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## Incidence of Violence Against HIV-Infected and Uninfected Women: Findings from the HIV Epidemiology Research (HER) Study

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**ABSTRACT** *The effect of human immunodeficiency virus (HIV) infection on the incidence of violence against women was addressed in a prospective cohort of HIV-infected and uninfected women. Participants were enrolled between 1993 and 1995 in four US cities and followed up semiannually through 1998. Among 1,087 women with a total accrual of 2,988 person-years (PY) of follow-up, there were 185 reports of abuse (incidence rate = 6.19 per 100 PY). The rate of abuse among HIV-infected women with a CD4+ count less than 350 cells/ $\mu$ L was lower than that among HIV-infected women with more CD4+ cells/ $\mu$ L or among uninfected women (4.87, 6.92, and 6.44 per 100 PY, respectively). In multivariate analysis, being separated or divorced, having a history of abuse in adulthood, using marijuana, using crack, and having multiple sex partners were each significantly associated with an elevated abuse rate; being older was inversely associated with abuse. Among HIV-infected women, those with fewer CD4+ cells/ $\mu$ L continued to show a decreased abuse rate (hazard ratio = 0.55, 95% CI = 0.36, 0.82) after adjustment for these factors. It is important to complement existing and future HIV prevention and intervention strategies with efforts to reduce violence against women.*

**KEYWORDS** *Abuse, HIV infection, Incidence, Violence against women.*

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### INTRODUCTION

The influence of human immunodeficiency virus (HIV) infection on women's risk for abuse remains uncertain, despite several recently published studies. Most reports of violence against HIV-infected and uninfected women have been limited to the analysis of cross-sectional data. In a New England study of 408 women who were interviewed about their lifetime experiences of sexual abuse, more of the HIV-infected women reported that they had experienced sexual abuse in adulthood than uninfected women.<sup>1</sup> Among 1,103 women enrolled in the multicenter Women's Interagency HIV Study (WIHS), fewer HIV-infected women compared with uninfected

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women reported having been physically or sexually abused in the past year.<sup>2</sup> In our previous baseline study of 1,132 women enrolled in the multicenter HIV Epidemiology Research (HER) Study, fewer HIV-infected women with a CD4+ count less than 350 cells/ $\mu$ L compared with uninfected women had experienced physical or sexual abuse during the past 6 months.<sup>3</sup>

Given the limitations of prevalence data from cross-sectional studies, prospective studies estimating the incidence of abuse are needed to advance our understanding of the relationship between HIV infection and violence against women. The temporal relationship between risk factors and abuse must be established if we are to understand better the causes of violence against women and plan prevention strategies for reducing violence against women.

In this article, we estimated the incidence of physical and sexual violence against HIV-infected and uninfected women in the HER Study. In addition, we examined the independent effects of HIV immunosuppression, sociodemographic characteristics, physical and sexual abuse in adulthood, depression, drug use, and multiple sex partners on the incidence of abuse.

## **METHODS**

### **Study Population**

The HER Study was initiated in 1993 to study the biological, psychological, and social influences of HIV infection on the health of women in the United States. The methods and the baseline characteristics of the participants have been described.<sup>4</sup>

From April 1993 through February 1995, a total of 871 HIV-infected women and 439 uninfected women were enrolled in the HER Study in four cities: Baltimore, Maryland; the Bronx, New York; Detroit, Michigan; and Providence, Rhode Island. Participants were recruited from various settings, including community gathering places, drug treatment centers, infectious disease clinics, and other behavioral or clinical studies and by word-of-mouth from a friend or another study participant. Eligibility criteria were HIV status documented within the past 60 days or consenting to HIV testing as part of screening, fluency in English or Spanish, age of 16 to 55 years, and one or more HIV risk behaviors (e.g., injection drug use [IDU], multiple sex partners).

