

PREDICTORS OF INJURY ASSOCIATED WITH RAPE

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The purpose of the study was to identify predictors of physical injury in adolescent and adult women, who have a medical history of rape. Severity of rape-related injury is linked to negative health consequences. Studying the impact of injury and the associated predictors expands the understanding of rape and the risks of long-term negative health consequences. Variables included regional setting, victim characteristics (age, ethnicity, and known or unknown perpetrator) and forensic characteristics (time from rape to examination, weapon presence, multiple perpetrators, and use of an evidence kit). Secondary analysis evaluated cross-sectional data of women ($N = 3318$) 13 to 89 years of age ($M = 26.6$; $SD = 11.1$) from three regions of the US: the northeast, the southern coast, and the west coast. The results of multiple logistic regression models included main and interaction effects, primarily involving setting and ethnicity variables. The forward stepwise model ($\chi^2 [18] = 387.26$, $p = .001$) demonstrated adequate fit based on the Hosmer-Lemeshow goodness-of-fit results ($\chi^2 [7] = 5.72$, $p = .57$), and was a slightly improved fit over the backward elimination model ($\chi^2 [22] = 398.12$, $p = .001$), which also had desirable Hosmer-Lemeshow χ^2 results ($\chi^2 [7] = 7.47$, $p = .38$). The forward and backward models included ten significant interactions: Setting C by age, Setting C by examination time of >72 hours, Setting A by other ethnicity, Setting A by weapon presence, Setting A by examination time of 48-72 hours, and Setting A by multiple perpetrators, age by weapon presence, African American by examination time of 24-48 hours, African American by multiple perpetrators, other ethnicity by examination time of >72 hours, and unknown

perpetrators by multiple perpetrators. Implications of this research emphasize the importance of location and ethnicity on documentation of injury and 1) can lead to refinement of data collection, 2) addresses the need for research in the acute time frame after rape, 3) informs tailored interventions, 4) links health and legal systems to improve forensic management, 5) emphasizes the need for multi-professional funding allocation for education, prevention and interventions to improve victim care.

TABLE OF CONTENTS

1. BACKGROUND	1
1.1. The Negative Health Effects of Rape	5
1.2. Definition of Terms.....	6
1.2.1. Rape	6
1.2.2. Outcome Variable: Injury	7
1.2.3. Predictor Variables: Regional Setting.....	8
1.2.4. Predictor Variables: Victim Characteristics.....	8
1.2.5. Predictor Variables: Forensic Characteristics.....	9
1.3. Research Questions.....	11
1.4. Injury Prediction Framework.....	11
1.5. Assumptions.....	14
1.6. Limitations	15
1.7. Summary.....	17
2. REVIEW OF THE LITERATURE	18
2.1. National Surveys.....	19
2.1.1. National Violence against Women Survey (NVAWS).....	19
2.1.2. Bureau of Justice Statistics National Crime Victim Survey (NCVS).....	25
2.2. Variables	29
2.2.1. Regional Setting.....	29
2.2.2. Victim Characteristics.....	29
2.2.2.1. Victim Characteristics: Age.....	30
2.2.2.2. Victim Characteristics: Ethnicity	37
2.2.2.3. Victim Characteristics: Unknown Perpetrator	41
2.2.3. Forensic Characteristics.....	49
2.2.3.1. Forensic Characteristics: Time from Rape to Examinations	49
2.2.3.2. Forensic Characteristics: Weapon Presence	51
2.2.3.3. Forensic Characteristics: Multiple Perpetrators.....	54
2.2.3.4. Forensic Characteristics: Use of Forensic Evidence Kit.....	55
2.2.4. Injury.....	56
2.3. Summary.....	62
3. METHODS	65
3.1. Research Design.....	66
3.2. Settings.....	68
3.2.1. Setting A	68
3.2.2. Setting B.....	69
3.2.3. Setting C.....	69
3.3. Sample.....	70

