

# Physical and Sexual Violence During Pregnancy and After Delivery: A Prospective Multistate Study of Women With or at Risk for HIV Infection

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Violence against women is a substantial public health problem. Annually, at least 2.1 million women in the United States are raped or physically assaulted, and more than 10 000 rape victims and 79 000 assault victims require hospitalization.<sup>1</sup> Violence committed by an intimate partner, which accounts for approximately three quarters of assaults against women and affects between 5.2% and 13.6% of women in couples, is greatest during the reproductive years.<sup>1-4</sup>

Violence against pregnant women is of particular concern because of the additional risk to the unborn child. Violence can harm a child through direct injury, causing placental damage, premature contractions, membrane rupture, or fetal death,<sup>5-9</sup> or through indirect mechanisms such as stress, substance abuse, or abuse-related maternal health problems.<sup>5,10-14</sup> Studies have documented significantly increased risks of preterm birth and low birthweight among infants born to abused women.<sup>15-20</sup>

According to most of the research in the area, between 4% and 8% of women experience violence during their pregnancy.<sup>21</sup> Statewide surveys of new mothers have shown average prevalence rates of 5.3% during pregnancy and 7.2% during the preceding 12 months.<sup>3</sup> These recent data,<sup>3</sup> which allow for an examination of patterns of violence against women before and during pregnancy,<sup>22</sup> do not suggest increased pregnancy-associated risks.

Little is known about differences in violence risk during pregnancy and after delivery. The few existing studies of prenatal and postpartum abuse varied widely in design and methods and yielded equivocal findings, some indicating increased risk after delivery<sup>23-25</sup> and some indicating decreased risk.<sup>26,27</sup> Reports of elevated risks for homicide among expectant and new mothers<sup>28-32</sup>

**Objectives.** We sought to describe and compare prevalence rates of and risk factors for violence against women during pregnancy and postpartum.

**Methods.** Physical and sexual violence and violence risk factors were assessed during late pregnancy and 6 months postpartum in a prospective study of pregnant women with (n=336) and without (n=298) HIV in 4 US states.

**Results.** Overall, 10.6% of women reported having experienced violence, 8.9% during pregnancy and 4.9% after delivery. Of these women, 61.7% were abused only during their pregnancy, 21.7% were repeatedly abused, and 16.7% were abused only after their delivery. Sexual violence rarely occurred in the absence of physical violence. The strongest predictor of violence was engaging in bartered sex (adjusted odds ratio [OR]=5.54; 95% confidence interval [CI]=2.0, 15.4). Other predictors included frequent changes in residence (adjusted OR=1.57; 95% CI=1.1, 2.2), financial support from family or partners (adjusted OR=0.42; 95% CI=0.2, 0.8), and HIV diagnosis during current pregnancy (adjusted OR=0.30; 95% CI=0.1, 0.7).

**Conclusions.** Women more commonly experienced violence during than after their pregnancy, but violence was best predicted by socioeconomic and behavioral indicators whose influence did not vary over time. (*Am J Public Health*. 2006;96:1052-1059. doi:10.2105/AJPH.2005.067744)

contribute to the debate about postpartum risk, particularly given that these findings arise in part from the definition of maternal mortality being expanded (see Frye<sup>33</sup>) to include events that occur during the postpartum year.

Factors associated with increased risk for violence both before and during pregnancy are young age, low education and income levels, minority race/ethnicity, and unmarried status.<sup>3,26,34</sup> Studies of pregnant<sup>12,23,35-38</sup> as well as nonpregnant<sup>39-41</sup> women have shown an association between violence and alcohol or drug use by women or their partners. Unique characteristics of pregnancy, such as the pregnancy being unplanned or unwanted, have also been associated with violence during pregnancy.<sup>3,27,34,37,42,43</sup>

One group of pregnant women that may be at elevated risk for violence is women who engage in HIV risk behaviors. High rates of violence against HIV-infected women have been well documented.<sup>44-47</sup> However, the risk attributable to serostatus appears small

relative to that attributable to other socioeconomic or behavioral factors (e.g., using drugs, having multiple sexual partners, and bartering sex) that increase women's risk of experiencing violence and contracting HIV.<sup>48</sup>

A better understanding of violence during the prenatal to postpartum transition is needed if the violence prevention needs of expectant and new mothers are to be adequately addressed. We used data collected as part of the Perinatal Guidelines Evaluation Project (PGEP), a prospective study involving pregnant women with HIV and pregnant women with risk factors for HIV,<sup>49</sup> to examine 3 issues related to prevalence rates of, patterns of, and risk factors for violence during or after pregnancy.

