

RISK FACTORS FOR INJURY TO WOMEN FROM DOMESTIC VIOLENCE

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ABSTRACT

Background Domestic violence is the most common cause of nonfatal injury to women in the United States. To identify risk factors for such injuries, we examined the socioeconomic and behavioral characteristics of women who were victims of domestic violence and the men who injured them.

Methods We conducted a case-control study at eight large, university-affiliated emergency departments. The 256 intentionally injured women had acute injuries resulting from a physical assault by a male partner. The 659 controls were women treated for other conditions in the emergency department. Information was collected with a standardized questionnaire; no information was obtained directly from the male partners.

Results The 256 intentionally injured women had a total of 434 contusions and abrasions, 89 lacerations, and 41 fractures and dislocations. In a multivariate analysis, the characteristics of the partners that were most closely associated with an increased risk of inflicting injury as a result of domestic violence were alcohol abuse (adjusted relative risk, 3.6; 95 percent confidence interval, 2.2 to 5.9); drug use (adjusted relative risk, 3.5; 95 percent confidence interval, 2.0 to 6.4); intermittent employment (adjusted relative risk, 3.1; 95 percent confidence interval, 1.1 to 8.8); recent unemployment (adjusted relative risk, 2.7; 95 percent confidence interval, 1.2 to 6.5); having less than a high-school education (adjusted relative risk, 2.5; 95 percent confidence interval, 1.4 to 4.4); and being a former husband, estranged husband, or former boyfriend (adjusted relative risk, 3.5; 95 percent confidence interval, 1.5 to 8.3).

Conclusions Women at greatest risk for injury from domestic violence include those with male partners who abuse alcohol or use drugs, are unemployed or intermittently employed, have less than a high-school education, and are former husbands, estranged husbands, or former boyfriends of the women. (N Engl J Med 1999;341:1892-8.)

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DOMESTIC violence is the most common cause of nonfatal injury to women in the United States.¹⁻³ Victims are pushed, punched, kicked, strangled, and assaulted with various weapons with the intent of causing pain, injury, and emotional distress.⁴ The lifetime risk of severe injury as a result of domestic violence has been estimated to be 9 percent for women, with a lifetime risk of up to 22 percent for any type of injury from domestic violence.⁵ The risk of death from domestic violence is also substantial; one third of the homicides of women in the United States are committed by a spouse or partner.⁶

As part of the Violence against Women Act of 1994, a panel created by Congress noted that “the development of effective preventive interventions will require a better understanding of the causes of violent behavior against women” and recommended “the examination of risk factors.”⁴ We examined socioeconomic and behavioral characteristics of women and their male partners to identify risk factors for injury to women as a result of domestic violence.

METHODS

Study Design

We conducted a multicenter case-control study at eight large, university-affiliated emergency departments throughout the United States. The emergency departments were in suburban, urban, and inner-city areas and had a diverse clientele, ensuring a broad representation of women with acute injuries due to domestic vi-

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olence. The institutional review board at each study site approved the study. All subjects provided oral consent, and all were guaranteed anonymity. The use of written consent was avoided in order to prevent a link identifying subjects to the questionnaires administered.

Study Population

The study population consisted of intentionally injured women and a control group of women who had not been intentionally injured who sought medical care at the participating emergency departments during the study period and who had current or recent (within one year) male partners. We defined an intentionally injured woman as any woman, 18 to 64 years of age, who had been assaulted and injured within the preceding two weeks by a current or recent male partner (boyfriend, husband, ex-boyfriend, or ex-husband). Specially trained physicians or research assistants identified eligible women with use of a standardized questionnaire administered to women with a history of trauma or signs of injury. The questionnaire was designed for use in emergency departments to identify episodes of domestic violence.^{7,8} Eligible women were included only if they reported or acknowledged being physically assaulted by their male partners. Women were excluded if they had also been sexually assaulted.

The control group was made up of women 18 to 64 years of age who were seen in the emergency department and who were selected in order to represent the distribution of study variables in the source population. At each study site, for periods of up to 15 months, research assistants identified, selected, and interviewed all consecutive eligible female patients. Women without a current or recent (within one year) male partner and women with a history of injury from domestic violence within the preceding year were excluded. Emergency-department-based controls were considered more appropriate than population-based controls because some victims of domestic violence in the source population may not have been treated for their injuries.⁹⁻¹¹ This method of nonrandom sampling was preferable to population-based sampling because it considered the selection factors that brought the controls to the emergency departments.⁹⁻¹⁴ The spectrum of initial diagnoses among the control patients was very wide; we did not document their final diagnoses.

