.77 and 1.51 times as likely, respectively, to exchange sex for money, goods, drugs, or shelter than those who were not.[59] Such findings suggest some of the mechanisms by which poverty may place women at increased risk of sexually transmitted infections, such as HIV, indicating the need to consider integration of sexual health and mental health services into care for low-income women suffering from PTSD.

Given the known links between mental health and sexual health among low-income women, it is critical that professionals working with women who are living with or at risk of HIV have knowledge about PTSD and its symptoms and develop a traumainformed approach to HIV care.[42] In addition, centers providing care to women with HIV must have access to a workforce of mental health service providers capable of providing trauma-focused services to this low-income population. These findings highlight the need for a call to action for structural changes to agencies that are focused on providing sexual health services to a population with substantial mental health needs.

The study has several strengths. It is one of the few large, multisite, longitudinal studies that has assessed PTSD symptoms and other relevant factors over time in a cohort of women at risk of HIV from diverse low-income communities. Retention of the cohort was excellent.[9,60] Moreover, those without six or 12 month data were generally similar to those included in the sample. Study limitations include follow-up of only 12 months. Another limitation is that, because the primary aim for the parent study was to assess HIV incidence, we relied on a relatively short clinical screening tool to assess PTSD rather than a full clinical evaluation or longer instrument. The PTSD-PC we used, however, was well-validated in two studies and demonstrated very good operating characteristics relative to a gold standard.[6,29–32] The possibility of recall or social desirability biases due to the sensitive nature of some of the questions also exists. We minimized these effects by utilizing ACASI interviews. In addition, because all women enrolled in HPTN 064 were living in areas of high poverty by design, we were unable to explore the independent effect of neighborhood poverty on stress symptoms.

In summary, the findings from this study point to the multiple chronic stressors that women living in low-income neighborhoods who are at increased risk of HIV experience. Such stressors include high rates of exposure to childhood abuse; ongoing physical, emotional and sexual abuse; depression; and economic hardship, all of which lead to development and persistence of PTSD symptoms.[2,7,12,22,23,40,61,62] These findings also add to our understanding of how such factors do or do not interact with each other to influence PTSD symptoms over time. Such symptoms, which are known to reduce functioning, may further the difficulty women face in trying to take steps to improve their living conditions and maintain their mental and sexual health. These findings demonstrate that interventions and policies that are based in an understanding of the complex interplay of forces that contribute to the well-being of women living in low-income neighborhoods are called for to reduce exposure to poverty-related trauma. In addition, trauma-focused services in agencies where such women may also be seeking care and treatment for sexually transmitted infections, including HIV, are needed.

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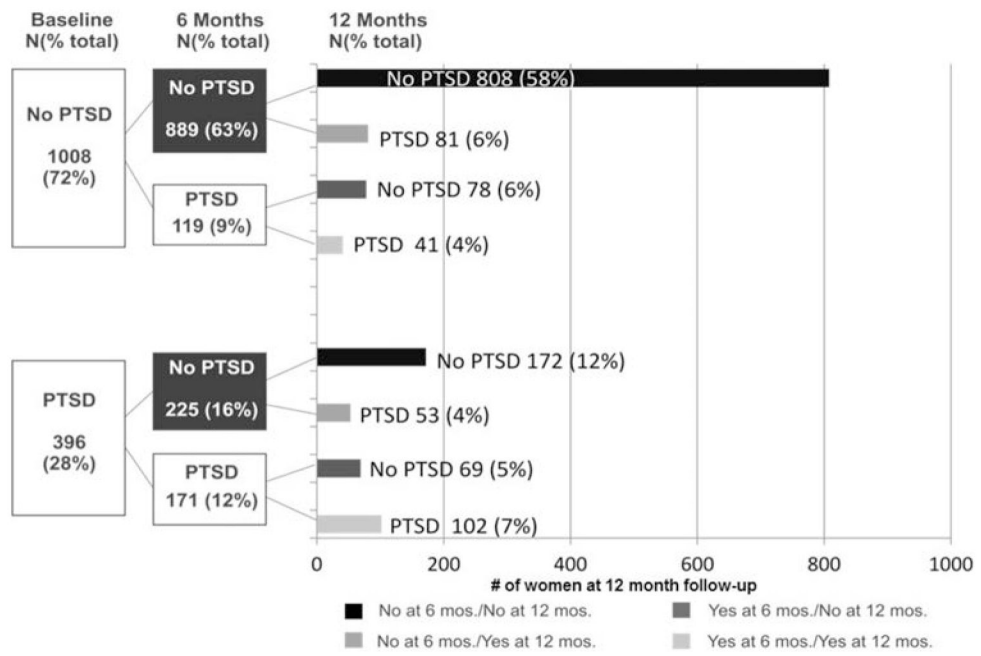
**Figure 1.**
Proportion of individuals in each of 8 PTSD change trajectories over 12 months (N=1404).