First, in an effort to extend earlier PGEP findings,<sup>50</sup> we sought to determine the percentages of women who had experienced violence during a 6-month period of their pregnancy and the 6 months after delivery. To enhance the comparability of our results with those of other studies, we calculated the

percentages of women who had experienced physical, sexual, and either physical or sexual violence. Second, we used longitudinal data to determine whether risks were higher during or after pregnancy and to characterize patterns of physical and sexual violence across time. Third, we sought to identify risk factors associated with violence and to determine whether they differed across time among this unique cohort of women.

## METHODS

Participants were 634 pregnant women (336 HIV seropositive, 298 seronegative) who were receiving prenatal care at health departments and publicly funded community health care and hospital-based clinics (infectious disease and obstetrics/gynecology) in 4 locations: Brooklyn, NY (n=224); Connecticut (n=55); Miami, Fla (n=220); and central North Carolina (n=135). Interviews were conducted between April 1997 and August 1999. The cohort, design, and procedures of the PGEF have been described in detail elsewhere.<sup>49</sup>

In brief, HIV-infected women were recruited from infectious disease, high-risk prenatal, or general prenatal clinics. Initial contact was made by either providers or study staff; all women with HIV were eligible. As a means of identifying psychosocial issues uniquely associated with HIV infection (and distinct from other demographic and behavioral variables characteristic of HIV infection among women), HIV-seronegative women were recruited from clinics serving women with demographic or behavioral characteristics (e.g., drug use) similar to those of the HIV-infected women.

HIV-seronegative women were screened for eligibility (i.e., receipt of prenatal care or services at the participating clinic and negative HIV test results during their current pregnancy) and frequency matched (at a within-state level of  $\pm 5\%$ ) to HIV-infected women according to sexual transmission risk behaviors (history of crack cocaine use, sexual intercourse with a man known or suspected to inject drugs, or trading sex for money), injection drug use, race/ethnicity, and late entry into prenatal care (20 or more weeks of gestation).

## Procedures

Consenting pregnant women were interviewed at 24 weeks of gestation or later (mean: 30 weeks) and at 6 months postpartum by trained assistants using a standardized assessment in English, Spanish, or Haitian Creole. At the first interview, data were collected on sociodemographic characteristics, behavioral and psychosocial functioning, and pregnancy and health; at both interviews, data were collected on recent sexual and drug risk behaviors and on partnerships and experiences of violence.

## Measures

*Sociodemographic characteristics and violence.* Data on age, race/ethnicity, income (including sources), housing stability (number of residence changes in previous year), and education were self-reported. As a measure of experiences of violence, women were asked whether they had been beaten, physically attacked, or physically abused and whether they had been sexually attacked, raped, or sexually abused by anyone during the preceding 6 months. Women who had experienced either of these types of assault were considered to have experienced violence.

*Drug use and sexual partnerships.* Women were asked whether they had ever used illicit drugs (crack, cocaine, and heroin or other drugs by injection) and whether, during their current pregnancy or since their delivery, they had used alcohol, marijuana, crack, cocaine, or heroin by snorting or injection or other drugs by injection. They were also asked 4 questions regarding lifetime and recent sexual risk behaviors:

1. Have you ever had sex with a man who you know or suspect injects drugs?
2. Have you ever had sex with a man to get money or drugs? (If a woman's answer was yes, she was asked: In the past 3 months [or Since you had the baby], have you had sex with a man to get money or drugs?)
3. How many sexual partners have you had in the last 3 months [or since you had the baby]? (Responses were coded into 2 categories:  $\leq 1$  or  $\geq 2$ .)
4. Do you have a main male partner?