3.4.	Protection of Human Rights.....	71
3.5.	Data Collection	71
3.6.	Variables	72
3.6.1.	Dependent Variables.....	72
3.6.2.	Independent Variables	73
3.6.2.1.	Independent Variables: Regional Setting.....	73
3.6.2.2.	Independent Variables: Victim Characteristics	73
3.6.2.3.	Independent Variables: Forensic Characteristics.....	74
3.7.	Data Analysis.....	75
3.7.1.	Data Screening.....	76
3.7.1.1.	Missing Data	76
3.7.1.2.	Creation of Variables	80
3.7.1.3.	Statistical Assumptions.....	81
3.7.1.4.	Predictor Variables not in the Model.....	82
3.7.1.5.	Clinician Differences and Location	83
3.7.1.6.	Chain of Communication.....	84
3.8.	Data Analysis Procedures	84
3.8.1.	Research Question One.....	85
3.8.2.	Research Question Two	86
3.8.3.	Research Question Three	86
3.8.4.	Minimum detectable effect size.....	89
3.8.5.	Limitations of Secondary Data Analysis	90
3.9.	Summary	90
4.	RESULTS	92
4.1.	Descriptive Results	92
4.2.	Victim Characteristic Variables.....	94
4.3.	Forensic Characteristic Variables	96
4.4.	Outcome Variable of Injury Status	96
4.5.	Research Question One.....	97
4.6.	Research Question Two	101
4.7.	Research Question Three	104
4.8.	Regression Diagnostics.....	112
5.	DISCUSSION	113
5.1.	Research Question One.....	113
5.1.1.	Setting.....	113
5.1.2.	Victim Characteristic Variables.....	115
5.1.3.	Forensic Characteristic Variables	120
5.2.	Research Question Two	126
5.3.	Research Question Three	131
5.3.1.	Full Logistic Regression Model.....	131
5.3.2.	Forward Stepwise Logistic Regression Model	131
5.3.3.	Backward Elimination Model	132
5.4.	Implications.....	134
5.5.	Limitations	140
	APPENDIX A.....	144
	APPENDIX B	148

APPENDIX C	151
APPENDIX D	159
BIBLIOGRAPHY	162

LIST OF TABLES

Table 1. Univariate Analysis of Functional Forms of Age.....	81
Table 2. Descriptive Results	93
Table 3. Univariate Logistic Regression Results.....	98
Table 4. Multivariate Logistic Regression Results with All Predictors Included.....	100
Table 5. Significant Interaction Effects among Setting, Victim and Forensic Characteristic Variables	103
Table 6. Univariate, Full, Forward Stepwise, and Backward Logistic Regression Results	106
Table 7. Model Statistics.....	111

LIST OF FIGURES

Figure 1. Injury Prediction Framework	13
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1. BACKGROUND

Rape is a violent crime with 302,091 women victimized per year, resulting in an annual victimization rate of 8.7 per 1000 women in the U. S. (Tjaden & Thoennes, 2000a). The social analysis of rape, initiated by the feminist movement over 30 years ago, resulted in strategies for change, community action and judicial reforms. Legal advocacy through rape crisis centers and a better understanding of the psychological impact of rape has influenced the development of a more holistic health care response to rape victims. Improved physical and psychological evaluation methods by forensic examiners with standard forensic assessment and evidence collection have an impact on the legal outcomes and increased availability of supportive interventions after rape.

Despite these efforts, there are immediate and long-term health consequences of rape. Chronic psychiatric and physical health problems following women's medical history of past victimization are well documented (Koss, Koss, & Woodruff, 1991; Walker, Unutzer, & Rutter, 1999). Psychiatric mental health problems are more prevalent in women who have been physically injured during rape and experienced high levels of violence. Mental health problems are worse for women who perceived their lives to be in danger, than for women who did not (D. G. Kilpatrick et al., 2003; D. G. Kilpatrick, Saunders, Veronen, Best, & Von, 1988; March, 1993). Psychopathological problems are significantly worse for women who experience rape than for women who experience severe, non-sexual life-threatening events such as car accidents, physical assaults, or robberies (Faravelli, Giugni, Salvatori, & Ricca, 2004). Severity of rape-related physical injury is linked to negative health consequences after rape and may serve as a signal to health care providers that a women who have been raped are at greater risk for long-term negative health consequences (Crowell & Burgess, 1996; Mercy, Rosenberg, Power,

Broome, & Roper, 1993; Resnick, Acierno, & Kilpatrick, 1997). Addressing rape-related injuries acutely is instrumental in reducing long-term health problems, medical syndromes, and repeated assaults (Resnick et al., 1997).

