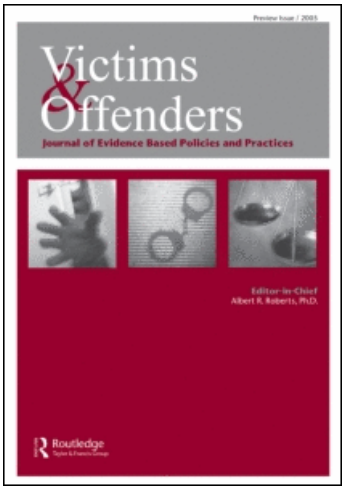

Victims & Offenders
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t716100771

Predicting Injuries of Women in Episodes of Intimate Partner Violence: Individual and Composite Risk Factors

Richard G. Greenleaf[a]; Jamie L. Flexon[b]; Arthur J. Lurigio[c]; Jessica A. Snowden[c]
[a] Elmhurst College, [b] Florida International University, Miami, Florida, USA [c] Loyola University, Elmhurst, Illinois, USA

Online publication date: 24 March 2010

To cite this Article Greenleaf, Richard G. , Flexon, Jamie L. , Lurigio, Arthur J. and Snowden, Jessica A.(2010) 'Predicting Injuries of Women in Episodes of Intimate Partner Violence: Individual and Composite Risk Factors', Victims & Offenders, 5: 2, 101 — 119
To link to this Article: DOI: 10.1080/15564880903422989
URL: http://dx.doi.org/10.1080/15564880903422989

Victims and Offenders, 5:101–119, 2010

ISSN: 1556-4886 print/1556-4991 online
DOI: 10.1080/15564880903422989

Routledge
Taylor & Francis Group

Predicting Injuries of Women in Episodes of Intimate Partner Violence: Individual and Composite Risk Factors

Richard G. Greenleaf

Elmhurst College

Jamie L. Flexon

Florida International University, Miami, Florida, USA

Arthur J. Lurigio and Jessica A. Snowden

Loyola University, Elmhurst, Illinois, USA

Abstract: This article examines incidents of intimate partner violence (IPV). The study involved a large sample of female victims and male perpetrators of IPV from Framingham, Massachusetts, just west of Boston. Physical injuries to IPV victims, which are sometimes serious and can be a harbinger of intimate partner homicide, were explored in order to explain the individual (and constellation of) factors that predict victim injury. We employed an innovative statistical technique that identified the profile or configuration of victim, perpetrator, and incident variables that predict victim injury. In applying various statistical techniques, different results emerged, which highlighted the complex nature of IPV.

Keywords: restraining order, domestic violence, injuries

BACKGROUND

Gravity of the Problem

Intimate partner violence (IPV) is a serious, widespread public health problem in the United States, affecting more than 3 million women annually and including 5 million episodes of intimate partner–related battery and sexual

Address correspondence to Richard G. Greenleaf, Elmhurst College, Department of Sociology and Criminal Justice, Elmhurst, IL 60126. E-mail: greenleafr@elmhurst.edu

assault (Collins et al., 1999; Straus & Gelles, 1990b; Tjaden & Thoennes, 2000). In 2001, more than 85% of the victims of nonfatal IPV (588,490) were women (Bureau of Justice Statistics, 2003); in addition, women are more likely than men to be injured or killed as a result of IPV (Straus & Gelles, 1990a). For example, in 2000, intimate partner homicide accounted for more than one-third of the murders of women but fewer than 4% of the murders of men (Bureau of Justice Statistics, 2003).

A recent national survey conducted by the Centers for Disease Control and Prevention found that 24% of women reported that they were a victim of IPV in their lives (Black & Breiding, 2008). According to this research, each year 1,200 women are killed and more than 2 million are injured in episodes of IPV. The female victims of IPV are more than twice as likely as female nonvictims to report physical and emotional problems, 50% more likely to use disability equipment, and 80% more likely to suffer from serious health conditions such as heart disease, arthritis, and asthma.

Reporting and Recording IPV Incidents

The recording and reporting of IPV incidents differs along racial, ethnic, and socioeconomic lines—and often depends on the nature and outcome of a particular episode (Grossman & Lundy, 2007). For example, among female victims of IPV, African Americans are more likely to call the police than are whites (Bachman & Coker, 1995). In addition, women who indicated that their current batterer had never previously abused them are more likely to report an attack to the police, compared to women who indicated that their current batterer had previously abused them (Bachman & Coker, 1995). Female victims of IPV who sustain physical injury in an attack are also more likely to report the incident to the police than those who sustain no physical injury (Bachman & Coker, 1995). The frequency and severity of victimization often escalate, with repeated occurrences of domestic violence (Straus & Gelles, 1990a).

The known prevalence of violence against women is higher among poorer women without college degrees—and is especially high among multiethnic, American Indian, and Alaskan Native women (Black & Breiding, 2008). According to Alvi, Schwartz, DeKeseredy, and Bachaus (2005), women who accept traditional patriarchal norms or endorse male privilege are more likely to be abused than women who do not. Immigrant women or those born outside the United States are at an unusually high risk of domestic violence (Raj & Silverman, 2002). Moreover, female victims of IPV often seek no medical assistance or other formal intervention until the abuse has become more pronounced, thereby increasing the likelihood of physical injury or death.

Shame and embarrassment frequently prevent female IPV victims from calling the police or obtaining medical attention for their injuries (Fugate,

Landis, Riordan, Naureckas, & Engel, 2005). This reluctance is more pronounced for some victims than for others. For example, in the United States, battered immigrant women are often isolated from their family and friends and therefore their injury and suffering likely go unreported and unnoticed (Raj & Silverman, 2002). When IPV victims are seen in emergency rooms, physicians are more likely to recognize and note the signs of abuse among poor patients of color than among other groups of patients who are as likely to experience partner abuse (Salber & Taliaferro, 1995). As a result, medical professionals miss cases of IPV because the woman does not fit the standard victim profile. Thus, police officers and emergency room doctors, nurses, and other medical professionals encounter only a small percentage of IPV victims. As a result, they have limited opportunities to obtain knowledge about such victims or their experiences.