*Pregnancy and health.* Length of gestation at entry into prenatal care, based on women's

self-reports, was categorized as 2 months or less, 3 to 4 months, 5 to 6 months, or 7 or more months. Women were asked "How many live children have you given birth to?" Responses were coded as 0, 1, 2, or 3 or more. As a means of assessing unintended pregnancies, women were asked "When you got pregnant with this baby, were you doing anything to keep from getting pregnant?" If the answer was no, they were asked "Did you plan to get pregnant?" Pregnancies were coded as "planned," "unplanned/failed prevention," or "unplanned/not prevented." Women with HIV were asked when they had been diagnosed, and a 3-level variable (seronegative results during pregnancy, seropositive results before pregnancy, and seropositive results during pregnancy) was generated.

## Statistical Analyses

We calculated the percentages of women who reported experiencing violence for the pregnancy period, the postdelivery period, and the 2 periods combined. Also, we categorized violence according to pattern—abating (during pregnancy only), emerging (after delivery only), or repeating (during and after pregnancy)—and computed the percentages of women who experienced each pattern of violence. We assessed bivariate and multivariate associations between violence at any time (i.e., during or after pregnancy) and demographic, behavioral, pregnancy, and health-related predictors using generalized estimating equation modeling. Such models allow for full use of data sets in that estimates can be calculated across multiple time points and correlations of predictors and outcomes can be accounted for over time.<sup>51</sup>

We examined whether predictors of violence changed from pregnancy to postpartum (as indicated by Predictor  $\times$  Time 2-way interactions) and whether changes in predictors over time differed according to HIV serostatus (as indicated by 3-way Predictor  $\times$  Time  $\times$  HIV interactions). We used generalized estimating equations in estimating all effects, and we computed odds ratios (ORs) and 95% confidence intervals (CIs). To control for residual confounding, multivariate models included variables on which the 2 cohorts were matched (race/ethnicity, HIV sexual risk, HIV drug risk);

**TABLE 1—Demographic and Risk Characteristics of Women in the Perinatal Guidelines Evaluation Project, 1997–1999**

Characteristic	All Women (n = 634)	HIV Positive (n = 336)	HIV Negative (n = 298)	P
Mean age, y	27.8	28.3	27.2	.04
Race/ethnicity, <sup>a</sup> %				.50
White	7.3	5.9	8.7	
Hispanic	19.9	19.4	20.5	
Black, non-Hispanic	69.7	71.1	68.1	
Other <sup>b</sup>	3.2	3.6	2.3	
Late entry into prenatal care, <sup>a</sup> %	14.7	14.0	15.4	.61
Monthly household income, \$, %				.52
<1000	76.0	75.0	77.2	
≥1000	24.0	25.0	22.8	
Income source, %				
Medicaid	86.6	86.0	87.2	.65
WIC	79.4	81.4	77.2	.19
Food stamps	49.8	57.8	40.9	.001
Disability	13.9	21.3	5.7	.001
Public aid or welfare	29.7	33.2	25.8	.04
Partner or family	74.1	69.8	78.9	.01
Mean no. of times moved in previous year	1.1	1.0	1.2	.05
Sexual transmission risk (crack use, sex with male injection drug user, bartering sex), <sup>a</sup> %				.41
Yes	39.3	40.8	37.6	
No	60.7	59.2	62.4	
Drug risk (ever injected drugs), <sup>a</sup> %				.09
Yes	4.9	6.3	3.4	
No	95.1	93.7	96.6	

Note. WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

<sup>a</sup>Used as matching characteristic.

<sup>b</sup>Includes women who self-identified their race/ethnicity as "mixed" (n = 13) or "other" (not Asian/Pacific Islander, not Native American/Alaska Native; n = 5) and those who did not report their race (n = 2).

also included were variables that, in bivariate analyses, either differed significantly according to HIV serostatus or were associated with violence at the  $P \leq .1$  level.