The total number of rape incidents occurring per year is estimated to be 876,064 in the National Violence against Women Survey (NVAW). The incidence of rape exceeds prevalence because it includes many women who experienced more than one victimization. Injury is reported by 31.5% of women who have been raped. More than one third (35.5%) of women injured receive medical care, and the majority (81.9%) receive care in the hospital (Tjaden & Thoennes, 2000a). The National Crime Victimization Survey (NCVS), a national survey of household experiences of crime, estimated 193,930 women injured from sexual violence in 432,100 incidents. Of the injured women, 48% received treatment in a hospital, an additional 24% were treated at home or at the scene, and 20% were treated at a doctor's office (Rennison, 2002a).

There are few research studies on large data sets of forensic interviews and physical findings documented by forensic examiners in the forensic medical records. There is a wealth and depth of information that is understudied in existing forensic data bases. Analysis of clinician documentation links clinical forensic practice to research and can help to shape forensic nursing practice with data uniquely suited to the study of women's individual differences and responses to rape.

Secondary analysis of cross-sectional data collected by forensic examiners would allow for an analysis of a large amount of diverse clinical data that is accessible to the researcher. Included in the data elements are other factors identified in extant literature as being associated with women's rape-related injury. The factors may be examined individually or as a group to

help clinicians and researchers understand the differences among women's injuries after rape. The purpose of this secondary data analysis is to identify predictors of physical injury (setting, victim characteristics, and forensic characteristics) in females over 12 years of age, adolescent and adult women, who have a medical history of rape by a male and are examined in the emergency Department (ED).

Women's responses to rape may vary depending on personal characteristics, such as age, ethnicity, and relationship with the perpetrator, geographic region, or a combination of factors that influence women's likelihood of injury (Koss & Harvey, 1990; Resnick et al., 1997). Furthermore, forensic characteristics such as time from rape to examination, multiple perpetrators, weapon presence, and the use of an evidence kit as a standardized protocol, may all be variables that influence clinical documentation of rape-related injury. Understanding salient characteristics that are associated with rape-related injury may help clinicians and researchers understand rape victims who are injured. More importantly, an improved understanding of women's injuries from rape may lead to the development of more effective tailored intervention strategies to diminish negative health following rape.

Rape-related injury is a forensic health issue, having health care and legal implications. Rape is a violent crime, defined as the use, attempted use, threatened use or risk of physical force against a person (Garner, 1999). Understanding the link between personal and forensic characteristics will help clinicians and researchers expand their current conceptions of the health effects of violent crime, such as rape-related injury, women's past history of victimization, victim-perpetrator relationships, minority women's experiences, and the post-rape use of health care services within different age groups (Tjaden & Thoennes, 2000a).

Information on victim and forensic characteristics may enhance the understanding of personal factors associated with a woman's likelihood of rape-related injury. Differences in age and racial groups of adolescent and adult women in different regional settings across the US may lead to refinement and further development of strategies for targeted preventive interventions for women most at risk for injury and post-rape pathology. Higher levels of violence-related injury and life threats lead to worse health outcomes (D. G. Kilpatrick et al., 1988; March, 1993). Injury may be influenced by a number of factors and is documented by a clinician during the forensic examination. Understanding physical injury, as an observed measure of the violent crime of rape, is useful in improving the health care response and reducing the long-term health problems, medical syndromes, and repeated assaults (Resnick et al., 1997).

Clinician observed rape-related injury has added importance as it influences whether charges are filed against perpetrators by law enforcement. Injuries are significantly associated with legal outcomes of rape (McGregor, Du Mont, & Myhr, 2002; Wiley, Sugar, Fine, & Eckert, 2003). Thus, forensic nursing knowledge and documentation practices, particularly with Sexual Assault Nurse Examiners (SANE) and other forensic examiners, receives national attention in areas of government funding for standardized education, development of national protocols, and support for research on factors associated with rape and the physical findings.

Negative health consequences are personally and financially costly to the women who have been raped and to the health care system (Basile, 2003; Resnick et al., 1997). For the women, increased health care utilization adds economic expense to the emotional, physical and psychological stress of rape. The economic cost of interpersonal violence is estimated based on categories of cost, such as quality of life, earnings, legal and medical costs at state and national levels by the World Health Organization (WHO) (Waters, Hyder, Rajkotia, Basu, & Rehinkel,

2004). One study reported the cost at \$159 million per year in the US, with 79% of this cost due to quality of life factors, lost earnings, and legal and medical costs (M. A. Cohen, 1988). The largest estimate was \$6.5 billion for one year at an average of more than \$700 per resident. This was an estimated total loss of \$261.3 billion, including productivity, when scaled up to the national level (Post, 2002). Treatment-related cost as a single factor is seldom studied; however, one study estimated the cost per person at \$85,000 per rape, including physical injuries and psychological harm (Miller, Cohen, & Wiersema, 1996). Others report estimates of over \$110,000 in cost per victim (ICASA, 2002), and average acute hospital charges of \$8,387 were calculated for victims in 19 states (Rudmond & Davey, 2000).