Variables

The study variables were selected on the basis of findings from our preliminary study¹⁵ and prior biomedical, psychological, sociological, and population-based investigations.¹⁶⁻²⁹ Variables in the analysis were classified on the basis of a woman's responses to specific questions concerning herself and her partner. Spousal and next-of-kin surrogates have been shown to be accurate sources of information in case-control studies.³⁰⁻³² Study site was included in the statistical analyses so as to limit the possibility of confounding by this variable.

Definition of Variables

The male partner was categorized as a husband, boyfriend, or former partner. A former partner was defined as a former husband, estranged husband, or former boyfriend.

The partner was categorized as working full time; working part time, defined as working at a regular job that was less than full time; working intermittently (e.g., as a day laborer); long-term unemployed; or recently unemployed. The woman's employment status was not assessed.

A partner's drug use was based on the woman's response to the following question: "During the last year, has your partner used illegal drugs?" Alcohol use by both the woman and her partner was categorized according to an abridged version of the Alcohol Use Disorders Identification Test,³³ which included only the three questions on the frequency and quantity of alcohol consumption. The questions, responses, and scores assigned to the responses were as follows: "During the past year, how often did you (or your

partner) have a drink containing alcohol?" The possible responses were never (a score of 1), monthly or less (2), two to four times a month (3), two or three times a week (4), or four or more times a week (5). "How many drinks containing alcohol do you (or does your partner) have on a typical day when you are (or your partner is) drinking?" The possible responses were never drink (a score of 1), 1 or 2 drinks (2), 3 or 4 drinks (3), 5 or 6 drinks (4), 7 to 9 drinks (5), or 10 or more drinks (6). "How often do you (or does your partner) have six or more drinks on one occasion?" The possible responses were never (a score of 1), less than monthly (2), monthly (3), weekly (4), or daily or almost daily (5). A total score of more than 8 of a possible 16 points was categorized as representing alcohol abuse, and a total score of 8 or less was categorized as not representing alcohol abuse. The wide range that we used to define alcohol abuse reflects a wide range of types of drinking behavior that may not be classified as abusive by others. The three questions were also evaluated independently as variables indicating alcohol use. In an independent evaluation, these three questions were found to be valid for use as a primary care screening test for excessive drinking and alcohol abuse.³⁴

Description of Injuries

We recorded the type, location, and severity of the injuries sustained by the women. We documented the use of weapons to inflict the injuries but not the treatment given, the management of the case by the emergency department, or the long-term outcomes.

Data Collection

Data were collected for periods of 3 to 15 months, depending on the study site, from July 1997 through September 1998. Information regarding the variables was collected from all the women at the time of their medical evaluation with use of a standard data-collection instrument with structured and closed-ended questions.^{35,36} We did not review the women's charts. This approach enhanced the quality of information obtained from both groups of women.^{10,11} Interviewers at each study site were instructed with respect to selection criteria, interviewing techniques, and use of the questionnaire.

Statistical Analysis

We first examined the distributions of the socioeconomic and demographic variables in the two groups of women and the percentage of missing values for each variable.³⁷ We used cross-tabular univariate analyses to estimate crude odds ratios for each categorical and ordinal variable.³⁷ We used cross-tabular stratified analyses to identify confounding and interactions among the variables.⁹ We used multiple logistic-regression analyses to estimate adjusted odds ratios.^{9,38} We then conducted sensitivity analyses to assess the variability of the estimates of the odds ratios depending on the inclusion and exclusion of different variables and product terms in the models.^{9,38} We used odds ratios to estimate relative risks.^{9,38} We used residual analyses to assess the fit of the multiple logistic-regression models.³⁸ The selected model included terms representing all the variables for the women's characteristics and those of their partners. All P values are two-sided.

RESULTS

At the eight emergency departments, 282 intentionally injured women and 749 control women were identified as eligible to participate in the study, and 256 (90.8 percent) and 659 (88.0 percent), respectively, agreed to participate. The age and race or ethnic group of women who declined to participate were similar to those of the women who agreed to participate. We did not record specific reasons for nonparticipation. Among the various study sites, the number of intentionally injured women ranged from 12

to 61, and the number of controls ranged from 20 to 244. The percentages of missing values ranged from 0.2 percent to 6.0 percent (average, 2.0 percent). The base-line characteristics of the women and their partners are presented in Table 1.