## RESULTS

### Characteristics of the Study Population

Participants ranged in age from 13 to 45 years and were predominantly women of color (Table 1). Women with HIV were slightly older than women without HIV, but the groups were well matched according to race/ethnicity, history of HIV sexual transmission risk behavior, and late entry into prenatal care. Income levels did not differ according to serostatus; however, compared with uninfected women, women

with HIV were less likely to receive financial support from family or partners and more likely to receive assistance in the form of food stamp, disability, or welfare benefits. More than a quarter of the women had moved 2 or more times in the previous year; on average, women without HIV had moved significantly more often than women with HIV, but the difference was small.

More than three quarters of the women (n = 485; 76.5%) completed the 6-month postpartum interview. Attrition did not differ according to HIV status, education or income level, drug use, number of recent sexual partners, or whether the women had engaged in bartered sex. Women who did not complete the postpartum interview were more likely to

be young and Black, to have a primary male partner, and to have a more stable housing situation (all  $P$ s < .05). Women who reported having experienced violence during their pregnancy were less likely to be missing at follow-up than women who did not report such violence (10.7% vs 24.8%;  $P < .02$ ).

### Prevalence and Patterns of Violence

Of 628 women who provided violence data, 56 (8.9%) reported either physical or sexual violence during their pregnancy: 55 (8.7%) reported any physical violence (that is, with or without sexual violence), 20 (3.2%) reported any sexual violence (that is, with or without physical violence), and 19 (3%) reported both physical and sexual violence. Of the 485 women who completed the postpartum interview, 24 (4.9%) reported having experienced either type of violence during the 6 months after their delivery: 21 (4.3%) reported any physical violence, 6 (1.2%) reported any sexual violence, and 3 (0.6%) reported both physical and sexual violence. Overall, 67 (10.6%) women experienced either type of violence either during or after their pregnancy: 64 (95.5%) reported any physical violence, 24 (35.8%) reported any sexual violence, and 21 (31.3%) reported both physical and sexual violence. These results represent conservative lower limits on the true percentages of women who experienced violence, because it was assumed in the analyses that all women missing at follow-up and not reporting violence during pregnancy (143 of 149 missing women) had not experienced violence as of the follow-up.

Of the 67 women reporting either physical or sexual violence, 60 completed both interviews; 6 were lost to follow-up, and 1 had missing data at the baseline interview but reported violence at the postpartum interview. Of these 60 women, 37 (61.7%) fit the abating pattern, 13 (21.7%) fit the repeating pattern, and 10 (16.7%) fit the emerging pattern. All but 4 of the women who reported having experienced violence reported physical violence; that is, only 4 women reported sexual violence only. Thus, the pattern of violence over time among women experiencing any physical violence (alone or in combination with sexual violence) resembled that among the group as a whole. Overall, 15 (40.5%), 4

**TABLE 2—Predictors of Violence During Pregnancy or After Delivery: Perinatal Guidelines Evaluation Project, 1997–1999**