**Table 1**

SUMMARY OF DEMOGRAPHIC, CLINICAL, AND PSYCHOSOCIAL CHARACTERISTICS OF HPTN 064 PARTICIPANTS INCLUDED IN STUDY

| Variables | Baseline (N = 1860) Frequency (%) | Month 6 (N=1860) Frequency (%) |
|---|---|---|
| *Independent Variables* | | |
| **DEMOGRAPHIC** | | |
| Age | | |
| 18–26 | 758 (41%) | — |
| 27–33 | 441 (24%) | — |
| 34 + | 661 (36%) | — |
| Education <High School | 677 (36%) | — |
| Household Income (Annual) | | |
| Refused to answer/ Don't know/Missing | 638 (34%) | — |
| >$10k | 387 (21%) | — |
| <=$10k | 835 (45%) | — |
| Being Employed \ in the past 12 months | 670 (36%) | — |
| Being Single | 1014 (55%) | — |
| Number of Children Responsible For Financially | | |
| Missing | 278 (15%) | — |
| 0 | 550 (30%) | — |
| 1 | 438 (24%) | — |
| >=2 | 594 (32%) | — |
| Concerned about Having Enough Food | 864 (46%) | 726 (39%) |
| **CLINICAL** | | |
| General Health Status (excellent/ very good/ good) | 1562 (84%) | 1562 (84%) |
| Forgone Medical Care | 359 (19%) | 279 (15%) |
| **PSYCHOSOCIAL** | | |
| Any Weekly Substance Use (excluding alcohol and marijuana) | 386 (21%) | 268 (14%) |
| Binge Drinking | | |
| Monthly/less than monthly/never | 1413 (76%) | 1574 (85%) |
| 2–3 times per week | 283 (15%) | 207 (11%) |
| 4 or more times a week | 155 (8%) | 72 (4%) |
| Childhood Abuse | 839 (45%) | 748 (40%) |
| Social Support (emotional) | | |
| <3 friends to help deal with feelings or emotional problems | 767 (41%) | 803 (43%) |
| Do not know/ not sure | 138 (7%) | 142 (8%) |
| >=3 friends to help deal with feelings or emotional problems | 955 (51%) | 912 (49%) |
| Social Support (financial) | | |
| <3 friends to help financially | 1103 (59%) | 1111 (60%) |
| Do not know/ not sure | 152 (8%) | 138 (7%) |
| >=3 to help financially | 596 (32%) | 602 (32%) |
| Ongoing Physical, Emotional or Sexual Abuse | 706 (38%) | 534 (29%) |

| Variables | Baseline (N = 1860) Frequency (%) | Month 6 (N=1860) Frequency (%) |
|---|:---:|:---:|
| CESD score | | |
| NA | 107 (6%) | 106 (6%) |
| Less than 7 | 1130 (61%) | 1232 (66%) |
| Greater than or equal to 7 | 623 (33%) | 522 (28%) |
| Exchange Sex in Past 6 Months | 671 (36%) | 522 (28%) |
| Any Male Sex Partners in last 6 Months | 1084 (58%) | 775 (42%) |
| Unprotected Anal or Vaginal Sex in Last 6 Months | 1586 (85%) | 1212 (65%) |
| *Dependent Variable* | | |
| PTSD Positive | 533 (29%) | 392 (21%) |

**Table 2**

MULTIVARIATE PREDICTORS OF ACQUISITION AND REMISSION OF PTSD SYMPTOMS

| Independent Variables | PTSD Acquisition N =1008[a] | | | | PTSD Remission N = 396[b] | | | |
|---|---|---|---|---|---|---|---|---|
| | RR [95% CI] | p-value | RR [95% CI] | p-value | RR [95% CI] | p-value | RR [95% CI] | p-value |
| **Social Support** | **.710 [.508, .991]** | **.0443** | .850 [.606, 1.193] | .3472 | 1.207 [.947, 1.537] | .1279 | 1.077 [.836, 1.387] | .5648 |
| **Depression** | — | — | **4.708 [3.287, 6.742]** | **<.0001** | — | — | **.517 [.401, .668]** | **<.0001** |
| **Food Insecurity** | **2.046 [1.459, 2.869]** | **<.0001** | **1.640 [1.157, 2.324]** | **.0055** | — | — | — | — |
| **Binge Drinking** (ref monthly) | | | | | | | | |
| 2–3 times per week | 1.079 [.656, 1.774] | .7657 | 1.131 [.687, 1.863] | .6275 | — | — | — | — |
| **4 times a week** | **2.706 [1.522, 4.809]** | **.0007** | **1.887 [1.056, 3.37]** | **.0319** | — | — | — | — |
| **Ongoing Abuse** | **2.568 [1.838, 3.588]** | **<.0001** | **1.739 [1.221, 2.476]** | **.0022** | **.634 [.493, .814]** | **.0004** | **.736 [.566, .957]** | **.0224** |
| **Childhood Abuse** | — | — | — | — | .835 [.657, 1.062] | .1412 | .791 [.618, 1.012] | .0627 |

[a] Among those screening negative for PTSD symptoms at baseline.

[b] Among those screening positive for PTSD symptoms at baseline.