The types and locations of the injuries sustained by the intentionally injured women are given in Table 2. The 256 women had a total of 434 contusions and abrasions, 89 lacerations, and 41 fractures and dislocations. Soft-tissue injuries were concentrated on the head, face, arms, hands, and legs. Fractures and dislocations were concentrated on the face, arms, and hands. A weapon was used to inflict the injuries in the cases of 69 women (27.0 percent). The majority of the weapons were blunt objects, such as pipes, broomsticks, bottles, and guns (in the case of 4 women), but a knife or other sharp object was used on 18 women. None of the women had a gunshot wound.

Crude and adjusted relative risks of injury from domestic violence, according to the base-line characteristics of the women and their partners, are presented in Table 3. For the women, in the adjusted analysis, having a former partner was the relationship variable that had the strongest association with injury from domestic violence (adjusted relative risk of injury, 3.5; 95 percent confidence interval, 1.5 to 8.3). This association was even stronger when the woman was living with her former partner (stratum-specific adjusted relative risk, 8.9; 95 percent confidence interval, 2.6 to 33.8).

Women with more than a high-school education also appeared to be at higher risk for injury from domestic violence than women who were high-school graduates (adjusted relative risk, 2.7; 95 percent confidence interval, 1.4 to 5.0). However, the relative risk varied significantly depending on which variables were included in or excluded from the multiple logistic-regression models. For example, when all characteristics of the partners were excluded, the relative risk was 1.3 (95 percent confidence interval, 0.8 to 2.0), but when all other characteristics of the women were excluded, the relative risk was 2.4 (95 percent confidence interval, 1.4 to 4.2). Such variation suggests that the relative risk associated with having more than a high-school education in the final model may be inaccurate.^{9,38}

The other characteristics of the women that we examined were not significant risk factors. In particular, alcohol abuse among the women was not a significant factor in the multivariate analysis, apparently because of confounding by alcohol abuse among the partners.

For the partners of intentionally injured women, factors that were associated with an increased risk of inflicting injury as a result of domestic violence included alcohol abuse (adjusted relative risk, 3.6; 95 percent confidence interval, 2.2 to 5.9), drug use

TABLE 1. BASE-LINE CHARACTERISTICS OF THE WOMEN AND THEIR PARTNERS.*

CHARACTERISTIC	INTENTIONALLY INJURED WOMEN (N=256)	CONTROL WOMEN (N=659)	P VALUE
Women			
Age — yr	32±9	35±11	<0.001
Race or ethnic group — no. (%)			0.12
White	42 (16.4)	156 (23.7)	
Black	128 (50.0)	295 (44.8)	
Hispanic	74 (28.9)	176 (26.7)	
Other	11 (4.3)	27 (4.1)	
Unknown	1 (0.4)	5 (0.8)	
Level of education — no. (%)			0.22
Less than high-school graduate	85 (33.2)	190 (28.8)	
High-school graduate	76 (29.7)	234 (35.5)	
More than high-school graduate	90 (35.2)	229 (34.7)	
Unknown	5 (2.0)	6 (0.9)	
Status of partner — no. (%)			<0.001
Husband	67 (26.2)	299 (45.4)	
Boyfriend	112 (43.8)	295 (44.8)	
Former partner	64 (25.0)	54 (8.2)	
Unknown	13 (5.1)	11 (1.7)	
Living arrangement — no. (%)			0.05
Not living with partner	111 (43.4)	243 (36.9)	
Living with partner	138 (53.9)	405 (61.5)	
Unknown	7 (2.7)	11 (1.7)	
Length of relationship with partner — yr	6±7	9±10	<0.001
Annual household income — no. (%)			0.39
<\$30,000	213 (83.2)	551 (83.6)	
>\$30,000	32 (12.5)	100 (15.2)	
Unknown	11 (4.3)	8 (1.2)	
Alcohol abuse — no. (%)			<0.001
No	195 (76.2)	611 (92.7)	
Yes	58 (22.7)	47 (7.1)	
Unknown	3 (1.2)	1 (0.2)	
Male partners			
Age — yr	34±10	38±12	0.003
Race or ethnic group — no. (%)			0.23
White	41 (16.0)	142 (21.5)	
Black	135 (52.7)	311 (47.2)	
Hispanic	68 (26.6)	176 (26.7)	
Other	11 (4.3)	23 (3.5)	
Unknown	1 (0.4)	7 (1.1)	
Level of education — no. (%)			<0.001
Less than high-school graduate	101 (39.5)	160 (24.3)	
High-school graduate	78 (30.5)	236 (35.8)	
More than high-school graduate	54 (21.1)	243 (36.9)	
Unknown	23 (9.0)	20 (3.0)	
Employment status — no. (%)			<0.001
Employed full time	126 (49.2)	471 (71.5)	
Employed part time	23 (9.0)	55 (8.3)	
Intermittently employed	23 (9.0)	26 (3.9)	
Long-term unemployed	43 (16.8)	69 (10.5)	
Recently unemployed	34 (13.3)	29 (4.4)	
Unknown	7 (2.7)	9 (1.4)	
Alcohol abuse — no. (%)			<0.001
No	77 (30.1)	474 (71.9)	
Yes	163 (63.7)	173 (26.3)	
Unknown	16 (6.2)	12 (1.8)	
Drug use — no. (%)			<0.001
No	131 (51.2)	579 (87.9)	
Yes	94 (36.7)	56 (8.5)	
Unknown	31 (12.1)	24 (3.6)	