Predictor	Women Reporting Violence During Pregnancy or After Delivery, % (No.)	Bivariate OR (95% CI)	Multivariate Adjusted OR (95% CI)
<b>Demographics and socioeconomic characteristics</b>			
Age, y			
> 30	11.0 (26/236)	1.01 (0.6, 1.7)	0.80 (0.4, 1.6)
≤ 30 (reference)	10.1 (40/396)	1.00	1.00
Race/ethnicity			
White (reference)	17.4 (8/46)	1.00	1.00
Hispanic	12.7 (16/126)	0.94 (0.4, 2.2)	1.15 (0.4, 3.1)
Black non-Hispanic	8.8 (39/442)	0.54 (0.2, 1.2)	0.69 (0.3, 1.7)
Other	20.0 (4/20)	1.89 (0.5, 7.0)	2.71 (0.4, 16.3)
Education			
Less than high school	9.3 (30/323)	0.81 (0.4, 1.5)	...
High school	11.6 (17/146)	1.00 (0.5, 2.0)	...
More than high school (reference)	12.7 (17/134)	1.00	...
Monthly household income, \$			
< 1000	11.8 (49/416)	2.10 (1.1, 4.0)*	1.11 (0.5, 2.4)
≥ 1000 (reference)	8.3 (18/218)	1.00	1.00
No. of times moved in previous year <sup>a</sup>		2.18 (1.6, 2.9)**	1.57 (1.1, 2.2)*
0	7.0 (18/257)		
1	8.8 (17/192)		
≥ 2	17.3 (32/185)		
<b>Income source</b>			
Food stamps			
Yes	12.9 (51/396)	0.91 (0.6, 1.4)	...
No (reference)	6.7 (16/238)	1.00	...
Social Security, disability, or worker's compensation			
Yes	12.8 (14/104)	0.94 (0.5, 1.9)	...
No (reference)	10.1 (53/525)	1.00	...
Partner or family			
Yes	9.7 (52/535)	0.46 (0.3, 0.7)**	0.42 (0.2, 0.8)**
No (reference)	15.1 (15/99)	1.00	1.00
Public aid or welfare			
Yes	13.4 (38/283)	0.98 (0.6, 1.6)	1.46 (0.8, 2.8)
No (reference)	8.3 (29/351)	1.00	1.00
<b>Pregnancy factors</b>			
No. of previous live births <sup>a</sup>		1.03 (0.8, 1.2)	...
0	6.1 (12/198)		
1	14.5 (24/166)		
2	8.9 (10/112)		
≥ 3	13.3 (21/158)		
Time of entry into prenatal care, months of gestation <sup>a</sup>		0.90 (0.7, 1.2)	...
1–2	10.3 (4/39)		
3–4	12.5 (15/120)		
5–6	10.5 (23/220)		
≥ 7	8.9 (21/237)		

Continued

(30.8%), and 2 (20%) women in the abating, repeating, and emerging groups, respectively, reported having experienced sexual violence (alone or in combination with physical violence). The corresponding numbers of women in these groups reporting physical violence only were 22 (56%), 9 (23%), and 8 (21%).

**Factors Associated With Violence**

Univariate analyses showed statistical associations between violence and socioeconomic, behavioral, and HIV diagnosis–related variables (Table 2). Violence risks were doubled among women with lower (vs higher) incomes, women who did not receive financial support from partners or family members, and women who had moved frequently during the previous year (vs those who had not). Odds of experiencing violence were approximately 3 to 4 times higher among women who had recently used marijuana or crack/cocaine, 6 times higher among women who had recently injected drugs, 4 times higher among women who had multiple sexual partners, and more than 8 times higher among women who had recently bartered sex than among women who had not engaged in these risk behaviors. Women who had been diagnosed with HIV infection during their current pregnancy were only half as likely as those who were seronegative to have experienced violence. Odds of experiencing violence were twice as high during pregnancy as after delivery.

Multivariate analyses showed that 4 of the variables assessed—recently engaging in bartered sex, moving frequently, receiving financial support from partner or family, and being diagnosed with HIV infection during pregnancy—were uniquely associated with violence. Adjusted odds of experiencing violence were 5.5 times higher among women who had recently bartered sex than among women who had not done so. Also, moving frequently continued to be associated with increased risks of violence, and receiving financial support from one's partner or family continued to be associated with decreased risks. Women who had been diagnosed with HIV infection during their current pregnancy were only a third as likely as those who were seronegative to report having experienced violence.



