

# Psychological Trauma and PTSD in HIV-Positive Women: A Meta-Analysis

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Published online: 17 January 2012  
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**Abstract** Women bear an increasing burden of the HIV epidemic and face high rates of morbidity and mortality. Trauma has been increasingly associated with the high prevalence and poor outcomes of HIV in this population. This meta-analysis estimates rates of psychological trauma and posttraumatic stress disorder (PTSD) in HIV-positive women from the United States. We reviewed 9,552 articles, of which 29 met our inclusion criteria, resulting in a sample of 5,930 individuals. The findings demonstrate highly disproportionate rates of trauma exposure and recent PTSD in HIV-positive women compared to the general population of women. For example, the estimated rate of recent PTSD among HIV-positive women is 30.0% (95% CI 18.8–42.7%), which is over five-times the rate of recent PTSD reported in a national sample of women. The estimated rate of intimate partner violence is 55.3% (95% CI 36.1–73.8%), which is more than twice the national rate.

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**Electronic supplementary material** The online version of this article (doi:10.1007/s10461-011-0127-4) contains supplementary material, which is available to authorized users.

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Studies of trauma-prevention and trauma-recovery interventions in this population are greatly needed.

**Keywords** HIV/AIDS · Women · Trauma · PTSD  
Meta-analysis

**Resumen** Las mujeres enfrentan un incremento en la epidemia de VIH y altos índices de morbilidad y mortalidad. El trauma psicológico ha sido cada vez más asociado con la alta prevalencia y los resultados pobres de VIH en esta población. El presente metaanálisis estima la tasa de trauma y Trastorno por Estrés Postraumático (TPEP) en mujeres estadounidenses. Fueron revisados 9,552 artículos de los cuales 29 cumplieron los criterios, resultando en una muestra total de 5,930 individuos. Los resultados demuestran una tasa desproporcionalmente alta de exposición a trauma y reciente TPEP en mujeres VIH positivas en comparación con la población general de mujeres estadounidenses. La tasa estimada de reciente TPEP entre mujeres VIH positivas es 30.0% (95% IC 18.8–42.7%), lo cual es cinco veces la tasa de reciente TPEP reportada en una muestra nacional de mujeres. La tasa estimada de violencia del compañero íntimo (VCI) es 55.3% (95% IC 36.1–73.8%), lo cual es más del doble de la tasa nacional. Estudios de prevención de trauma e intervenciones de recuperación de trauma en esta población son enormemente necesitados.

## Introduction

Women bear a steadily increasing burden of the HIV epidemic. In the United States (US), women account for at least 27% of all new HIV/AIDS diagnoses, up from 8% in 1985 and 14% in 1992 [1–3]. Women of color bear the

lion's share of this burden; Black and Hispanic women now represent more than three-quarters (77%) of women recently diagnosed with HIV/AIDS [3].

Despite the availability of effective antiretroviral therapy (ART), women face surprisingly high rates of HIV-related morbidity and mortality [1, 4, 5]. HIV/AIDS is now the leading cause of death for US Black women aged 25–34 [1]. Numerous calls have been made to identify and respond to factors associated with the high prevalence and poor outcomes of HIV in women [6–8].

Trauma is increasingly recognized as an important factor associated with the rising prevalence and poor outcomes of HIV in women [9–11]. HIV-positive women are affected by high rates of sexual and physical trauma in both childhood and adulthood, as well as by posttraumatic stress disorder (PTSD) [12–40]. Trauma and PTSD are well known to predispose women to becoming infected with HIV [11, 16, 17, 41–43]. Once infected, women exposed to trauma and those who go on to develop PTSD have poorer health outcomes [44–49] and higher transmission risk behaviors [12, 15, 16, 25, 27, 50, 51].

Although prior studies [12–40] have documented high rates of different types of psychologically traumatizing experiences and PTSD in HIV-positive women, the rates reported by individual studies often vary, even for a specific type of trauma. For example, the reported rates of intimate partner violence (IPV) among US HIV-positive women range from 10 to 100% [25, 26] and the reported rates of recent PTSD range from 15 to 53% [23, 37]. Many studies cannot be generalized to the larger HIV-positive female population in the US because of the use of convenience samples or site-specific recruitment methods (e.g., prisons, drug treatment programs).