Victim Harm

Victims of IPV can experience physical harm, ranging from minor scrapes to life-threatening injuries to death. At one end of the spectrum, researchers reported that contusions were the most common injury sustained by female IPV victims and were more likely to involve bruises to the facial area than any other part of the body (Coben, Forjuoh, & Gondolf, 1999). At the other end of the spectrum, IPV incidents of male-to-female partner violence can result in serious injury or death (Salber & Taliaferro, 1995). The proportion of women killed by an intimate partner has been increasing in the past few years, whereas the percentage of men killed by an intimate partner has been decreasing (Fox & Zawitz, 2007). Based on data collected from the National Crime Victimization Survey, IPV incidents in which a perpetrator had used alcohol were more likely to result in victim injury overall and in injury that required medical attention (Brecklin, 2002).

The occurrence of injury often motivates a victim to seek a restraining order against the perpetrator. For example, in one study, 56% of the women who sought temporary restraining orders sustained injury during the incident. Nearly 40% of those injured required medical attention or hospitalization (Harrell & Smith, 1996). The effectiveness of restraining orders in preventing future cases of IPV among certain types of batterers has been established in previous investigations, but the relationship between the presence of a restraining order and victim injury has not been thoroughly explored (Coben et al., 1999; Holt, Kernic, Lumley, Wolf, & Rivara, 2002). Questions about victim injury remain: Does a restraining or protective order prevent further injury? What other factors might influence the effectiveness of restraining orders in preventing further injury? Although the relationship between alcohol consumption and IPV is complicated, several investigations suggest that alcohol can have a disinhibatory effect on men with a predilection toward IPV against women (Brecklin, 2002; Caetano, Ramisetty-Mikler, & McGrath,

2004). However, relatively few studies have explored the relationship between the extent of victim injury and a perpetrator's use of illicit drugs.

Current Study

The majority of reported IPV offenders are men, and most of the victims of IPV are women; hence, the current study focused on injuries suffered by women at the hands of men. The present research further explored the relationships between female victim injury and the male perpetrator's use of alcohol and drugs as well as the presence of a restraining order. It also investigated other critical questions. Are repeat abusers more likely to inflict injuries on their victims than those with no history of abuse? Does the presence of children in the home affect the likelihood of victim injuries? What is the relationship between who called the police and victim injuries? Does the offender's race or his country of birth affect victim injuries?

Unlike previous studies of injury to IPV victims—which have been generally based on self-reports that can fall short of capturing the true nature and extent of victim harm—this research used police incident reports to document victim injury in IPV cases. Most significant, this research investigated both individual factors and sets of factors that predict victim injury. The current study employed an analysis that identified the profile of female victims of IPV who are most likely to sustain injuries in the incident.

METHODS

Sample

The investigation was conducted in Framingham, Massachusetts. Framingham is located 20 miles west of Boston and has approximately 67,000 residents; 75% are white, 11% Latino, 5% African American, 4% Asian, and 5% other. Brazilian immigrants are among the largest segments of the Latino population (Framingham, 2008). Data were collected for a period of approximately 18 months (December 1995 to June 1997). Study participants were female victims of IPV and their male partners. Approximately 72% of the participants were in their relationship for five years or less; 8% of the participants were involved in the relationship for ten years or more.

A total of 670 domestic violence police reports were collected. The principal researcher, who has seven years of municipal law enforcement experience, coded most of the data. Only cases that involved female victims and their current or former male partners were included in the study (n = 424). Incidents of familial abuse that involved parents, children, siblings, or other family members were not examined.

Dependent Variable

The study's binary dependent variable was injury to the victim (0 = no injuries, 1 = injuries), which was gleaned from a box on the police incident report. In some cases, the officers' narrative was also read to determine if any injuries had occurred.

Predictor Variables

IPV data were obtained from police incident reports, which were stored in the Records Department of the Framingham Police Department. The study's predictor variables were the race of the victim and the batterer (white = 0, African American = 1, Hispanic = 2, Asian/other = 3), the batterer's use of alcohol or drugs (0 = no, 1 = yes), his prior involvement in domestic violence incidents (0 = no, 1 = yes), his employment status (0 = unemployed, 1 = employed), country of birth (0=United States, 1=other), and his use of a weapon during the incident (0 = no, 1 = yes).

Other independent variables included who called the police (0 = victim, 1 = male partner, 2 = other), if children were present during the incident (0 = no, 1 = yes), if a violation of a restraining order had been issued (0 = no, 1= yes), the status of the victim-offender relationship (current = 1, former = 2, child-in-common = 3), the length of the relationship in months (1 = 1–18 months, 2 = 19–60 months, 3 = 61–120 months, 4=more than 120 months), and if the victim spoke English (0 = no, 1 = yes).

Statistical Analysis

Data were entered into an SPSS file, and univariate, bivariate, and multivariate analyses were conducted. The bivariate analyses were used to test the associations between victims' injuries and the predictor variables. Multivariate logistic regression was used to estimate the unique contribution of each independent variable in explaining the dependant measure.

Optimal Data Analysis (ODA) was also employed to identify the predictors of victim injury by creating a multivariable classification tree model (Soltysik & Yarnold, 1994; Yarnold & Soltysik, 2005). ODA finds a decision rule for each predictor that maximizes the overall percentage of classification accuracy for the sample (Soltysik & Yarnold, 1994; Yarnold & Soltysik, 2005). Moreover, ODA identifies both main effects and interactions.

UniODA was conducted to first test the main effects of the predictor variables (e.g., whether victims were more likely to experience injury when children were present). The next step in the analyses tested the interactions of the predictor variables by performing a Classification Tree Analysis (CTA). The CTA selected the attribute from UniODA that had the greatest effect strength or sensitivity; that is, the attribute with the optimal power to predict victim injury. For this predictor, ODA formulated a decision rule that differentiated those injured from

those who were not in a sample of cases in which the first predictor variable was the most effective one in distinguishing female victims on the basis of injury.