Enrollment goals were to attain a 2:1 ratio of HIV-infected and uninfected participants at each site, with half at risk through IDU and half at risk through sexual contact. Risk through IDU was defined as having injected drugs at least once since 1985. Risk through sexual contact was defined as having had five or more sex partners in the past 5 years, ever having had sex with a male injection drug user, having exchanged sex for money or drugs, or having had sex with a man suspected of being, or known to be, infected with HIV. The risk behaviors assessed were chosen to facilitate recruitment of an uninfected cohort behaviorally comparable with the HIV-infected cohort.

### **Data Collection**

Participants in the HER Study returned semiannually for follow-up visits. At each follow-up visit, the participants responded to a comprehensive interview, underwent a general physical and pelvic examination, and provided clinical specimens for laboratory evaluation. A supplementary psychosocial interview was conducted within 2 to 4 weeks. All data collection instruments, materials, and study procedures were cleared through institutional review boards at each site.

The follow-up interview, lasting about an hour, was conducted by a trained interviewer in a private room. This face-to-face interview, available in English and Spanish, covered the following: medical symptoms and illnesses; reproductive events and gynecologic symptoms; health care utilization; sexual behavior and use of tobacco, alcohol, or illicit drugs; depressive symptoms and experienced violence; and demographic information. All questions (except for those about demographics) referred to the 6 months before the interview.

The supplementary psychosocial interview, also lasting about an hour, covered additional assessments of stressful or traumatic life events (e.g., history of abuse in adulthood). Because the psychosocial interview addressed sensitive questions that could elicit emotionally charged responses, the interview was conducted by specially qualified and trained psychosocial interviewers.

Serum specimens were tested for antibody to HIV-1 by using enzyme-linked immunoassay (ELISA) according to the manufacturer's instructions (Genetic Systems, Seattle, WA). Repeatedly reactive assays were confirmed by Western blot (DuPont, Wilmington, DE). Counts of CD4+ T-cell lymphocytes were performed using flow cytometry according to methods described elsewhere.<sup>5</sup>

### Measures

*Abuse* At each follow-up visit, participants were asked whether they had been "physically attacked or raped" within the past 6 months. During the supplementary psychosocial interview, participants were asked whether they had ever been "beaten, physically attacked, or physically abused" as adults and whether they had ever been "sexually attacked, raped, or sexually abused" as adults.

*HIV Status and CD4+ Cell Count* Participants were classified as seropositive or seronegative to HIV antibody according to status at baseline. Those who seroconverted ( $n = 9$ ) during the follow-up period were excluded. Among HIV-infected participants, CD4+ count was categorized by the median value of 350 cells/ $\mu$ L.

*Drug Use and Multiple Sex Partners* For alcohol consumption, number of drinks per day was classified as 0 to 1 or as 2 or more. Use of marijuana, crack, cocaine, and heroin, as well as current IDU were each assessed as dichotomous variables. Cocaine and heroin use included any method of administration. Number of sex partners (male and female) was categorized as 0 to 1 or as 2 or more.

*Depressive Symptoms* Depressive symptoms were measured using the Center for Epidemiologic Studies Depression (CES-D) Scale, a 20-item, self-report measure developed for use in general population studies.<sup>6</sup> The presence and severity of depressive symptoms are rated for each item on a 4-point scale from 0 (rarely or none of the time) to 3 (most or all of the time). Total scale scores range from 0 to 60, and the customary cutoff for depressive symptoms is 16.

*Sociodemographic Variables* Six sociodemographic variables were evaluated: age, race, monthly income, education, relationship status, and number of children under the age of 18 years living in the household.

### Statistical Analysis

Statistical analysis focused on prospective data collected from the baseline visit through visit 8, spanning April 1993 through August 1998. Recent abuse was the

dependent variable, and sociodemographic characteristics, history of abuse in adulthood, depressive symptoms, drug use, and multiple sex partners were the independent variables. Participants who reported at baseline that they had experienced physical or sexual abuse within the past 6 months were excluded from the analysis. Women who had seroconverted and those who were not seen after the baseline visit were also excluded. Differences between HIV-infected and uninfected participants on sociodemographic characteristics, history of abuse in adulthood, depressive symptoms, drug use, and multiple sex partners were compared using a chi-square test.