1.1. The Negative Health Effects of Rape

The negative health impact of rape may affect mental health and all physical systems of the body. As many as 29% of women in primary care medical practices who report a history of rape have poor health-related quality of life (Walker, Torkelson, Katon, & Koss, 1993). They report more somatizing complaints and more medical and psychiatric problems than women who do not have a history of rape (Dickinson, deGruy, Dickinson, & Candib, 1999). Rape experiences are often followed by physical, cognitive, and behavioral responses that are consistent with Post-Traumatic Stress Disorder (PTSD) and rape victims have long been thought to constitute the largest proportion of PTSD sufferers (Foa & Meadows, 1997; Steketee & Foa, 1987). Other researchers claim that PTSD symptoms capture only a small portion of the associated distress and harm caused by rape, and may not be applicable to multicultural populations (Wasco, 2003). Women of the non-dominant culture may report the experience of rape to others based on societal and cultural expectations for women, peer acceptance, attitudes of law enforcement and

health care professionals, and approach and avoidance coping styles may not be so clearly defined within their culture.

Low and high-severity violence are associated with physical and psychological health problems in women (McCauley, Kern, Kolodner, Derogatis, & Bass, 1998). Negative physical health following rape has been studied in clinical settings and in health care organizations to document utilization of health care after violent victimization. Women with a past history of rape report more gastrointestinal problems (Leserman et al., 1996; Leserman et al., 1997) muscular problems and headaches (Gold, Lucenko, Elhai, & Sellers, 1999; Golding, Cooper, & George, 1997), sleep problems and depression (Clum, Calhoun, & Kimerling, 2000) and gynecological problems (Bottomly, Sadler, & Welch, 1999; Golding, Wilsnack, & Learman, 1998; Petrak, Skinner, & Claydon, 1995; Plichta & Abraham, 1996). Methodological and analytical strategies have been used primarily to examine the relationships among specific individual variables and the risk of violence, injury versus no injury, patterns of injury, or the associations between injury and legal outcomes (Acierno et al., 2001; Acierno, Resnick, Kilpatrick, Saunders, & Best, 1999). Studies of women following rape often report diverse findings and further research is needed to expand the understanding of acute and long term health status after rape.

1.2. Definition of Terms

1.2.1. Rape

A uniform definition of rape is helpful in research on sexual violence that is based on clinical documentation because legal definitions of rape vary across jurisdictions and by national agencies. Therefore, the behavioral definition of rape used in this study is from the Centers for Disease Control and Prevention (CDC) recommendation for uniform definitions and data elements. The CDC defines a sex act as “contact between the penis and the vulva or the penis

and the anus involving penetration, however slight; contact between the mouth and the penis, vulva, or anus; or penetration of the anal or genital opening of another person by a hand, finger, or other object” (Basile & Saltzman, 2002, p.9). Sexual violence categories from CDC include:

- A completed sex act without the victim’s consent, or involving a victim who is unable to consent or refuse
- An attempted (non-completed) sex act without the victim’s consent, or involving a victim who is unable to consent or refuse
- Abusive sexual contact
- Non-contact sexual abuse
- Sexual violence, type unspecified

The first two categories involving a sex act, completed or attempted, will be used to define rape in this research study. Women reporting a completed or attempted (non-completed) sex act that occurs without the victim’s consent, or involving a victim who is unable to consent or refuse will be included in this study because women who experience the latter three categories are not examined routinely for evidentiary examinations and medical treatment by forensic sexual assault examiners. The last three CDC categories of sexual violence do not describe sex acts and are not as likely to result in medical care and physical injury documentation by a forensic examiner for evidence collection.