ODA then used all the attributes again, this time only for members of the partitioned sample that was identified by the first significant predictor, which had the greatest overall effect strength sensitivity (i.e., the greatest statistical power to differentiate members of the sample on the outcome variable). The sample was partitioned further on the basis of other significant predictor variables. This continued for each "branch" of the CTA until the sample could be subdivided no further. At this point, that branch ended, and ODA constructed other branches of the tree using combinations of other significant predictors (Yarnold & Soltysik, 2005).

Unlike other statistical methods for constructing classification tree models (e.g., regression- and chi square–based classification trees), ODA uses an exact permutation probability with no distributional assumptions, assesses the expected cross-sample generalizability of classification rules, and finds main effects and nonlinear interactions that optimally predict outcomes. In addition, ODA can accommodate multicategory nominal predictors, such as race, without dummy coding these variables (Soltysik & Yarnold, 1994; Yarnold & Soltysik, 2005).

After the CTA was performed, post-hoc analyses were conducted to assess the final classification performance of the model, examining overall classification accuracy, sensitivity, predictive value, and effect strength (Yarnold & Soltysik, 2005). Overall classification accuracy is the percentage of the total sample that the tree model correctly classified. The effect strength sensitivity (i.e., the percentage of the actual members of a given category that the model correctly classified) and effect strength specificity (i.e., a prognostic index that indicates the percentage of the correct classifications in each category) were also used to assess the model's analytic performance.

Overall effect strength is the mean of the effect strengths for sensitivity and for predictive accuracy and reflects the model's performance from both descriptive and prognostic perspectives. In CTA, effect strength is a standardized index of model performance defined as how much better than chance the model does in making predictions on a scale of 0 to 100—in which 0=performance expected by chance and 100 = perfect classification accuracy—computed using the following formula: [(1−{(100−model performance statistic) / (100 / C)}) · 100%], in which C=number of response categories for the class variable (Yarnold, Soltysik, & Bennett, 1997, p. 1454). Effect strength values of 25% or less are considered weak, values greater than 25% and less than 50% are considered moderate, and values greater than 50% are considered strong (Yarnold & Soltysik, 2005).

ODA has proved accurate and informative in numerous applications, including studies of risky sexual behaviors (Donenberg, Bryant, Emerson, Wilson, & Pasch, 2003), substance abuse (Mueser et al., 2000), psychiatric hospital utilization

(Snowden, Leon, & Bryant, 2007), and geriatric medicine (Yarnold, 1996). Stalans, Yarnold, Seng, Olson, and Repp (2004) also used ODA to predict the recidivism of sex offenders on probation. The current research is the first to employ ODA to predict victim injury in a sample of women victims of IPV.

RESULTS

Participant and Incident Characteristics

Table 1 reports descriptive statistics for the participants and the domestic dispute. Most of the victims involved in the incidents (70%) were in a current relationship with the perpetrator, 26% were in a prior relationship, and 4% had a child-in-common. The length of victim-offender relationships was variable. Approximately 35% were less than 18 months in duration, 56% were between 18 months and 10 years in duration, and 8% were more than 10 years in duration. The overwhelming majority of victims (91%) were English-speaking, and two-thirds of the batterers were born in the United States. Offenders in the sample originated from more than twenty-five different countries, including Bangladesh, Bolivia, Brazil, Canada, China, El Salvador, Great Britain, India, Iran, Italy, Korea, Mexico, and Vietnam.

At the time of the event, two-thirds of the batterers were employed, and 62% had committed previous acts of IPV. During the incident, nearly one-fourth (24%) were under the influence of alcohol, and 5% were under the influence of drugs. In 71% of the cases, the victim notified the police; in 26% of the cases, someone else called the police (e.g., neighbor, family member, landlord); in only 3% of the cases did the offender call the police. Approximately 50% of the women sustained injuries from the assault, and more than 40% of the victims overall complained of pain following the episode. Furthermore, victims reported a total of nearly 200 specific injuries from the episode. In general, most of the injuries reported were minor. The most common injury was bruises (41%), followed by abrasions (34%), minor cuts (16%), and lacerations (7%).

The offender was present when the police arrived in 58% of the disturbances; children were present during 33% of the episodes. The majority of perpetrators (72%) were arrested during or immediately after the incident. At the time of the event, 18% of the men were in violation of a restraining order. A weapon was used in 10% of the episodes. The most common weapons were a blunt object, knife, or sharp object.

Correlates of Victim Injury

Table 2 reports the bivariate association between the presence of physical injuries and characteristics of the victim and her male partner. The victim's relationship with the offender was directly associated with victim injuries. Women in a current relationship with their assailants were substantially more

Table 1: Victim, offender, and situational variables.

	No	Yes			
Variables	**No. (%)**	**No. (%)**	**Mean**	**SE**	**N**
Female Victim					
Race or ethnic group			.60	.046	412
White		273 (66.3)			
African American		49 (11.8)			
Latino		79 (19.2)			
Asian		5 (1.2)			
Other		6 (1.5)			
Seeks medical assistance	284 (88.5)	37 (11.5)	2.26	.186	321
Complains of pain	90 (57.3)	67 (42.7)	.43	.040	157
Length of relationship					285
1–18 months		101 (35.4)			
19–60 months		105 (36.8)			
61–120 months		55 (19.3)			
>121 months		24 (8.4)			
Status of relationship			1.34	.027	403
Current		282 (70.0)			
Former		105 (26.0)			
Child-in-common		16 (4.0)			
Speaks English	39 (9.3)	379 (90.7)	.91	.014	418
Male Partners					
Race or ethnic group			.76	.047	417
White		229 (55.0)			
African American		75 (18.0)			
Latino		102 (24.5)			
Asian		4 (.9)			
Other		7 (1.7)			
Employed	108 (33.1)	218 (66.8)	.67	.026	326
Prior domestic violence	136 (38.1)	221 (61.9)	.62	.026	357
Under influence alcohol	319 (76.5)	98 (23.5)	.24	.021	417
Under influence drugs	396 (95.2)	20 (4.8)	.05	.011	416
Type of weapon used			.18	.031	420
None		378 (90.0)			
Blunt object		22 (5.2)			
Knife or sharp object		13 (3.1)			
Other		7 (1.6)			
Present when police arrived	174 (42.0)	240 (57.9)	.58	.024	414
Arrested	118 (27.8)	306 (72.2)	.72	.022	424
Restraining order violated	342 (81.6)	77 (18.4)	.22	.030	419
Country of birth					424
United States		278 (65.6)			
Other		146 (34.4)			
Other Variables					
Who called the police?			.55	.043	416
Female victim		295 (70.9)			
Male partner		14 (3.4)			
Other		107 (25.7)			
Children present?	280 (67.0)	138 (33.0)	.33	.023	418