The purpose of this study is to employ meta-analytic technique to clarify rates of trauma exposure and PTSD in HIV-positive women and, where possible, to compare these rates to those in the general population of US women. To the authors' knowledge, this is the first time that a meta-analysis has addressed this question.

## Methods

### Search Strategy

Four computerized databases (PubMed, Cochrane Reviews, EMBASE, and PsycINFO) were systematically searched for citations in the date range from March 1, 1990 through December 31, 2009. Search algorithms were customized to the terminology of each database. A wide range of key words was used to reflect the variations in trauma-related terminology over time. Search terminology, algorithms, and counts of articles identified can be found in the

electronic supplementary material (Supplementary material 1).

### Inclusion Criteria

Articles were included for the meta-analysis if they met all of the following five criteria: (1) published in English in a peer-reviewed journal; (2) included adult participants from the US, a Western European country, Scandinavia, Australia, or New Zealand; (3) included at least some study participants who were female and diagnosed as HIV-positive; (4) reported data separately for HIV-positive women if the study included men or HIV-negative participants; and (5) examined current or past exposure to at least one type of traumatic stressor that met *Criterion A* of the DSM-IV diagnostic criteria for PTSD [52] or examined PTSD but did not specify the traumatic event. In brief, *Criterion A* is defined by an exposure to an extreme traumatic stressor that is associated with intense fear, helplessness, or horror (e.g., actual or threatened death or serious harm to one's physical integrity or witnessing an event that involves death, injury, or a threat to the physical integrity of another person). We chose to limit our inclusion criteria geographically in an effort to limit the heterogeneity in definitions, measurements, and experiences of trauma exposure and PTSD.

### Exclusion Criteria

Articles were excluded for the following reasons: (1) the event was a "non-traumatic" stressor such as losing a job, or having financial, relationship, or health problems; (2) the focus of the study was on the psychological impact of war, genocide, injury, or natural disaster; (3) the article was a case report, letter, review of the literature, or doctoral dissertation; (4) traumatic exposure or PTSD was a criterion for being included in the sample and resulted in 100% prevalence; or (5) the study examined a traumatic event that is clearly a constituent of a broader type of traumatic event (e.g., rape being one of several types of sexual abuse). Because we could not include unlimited categories for every specific type of trauma, the rationale for this last exclusion criterion was to avoid underestimating the broad categories of trauma. Studies were *not excluded* if they imposed regional, socio-economic, or health criteria for participating. However, these differences between studies were abstracted and listed in the table of included studies (Table 1).

Articles were reviewed closely to ensure that the same data published in more than one article would be included only once. In the situation of multiple reports of the same data set, data was included from the study with the earliest published date.