We conducted prospective analyses of factors associated with abuse, initially treating all variables as fixed at baseline. Person-time methods were applied to compute the incidence of abuse according to HIV status and CD4+ cell count, as well as sociodemographic characteristics, history of abuse in adulthood, depressive symptoms, drug use, and multiple sex partners. Incidence rates were expressed as the number of violent events per observed follow-up time contributed by participants (person-time). Observations were censored at the visit date at which abuse was reported or, in the case of no abusive event, at either the date of visit 8 or the last date of follow-up before visit 8. Incidence rate ratios with 95% confidence intervals (CIs) were calculated using Poisson regression methods.<sup>7</sup>

Repeated measures of CD4+ cell count, drug use, and multiple sex partners that may have varied within an individual over time were considered time-dependent variables. Cox regression methods were used to analyze time-dependent covariates and compute the corresponding hazard ratios (HRs) and 95% confidence intervals for incidence of abuse.<sup>7</sup>

Using both fixed and time-dependent covariates, Cox regression methods were used to construct a final multivariate model to predict the incidence of abuse. All variables that were initially associated with abuse in univariate analysis were included and entered using a forward stepwise procedure, in which only the variables that were statistically significant ( $P < .05$ ) were retained. Finally, we stratified the model by HIV status so that we could examine the effect of HIV immunosuppression on violence against women.

## RESULTS

A total of 1,310 HIV-infected and uninfected women were enrolled from 1993 through 1995 and followed up semiannually through August 1998. The 99 (7.6%) women who reported at baseline that they had experienced physical or sexual abuse in the past 6 months were excluded from the analysis. The sample was limited further by the exclusion of 9 (0.7%) women who seroconverted and 115 (8.7%) who were not seen after the baseline visit. Thus, the final sample constituted a total of 1,087 women, for whom 2,988 person-years (PY) of follow-up were accrued through study visit 8. There were 185 reports of abuse for the total cohort, giving a crude incidence rate of 6.19 per 100 PY of follow-up.

More of the women who were not seen after the baseline visit compared with those who continued to participate in the study were white, had no children in the household, and were HIV negative. However, we found no statistically significant differences by age, education, income, or relationship status (data not shown).

Table 1 compares baseline characteristics of the study population by HIV status. By the 2:1 ratio of the study design, 741 (68.2%) women were HIV infected and 346 (31.8%) were uninfected. More of the uninfected women were younger;

**TABLE 1. Selected baseline characteristics of 1,087 women by HIV status in the HIV Epidemiology Research Study\***

Baseline characteristics	HIV+ (n = 741)		HIV- (n = 346)		P†
	n	%	n	%	
Age, years					.007
<30	118	16.7	79	23.8	
30–39	370	52.4	144	43.4	
40+	218	30.9	109	32.8	
Race					.004
Black/African American	451	60.9	188	54.5	
White	139	18.8	97	28.1	
Hispanic/Latina	117	15.8	51	14.8	
Other	33	4.5	9	2.6	
Monthly income, \$					.339
0–500	274	37.6	115	34.4	
501–1000	261	35.8	116	34.7	
>1000	194	26.6	103	30.8	
Education					.040
Up to ninth grade	122	16.5	49	14.3	
Some high school	220	29.8	80	23.3	
High school graduate	240	32.5	121	35.3	
Post–high school	157	21.2	93	27.1	
Relationship status					.002
Married	205	28.0	83	24.3	
Separated/divorced	152	20.8	96	28.2	
Widowed	66	9.0	13	3.8	
Single	309	42.2	149	43.7	
Children in household					.264
0	350	47.4	179	52.2	
1–2	298	40.3	121	35.3	
3+	91	12.3	43	12.5	
Physical abuse ever as an adult					.356
No	256	35.8	109	32.9	
Yes	458	64.2	222	67.1	
Sexual abuse ever as an adult					.230
No	401	56.2	173	52.3	
Yes	312	43.8	158	47.7	
Depressive symptoms, CES-D*					.882
0–15	313	42.3	148	42.8	
16+	427	57.7	198	57.2	
Drinks per day					.001
0–1	635	87.4	273	79.6	
2+	92	12.6	70	20.4	
Marijuana use					.001
No	569	76.8	229	66.2	
Yes	172	23.2	117	33.8	
Crack use					.001
No	601	81.1	242	69.9	
Yes	140	18.9	104	30.1	