TABLE 2—Continued

Pregnancy planning				
Planned (reference)	7.4 (9/121)	1.00	...	...
Unplanned/not prevented	13.1 (41/312)	1.30 (0.6, 3.0)	...	...
Unplanned/failed prevention	7.7 (15/194)	0.67 (0.3, 1.4)	...	...
HIV diagnosis				
Seronegative during current pregnancy (reference)	12.4 (37/298)	1.00	1.00	
Seropositive before pregnancy	10.0 (14/140)	0.82 (0.4, 1.6)	1.57 (0.8, 3.3)	
Seropositive during current pregnancy	7.8 (15/193)	0.47 (0.3, 0.9)**	0.30 (0.1, 0.7)*	
Pregnancy period				
Prenatal	8.9 (56/628)	2.07 (1.3, 3.2)**	1.35 (0.78, 2.36)	
Postpartum	4.9 (24/485)	1.00	1.00	
<b>Drug use (during pregnancy/since delivery)</b>				
Marijuana use				
Yes	15.1 (44/291)	3.29 (1.7, 6.2)**	1.20 (0.4, 3.4)	
No (reference)	6.7 (23/343)	1.00	1.00	
Cocaine or crack use				
Yes	27.4 (29/106)	4.56 (2.6, 7.8)**	1.54 (0.6, 4.3)	
No (reference)	7.2 (38/528)	1.00	1.00	
Heroin use				
Yes	14.3 (2/14)	2.25 (0.6, 7.8)	...	
No (reference)	10.5 (65/620)	1.00	...	
Injection drug use				
Yes	50.0 (1/2)	5.91 (1.3, 26.2)*	4.05 (0.4, 40.8)	
No (reference)	10.4 (66/632)	1.00	1.00	
<b>Partnerships</b>				
Has primary male partner				
Yes	10.0 (56/505)	0.75 (0.4, 1.3)	...	
No (reference)	15.1 (11/73)	1.00	...	
Has had 2 or more sexual partners in past 3 months/since delivery				
Yes	29.5 (18/61)	3.96 (2.2, 7.3)**	1.49 (0.5, 4.3)	
No (reference)	8.5 (49/573)	1.00	1.00	
Bartered sex (past 3 months/since delivery)				
Yes	40.0 (22/55)	8.49 (4.5, 6.1)**	5.54 (2.0, 15.4)**	
No (reference)	7.8 (45/579)	1.00	1.00	

Note. OR = odds ratio; CI = confidence interval. The multivariate model included matching variables (race/ethnicity, HIV sexual risk, HIV drug risk), those that differed according to serostatus (age, number of moves, income from partner/family, public aid), and additional variables associated with violence in bivariate analyses (total income; marijuana, cocaine, and injection drug use; multiple sexual partners; bartered sex; timing of HIV diagnosis; period of pregnancy when violence was experienced).

<sup>a</sup>Continuous variable (thus, odds ratio reflects increased risk associated with each unit increase).

\* $P \leq .05$ ; \*\* $P < .01$ .

Tests of interactions revealed no main effects of time (i.e., prenatal vs postpartum period) on occurrences of violence. One significant 2-way interaction indicated that women falling into the “other” race category (Table 1) were more likely than White women (the reference group) to have experienced violence after their delivery (OR =

10.15; 95% CI = 1.03, 99.6;  $P = .05$ ) but not during their pregnancy (OR = 0.70; 95% CI = 0.13, 3.72). There were no other significant 2-way (i.e., between all of the predictors and time and between all of the predictors and HIV status) or 3-way (i.e., between all of the predictors, time, and HIV status) interactions.

## DISCUSSION

In this prospective study of violence toward women during pregnancy and postpartum, one of the first of which we are aware, we found that more women experienced violence during a 6-month period of their pregnancy (8.9%) than in the 6 months after delivery (4.9%). Approximately one third of abused women reported sexual violence, and such violence rarely occurred in the absence of physical violence. The absence in the multivariate model of a main effect of “time” (i.e., prenatal period vs postpartum period), or interactions involving time, suggests that the period of pregnancy is less relevant in understanding violence risks than are other social, health, and behavioral characteristics and that the influence of these characteristics does not vary by pregnancy period. That is, variations in prevalence rates of violence probably reflect variations in these risk factors.