*Plus-minus values are means ±SD. Because of rounding, not all percentages total 100.

TABLE 2. TYPES AND LOCATIONS OF THE INJURIES TO THE 256 INTENTIONALLY INJURED WOMEN.*

LOCATION	CONTUSIONS AND ABRASIONS		FRACTURES AND DISLOCATIONS
	ABRASIONS	LACERATIONS	DISLOCATIONS
Head†	70	26	1
Face‡	83	34	11
Neck	32	5	0
Chest	37	0	1
Breasts	12	1	NA
Abdomen§	18	2	NA
Back	43	1	0
Buttocks	23	0	NA
Arms and hands	61	18	20
Legs and feet	55	2	8
Total	434	89	41

*Some women had more than one injury. NA denotes not applicable.

†Thirteen women had loss of consciousness, and one woman had a depressed skull fracture.

‡Two women had a ruptured ocular globe, and two had a facial-nerve laceration.

§Three women had injuries of internal organs.

(adjusted relative risk, 3.5; 95 percent confidence interval, 2.0 to 6.4), intermittent employment (adjusted relative risk, 3.1; 95 percent confidence interval, 1.1 to 8.8), recent unemployment (adjusted relative risk, 2.7; 95 percent confidence interval, 1.2 to 6.5), and having less than a high-school education (adjusted relative risk, 2.5; 95 percent confidence interval, 1.4 to 4.4). The race or ethnic group of the partner was not associated with the risk of inflicting injury as a result of domestic violence.

The adjusted relative risks of injury from domestic violence according to the responses to the three questions on alcohol use by both the women and their partners are presented in Table 4. For the women, only the response to the question about the number of drinks containing alcohol that were consumed on a typical day during periods of drinking was significantly associated with the risk of injury from domestic violence. The estimates, however, may be imprecise because of the very few subjects in some of the categories. For male partners, all three measures of alcohol consumption were associated with the risk of inflicting injury as a result of domestic violence.

Of the 256 intentionally injured women, 163 (63.7 percent) had partners who were alcohol abusers and 94 (36.7 percent) had partners who used drugs. When asked whether their partners had been drinking or using drugs just before the assault, 132 women (51.6 percent) answered yes to the question about alcohol use and 38 (14.8 percent) answered yes to the question about drug use.

TABLE 3. ESTIMATES OF THE RELATIVE RISK OF INJURY FROM DOMESTIC VIOLENCE, ACCORDING TO THE BASE-LINE CHARACTERISTICS OF THE INTENTIONALLY INJURED WOMEN AND THEIR PARTNERS.*