**TABLE 1. Continued**

Baseline characteristics	HIV+ (n = 741)		HIV- (n = 346)		P†
	n	%	n	%	
Cocaine use‡					.064
No	455	61.4	192	55.5	
Yes	286	38.6	154	44.5	
Heroin use‡					.008
No	530	71.5	220	63.6	
Yes	211	28.5	126	36.4	
Current IDU					.908
No	563	76.0	264	76.3	
Yes	178	24.0	82	23.7	
Number of sex partners					.001
0–1	593	80.4	216	63.0	
2+	145	19.6	127	37.0	

CES-D, Center for Epidemiologic Studies Depression Scale; HIV, human immunodeficiency virus; IDU, injection drug use.

\*Total n may not sum to 1,087 because of missing variables.

†Chi square.

‡Includes any route of administration.

white; had completed high school or more; were separated or divorced; drank heavily; used marijuana, crack, cocaine, or heroin; and had multiple sex partners. Monthly income, number of children in the household, history of abuse in adulthood, depressive symptoms, and current IDU were each statistically similar by HIV status.

Incidence rates and rate ratios for abuse according to HIV status and CD4+ cell count at baseline are presented in Table 2. The rate of abuse was no different between HIV-infected and uninfected women (rate ratio [RR] = 0.94, 95% CI =

**TABLE 2. Incidence rates per 100 person-years and rate ratios for violence according to baseline (fixed) HIV-related characteristics for women in the HIV Epidemiology Research Study, 1993–1998**

HIV-related characteristics	Violent events*	Person-years*	Incidence rate	Rate ratio	95% CI
HIV status					
Negative	63	978.61	6.44	1.00	
Positive	122	2,009.81	6.07	0.94	(0.70–1.28)
CD4+ cell count					
HIV negative	63	978.61	6.44	1.00	
350+ cells per mm <sup>3</sup>	77	1,112.70	6.92	1.07	(0.77–1.50)
<350 cells per mm <sup>3</sup>	41	841.63	4.87	0.76	(0.51–1.12)

CI, confidence interval; HIV, human immunodeficiency virus.

\*Because of missing data, violent events and person-years of observation may not add to equal sums for different variables.

0.70, 1.28). However, the rate of abuse was less among HIV-infected women with a CD4+ count of less than 350 cells/ $\mu$ L than among uninfected women (RR = 0.76, 95% CI = 0.51, 1.12).

Table 3 shows the incidence rates and rate ratios for abuse according to socio-demographic characteristics, history of abuse in adulthood, depressive symptoms, drug use, and multiple sex partners at baseline. The rate of abuse was lower among older women and Hispanics, although the rates for black women and women of other races or ethnicities did not differ significantly from that for white women. The rate of abuse was higher for separated or divorced women and single women compared with married women. Experiences of physical and sexual abuse in adulthood were significantly associated with an elevated rate of abuse. The rate of abuse was higher among women who were depressed. An elevated rate of abuse was associated with crack, cocaine, and heroin use, but not with alcohol, marijuana, or IDU. Finally, the rate of abuse among women with two or more sex partners was higher than that among women with one or no sex partners.

Table 4 shows the univariate hazard ratios and 95% confidence intervals for abuse; these values were derived from Cox regression with time-dependent variables. The rate of abuse was lower among HIV-infected women with a CD4+ count of less than 350 cells/ $\mu$ L than among uninfected women (HR = 0.68, 95% CI = 0.46, 0.99). Among other time-dependent variables, drinking heavily; using marijuana, crack, cocaine, or heroin; currently injecting drugs; and having multiple sex partners were each associated with an increased rate of abuse.