Violence was associated with socioeconomic and behavioral factors indicative of financial hardship and social instability. Consistent with the results of studies focusing on nonpregnant women, our bivariate analyses showed that violence was associated with low income, substance abuse, and the presence of multiple sexual partners. Those variables shown by our multivariate analyses to be uniquely associated with violence may have been more specific with respect to the connections between economic disadvantage, illicit drug use, and involvement in risky situations. That is, a higher income may be less important than financial support from family or partners and a stable housing situation, and multiple sexual partners and illicit drug use may be most risky in the context of bartering sex for money or drugs.

Consistent with the results of 2 HIV cohort studies of nonpregnant women in which HIV-seronegative and HIV-seropositive participants were matched according to HIV risk behaviors,<sup>44,45</sup> our findings show that HIV infection itself does not lead to violence. Rather, violence commonly experienced by women with HIV has less to do with HIV than demographic or risk behaviors associated with acquisition of HIV. An unexpected result, however, was the lower risk among women who had recently been diagnosed

with HIV infection. Although women diagnosed during their current pregnancy were less likely to have engaged in sexual or drug risk behavior than those diagnosed before their current pregnancy, they were also less likely to have received financial support from family or partners (data not shown).

Moreover, because we adjusted for risk behaviors and income sources in our model, other variables that we did not measure must have accounted for the decreased risk among recently diagnosed women. One possible factor is the network of health and social services (e.g., assistance with housing and financial needs, substance abuse treatment, and support networks) to which pregnant women are connected when they are diagnosed with HIV infection. Women diagnosed with HIV infection during pregnancy may be more likely than women who already know their positive serostatus to begin taking antiretroviral therapy and receiving adherence counseling, as well as making use of other services. Also, during pregnancy, newly diagnosed women may be more likely to make changes that decrease their risk for violence.

To our knowledge, only one study focusing on violence prevalence rates has followed women longitudinally from pregnancy to the postpartum period (in another study, a sample of adolescent mothers has been followed from delivery with retrospective 12-month recalls<sup>24,52</sup>). Using both a prospective design and 6-month assessment periods, Geilen et al.<sup>23</sup> found that large percentages of women in Baltimore receiving HIV counseling and testing had experienced violence during their pregnancy (19%) and after their delivery (26%). Although the relationship between these percentages was not tested, stratification according to type of perpetrator revealed that differences in risk across pregnancy periods were associated with violence committed by an intimate partner (10% during pregnancy, 19% after delivery); few differences were observed among women abused by perpetrators other than their partners (9% during pregnancy, 10% after delivery).

The lower overall prevalence rates of violence found in our study than in the Geilen et al. investigation might have been because of the relative brevity of our assessment (compared with the multiple interviews

administered by Geilen et al.) or to the high percentage of women with HIV, possibly because women infected with HIV were significantly less likely than women who were not infected to have a primary male partner (data not shown). It is also possible that we underestimated the prevalence of emergent violence as a result of the greater attrition among women who were not abused during their pregnancy. Emergent violence was the most common pattern found by Geilen et al., although it is interesting to note that the percentages of women who experienced repeated violence were similar across the 2 studies (21.7% in the PGEP and 19.8% in the Geilen et al. study).

In the absence of prospective research designs, understanding the pattern of violence characterizing the pregnancy-to-postpartum transition has been difficult. In 2 retrospective statewide surveys conducted under the Pregnancy Risk Assessment Monitoring System (PRAMS), new mothers reported physical violence experienced before, during, and after pregnancy. These surveys also showed that more women experienced violence during pregnancy than after delivery<sup>25,26</sup>; however, the pregnancy period is more than twice as long as the average postpartum period (3.6 and 3.9 months for PRAMS North Carolina and PRAMS Alaska, respectively).

Gessner and Parham-Hester (with the Alaska PRAMS) created an index—the weekly percentage of women reporting violence—to adjust for the varying amount of time covered in each assessment.<sup>25</sup> This index suggests that fewer women experienced violence during pregnancy than after delivery, but it rests on the assumption of an equal and continuous increase in prevalence with each successive week after delivery. This assumption may not be accurate, particularly given data suggesting that rates of partner violence<sup>24</sup> and homicide<sup>32</sup> may be highest in the first 3 months after delivery.