1.2.2. Outcome Variable: Injury

The outcome of injury is defined as observed injury (bodily or genital) or no observed injury documented by a clinical forensic examiner. Further, injury was defined as bodily non-genital injury, genital injury, or a combination of the two. Bodily non-genital injury included bruising, abrasions, lacerations, tears, bitemarks, burns, and contusions to all body areas except the genital

area. Genital injury included bruising, abrasions, lacerations, tears, bite marks, burns, and contusions to the ano-genital area of the body. Rape is a violent crime and may result in genital or bodily non-genital injury. Therefore, whether the sex act is attempted or completed, the woman may experience and the examiner may observe and document genital or bodily non-genital injury. The documentation of injury may depend on personal and forensic characteristics that influence victim responses.

1.2.3. Predictor Variables: Regional Setting

Regional setting included three geographic and ethnically diverse areas. Setting A was a multi-state area in the northeastern U.S., which included rural areas and small towns in counties along the Vermont and New Hampshire border. Setting B was a metropolitan city on the southern coast of California. Setting C was one large city hospital on the southern coast of Louisiana that primarily served an urban metropolitan area.

1.2.4. Predictor Variables: Victim Characteristics

Victim characteristics included personal characteristics of the victim: age, ethnicity, and known or unknown perpetrator. There were many characteristics and demographic data in the forensic medical records. Several variables found consistently in forensic medical records are often found in the rape literature were also suggested as data elements by the CDC (Basile & Saltzman, 2002). Victim characteristics in this research are defined below.

- Age was defined as continuous and included females over 12 years of age, adolescent and adult women, over 12 years of age through adulthood, with the oldest being 89 years of age
- Ethnicity was defined as Caucasian, African American and Other (Hispanic, African-American, Native-American, Asian-American, and other categories).

- The known or unknown perpetrator was defined as no relationship between the victim and the perpetrator. A stranger is unknown to victim and non-stranger was currently or formerly married or in an intimate relationship, parent, step-parent, sibling, or other relative, acquainted as a friend, neighbor, co-worker, schoolmate, or roommate.

Individually or as a group, the sexual experience may vary with age, ethnicity, or victim-perpetrator relationships. The level of fear from control exerted on the victim by a stranger or a known violent perpetrator may influence women of different races in a variety of ways. Higher levels of violence and life threats lead to poor health (D. G. Kilpatrick et al., 1988; March, 1993). Understanding injury prediction may help reduce long-term health problems, medical syndromes, and repeat assaults, such as rape (Resnick et al., 1997).

1.2.5. Predictor Variables: Forensic Characteristics

Forensic characteristics include aspects of the crime that explain the context of the event, and may include background, circumstances, or environment. There are many forensic characteristics in the forensic medical record. Several that are found in all forensic medical records and found commonly in the rape literature are also suggested as data elements by the CDC. Forensic characteristics are defined below.

- The time from assault to examination was defined as four categories of less than 24 hours, 24 to 48 hours, 49 to 72 hours, and greater than 72 hours.
- Weapon presence was defined as the perpetrator having a gun, knife or other weapon at the time of the rape.
- Multiple perpetrators was defined as one or more than one male perpetrator.
- Use of a forensic evidence kit was defined as whether or not a kit was used with the forensic examination.

Forensic characteristics are critical for the understanding of a crime, but are not typical health assessment interview information. The response of a community, individuals and institutions may have an influence on the timing of forensic examinations after rape occurs and the documentation of rape-related injury by examiners using an evidence kit. Weapon presence and multiple perpetrators may induce fear in a woman and influence injury outcomes. Forensic characteristics may interact with victim characteristics as well.

The additional variable of regional setting is defined by the three settings from which data were acquired. The ethnic and age characteristics in the different regions of the US may result in distinct and salient differences in injury findings with women in large urban areas and rural smaller towns.

Consistency in the terms and definitions is necessary in monitoring the problem of rape across multiple data sources. Terms may be defined differently by law enforcement, health care and other professionals (Basile & Saltzman, 2002). In this study, the case number and source, with variables of age, ethnicity, relationship, region, and injury are variables considered by CDC to be minimum data elements included in rape research. The CDC considers expanded data elements to be the multiple perpetrators, evidence collection, report to law enforcement, and weapon presence (Basile & Saltzman, 2002). Therefore, the data elements in this study, are consistent with national guidelines for rape research, and are common in the data collection instruments utilized with rape victims in all settings.