CHARACTERISTIC	CRUDE RELATIVE RISK (95% CI)	ADJUSTED RELATIVE RISK (95% CI)†
Women		
Age (per year of age)	NA	1.0 (1.0–1.0)
Race or ethnic group		
White‡	1.0	1.0
Black	1.6 (1.1–2.4)	1.8 (0.6–5.2)
Hispanic	1.6 (1.0–2.5)	2.5 (0.8–7.7)
Other	1.5 (0.6–3.5)	2.1 (0.4–9.7)
Level of education		
High-school graduate‡	1.0	1.0
Less than high-school graduate	1.4 (0.9–2.0)	1.1 (0.6–1.9)
More than high-school graduate	1.2 (0.8–1.8)	2.7 (1.4–5.0)
Status of partner		
Husband‡	1.0	1.0
Boyfriend	1.7 (1.2–2.4)	1.0 (0.5–1.8)
Former partner	5.3 (3.3–8.5)	3.5 (1.5–8.3)
Living arrangement		
Not living with partner‡	1.0	1.0
Living with partner	0.8 (0.6–1.0)	1.4 (0.8–2.5)
Length of relationship with partner (per year)	NA	1.0 (1.0–1.0)
Annual household income		
<\$30,000‡	1.0	1.0
>\$30,000	0.8 (0.5–1.3)	1.5 (0.7–3.2)
Pregnancy status		
Not pregnant‡	1.0	1.0
Pregnant	0.8 (0.4–1.6)	0.4 (0.2–1.3)
Alcohol abuse		
No‡	1.0	1.0
Yes	3.9 (2.5–6.0)	1.8 (0.9–3.6)
Male partners		
Age (per year of age)	NA	1.0 (0.9–1.0)
Race or ethnic group		
White‡	1.0	1.0
Black	1.5 (1.0–2.3)	1.5 (0.5–4.6)
Hispanic	1.3 (0.8–2.1)	0.6 (0.2–1.8)
Other	1.7 (0.7–3.9)	1.7 (0.3–8.7)
Level of education		
High-school graduate‡	1.0	1.0
Less than high-school graduate	1.9 (1.3–2.8)	2.5 (1.4–4.4)
More than high-school graduate	0.7 (0.4–1.0)	0.6 (0.3–1.1)
Employment status		
Employed full time‡	1.0	1.0
Employed part time	1.6 (0.9–2.7)	0.8 (0.3–1.7)
Intermittently employed	3.3 (1.8–6.2)	3.1 (1.1–8.8)
Long-term unemployed	2.3 (1.4–3.6)	2.4 (1.2–4.9)
Recently unemployed	4.4 (2.5–7.7)	2.7 (1.2–6.5)
Alcohol abuse		
No‡	1.0	1.0
Yes	5.8 (4.2–8.1)	3.6 (2.2–5.9)
Drug use		
No‡	1.0	1.0
Yes	7.4 (5.0–11.1)	3.5 (2.0–6.4)

*CI denotes confidence interval, and NA not applicable.

†The adjusted multiple logistic-regression model included terms for all characteristics of the women, all characteristics of their partners, and the study site.

‡This group served as the reference group.

TABLE 4. ESTIMATES OF THE ADJUSTED RELATIVE RISK OF INJURY FROM DOMESTIC VIOLENCE, ACCORDING TO THE RESPONSES TO QUESTIONS ON ALCOHOL USE.

QUESTION AND RESPONSE	INTENTIONALLY INJURED WOMEN (N=256)	CONTROL WOMEN (N=659)	ADJUSTED RELATIVE RISK (95% CI)*	PARTNERS OF INTENTIONALLY INJURED WOMEN (N=256)	PARTNERS OF CONTROL WOMEN (N=659)	ADJUSTED RELATIVE RISK (95% CI)*
During the past year, how often did you (or your partner) have a drink containing alcohol?						
Never†	87	328	1.0	34	244	1.0
Monthly or less	63	193	1.1 (0.6–2.0)	30	127	1.0 (0.5–2.1)
2 to 4 times a month	54	80	1.6 (0.8–3.3)	35	124	1.3 (0.6–2.7)
2 or 3 times a week	27	33	1.7 (0.7–4.3)	47	75	3.7 (1.7–8.0)
4 or more times a week	23	25	1.2 (0.4–3.4)	102	86	5.2 (2.6–10.5)
Unknown	2	0	—	8	3	—
How many drinks containing alcohol do you (or does your partner) have on a typical day when you are (or your partner is) drinking?						
Never drink†	87	328	1.0	34	244	1.0
1 or 2	74	222	0.9 (0.5–1.6)	37	145	1.5 (0.8–3.0)
3 or 4	51	81	1.8 (0.9–3.6)	36	128	1.4 (0.7–2.8)
5 or 6	20	19	3.3 (1.1–9.9)	45	80	2.1 (1.0–4.4)
7 to 9	11	4	2.3 (0.4–13.4)	31	13	6.6 (2.4–18.5)
10 or more	10	3	16.5 (2.2–120.2)	60	37	4.7 (2.0–10.9)
Unknown	3	2	—	13	12	—
How often do you (or does your partner) have six or more drinks on one occasion?						
Never†	171	548	1.0	65	417	1.0
Less than monthly	36	76	1.6 (0.8–3.2)	26	77	1.3 (0.6–2.7)
Monthly	19	17	1.7 (0.6–4.7)	22	47	1.9 (0.8–4.3)
Weekly	10	8	2.1 (0.5–9.3)	55	67	2.9 (1.5–5.6)
Daily or almost daily	18	10	3.0 (0.8–10.3)	74	39	6.6 (3.1–14.0)
Unknown	2	0	—	14	12	—

*The adjusted multiple logistic-regression models for each question included terms for the study site, all characteristics of the women except alcohol abuse (yes or no) in estimates of the women's alcohol-consumption measures, and all characteristics of their partners except alcohol abuse in estimates of the partners' alcohol-consumption measures. CI denotes confidence interval.