Note: Percents may not add to 100 because of rounding.

Table 2: Victim and offender characteristics by victim injury.

Characteristic	Noninjured female (N = 219) No. (%)	Injured female (N = 205) No. (%)	P value
Female Victim			
Race or ethnic group			0.22
White	147 (70.3)	126 (62.1)	
African American	19 (9.1)	30 (14.8)	
Latino	37 (17.7)	42 (20.7)	
Asian/Other	6 (2.9)	5 (2.5)	
Length of relationship			0.37
1–18 months	39 (30.2)	62 (39.7)	
19–60 months	51 (2.3)	17 (8.4)	
61–120 months	26 (20.2)	29 (18.6)	
>121 months	13 (10.1)	11 (7.1)	
Status of relationship			<0.001
Current	113 (55.7)	169 (84.5)	
Former	78 (38.4)	27 (13.5)	
Child-in-common	12 (5.9)	4 (2.0)	
Speaks English			0.53
No	22 (10.2)	17 (8.4)	
Yes	194 (89.8)	185 (91.6)	
Male Partners			
Race or ethnic group			0.69
White	122 (57.5)	107 (52.2)	
African American	35 (16.5)	40 (19.5)	
Latino	49 (23.1)	53 (25.9)	
Asian/Other	6 (2.8)	5 (2.4)	
Employed			0.88
No	53 (32.7)	55 (33.5)	
Yes	109 (67.3)	109 (66.5)	
Prior domestic violence			0.07
No	60 (33.5)	76 (42.7)	
Yes	119 (66.5)	102 (57.3)	
Under influence alcohol			<0.001
No	181 (83.8)	138 (68.7)	
Yes	35 (16.2)	63 (31.3)	
Under influence drugs			0.54
No	206 (95.8)	190 (94.5)	
Yes	9 (4.2)	11 (5.5)	
Weapon used[†]			<.001
No	206 (94.9)	172 (84.7)	
Yes	11 (5.1)	31 (15.3)	
Present when police arrived			<.001
No	109 (51.2)	65 (32.3)	
Yes	104 (48.8)	136 (67.7)	
Arrested			<.001
No	88 (40.2)	30 (14.6)	
Yes	131 (59.8)	175 (85.4)	
Restraining order violated			<.000
No	148 (68.2)	194 (96.0)	
Yes	69 (31.8)	8 (4.0)	

(Continued)

Table 2: *(Continued).*

Characteristic	Noninjured female (N = 219) No. (%)	Injured female (N = 205) No. (%)	P value
Country of birth			0.56
United States	141 (64.4)	137 (66.8)	
Other</TC>	78 (35.6)	68 (33.2)	
Other Variables			
Who called the police?			<0.05
Female victim	161 (74.5)	134 (67.0)	
Male partner	10 (4.6)	4 (2.0)	
Other	45 (20.8)	62 (31.0)	
Children present?			<0.05
No	153 (71.5)	127 (62.3)	
Yes	61 (28.5)	77 (37.7)	

Percents may not add to 100 because of rounding.
†The variable categories were collapsed to accommodate cells with a small number of cases.

likely to be injured, compared to those who were not ($p < .01$) (see Bachman & Coker, 1995). Injuries to the victim were more likely to be sustained when the assailant was under the influence of alcohol ($p < .01$). No relationship was found between other illicit drug use and injuries. Victim injury was more likely to occur when the abuser used a weapon ($p < .01$). The presence of children in the home during the incident increased the risk of victim injury ($p < .05$). Perpetrators with no official record of domestic violence were more likely to be involved in cases with victim injury; however, the association failed to reach statistical significance ($p < .07$). Of course, this might be attributable to the so-called "dark figure" of domestic abuse or the underreporting of these incidents.

Victims were more likely to be injured in incidents in which a third party notified the police ($p < .05$), but less likely to be injured when the offender was in violation of a restraining order ($p < .001$). Victims were more likely to be injured when the offender was still at the scene when the police arrived ($p < .001$). The presence of injuries to the victim also increased the likelihood of arrest ($p < .001$). Contrary to previous research, no relationship was found between injury and the employment status of the assailants (Kyriacou et al., 1999).

Predicting Injury

The objective of our study was to predict victims' injury rather than victims' reactions to those injuries. Consequently, excluded from the multivariate analyses were whether perpetrators were present when officers arrived and whether they were arrested. The bivariate analysis was used to screen variables for additional exploration. Hence only variables that reached a probability level of < .05 were included in the follow-up analyses. Variables

Table 3: Logistic regression model predicting victim injury.

Variables	B	SE	EXP(B)	Sig.
Children present	.243	.228	1.274	.288
Current relationship†	.960	.251	2.613	.000
Alcohol involved	.513	.239	1.671	.032
Restraining order violated	–1.838	.368	.159	.000
Victim called police‡	.434	.403	1.543	.282
Other called police‡	.609	.432	1.838	.159
Weapon used**	.300	.230	1.349	.192
Constant	–1.455	–1.455	.233	.003

X^2 = 82.986 Sig. = .000.
Figures are rounded.
†Former relationship is used as the comparison group.
‡Suspect called police is used as the comparison group.
**Weapon use is measured by degree of weapon seriousness.

meeting this criterion included: children present, current relationship, alcohol use, restraining order violated, weapon used, and who called the police.