The results of final multivariate analyses, including both fixed and time-dependent variables and stratified by HIV status, are shown in Table 5. In the final multivariate analysis, an increased rate of abuse was positively associated with being separated or divorced, having experienced abuse in adulthood, using marijuana, using crack, and having multiple sex partners and was inversely associated with being older. Having a CD4+ count of less than 350 cells/ $\mu$ L was significantly inversely associated with abuse when restricted to HIV-infected women (HR = 0.55, 95% CI = 0.36, 0.82). To substantiate these findings, we examined the effect of CD4+ cell count as a continuous variable. Among HIV-infected women, the rate of abuse decreased for every decline of 100 cells in the CD4+ cell count (HR = .94, 95% CI = 0.88, 1.00).

## DISCUSSION

In this prospective study of HIV-infected and uninfected women, the incidence of abuse over a 4-year period was similar between HIV-infected and uninfected women. However, HIV-infected women with advanced immunosuppression (CD4+ count less than 350 cells/ $\mu$ L) were less likely to experience violence than either more immunocompetent HIV-infected women or uninfected women.

Several factors suggest that reduced vulnerability to, and opportunity for, violence may explain the decreased rate of abuse among HIV-infected women with lower CD4+ cell counts. First, the association may be partly due to HIV-related disability. As HIV disease progresses and becomes more disabling because of fatigue, weight loss, recurrent infections, and overt manifestations of the disease, women may withdraw from their daily activities and encounters with others. Our primary findings with respect to CD4+ cell count support this hypothesis, although we did not measure other clinical characteristics of HIV disease. Second, the association may be mediated by the number of sex partners or drug use. That is, as HIV-

**TABLE 3. Incidence rates per 100 person-years and rate ratios for violence according to baseline (fixed) characteristics for women in the HIV Epidemiology Research Study, 1993–1998**

Baseline (fixed) characteristics	Violent events*	Person-years*	Incidence rate	Rate ratio	95% CI
<b>Age, years</b>					
<30	40	534.00	7.49	1.00	
30–39	93	1,403.16	6.63	0.88	(0.61–1.28)
40+	40	924.07	4.33	0.58	(0.37–0.90)
<b>Race</b>					
Black/African American	110	1,746.31	6.30	1.00	
White	51	647.22	7.88	1.25	(0.90–1.74)
Hispanic/Latina	13	480.14	2.71	0.43	(0.24–0.76)
Other	10	108.97	9.18	1.46	(0.76–2.78)
<b>Monthly income, \$</b>					
0–500	66	1,065.87	6.19	1.00	
501–1000	60	1,032.42	5.81	0.94	(0.66–1.33)
>1000	49	834.24	5.87	0.95	(0.67–1.37)
<b>Education</b>					
Up to ninth grade	29	466.52	6.22	1.00	
Some high school	42	803.22	5.23	0.84	(0.52–1.35)
High school graduate	76	986.81	7.70	1.24	(0.81–1.90)
Post high school	37	719.12	5.15	0.83	(0.51–1.35)
<b>Relationship status</b>					
Married	33	804.18	4.10	1.00	
Separated/divorced	55	677.97	8.11	1.98	(1.28–3.04)
Widowed	8	220.44	3.63	0.88	(0.41–1.92)
Single	85	1,249.46	6.80	1.66	(1.11–2.48)
<b>Children in household</b>					
0	109	1,375.93	7.92	1.00	
1–2	58	1,179.29	4.92	0.62	(0.45–0.85)
3+	15	419.15	3.58	0.45	(0.26–0.78)
<b>Physical abuse ever as an adult</b>					
No	27	1,081.23	2.50	1.00	
Yes	153	1,842.18	8.31	3.33	(2.21–5.01)
<b>Sexual abuse ever as an adult</b>					
No	65	1,658.55	3.92	1.00	
Yes	115	1,261.43	9.11	2.33	(1.72–3.15)
<b>Depressive symptoms, CES-D</b>					
0–15	67	1,331.85	5.03	1.00	
16+	117	1,655.64	7.07	1.40	(1.04–1.90)
<b>Drinks per day</b>					
0–1	150	2,506.26	5.99	1.00	
2+	34	430.80	7.89	1.32	(0.91–1.91)
<b>Marijuana use</b>					
No	128	2,215.06	5.78	1.00	
Yes	57	773.36	7.37	1.28	(0.93–1.74)
<b>Crack use</b>					
No	119	2,359.27	5.04	1.00	
Yes	66	629.15	10.50	2.08	(1.54–2.81)