In summary, all of the variables may be related to the documented physical injury, but to different degrees in women of various age or racial groups from different regional settings of the U.S. Assessing combinations of variables that are victim and forensic characteristics in different age and racial groups may be the most informative, rather than assuming that all women are the

same (Ullman, 1997). In this study, minimum and expanded data elements are used: victim characteristics of age, ethnicity, known or unknown perpetrator and region and forensic characteristics of time from rape to examination, weapon presence, multiple perpetrators, and the use of forensic evidence kit. This research may help to address the gaps in the literature regarding the variables used to predict rape-related injury (Acierno et al., 2001; Acierno et al., 1999).

1.3. Research Questions

The purpose of this secondary data analysis was to identify predictors of physical injury (setting, victim characteristics, and forensic characteristics) in females over 12 years of age, adolescent and adult women, who have a medical history of rape by a male and are examined in the emergency Department (ED). In pursuit of this purpose, the following research questions will be addressed:

1. Which setting, victim variables and forensic variables are most highly correlated with the outcome of injury status?
2. What are the interaction effects between predictor variables when predicting injury status?
3. What is the best model of setting, victim and forensic variables, including main and interaction effects, as predictors of injury status?

1.4. Injury Prediction Framework

The Injury Prediction Framework is used to organize concepts and guide inquiry into the development of a predictive model of injury associated with rape. The organizing framework in this research is based on past research on the effects of trauma.

The concepts are similar to conceptual models presented by Koss and Harvey (1990) and Resnick and colleagues (Koss & Harvey, 1990; Resnick et al., 1997). No single framework or factor can be used to explain sexual violence toward women and the variations in their response, different rates of occurrence in different regions, or in different age groups. In the 1970s an ecological model was introduced and subsequently applied to youth violence, elder abuse, intimate partner violence (Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002) to understand the relationships among various factors that influence violent behavior.

The ecological model helps to frame the personal, situational and sociocultural factors that influence rape. Examining multiple levels, the ecological application includes personal victim characteristics, contextual factors such as the relationship with the perpetrator to cultural, institutional, and societal factors that must be addressed in an effort to understand the impact of rape. The ecological model has been helpful with the timing and targeting of prevention efforts by public health professionals for multiple problems.

More specifically, in regards to rape, application of an organizing framework that explores a combination of personal, contextual, and institutional or societal factors can help clinicians and researchers to understand adolescent and adult women's physical injury after rape and develop strategies for prevention of negative health consequences after rape. The ecological approach has been applied to rape response and recovery, and "is concerned with interrelationships among the characteristics of the person who has been victimized, and the rape event that has occurred, and the social environment" (Koss & Harvey, 1990, p. 43). In line with this application of the ecological model, the personal characteristics include simple descriptive demographic information on the victim. The forensic characteristics include contextual factors

that are associated with the rape event itself. The outcome of physical injury may be influenced to a different degree by different combinations of the characteristics.