Table 3 displays the findings of the multivariate model. The results of the logistic regression analysis indicated that women in a current relationship with their male partner were more likely to experience injuries than women assaulted by a former partner ($B = .96$, $SE = .25$, $Exp\ B = 2.6$). Consistent with prior research (Brecklin, 2002), alcohol use by the offender predicted victim injury ($B = .51$, $SE = .24$, $Exp\ B = 1.7$). Victims were also less likely to be injured when the offender violated a restraining order, compared to cases in which no such order was in effect ($B = -1.84$, $SE = .37$, $Exp\ B = .159$). Who called the police and the use of a weapon did not reach statistical significance in the logistic regression model. The presence of children in the household also was not statistically significant.

Main Effects

The status of the offender-victim relationship was the strongest predictor of physical injury. Women assaulted by men who were in a current relationship with them were more likely to sustain injuries than those assaulted by men from a past relationship or by men with whom they shared a child. The second strongest predictor of injury was a restraining order violation. Offenders who violated a protective order were less likely to inflict injuries on their victims than offenders without such an order. Other significant predictors of injury are presented in Table 4; they include alcohol use, being assaulted with a weapon, having someone other than the offender or victim call the police, and having children present.

Figure 1 displays the final ODA classification tree model, which explains the interactions between variables. Rectangles represent decision points, arrows represent predictive pathways, and the final shaded rectangles represent classifications. The p values for each decision point are displayed in the

Table 4: Significant UniODA results for predictors of injury.

Variables	No injury	Injury	P value	Effect strength sensitivity
Relationship status	Former/Child-in-common	Current	.00000001	27.84%
Was a restraining order violated	Violation	No violation	.00000001	28.83%
Alcohol involvement	No	Yes	.000321	15.14%
Type of weapon used	None	Blunt object/ Knife/Other	.000387	10.20%
Who called the police	Victim/Suspect	Other	.011933	10.17%
Was a child present	No	Yes	.048471	9.24%

rectangle. Numbers beside the arrows indicate the cutoff value for optimally classifying observations into categories. Fractions beneath the endpoints constitute the number of correct classifications at the endpoint in the numerator and the total number of subjects classified at the endpoints in the denominator. Numbers in the parentheses beside the fractions are the percentage of the predicted classifications, in a given category, that are correct. Letters under each endpoint are labels that further describe each endpoint. Shaded endpoints represent individuals who were not injured; unshaded endpoints represent individuals who were injured.

Figure 1 shows two pathways for predicting injury and two pathways for predicting no injury. The most significant predictive pathways for predicting injury versus no injury are the two pathways that predict no injury. Women who had a child in common with the offender, were in a prior relationship with him, and had a restraining order issued against him were the least likely to be injured. This configuration predicted victim injury with 97% accuracy (Group A). The second profile of those not being injured was predicted with 91% accuracy (Group B). This group included those who were in a current relationship with the perpetrator in which he was in violation of a restraining order and in which no children were present at the time of the event.

Women who were most likely to be injured were in a current relationship with the offender, had incidents in which the offender did not violate a restraining order, and alcohol use was involved. This configuration predicted victim injury with 76% accuracy (Group D). The other interactions that predicted injury included being in a current relationship with the offender, having the perpetrator violate a restraining order, and having children present. This configuration predicted victim injury with 62% accuracy (Group C).

Table 5 presents statistics that summarize the classification performance of the classification tree model. The model correctly classified 119 (83%) of the total number of victims in the CTA ($n = 142$) for an absolute effect strength of 68%, which is an overall indicator of the performance of the model compared