†This group served as the reference group.

DISCUSSION

In a study at eight university-affiliated emergency departments, we examined risk factors for injury to women as a result of domestic violence. We placed special emphasis on evaluating the effect of alcohol use by both the woman and her male partner. Despite the strong association between alcohol use and injury from domestic violence in biomedical, pharmacologic, psychological, and sociological studies,^{21,26,39-44} there is still controversy about the precise effect of alcohol use in this setting.

We found that alcohol abuse by men was associated with an increased likelihood of inflicting injury as a result of domestic violence. In addition, there was a clear dose–response effect for the three measures of alcohol consumption that we evaluated. The precise mechanism by which alcohol acts to increase the risk of injury from domestic violence is not clear, but physiologic, psychological, and environmental factors may all be important. In addition, many women in our study noted that their partners did not abuse alcohol and had not been drinking just before the assault. Thus, alcohol use by men cannot account

for all injuries from domestic violence and cannot be considered either a necessary or a sufficient condition for domestic violence.

More important, the use of alcohol does not explain the underlying pathological relationship between intimate partners that results in physical assault. This relationship has been characterized as one in which there is an imbalance of power, with one partner exerting coercive control. Psychologists and sociologists believe that this type of asymmetric power structure is the main determinant of conflict in intimate relationships.^{22,27-29,45,46} Alcohol use by men, therefore, may increase the risk that such men will assault their partners. If this is the case, then decreasing the use of alcohol may reduce, but not eliminate, this risk.^{47,48}

The association between alcohol use and domestic violence was not as apparent for women as it was for men. Specifically, the effect of alcohol abuse by women appeared to be confounded by alcohol abuse by their partners. This is consistent with the finding of a high degree of concordance between spouses with respect to alcohol dependence and heavy drinking.⁴⁹ In addition, women may turn to alcohol use

in response to the recurrent episodes of physical and emotional abuse inflicted by their partners.

Drug use by men was also associated with an increased risk of inflicting injury as a result of domestic violence. This finding corroborates those of earlier studies.^{20,26,50} The women in our study reported a much lower frequency of drug use than of alcohol use by their partners just before the assault. We did not assess the effect of specific types or quantities of drug use.

We also found that intermittent employment and unemployment (both recent and long term) of the partner were risk factors. Possibly, the stress of finding work or of unemployment (alone or in combination with other factors) increases the risk that a man will physically abuse his partner.

Lower levels of education for men were also associated with an increased risk of inflicting injury as a result of domestic violence. This factor may be closely associated with other risk factors in men, such as unemployment or alcohol abuse. Low levels of education may also be an indicator of poor communication skills, which have likewise been linked to a history of domestic violence among men.⁴⁶

The man's status as a partner was also associated with the risk of inflicting injury as a result of domestic violence. Specifically, women with a former partner appeared to be at greater risk for injury, and the risk increased substantially if the woman was still living with her former partner.

One limitation of our study is the possibility of selection bias. Although the control women were selected from the same emergency-department populations as the intentionally injured women, factors related to injury from domestic violence may have influenced their selection. To limit this type of bias, the controls were selected from among all eligible female patients in the emergency department (without regard to the reason for their visit), so that no one disease was unduly represented in the control group.^{10,11} Selection bias was also limited by the use of the same criteria for eligibility and exclusion for the two groups, by the high degree of participation in both groups of eligible women, and by the absence of demographic differences between participants and nonparticipants.⁹

Misclassification may also have biased our results. Since most of the study variables (e.g., age, race or ethnic group, level of education, income, and employment status) were not subject to substantial errors in recall or intentional misclassification, the degree of bias resulting from misclassification for these variables is likely to be very low. Misclassification of alcohol use and drug use was more likely. The assessment of alcohol use may have been inaccurate, depending on which group a woman was in, resulting in a misclassification bias toward or away from the null effect. For example, as compared with the

controls, intentionally injured women may have underreported their alcohol consumption to deflect any assumptions about their responsibility for the domestic violence. These women may also have overreported alcohol consumption or drug use by their partners. Since intentionally injured women may be more concerned than other women about their partners' alcohol and drug use, recall bias may have resulted in an overestimation of the effect of these factors.