**TABLE 3. Continued**

Baseline (fixed) characteristics	Violent events*	Person-years*	Incidence rate	Rate ratio	95% CI
Cocaine use†					
No	85	1,839.12	4.62	1.00	
Yes	100	1,149.30	8.70	1.88	(1.41–2.51)
Heroin use†					
No	117	2,109.53	5.55	1.00	
Yes	68	878.89	7.74	1.40	(1.03–1.88)
Current IDU					
No	136	2,305.56	5.90	1.00	
Yes	49	682.86	7.18	1.22	(0.88–1.69)
Number of sex partners					
0–1	124	2,238.91	5.54	1.00	
2+	60	730.21	8.22	1.48	(1.09–2.02)

CI, confidence interval; CES-D, Center for Epidemiologic Studies Depression Scale; HIV, human immunodeficiency virus; IDU, injection drug use.

\*Because of missing data, violent events and person-years of observation may not add to equal sums for different variables.

†Includes any route of administration.

infected women become more ill, they may engage less in sexual activity with multiple partners, thereby reducing their exposure to potentially abusive individuals and volatile situations. In univariate analysis, the number of sex partners seemed clearly related to HIV disease progression (data not shown). However, adjusting for multiple sex partners (as the only confounder) did not alter the statistical significance of the inverse association between CD4+ cell count and abuse nor did adjusting for drug use. Thus, it remains to be determined whether other measures of reduced vulnerability (such as inactivity or social isolation) might explain the decreased rate of abuse among HIV-infected women with advanced immunosuppression.

We confirmed several predictors of violence against women found in studies of HIV-infected or at-risk women.<sup>1–3</sup> In addition, the rate of abuse among separated or divorced women was higher than that among married women, while single women had only a modest increase in risk. In the National Crime Victimization Survey, the reported abuse rate for women who were separated from their partners was three times higher than that for divorced women and almost 25 times higher than that for married women.<sup>8</sup> However, caution is urged in interpreting the findings of this survey because it is not possible to determine whether a woman was separated or divorced at the time of the abuse or whether separation or divorce followed the abuse. As our data reflect abuse that took place after the separation or divorce, a different interpretation warrants consideration. It is likely that many women who are separated or divorced (because of an abusive marriage) may be abused even more severely if the men continue to harass them. Moreover, women may be unable to avoid contact with an abusive spouse or former spouse, especially if they have children and are not financially independent. Alternatively, women may have left an abusive spouse only to become involved with another violent partner, although most longitudinal research suggests that this is relatively unlikely.<sup>9,10</sup> Another possibility is that women may be unable to extricate themselves completely from an abusive marriage if they hope for reconciliation.

**TABLE 4. Univariate hazard ratios for violence according to selected time-dependent characteristics for women in the HIV Epidemiology Research Study, 1993–1998**

Time-dependent characteristics	Hazard ratio	95% CI
<b>HIV/CD4</b>		
Negative	1.00	
Positive/350+	1.22	(0.87–1.72)
Positive/<350	0.68	(0.46–0.99)
<b>Drinks per day</b>		
0–1	1.00	
2+	2.00	(1.40–2.86)
<b>Marijuana use</b>		
No	1.00	
Yes	2.21	(1.64–2.97)
<b>Crack use</b>		
No	1.00	
Yes	2.94	(2.16–4.00)
<b>Cocaine use*</b>		
No	1.00	
Yes	2.54	(1.90–3.40)
<b>Heroin use*</b>		
No	1.00	
Yes	1.72	(1.27–2.33)
<b>Current IDU</b>		
No	1.00	
Yes	1.63	(1.17–2.27)
<b>Number of sex partners</b>		
0–1	1.00	
2+	3.74	(2.76–5.07)

CI, confidence interval; HIV, human immunodeficiency virus; IDU, injection drug use.

\*Includes any method of administration.