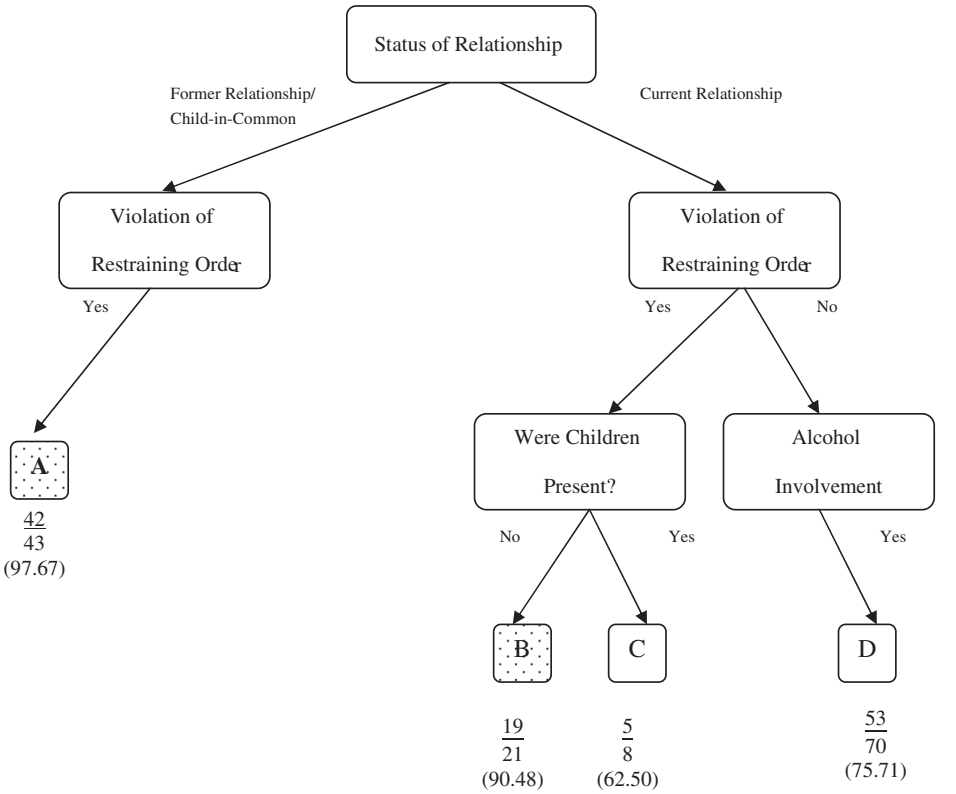

Figure 1: Optimal Data Analysis (ODA) classification tree model for predicting injury versus no injury in domestic violence.
Note: In this figure, rectangles represent decision points, with the last rectangle representing a decision endpoint. Arrows represent predictive pathways. Numbers beside arrows indicate the value of the cut point for optimally classifying observations into categories for each node. Numbers in rectangles represent *p* values for that decision point. Fractions beneath each prediction endpoint represent the number of correct classifications at the endpoint (numerator) and the total number of observations classified at the endpoint (denominator). Numbers in parenthesis under each fraction are the predictive value for each endpoint (or the percentage of the predicted classifications into the given category that were correct). Letters under each endpoint are labels utilized to further describe each endpoint. Those endpoints that are shaded represent those who are not injured, while those that are not shaded represent those who were injured. Branches that had an effect strength less than chance were also pruned.

to chance and suggests that the model had strong predictive power (Yarnold & Soltysik, 2005). In addition, the model accurately predicted 58 of the 61 victims who were actually injured (95% accuracy) and 61 of the 81 victims who were actually not injured (75% accuracy) for a mean sensitivity rate of 85% (Yarnold & Soltysik, 2005). With regard to the model's predictive value, 58 of the 78 victims predicted to be injured were actually injured (75% prediction accuracy) while 61 of the 63 victims predicted to not be injured were actually not injured (95% prediction accuracy). The mean predictive value of the model

Table 5: Classification performance summary for the tree model of injury versus no injury.

Performance index	Performance parameter	Effect strength
Overall classification accuracy	119/142 (83.80%)	67.60%
Sensitivity (injury)	58/61 (95.08%)	91.00%
Sensitivity (no injury)	61/81 (75.31%)	51.00%
Mean sensitivity across classes	85.20%	70.40%
Predictive value (injury)	58/78 (74.36%)	59.00%
Predictive value (no injury)	61/64 (95.31%)	90.62%
Mean predictive value across classes	84.84%	69.68%
Mean performance across classes	85.02%	70.04%

	Predicted status	
	Injury	**No Injury**
Overall Cross-Classification Table		
Actual status 3 Injury	58	
No injury	20	61

was 85%. Combining measures of sensitivity and predictive accuracy into a single index of classification performance, the tree model had an overall effect strength of 85%, which is quite powerful.

DISCUSSION

The majority of IPV victims were in a current relationship—some of these were quite lengthy while some were not. This suggests that domestic violence can erupt at any point in a relationship. Not surprisingly, victims themselves were the most likely people to summon the police for assistance. A relatively small percentage of women in the study sustained a large number and wide range of injuries, and one-fifth of them sought medical attention. Most batterers were still present at the scene when the police arrived, had a history of domestic violence, and were subsequently arrested. Children were present and witnessed one-third of these incidents. Children can become seriously traumatized by witnessing family violence and by watching their parents being arrested (Buzawa & Buzawa, 1990). Children who observe incidents of domestic abuse are more likely to have behavioral, cognitive, and emotional problems, as well as lower verbal ability than children who do not (Edelson, 1999; Huth-Bocks, Levendosky, & Semel, 2001). However, several factors can moderate the effects of exposure to violence, such as the child's age, gender, and if the children were abused as well (Edelson, 1999).

The bivariate findings concerning offenders' past arrests and employment status are noteworthy. In contrast to expectations, we found that offenders with no prior record of domestic violence were more likely to cause injuries to

their victims than those with a prior history of domestic violence. Moreover, offenders' employment status had no significant effect on the likelihood of victim injuries. The emphasis of the current research was focused on the outcome of the assault (i.e., injury or not) rather than if an assault occurred. Thus, recidivists and unemployed batterers might still be more likely than first-time, employed males to commit an assault.

The results of the logistic regression analysis supported many of the bivariate findings. By controlling for other variables, the regression analysis indicated that injuries were more likely to occur when victims were in a current relationship and when the offender had been using alcohol. As discussed above, this investigation also showed that injuries were less likely to occur when a restraining order had been violated. This indicated that in some cases, attentiveness of the victim and the police can be effective in reducing the odds of injuries to women in violent relationships.

In general, the results of the ODA were consistent with the logistic regression findings, demonstrating that the strongest predictors of injury to women were being in a current relationship with the offender, the absence of a restraining order, and the offender's alcohol use. Although no primary effect was found in the logistic model, the ODA was consistent with the bivariate analysis; children in the house at the time of the incident increased the likelihood of victim injuries. Ultimately, the ODA permitted further specificity in the prediction model and was able to generate definitive subsets of women in the sample who were most likely to sustain injuries. For example, a constellation of factors identified a sample of cases with restraining orders that were likely to result in victim injury.

The ODA not only helped confirm the findings of logistic regression, it was more capable of identifying which levels of the variables predicted injury (e.g., identifying that having the suspect or victim call the police predicted less injury than if someone else called the police). The ODA also examined the variables in a context that was based on the assumption that variables in complicated social situations act in concert to predict their outcomes. For instance, identifying the group at greatest risk of injury (i.e., individuals who are in a current relationship with the suspect, have not filed for a restraining order, and are involved with a partner who uses alcohol), can help target victims for prevention programs. In addition, understanding that for the same group of individuals (i.e., those in a current relationship with the suspect in which he has violated a restraining order), the presence of children significantly increases the likelihood of injury. In contrast, the absence of children reduces the likelihood of injury.