Potential misclassification of the variables was limited by our use of a validated questionnaire. We limited misclassification of intentionally injured women by including only women who reported or acknowledged being injured as a result of domestic violence. We limited misclassification of controls by excluding women with a history of physical abuse.

Because we examined potential risk factors among women who sought care in eight geographically diverse emergency departments that served a broad variety of people, our findings can be extrapolated (at least to a limited degree) to women who seek care in emergency departments. Even with this degree of heterogeneity, however, the women we studied may not represent victims of domestic violence in general. Risk factors for injury from domestic violence may differ greatly among women with higher socioeconomic status and women with injuries that do not require emergency medical care. This uncertainty makes it difficult to generalize our findings.

Our findings underscore the multifactorial nature of injuries from domestic violence. Future studies should consider additional factors, including psychological disorders, physiologic disorders, and social-learning determinants, such as a history of child abuse or witnessing domestic violence as a child. They should also include an adequate period of follow-up and an assessment of the past experiences of both the women and the men involved.

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REFERENCES

1. Family and other intimate assaults — Atlanta, 1984. *MMWR Morb Mortal Wkly Rep* 1990;39:525-9.
2. Grisso JA, Wishner AR, Schwarz DF, Weene BA, Holmes JH, Sutton RL. A population-based study of injuries in inner-city women. *Am J Epidemiol* 1991;134:59-68.
3. Stark E, Flitcraft A. Spouse abuse. In: Surgeon General's workshop on violence and public health: source book, 1985. Atlanta: Centers for Disease Control, 1986:SA1-SA43.
4. Crowell NA, Burgess AW, eds. *Understanding violence against women*. Washington, D.C.: National Academy Press, 1996.
5. Wilt S, Olson S. Prevalence of domestic violence in the United States. *J Am Med Womens Assoc* 1996;51:77-82.
6. Kellermann AL, Mercy JA. Men, women, and murder: gender-specific differences in rates of fatal violence and victimization. *J Trauma* 1992;33:1-5.