**Table 1** Included studies

Primary author	Year	HIV+ women (N)	Measures	Key characteristics	Prevalence	
					(n)	(%)
<b>Recent PTSD</b>						
Martinez [30]	2002	41	PCL-C	County HIV outpatient clinics	17	42
Katz [23]	2005	102	PCL-C, THQ	New York City	15	15
Murphy [31]	1999	40	DIS-IV	Midwestern children's hospital; mothers	9	22
Pence [33]	2007	191	PCL	ID clinics in southeastern states	35	18
Smith [37]	2002	58	PCL-C	New York City; patients with chronic pain	31	53
Kimerling [24]	1999	67	IES-Revised, LSC	New Orleans; African American	24	35
<b>Lifetime PTSD</b>						
Lewis [27]	2005	81	SCID-P, SCID II, CAPS	Niantic, CT; incarcerated	60	74
<b>Intimate partner violence</b>						
Henny [21]	2007	193	UNPUB-INT, 8 dichotomous items, 1 per type of trauma	Baltimore, Chicago, L.A.; homeless or near-homeless	120	62
Lang [25]	2007	304	UNPUB-INT, 2 dichotomous items	Georgia and Alabama; sexually active within 6 months	31	10
Cohen [16]	2000	1288	UNPUB-INT, 7 dichotomous items	WIHS study; 6 urban clinical cohorts	850	66
Gielen [19]	2002	188	CTS2	Baltimore, Maryland; in intimate relationship	79	42
Leenerts [26]	1999	12	UNPUB-interviews, observation, notes, etc.	Large western city; Caucasian	12	100
Liebschutz [28]	2000	50	UNPUB-INT, 2 dichotomous items; medical record review	Boston, Mass and Providence, Rhode Island	34	68
Sareen [34]	2009	30	Abbreviated CTS	National survey; romantic relationship within year	8	27
Simoni [35]	2000	220	UNPUB-INT, 4 items on 1–7 scale	New York City	150	68
<b>Adult sexual abuse</b>						
Bedimo [12]	1997	238	UNPUB-INT, 1 dichotomous item	Outpatient clinic in New Orleans; childbearing age	76	32
Gielen [18]	2000	257	Adapted CTS2, 5 dichotomous items	Baltimore, Maryland	69	27
Henny [21]	2007	193	UNPUB-INT, 8 dichotomous items, 1 per type of trauma	Baltimore, Chicago, L.A.; homeless or near-homeless	89	46
Kalichman [22]	2002	115	Adapted SES, 3 dichotomous items	None specified	59	51
Lang [25]	2007	304	UNPUB-INT, 2 dichotomous items	Georgia and Alabama; sexually active within 6 months	4	1
Myers [32]	2006	147	UNPUB-INT, 2 dichotomous items	Los Angeles	73	49
Simoni [35]	2000	220	UNPUB-SR	New York City	101	46
Vlahov [39]	1998	763	UNPUB-INT	Maryland, New York, Rhode Island, Michigan	350	46
<b>Adult physical abuse</b>						
Burke [14]	2005	310	UNPUB-INT, 2 dichotomous items	Baltimore; low income	191	62
Henny [21]	2007	193	UNPUB-INT, 8 dichotomous items, 1 per type of trauma	Baltimore, Chicago, L.A.; homeless or near-homeless	142	74
Lang [25]	2007	304	UNPUB-INT, 2 dichotomous items	Georgia and Alabama; sexually active within 6 months	30	10
Simoni [35]	2000	220	UNPUB-SR	New York City	139	63
Vlahov [39]	1998	764	UNPUB-INT	Maryland, New York, Rhode Island, Michigan	508	66
<b>Adult abuse (unspecified)</b>						
Gielen [18]	2000	257	Adapted CTS2, 5 dichotomous items	Baltimore, Maryland	159	62
Sowell [38]	2002	275	UNPUB-INT, 6 items	Georgia, North Carolina, South Carolina	187	68