Women who had a restraining order against their partner might have been able to call the police to enforce the order before the offender could pursue the assault and inflict physical injuries. In addition, officers might respond more rapidly when a protective order is being violated, thereby

diminishing the opportunity for victim harm. According to Buzawa and Buzawa (1990), protective orders make it more likely that the police will act decisively, and they serve to demonstrate that the victim is prepared to initiate legal action against the offender. A protective order also provides evidence that the offender has been involved in prior episodes of domestic violence.

Although our data (i.e., police reports) did not allow us the opportunity to explore the deterrent effects of restraining orders where no breach had occurred, protective orders appear to reduce the odds of harm to the victim. We agree with Shannon, Logan, and Cole (2007), who recommended extending the coverage of restraining orders to all cohabitating partners as well as dating couples. Some jurisdictions permit restraining orders only when couples are married or cohabitating. For example, in the state of Oregon, restraining orders are issued only for abuse committed by a current or former spouse, cohabitating partner, parent of a minor child, or adult with whom a blood relationship exists (Oregon State Bar, 2008).

Women who are recent immigrants present unique challenges for the police and the criminal justice system. Even if restraining orders can be an effective tool in reducing victim injuries, these women might be hesitant to request such legal intervention because of their negative experiences with authorities in their birth country, as well as their limited language skills and dubious legal status (Fanlund, 2008; Kasturirangan, Krishnan, & Riger, 2004; Menjivar & Salcido, 2002). As Erez and Hartley (2003) stated, "Immigrant women often do not know that battering is a criminal offense in their new country, nor are they aware of any social, legal, health, or other services available for women in their predicament" (p. 158). Some additional reasons why women might not summon the police include the fear of retaliation by the offender, no telephone, shame, and emotional and financial dependency (Fleury, Sullivan, Bybee, & Davidson, 1998). According to Fanlund (2008), two-thirds of undocumented women in the San Francisco area reported that fear of being deported was the primary reason why they did not seek help from social services.

As first responders, the police can assist IPV victims by attending to their physical, emotional, and social needs. Victims often minimize the incident in order to protect their assailants. In such cases, officers should attempt to break through the wall of fear and shame in order to equip victims with supportive strategies for protecting their future safety. Police officers must be ready to refer victims to appropriate interventions and should be well informed about the services that are available for battered women in their communities (cf., Salber & Taliaferro, 1995). A coordinated community response can be effective in protecting female victims from their abusive male partners (Fleury et al., 1998). The relationship between offenders' use of alcohol and IPV has been suitably documented (Brecklin, 2002; Stuart et al., 2006).

However, the link between alcohol and victim injuries has not been established. Our study provides evidence that offenders' use of alcohol is not only associated with domestic abuse, but it is also associated with the seriousness of the assault.

In conclusion, this study has several limitations. First, we relied on police incident reports; therefore, we had no information on the "dark figure" of domestic violence or unreported cases. Police reports have been challenged for their tendency to underreport the occurrence of domestic abuse; however, some researchers have concluded that they generate similar causal explanations as do unofficial sources of data, such as victimization reports (Carlson, Harris, & Holden, 1999). Second, we had no access to information on the victims' country of birth. Future researchers should attempt to compare the presence of injuries among female immigrants and women born in the United States. Third, missing data call into question the results on the offenders' use of alcohol. A number of cases of alcohol use were likely missed because we had to rely on the officers' report narratives rather than a separate box on the incident report, which increased the possibility of measurement error. Fourth, we had no information on the victims' use of alcohol at the time the event transpired. If both disputants had been drinking heavily before the incident, their condition might increase the odds of injury to both parties. Finally, our study was conducted in one city in Massachusetts; thus, the results might not generalize to other locations. The Framingham Police Department's response to domestic violence was legalistic, and the officers were mandated to arrest the batterer. As a result, this could have affected our results.

REFERENCES

Alvi, S., Schwartz, M., De Keseredy, W., & Bachaus, J. (2005). Victimization and attitudes toward women abuse of impoverished minority women. *Western Criminology Review*, *6*, 1–11.

Bachman, R., & Coker, A. (1995). Police involvement in domestic violence: The interactive effects of victim injury, offender's history of violence, and race. *Violence and Victims*, *10*, 91–106.

Black, M. C., & Breiding, M. J. (2008). *Adverse health conditions and health risk behaviors associated with intimate partner violence*. Atlanta, GA: National Centers for Disease Control and Prevention.

Brecklin, L. R. (2002). The role of perpetrator alcohol use in the injury outcomes of intimate assaults. *Journal of Family Violence*, *17*, 185–197.

Bureau of Justice Statistics. (2003). *Crime data brief, intimate partner violence*, 1993–2001. Washington, DC: United States Department of Justice.

Buzawa, E. S., & Buzawa, C. G. (1990). *Domestic violence: The criminal justice response*. Newbury Park, CA: Sage.

Caetano, R., Ramisetty-Mikler, S., & McGrath, C. (2004). Acculturation, drinking, and intimate partner violence among Hispanic couples in the United States: A longitudinal study. *Hispanic Journal of Behavioral Sciences*, *26*, 60–78.

Carlson, M., Harris, S., & Holden, G. (1999). Protective orders and domestic violence: Risk factors for re-abuse. *Journal of Family Violence*, *14*(2), 205–226.

Coben, J., Forjuoh, S. N., & Gondolf, E. (1999). Injuries and health care use in women with partners in batterer intervention programs. *Journal of Family Violence*, *14*, 83–94.

Collins, K. S., Schoen, C., Joseph, S., Duchon, L., Simantov, E., & Yellowitz, M. (1999). *Health concerns across a woman's lifespan: The Commonwealth Fund 1998 survey of women's health*. New York: Commonwealth Fund.

Donenberg, G. R., Bryant, F. B., Emerson, E., Wilson, H. W., & Pasch, K. E. (2003). Tracing the roots of early sexual debut among adolescents in psychiatric care. *Journal of the American Academy of Child and Adolescent Psychiatry*, *42*, 594–608.

Edelson, J. (1999). Childhood adverse events and current traumatic distress: A comparison of men and women drug dependent prisoners. *Journal of Interpersonal Violence*, *14*, 839–870.