More than 10% of the members of our sample of primarily low-income women of color experienced violence during the 12-month assessment period. Five percent of new mothers experienced abuse; of these women, more than half had also been abused during their pregnancy. The percentage of women in this study who had experienced violence after their delivery was somewhat

larger than the percentages reported in the North Carolina PRAMS (3.2%) and Alaska PRAMS (2.9% among adults).<sup>25,26</sup>

However, our study differed from these PRAMS studies in terms of PRAMS's shorter average postpartum period, as well as the measures used (PRAMS assessed only physical violence or physical violence committed by an intimate partner; PGEP did not assess type of perpetrator) and the sample composition. Women with or at risk of HIV have been shown to be at increased risk of violence,<sup>44–46</sup> in that many HIV risk factors are also violence risk factors. However, together, the present study and the other investigations just discussed make it clear that pregnant women's risk for violence does not end with delivery<sup>23–26,53</sup> and highlight the need for enhanced prevention efforts aimed at new mothers, particularly those at risk.

Our findings must be viewed in light of several limitations. For example, assessments took place within the context of a larger study on pregnancy and HIV, limiting the measures of violence we were able to employ. Also, although our questions had been used successfully with a similar population<sup>45</sup> and we assessed both sexual and physical violence, we did not include important information about frequency or severity of abuse or information about perpetrators or context. Absence of information about perpetrators means that our findings cannot be directly compared with those of studies on the unique causes and consequences of intimate partner violence.

Also, we do not know whether violence occurring during pregnancy or after delivery represented continuation of violence initiated before pregnancy. Because we assessed only 6 months of the pregnancy period, it is unlikely that we captured all experiences of violence occurring during women's pregnancies. Finally, some of our odds ratios must be interpreted with caution. Although they estimated accurately the strengths of the associations, the wide confidence intervals indicate that some of these estimates were not always measured precisely in this study population.

However, our study had several important strengths as well. First, as one of the largest multistate studies of its kind, the PGEP represents the population of HIV-seropositive women who are of childbearing age, as well as

uninfected women at risk for HIV infection, in 4 HIV epicenters. Second, we were able to assess a wide range of socioeconomic and behavioral factors that contribute to risks for HIV and violence. Third, we compared 2 equal periods of time, preventing the need to make uncertain adjustments. Finally, the prospective design, in which women reported on each period of pregnancy separately, limited bias associated with long retrospective recalls and allowed for a longitudinal analytic approach that could account for attrition over time.

Protecting women from violence during pregnancy and after delivery will probably involve identifying women who have already been abused as well as preventing violence before it occurs. Routine screening is recommended by many medical and professional organizations<sup>54–57</sup> and endorsed as an important aspect of medical intervention, but scientific evidence of its effectiveness is needed.<sup>58–61</sup>

However, in any case, screening is far from universal, and even providers who routinely screen women at their entry into prenatal care rarely do so again.<sup>62–65</sup> In all likelihood, opportunities to detect abuse, particularly abuse that occurs late in pregnancy or emerges (or resumes) after delivery, are being missed.

Referral of women to adjunct social services, parenting support groups, and substance abuse interventions and integration of these types of support with prenatal, postpartum, and pediatric care are also critical. The recent attention of the scientific community and the news media to pregnancy-related homicides has led to congressional and legislative actions designed to deter violence against pregnant women.<sup>66,67</sup> It is likely that broader health and social initiatives directed toward the economic, social, and behavioral issues that increase women's risk for violence in general will also benefit expectant and new mothers. ■

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### Contributors

L.J. Koenig originated the study and drafted and finalized the article, with collaboration from D.J. Whitaker and R.A. Royce. D.J. Whitaker analyzed the data with assistance from L.J. Koenig and R.A. Royce. D.J. Whitaker, R.A. Royce, T.E. Wilson, K. Ethier, and M.I. Fernandez contributed to interpretation of the results and revision of the article for important intellectual content.

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This study was approved by the institutional review boards of the Centers for Disease Control and Prevention and each of the participating universities and hospitals. Participants provided written informed consent to take part in the study.

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