**Table 1** continued

Primary author	Year	HIV+ women ( <i>N</i> )	Measures	Key characteristics	Prevalence	
					( <i>n</i> )	(%)
<b>Childhood sexual abuse</b>						
Chuang [15]	2006	73	UNPUB-INT, 2 dichotomous items	Boston; history of alcohol abuse	28	39
Cohen [16]	2000	1288	UNPUB-INT, 7 dichotomous items	WIHS study: 6 urban clinical cohorts	399	31
Gielen [20]	2001	287	UNPUB-INT, 1 dichotomous item	Baltimore	118	41
Henny [21]	2007	193	UNPUB-INT, 8 dichotomous items, 1 per type of trauma	Baltimore, Chicago, L.A.; homeless or near-homeless	100	52
Pence [33]	2007	191	UNPUB-INT	ID clinics in southeastern states	66	35
Simoni [35]	2000	220	UNPUB-SR	New York City	84	38
Vlahov [39]	1998	761	UNPUB-INT	Maryland, New York, Rhode Island, Michigan	314	41
<b>Childhood physical abuse</b>						
Brady [13]	2002	100	UNPUB-CHART REVIEW, progress notes	Urban area in Northeast; HMO	66	66
Henny [21]	2007	193	UNPUB-INT, 8 dichotomous items, 1 per type of trauma	Baltimore, Chicago, L.A.; homeless or near-homeless	110	57
Kalichman [22]	2002	115	Adapted SES, 3 dichotomous items	None specified	38	34
Pence [33]	2007	191	UNPUB-INT	ID clinics in southeastern states	36	19
Simoni [35]	2000	220	UNPUB-SR	New York City	95	43
Vlahov [39]	1998	763	UNPUB-INT	Maryland, New York, Rhode Island, Michigan	316	41
<b>Childhood abuse (unspecified)</b>						
Simoni [35]	2000	220	UNPUB-SR	New York City	110	50
Leenerts [26]	1999	12	UNPUB-INT, observation, notes, etc.	Large western city; Caucasian	9	75
<b>Lifetime sexual abuse</b>						
Brady [13]	2002	100	UNPUB-CHART REVIEW, progress notes	Urban area in Northeast; HMO	95	95
Chuang [15]	2006	73	UNPUB-INT, 2 dichotomous items	Boston; history of alcohol abuse	53	73
El-Bassel [17]	2001	15	UNPUB-INT, 2 dichotomous items, 2 items on 0–7 scale	New York; sex workers	3	18
Henny [21]	2007	193	UNPUB-INT, 8 dichotomous items, 1 per type of trauma	Baltimore, Chicago, L.A.; homeless or near-homeless	127	66
Kalichman [22]	2002	115	Adapted SES, 3 dichotomous items	None specified	78	68
Sowell [38]	2002	275	UNPUB-INT, 6 items	Georgia, North Carolina, South Carolina	143	52
Simoni [36]	2002	222	UNPUB-INT, 4 items on 1–7 scale	New York City	129	58
Whetten [40]	2006	189	UNPUB-INT	ID clinics in southeastern states	72	38
<b>Lifetime physical abuse</b>						
Brady [13]	2002	100	UNPUB-CHART REVIEW, progress notes	Urban area in Northeast; HMO	83	83
Chuang [15]	2006	73	UNPUB-INT, 2 dichotomous items	Boston; history of alcohol abuse	64	88
El-Bassel [17]	2001	15	UNPUB-INT, 2 dichotomous items, 2 items on 0–7 scale	New York; sex workers	5	32
Henny [21]	2007	193	UNPUB-INT, 8 dichotomous items, 1 per type of trauma	Baltimore, Chicago, L.A.; homeless or near-homeless	156	81
Sowell [38]	2002	275	UNPUB-INT, 6 items	Georgia, North Carolina, South Carolina	162	59
Simoni [36]	2002	222	UNPUB-INT, 4 items on 1–7 scale	New York City	155	70
<b>Lifetime abuse (unspecified)</b>						
El-Bassel [17]	2001	15	UNPUB-INT, 2 dichotomous items, 2 items on 0–7 scale	New York; sex workers	4	27
Gielen [20]	2001	287	UNPUB-INT, 4 dichotomous items	Baltimore City	180	63
Henny [21]	2007	193	UNPUB-INT, 8 dichotomous items, 1 per type of trauma	Baltimore, Chicago, L.A.; homeless or near-homeless	166	87
Liebschutz [29]	2005	73	UNPUB-INT, 3 dichotomous items	Boston; history of alcohol abuse	64	88

**Table 1** continued

Primary author	Year	HIV+ women (N)	Measures	Key characteristics	Prevalence	
					(n)	(%)
Sowell [38]	2002	275	UNPUB-INT, 6 items	Georgia, North Carolina, South Carolina	187	68
Simoni [36]	2002	222	UNPUB-INT, 4 items on 1–7 scale	New York City	167	75