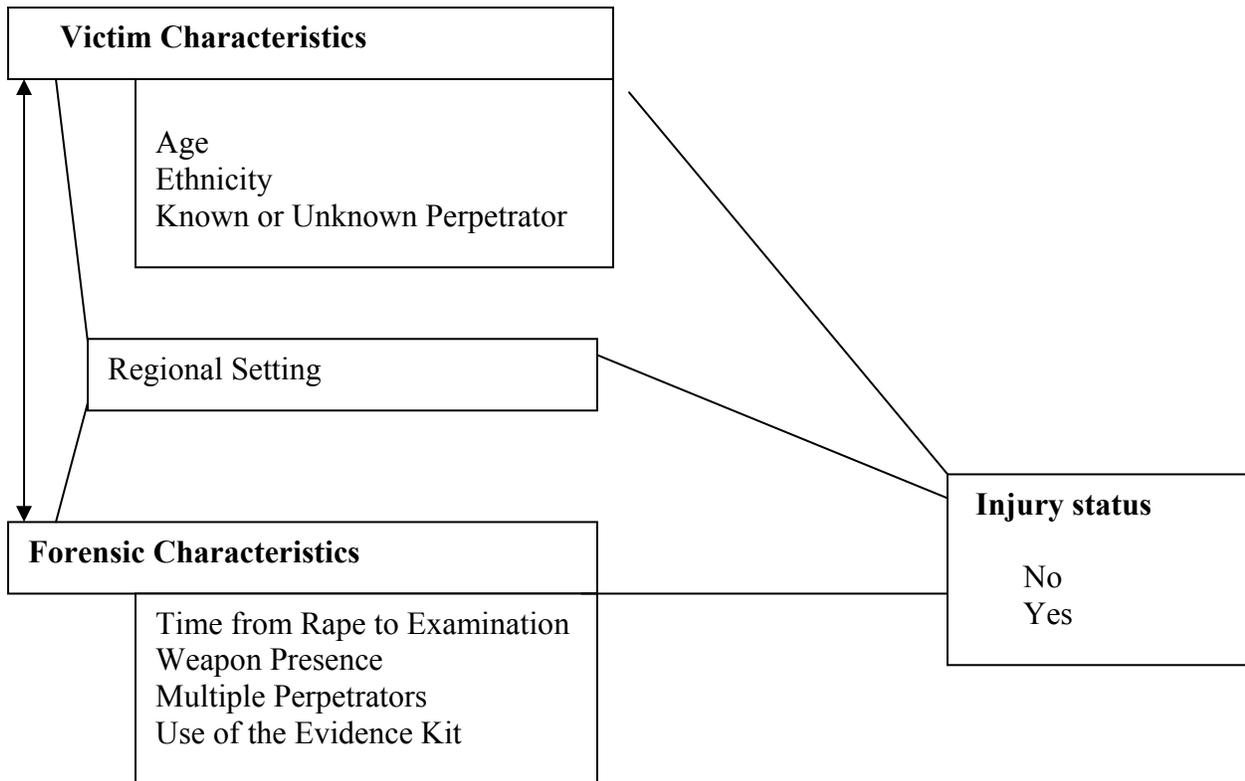


Figure 1. Injury Prediction Framework

Understanding the combination of characteristics that influence injury outcomes may be important in the understanding of women who are at increased risk for health problems after rape. A framework presented by Resnick, Acierno, and Kilpatrick (1997) in their study of violent assaults examines factors that lead to increased risk of health problems. Resnick and colleagues and Koss and Harvey admit that many of the relationships between variables are not yet tested with research, and other variables need to be added in future studies (Koss & Harvey, 1990; Resnick et al., 1997). Extant literature and national surveys confirm that multiple factors are associated with rape injury and health outcomes.

Clinicians and researchers can examine a variety of aspects of rape that may broaden the scope of what is put forth by traditional trauma theory when an array of variables are examined as predictors of injury (Wasco, 2003). Understanding the differences in adolescent and adult women's acute and long-term responses will be advanced by expanding traditional trauma theory. Rape as a single event from which a linear cause and effect trajectory is initiated may not adequately explain the differences in women's physical and psychological health after rape (Wasco, 2003). Further exploration and clarification of preceding and co-existing victim and forensic characteristics is needed to determine women's risks for acute injury, increased stress, and long-term negative health consequences.

Although models of trauma response and recovery provide a framework for researchers to understand the variables, the scope of recovery is long-term. One third of women seek care acutely, and the others seek care later in life with a variety of health complaints. Clinician documented information from acute forensic examinations may be used to build on the current research and develop predictive models that incorporate known and unknown predictors and advance the model building and testing in future analysis.

1.5. Assumptions

Assumptions of the organizing framework for the prediction of injury from rape are:

- All adolescent and adult women do not respond to the trauma of rape in the same way.
- Multiple characteristics and factors in a woman's life precede rape.
- Some preceding variables are victim characteristics and forensic characteristics that may be cumulative, behavioral, situational, and environmentally derived.
- Victim response is measured by physical injury and varies according to the victim and forensic characteristics.

1.6. Limitations

The models used to examine the risks, responses, and recovery after rape include an exhaustive group of physical, emotional, psychological, medical, and environmental risk factors. Thus, a limitation of this research study is that there are a limited group of characteristics as independent variables included. Data elements are used that are uniform and similar across data sets from different regions of the US. Cognitive, psychological, emotional, personality, and behavioral assessments are important but not available in the forensic data bases because they are not part of the forensic clinical assessments. Psychiatric history and past victimization significantly impact adolescent and adult women's responses to rape and are studied extensively. Also not included are longitudinal aspects of chronic health sequelae from rape, and whether or not interventions were instituted following past victimization.

Terminology in the study of rape is a concern in obtaining information in clinical and community samples. The use of the definition from the CDC in this research study may help to alleviate the issue. The terms "rape" and "penetration" and "force" are not defined uniformly in all of the literature, however.