7. Feldhaus KM, Koziol-McLain J, Amsbury HL, Norton IM, Lowenstein SR, Abbott JT. Accuracy of 3 brief screening questions for detecting partner violence in the emergency department. *JAMA* 1997;277:1357-61.
8. Grunfeld AF, Ritmiller S, Mackay K, Cowan L, Hotch D. Detecting domestic violence against women in the emergency department: a nursing triage model. *J Emerg Nurs* 1994;20:271-4.
9. Rothman KJ, Greenland S. *Modern epidemiology*. 2nd ed. Philadelphia: Lippincott-Raven, 1998.
10. Wacholder S, McLaughlin JK, Silverman DT, Mandel JS. Selection of controls in case-control studies. I. Principles. *Am J Epidemiol* 1992;135:1019-28.
11. Wacholder S, Silverman DT, McLaughlin JK, Mandel JS. Selection of controls in case-control studies. II. Types of controls. *Am J Epidemiol* 1992;135:1029-41.
12. Savitz DA, Pearce N. Control selection with incomplete case ascertainment. *Am J Epidemiol* 1988;127:1109-17.
13. Miettinen OS. The concept of secondary base. *J Clin Epidemiol* 1990;43:1017-20.
14. Robins J, Pike M. The validity of case-control studies with nonrandom selection of controls. *Epidemiology* 1990;1:273-84.
15. Kyriacou DN, McCabe F, Anglin D, Lapesarde K, Winer MR. Emergency department-based study of risk factors for acute injury from domestic violence against women. *Ann Emerg Med* 1998;31:502-6.
16. Sorenson SB, Upchurch DM, Shen H. Violence and injury in marital arguments: risk patterns and gender differences. *Am J Public Health* 1996;86:35-40.
17. McCauley J, Kern DE, Kolodner K. The "battering syndrome": prevalence and clinical characteristics of domestic violence in primary care internal medicine practices. *Ann Intern Med* 1995;123:737-46.
18. Gazmararian JA, Adams MM, Saltzman LE, et al. The relationship between pregnancy intendedness and physical violence in mothers of newborns. *Obstet Gynecol* 1995;85:1031-8.
19. Gelles RJ, Straus MA. Determinants of violence in the family: toward a theoretical integration. In: Burr WR, Hill R, Nye FI, Reiss IL, eds. *Contemporary theories about the family*. Vol. 1. New York: Free Press, 1979.
20. Golden CJ, Jackson ML, Peterson-Rohne A, Gontkovsky ST. Neuropsychological correlates of violence and aggression: a review of the clinical literature. *Aggression Violent Behav* 1996;1:3-25.
21. Lindman R, von der Pahlen B, Öst B, Eriksson CJP. Serum testosterone, cortisol, glucose, and ethanol in males arrested for spouse abuse. *Aggress Behav* 1992;18:393-400.
22. Holtzworth-Munroe A, Stuart GL. Typologies of male batterers: three subtypes and the differences among them. *Psychol Bull* 1994;116:476-97.
23. Hastings JE, Hamberger LK. Personality characteristics of spouse abusers: a controlled comparison. *Violence Vict* 1988;3:31-48.
24. Dutton DG, Starzomski AJ. Borderline personality in perpetrators of psychological and physical abuse. *Violence Vict* 1993;8:327-37.
25. Physical violence and injuries in intimate relationships — New York, Behavioral Risk Factor Surveillance System, 1994. *MMWR Morb Mortal Wkly Rep* 1996;45:765-7.
26. Hotelling GT, Sugarman DB. An analysis of risk markers in husband to wife violence: the current state of knowledge. *Violence Vict* 1986;1:101-24.
27. Tontodonato P, Crew BK. Dating violence, social learning theory, and gender: a multivariate analysis. *Violence Vict* 1992;7:3-14.
28. Ellis D. Male abuse of a married or cohabiting female partner: the application of sociological theory to research findings. *Violence Vict* 1989;4:235-55.
29. Bookwala J, Frieze IH, Smith C, Ryan K. Predictors of dating violence: a multivariate analysis. *Violence Vict* 1992;7:297-311.
30. Lerchen ML, Samet JM. An assessment of the validity of questionnaire responses provided by a surviving spouse. *Am J Epidemiol* 1986;123:481-9.
31. McLaughlin JK, Mandel JS, Mehl ES, Blot WJ. Comparison of next-of-kin with self-respondents regarding questions on cigarette, coffee, and alcohol consumption. *Epidemiology* 1990;1:408-12.
32. Graham P, Jackson R. Primary versus proxy respondents: comparability of questionnaire data on alcohol consumption. *Am J Epidemiol* 1993;138:443-52.
33. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption—II. *Addiction* 1993;88:791-804.
34. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. *Arch Intern Med* 1998;158:1789-95.
35. Fink A. *How to ask survey questions*. Thousand Oaks, Calif.: Sage, 1995.
36. *Idem*. *How to design surveys*. Thousand Oaks, Calif.: Sage, 1995.
37. Woolson RF. *Statistical methods for the analysis of biomedical data*. New York: John Wiley, 1987.
38. Hosmer DW Jr, Lemeshow S. *Applied logistic regression*. New York: John Wiley, 1989.
39. Gustafson R. Alcohol and aggression: a replication study controlling for potential confounding variables. *Aggressive Behav* 1992;18:21-8.
40. Gantner AB, Taylor SP. Human physical aggression as a function of alcohol and threat of harm. *Aggressive Behav* 1992;18:29-36.
41. Lee WV, Weinstein SP. How far have we come? A critical review of the research on men who batter. *Recent Dev Alcohol* 1997;13:337-56.
42. Gustafson R. A possible confounding variable in different versions of the "aggression machine" when used in research on alcohol. *Psychol Rep* 1986;58:303-8.
43. Branchey MH, Buydens-Branchey L, Lieber CS. P3 in alcoholics with disordered regulation of aggression. *Psychiatry Res* 1988;25:49-58.
44. Cloninger CR. Neurogenetic adaptive mechanisms in alcoholism. *Science* 1987;236:410-6.
45. Coleman DH, Straus MA. Marital power, conflict, and violence in a nationally representative sample of American couples. *Violence Vict* 1986;1:141-57.
46. Dutton DG, Strachan CE. Motivational needs for power and spouse-specific assertiveness in assaultive and nonassaultive men. *Violence Vict* 1987;2:145-56.
47. O'Farrell TJ, Murphy CM. Marital violence before and after alcoholism treatment. *J Consult Clin Psychol* 1995;63:256-62.
48. Conner KR, Ackerley GD. Alcohol-related battering: developing treatment strategies. *J Fam Violence* 1994;9:143-55.
49. McLeod JD. Spouse concordance for alcohol dependence and heavy drinking: evidence from a community sample. *Alcohol Clin Exp Res* 1993;17:1146-55.
50. Roberts AR. Substance abuse among men who batter and their mates: the dangerous mix. *J Subst Abuse Treat* 1988;5:83-7.