*PCL-C* Posttraumatic Stress Disorder Checklist-Civilian Version, *THQ* Trauma History Questionnaire, *DIS-IV* Diagnostic Interview Schedule for DSM-IV diagnoses, *PCL* Posttraumatic Stress Disorder Checklist, *IES-Revised* Impact of Event Scale-Revised, *LSC* Life Stressor Checklist, *SCID-P* Structured Clinical Interview for Diagnosis for DSM-IV, *SCID II* Structured Clinical Interview for Diagnosis for DSM-IV-TR Personality Disorders, *CAPS* Clinician Administered Post-traumatic Stress Scale, *CTS2* Revised Conflict Tactics Scales, *CTS* Conflict Tactics Scales, *SES* Sexual Experiences Survey, *UNPUB-INT* Unpublished interview

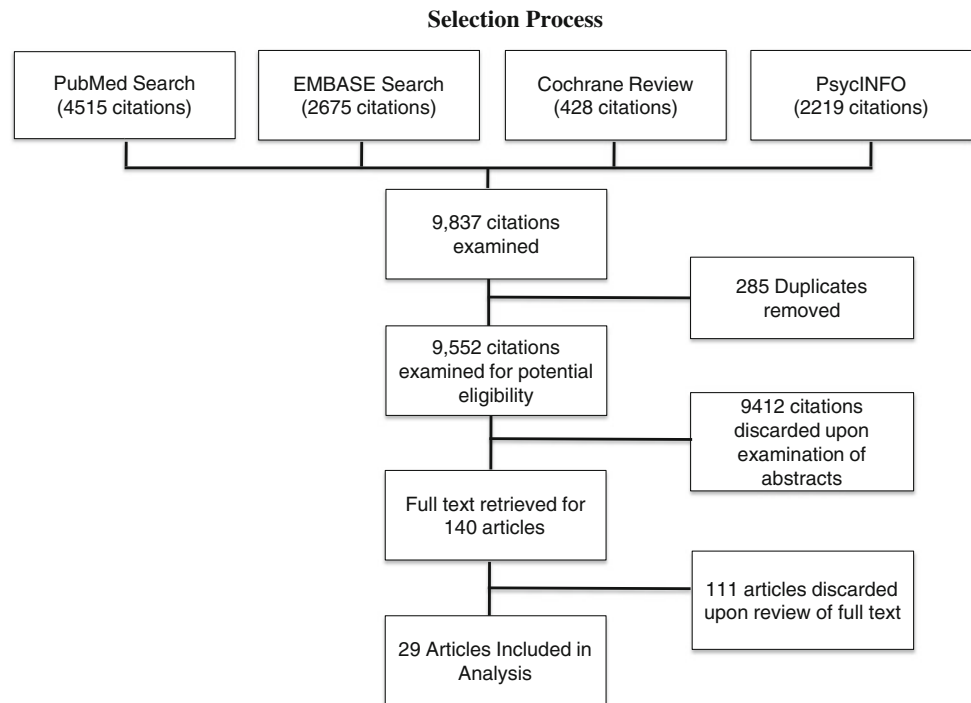
**Fig. 1** Selection process

Figure 1 depicts the article selection process. The primary search of the literature was designed to maximize sensitivity to identify all potentially eligible articles. The primary search of four databases returned 9,837 citations; 285 duplicates were removed. In the secondary screen, the titles, abstracts, and keywords of the remaining 9,552 articles were evaluated against the inclusion and exclusion criteria. This secondary screen excluded the vast majority of the articles and left 140 remaining. In the tertiary screen, the full text of each remaining article was reviewed against criteria, and 111 of the 140 articles did not qualify. Table 2 describes the reasons for exclusion in the tertiary screen. The remaining 29 articles were included in the analysis [12–40] resulting in a sample of 5,930 individuals.

#### Data Abstraction

The 29 articles included in the final analysis were coded for date of publication, sample size, method of measurement,

other key study characteristics (e.g., study location, patient demographics), type of trauma exposure, time-frame of trauma exposure, rate of exposure, and for those with PTSD as the outcome, the time-frame and rate of PTSD identified. To reduce the possibility of error, the data were abstracted by one author (TW) and subsequently confirmed in detail by a research assistant.