A conspicuous finding is the strong association between history of abuse in adulthood and risk for later abuse. Evidence is mounting that childhood abuse tends to lead to abuse in adulthood,<sup>11–14</sup> yet little is known about repeated abuse in adulthood and patterns of violence against HIV-infected and uninfected women. Of the 1,310 women in the HER Study, 103 (8%) reported two or more episodes of abuse through visit 8. Future prospective studies of repeated abuse during adulthood would contribute to our understanding of the nature and course of violence against women, especially with respect to HIV disease progression.

The strengths of this study are its size, prospective design, and the exclusion of women who had experienced violence in the 6 months before enrollment. However, our study had several limitations. First, the estimates of the incidence of abuse were for the study period rather than for all adulthood (many [66.2%] of both HIV-infected and uninfected women had abusive experiences as adults long before study

**TABLE 5. Multivariate analysis of fixed and time-dependent variables predicting incident violence against women in the HIV Epidemiology Research Study, 1993–1998**

Variables	Overall		HIV+	
	HR*	(95% CI)	HR	(95% CI)
<b>HIV/CD4</b>				
Negative	1.00		N/A	
Positive/350+	1.40	(0.97–2.02)	1.00	
Positive/<350	0.77	(0.51–1.17)	0.55	(0.36–0.82)
<b>Age, years</b>				
<30	1.00		1.00	
30–39	0.84	(0.56–1.27)	0.94	(0.56–1.59)
40+	0.62	(0.38–1.01)	0.62	(0.32–1.20)
<b>Relationship status</b>				
Married	1.00		1.00	
Separated/divorced	2.05	(1.27–3.30)	1.56	(0.87–2.81)
Widowed	1.26	(0.56–2.82)	0.64	(0.22–1.92)
Single	1.43	(0.91–2.26)	1.30	(0.76–2.21)
<b>Past violence ever as an adult†</b>				
No	1.00		1.00	
Yes	2.83	(1.81–4.43)	2.51	(1.45–4.34)
<b>Marijuana use</b>				
No	1.00		1.00	
Yes	1.51	(1.08–2.12)	1.46	(0.95–2.26)
<b>Crack use</b>				
No	1.00		1.00	
Yes	1.75	(1.21–2.52)	1.36	(0.83–2.21)
<b>Number of sex partners</b>				
0–1	1.00		1.00	
2+	2.53	(1.77–3.62)	2.78	(1.75–4.41)

CI, confidence interval; HIV, human immunodeficiency virus; HR, hazard ratio.

\*Variables are simultaneously adjusted for each other.

†Includes both physical and sexual abuse.

enrollment). Rates of past physical and sexual abuse in adulthood did not differ by HIV status in our study population; therefore, any bias introduced because of the high prevalence of past abuse is probably of limited importance in this population. In fact, we repeated analyses for women with a history of abuse in adulthood and found that the inverse association between CD4+ cell count and abuse continued to hold. Second, losses to follow-up may have resulted from abuse because a woman was physically unable to leave home, forbidden by her abuser to seek assistance, or too ashamed to be seen with a black eye or a bruised face. However, we have no indication that losses to follow-up due to injury would differ by HIV status.

Incidence data are enormously important for planning violence prevention strategies and identifying women in need of violence counseling services. Our data demonstrate that the incidence of abuse is not greater in immunocompetent HIV-

infected women than in uninfected women and is lower in HIV-infected women with advanced immunosuppression. As HIV-infected women become more immunosuppressed, their vulnerability to abuse decreases, in part because of disability and disengagement from a dangerous lifestyle of drug use and multiple sex partners. On the other hand, more immunocompetent HIV-infected women and those at risk for HIV infection remain at high risk for abuse if they continue drug use and risky sexual activity. Consequently, HIV prevention strategies aimed at reducing drug use and risky sexual behavior, as well as those intervention programs working with already infected women, need to be coordinated with violence prevention programs. Unfortunately, violence may ultimately limit women's ability to implement HIV prevention strategies because of a partner's coercive control of sexual practices (e.g., condom use)<sup>15,16</sup> and tendency to use forced sex.<sup>17</sup>

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