Erez, E., & Hartley, A. (2003). Battered immigrant women and the legal system: A therapuetic jurisprudence perspective. *Western Criminology Review*, *4*, 155–169.

Fanlund, K. (2008). Our safety or their lives: Legislative changes impacting immigration and the risks posed to immigrant women. *Wisconsin Journal of Law, Gender & Society*, *23*, 135–159.

Fleury, R., Sullivan, C., Bybee, D., & Davidson, W. (1998). Why don't they just call the cops: Reasons for differential police contact among women with abusive partners. *Violence and Victims*, *13*, 333–347.

Fox, J. A., & Zawitz, M. W. (2007). *Homicide trends in the United States*. Washington, DC: United States Department of Justice, Bureau of Justice Statistics.

Framingham. (2008). *Detailed profile*. Retrieved January 18, 2008, from http://www.city-data.com/city/Framingham,Massachusetts.htm

Fugate, M., Landis, L., Riordan, K., Naureckas, S., & Engel, B. (2005). Barriers to domestic violence help seeking: Implications for intervention. *Violence against Women*, *11*, 290–310.

Grossman, S. F., & Lundy, M. (2007). Domestic violence across race and ethnicity: Implications for social work practice and policy. *Violence against Women*, *13*, 1029–1052.

Harrell, A., & Smith, B. (1996). Effects of restraining orders on domestic violence victims. Do arrests and restraining orders work? In E. S. Buzawa & C. G. Buzawa (Eds.), *Domestic violence: The criminal justice response* (2nd ed., pp. 214–242). Thousand Oaks, CA: Sage.

Holt, V., Kernic, M., Lumley, T., Wolf, M., & Rivara, F. (2002). Civilian protection orders and risk of subsequent police-reported violence. *Journal of the American Medical Association*, *288*, 589–594.

Huth-Bocks, A., Levendosky, A., & Semel, M. (2001). The direct and indirect effects of domestic violence on young children's intellectual functioning. *Journal of Family Violence 16*(3), 269–290.

Kasturirangan, A., Krishnan, S., & Riger, S. (2004). The impact of culture and minority status on women's experience of domestic violence. *Trauma Violence Abuse*, *5*, 318–332.

Kyriacou, D., Anglin, D., Taliaferro, E., Stone, S., Tubb, T., Linden, J., Muelleman, R., Barton, E., & Kraus, J. F. (1999). Risk factors for injury to women from domestic violence. *New England Journal of Medicine*, *25*, 1892–1898.

Menjivar, C., & Salcido, O. (2002). Immigrant women and domestic violence: Common experiences in different countries. *Gender and Society*, *16*, 898–920.

Mueser, K. T., Yarnold, P. R., Rosenberg, S. D., Drake, R. E., Swett, C., Miles, K., & Hall, D. (2000). Substance use disorder in hospitalized severely mentally ill psychiatric patients: Prevalence, correlates, and subgroups. *Schizophrenia Bulletin*, *26*, 179–193.

Oregon State Bar. (2008). *Restraining order and domestic violence*. Retrieved May 4, 2008, from http://www.osbar.org/public/legalinfo/1140.htm

Raj, A., & Silverman, J. (2002). Violence against immigrant women: The role of culture, context and legal immigrant status on intimate partner violence. *Violence against Women*, *8*, 367–398.

Salber, P., & Taliaferro, E. (1995). *The physician's guide to domestic violence*. Volcano, CA: Volcano Press.

Shannon, L., Logan, T., & Cole, J. (2007). Intimate partner violence, relationship status, and protective orders: Does "living in sin" entail a different experience? *Journal of Interpersonal Violence*, *22*, 1114–1130.

Snowden, J. A., Leon, S. C., & Bryant, F. B. (2007). Evaluating psychiatric admission decisions for children in foster care: An optimal classification tree analysis. *Journal of Clinical Child and Adolescent Psychology*, *36*, 8–18.

Soltysik, R. C., & Yarnold, P. R. (1994). The Warmack–Gonzalez algorithm for linear two-category multivariable optimal discriminant analysis. *Computers and Operations Research*, *21*, 735–745.

Stalans, L. J., Yarnold, P. R., Seng, M., Olson, D. E., & Repp, M. (2004). Identifying three types of violent offenders and predicting violent recidivism while on probation: A classification tree analysis. *Law & Human Behavior*, *28*, 253–271.

Straus, M. A., & Gelles, R. J. (1990a). How violent are American families? Estimates from the National Family Violence Resurvey and other studies. In M. A. Straus & R. J. Gelles (Eds.), *Physical violence in American families: Risk factors and adaptations to violence in 8,145 families* (pp. 95–112). New Brunswick, NJ: Transaction Publishers.

Straus, M. A., & Gelles, R. J. (Eds.). (1990b). *Physical violence in American families*. New Brunswick, NJ: Transaction Publishers.

Stuart, G., Meehan, J., Moore, T., Morean, M., Hellmuth, J., & Folansbee, K. (2006). Examining a conceptual framework of intimate partner violence in men and women arrested for domestic violence. *Journal of Studies on Alcohol*, *67*, 102–112.

Tjaden, P., & Thoennes, N. (2000). *Extent, nature, and consequences of intimate partner violence: Findings from the National Violence against Women Survey*. Washington, DC: National Institute of Justice, Department of Justice.

Yarnold, P. R. (1996). Characterizing and circumventing Simpson's paradox for ordered bivariate data. *Educational and Psychological Measurement*, *56*, 430–442.

Yarnold, P. R., & Soltysik, R. C. (2005). *Optimal data analysis with software for DOS and Windows*. Washington, DC: American Psychological Association.

Yarnold, P. R., Soltysik, R. C., & Bennett, C. L. (1997). Predicting in-hospital mortality of patients with AIDS-related *Pneumocystis carinii* pneumonia: An example of hierarchically optimal classification tree analysis. *Statistics in Medicine*, *16*, 1451–1463.