#### Categorization

We utilized categories of trauma exposure and PTSD that most specifically captured the categories used by the included studies. For trauma exposure, two variables were used for categorization. The first was stage of life at which trauma exposure occurred: (a) childhood, (b) adulthood, and (c) unspecified. The second variable was type of trauma exposure. Combining the first and second variables resulted in 10 categories: IPV, childhood sexual abuse (CSA), childhood physical abuse (CPA), childhood abuse

**Table 2** Exclusion of articles in tertiary screen

Reason for exclusion	Number of studies
Data for HIV-positive women not reported separately from HIV-positive men	32
Article did not fulfill criteria for types of included studies (e.g., not peer-reviewed, literature review, case report, letter to editor)	29
Study measured non-traumatic event (e.g., stress)	17
Data for HIV-positive women not reported separately from HIV-negative women	12
Data from study was not amenable to pooling (e.g., qualitative data)	12
Inclusion criteria for participation in study required history of trauma or PTSD	4
Sample included adolescents	3
Data reported previously and already included in analysis	1
Location of study	1
Total number of studies excluded	111

(unspecified), adult sexual abuse, adult physical abuse, adult abuse (unspecified), lifetime sexual abuse, lifetime physical abuse, lifetime abuse (unspecified). We used the term “unspecified” when studies reported abuse (childhood, adulthood, or lifetime) but: (1) did not describe the specific type of abuse (physical or sexual) or, (2) included types of abuse that did not fit into sexual or physical abuse (e.g., neglect). For PTSD, we utilized two categories: recent (within 1 year) and lifetime. Studies which reported data as intimate partner violence, domestic violence, or gender-based violence were included in the IPV category because of significant overlap in the interpretation of the meanings of these terms in the included studies. We included all studies of IPV among HIV-positive women in a single category despite the wide variability of time frames used by individual studies. There was also considerable heterogeneity among the included studies in the age used to differentiate childhood versus adulthood abuses. Because rates were reported in aggregate and not reported separately for each specific age, we were unable to establish a uniform definition of childhood and adulthood and instead relied on the definition used by each of the studies.

### Statistical Methods

To calculate pooled prevalence rates for each category of trauma and PTSD, we initially explored using a fixed-effects model with inverse variance weighting. However, substantial heterogeneity among the studies was found, as indicated by a large Cochran Q statistic. Following accepted evidence-based protocols for meta-analytic technique involving studies with substantial heterogeneity [53], we employed a random-effects model (Dersimonian–Laird) to calculate pooled prevalence rates [54]. Studies were not given additional or diminished statistical weight based on their methodologies or other perceived qualities. The

random-effects analysis (DerSimonian–Laird) was conducted in StatsDirect v2.7.8.

For PTSD, only data for recent PTSD was amenable to meta-analytic technique because we found only a single study reporting rates of lifetime PTSD in HIV-positive women that met our inclusion criteria. National prevalence rates in the general population of US women were included for comparison, if such rates were available.

To assess for publication bias, all categories of trauma exposure and PTSD were analyzed using Begg and Mazumdar’s test [55].

### Results

The results of the meta-analysis are presented in Table 3. The estimated rate of recent PTSD in HIV-positive women is 30.0% (95% confidence interval [CI] 18.8–42.7%). This estimate is over five times the rate of recent PTSD reported in a national prevalence sample of women [56, 57]. The rate of lifetime PTSD in one study is reported to be 74%. While this rate is much higher than 9.7% reported in a national sample of women [57, 58], a single study is not amenable to meta-analytic technique. The estimated rate of IPV among HIV-positive women is 55.3% (95% CI 36.1–73.8%). This estimate is more than twice the national prevalence rate of IPV in women [59].

Estimated rates of adult sexual abuse and adult physical abuse are 35.2% (95% CI 20.1–51.4%) and 53.9% (95% CI 30.2–76.8%), respectively. The estimated rate of adult abuse (unspecified type) is 65.0% (95% CI 58.9–70.8%). National prevalence rates in the general population of women for these three types of abuse are not available for comparison.

The estimated prevalence of CSA and CPA are 39.3% (95% CI 33.9–44.8%) and 42.7% (95% CI 31.5–54.4%),

**Table 3** Meta-analytic prevalence rates of traumatic events and PTSD in HIV-positive women

Categories	Number of studies	Pooled <i>n</i>	Prevalence <sup>a</sup> (%)	95% confidence interval	Reference prevalence <sup>b</sup> (%)
Recent PTSD	6	499	30.0	18.8–42.7	5.2
Intimate partner violence	8	2285	55.3	36.1–73.8	24.8
Adult sexual abuse	8	2237	35.2	20.1–51.4	– <sup>c</sup>
Adult physical abuse	5	1791	53.9	30.2–76.8	– <sup>c</sup>
Adult abuse unspecified	2	532	65.0	58.9–70.8	– <sup>c</sup>
Childhood sexual abuse	7	3013	39.3	33.9–44.8	16.2
Childhood physical abuse	6	1582	42.7	31.5–54.4	22.9
Childhood abuse unspecified	2	232	58.2	36.0–78.8	31.9
Lifetime sexual abuse	8	1182	61.1	47.7–73.8	12.0
Lifetime physical abuse	6	878	72.1	60.1–82.1	– <sup>c</sup>
Lifetime abuse unspecified	6	1065	71.6	61.0–81.1	39.0

<sup>a</sup> Pooled prevalence from random-effects model (DerSimonian-Laird)

<sup>b</sup> National samples of US women (citations in text)

<sup>c</sup> Data from a national sample not available or national samples report conflicting rates

respectively. Both of these estimates are approximately twice those documented in a national prevalence sample of women [60]. The estimated rate of childhood abuse (unspecified type) among HIV-positive women is 58.2% (95% CI 36.0–78.8%), compared to 31.9% prevalence in a national sample [60].

The estimated rate of lifetime sexual abuse is 61.1% (95% CI 47.7–73.8%); this estimate is five times the national prevalence in women [61]. The estimated rate of lifetime physical abuse is 72.1% (95% CI 60.1–82.1%). The estimated rate of lifetime abuse (unspecified type) is 71.6% (95% CI 61.0–81.1%), compared to 39% in a national sample [61].

No category of PTSD or trauma exposure yielded significance for publication bias using Begg and Mazumdar's test. Of note, two categories (unspecified adult abuse and unspecified childhood abuse) contained too few studies to conduct the Begg and Mazumdar's test for publication bias. Forest plots of estimated prevalence rates of trauma exposure and recent PTSD can be found in electronic supplemental material (Supplementary material 2).

## Discussion

Using meta-analytic technique to estimate rates of exposure to traumatic events and recent PTSD in HIV-positive women, we observed very high rates of all categories of trauma exposure and PTSD. Where data exist that allow comparison to nationally representative samples of US women, the estimated rates of the various categories of trauma exposure and recent PTSD in HIV-positive women are mostly between two and five-fold higher.

The implications of these findings are highly significant. HIV/AIDS has increasingly become a health crisis for women, especially among women of color. These results estimating disproportionately high rates of trauma and PTSD support and inform longtime calls for studies of trauma-prevention and trauma-recovery interventions to reduce the high incidence and poor outcomes of HIV among women [9, 10, 24, 35, 62, 63]. Relatively few such interventions have been reported in the literature among HIV-positive women [64], or women at high risk for HIV [65, 66] and more are urgently needed.

The study conclusions have a number of limitations primarily based on the nature of the literature we utilized. First, we found considerable variation in the methods used to measure trauma exposure and PTSD in the set of 29 studies. Methods to assess trauma exposure ranged from asking study participants a single non-validated dichotomous question to employing validated inventories in the setting of diagnostic interviews conducted by trained and calibrated clinicians. The majority of included studies, however, utilized unpublished, non-validated, methods to measure trauma exposure. The methods for diagnosing PTSD in the included studies were similarly variable. One study used the gold standard in the field, the Clinician Administered Post-traumatic Stress Scale for DSM-IV (CAPS), which is a comprehensive structured interview conducted by experienced clinicians that assesses the frequency and intensity of core and associated symptoms of PTSD [67]. Others used self-report instruments that all measure symptom level but vary with respect to their ability to map to the DSM diagnostic criteria. For example, the Impact of Event Scale Revised (IES-R) was designed not to be a proxy for a PTSD diagnosis, but instead to

measure the amount of distress from PTSD symptoms over the previous week [68]. The PTSD Checklist-Civilian Version (PCL-C) is a 17-item self-report of PTSD-related symptoms [69] that does map to the 17 DSM symptoms. The PCL-C was the most common method for indexing a diagnosis of PTSD in the included studies, but it too is not formally diagnostic. In the included studies that utilized this measure, a variety of cut-off scores were utilized because there is no single validated cut-off value. The use of symptom-based assessments in the included studies has the potential to overestimate rates of PTSD. The variability in measurement of both trauma exposure and PTSD is a limitation inherent in the current literature and is not limited to this set of studies.

Second, there is a degree of heterogeneity among the rates of trauma and PTSD found in the included studies that may be partially attributed to each study's unique characteristics. These characteristics included geographic location, race, substance abuse, sexual activity, homelessness, incarceration, motherhood, and participation in a study cohort. Because many of these characteristics may be correlated with trauma exposure and/or PTSD [70, 71], our analysis may overestimate rates of trauma exposure and PTSD among HIV-positive women. However, the possibility or degree of this overestimation is limited because these same characteristics are well-known to be associated with HIV in women. While these characteristics were abstracted and noted in Table 1, we did not formally analyze them as moderating variables. Doing so calls for a different study in which the design acknowledges that many of these characteristics are correlated and whose purpose is to tease out the complex mechanisms by which trauma and PTSD are associated with HIV. Nonetheless, the lack of consistent inclusion criteria across the included studies, or inclusion criteria that ensure a representative sample of HIV-positive women, may affect the generalizability of our results to all sub-populations of HIV-positive women.

Third, there was heterogeneity in the definitions for specific categories of psychological trauma among the included studies. To accommodate these multiple definitions, we included 10 categories of trauma and only included data if it clearly fit into one of these categories. This heterogeneity is an acknowledged limitation of the comparisons made between rates found in this study to those documented in national samples of US women.

Fourth, the time frame for IPV varied among the included studies, ranging from “in the previous three-months” to “ever”. However, the great majority of included participants in this category reported IPV “as an adult” or “ever”. The data we cite for comparison rates of IPV in the general population of women used “ever” for the timeframe of IPV. As such, if bias exists due to the variability of time frames for IPV in the included studies, our estimate of the rate of

IPV among HIV-positive women would likely be an underestimation when compared to the rates among the general population of women.

Lastly, our data could be affected by publication bias. Specifically, concern exists for the “file drawer effect” in which studies that identify trauma rates in the range of, or lower than, the prevalence in the general population of women are not published. In our study, however, no category of PTSD or trauma exposure yielded significance for publication bias using the Begg and Mazumdar's test, implying that it is unlikely that such bias substantially affects our results.

## Conclusion

Effectively addressing trauma and PTSD may be an opportunity to make a transformational impact on the HIV epidemic. Given the high rates and known consequences of trauma and PTSD in HIV-positive women, screening and referrals for recent and past trauma and PTSD should be considered a core component of HIV treatment in this population, along with medication adherence, CD4 counts, and viral loads. Additional studies of trauma-prevention and trauma-recovery interventions in HIV-positive and at-risk women are greatly needed.

**Acknowledgements** The authors extend special thanks to the following colleagues who contributed meaningfully to this manuscript: Alan Bostrom, Ph.D., Jennifer Cocohoba, Pharm.D, Susannah Empson, Tulia Gonzales-Flores, Starr Hilliard, Michael Kohn, MD, Vanessa Pascoe, and Gloria Won.

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