The word "rape" is not the term used in clinical settings, but is used more often by law enforcement and legal experts. The use of the word "rape" in screening is not as likely to elicit a positive response from a woman as questions describing the sexual behaviors (Hamby & Koss, 2003). Forensic examiners use behavioral descriptions in specific questions in the forensic interview and examination.

A second potential terminology problem is the word "penetration", which entails specific acts and is defined slightly different in every state (APRI, 2004). Some researchers define penetration of the vulva as sufficient for rape, or an intrusion, however slight, while others are more or less specific. Actual entry into the vaginal orifice is not necessary per CDC definitions,

but completed or attempted penetration is considered rape. The term penetration may elicit different perceptions from women in a national survey, or clinical interview than from an expert who understands the behavioral definition.

The third problem is the definition of the word “force”. In Black’s Law Dictionary a crime with the use, attempted use, threatened use of substantial risk of use of physical force against the person is a violent crime (Garner, 1999), and rape is a violent crime. However women have their own perception and interpret rape, force or consent based on their age, peer pressure and associated behaviors, culture and language differences (Hamby & Koss, 2003) but not the legal dictionary. Victims may give false information in a forensic interview if they were under the influence of alcohol, drugs or legal medication, or illness, not understanding that they may be unable to give consent. Inability to give consent to a sex act may be due to psychiatric mental health issues, developmental disability or being under the age of consent to have sexual intercourse. All of these issues may lead to inaccurate information being given by a woman.

A fourth problem is that national surveys on rape and other types of violence against women, the NVAWS and NCVS, are the primary sources for incidence and prevalence of rape, and the information is from retrospective self-reports from women to a person collecting data. Survey data is not directly comparable to clinician observation of injury. Women may not consider themselves injured if they were not seen by a forensic examiner and informed about the injury and most physical or genital rape-related injuries are minor. The physical or genital injuries may not be visible to women who have been raped, or they may not remember being told by a forensic examiner that there was an injury. Information on rape-related physical or genital injury may be best gathered from an examiner’s documentation at the time of the acute visit. Examiners have special education and the ability to utilize technology and examination

techniques (nuclear staining, digital camera, colposcopy, and magnification, and special light sources) to help with visualization of physical injury on the woman's body or genital findings consistent with injury (other than redness or pain).

However, the information gathered during clinical forensic examination and documented by a variety of clinicians, with varied levels of experience and skill in different regions of the US is likely to vary.

1.7. Summary

The emotional, physical, and psychological responses to rape are burdensome to women themselves and to the health care and legal systems. The number of rapes experienced by women is far greater than the number of women who are examined in a health care setting. Medical forensic examination records of women who have reported being raped contain information that will help clarify factors that are associated with rape-related physical and genital injury as a measure of the violence that is linked with long-term health. The personal and contextual factors surrounding rape may influence rape-related injury to different degrees with different women. Understanding the relationships among victim and forensic characteristics and regional setting on acute injury that is documented will help clinicians and researchers understand acute physical and genital injury and long-term health of women after rape. This research study will provide information on the associations between factors that influence physical and genital injury differently among women, and can be used to develop improved assessment techniques, and more effective preventive intervention strategies for women most likely to suffer acutely and over the long term.

2. REVIEW OF THE LITERATURE

Chapter two presents a review of the literature on national surveys of rape, victim self-reports, and clinician observations that document the significance and impact of rape for adolescent and adult women. The reviewed studies help explain the predictors of rape linked to increased physical injury that leads to negative long-term health outcomes.

National surveys that document the incidence and prevalence of rape are presented. Following national surveys is literature addressing each of the victim characteristics of age, ethnicity, known or unknown perpetrator, which will be followed by research on the forensic characteristics, time from rape to examinations, weapon use, use of the evidence kit, crime report, multiple perpetrators, in addition to the outcome variable of physical or genital injury from rape. Victim self-reports add to the knowledge gained from survey data and include more individual details regarding the circumstances of the rape. Medical and forensic records relate clinician observations of levels, severity, and types of injury documented. A brief summary concludes each section of literature review on each variable, and will address the value and limitations of the research. Females are the primary victims of sexual violence perpetrated by males (95 to 99%), thus research on females over 12 years of age is presented.

The value of victim and forensic variables in the existing research can help to identify predictors of injury in the development of predictive models. Models evaluate multiple characteristics of victims, the event, their effects, and interactions on the outcome of acute injury, and can be influential in reducing long-term health problems, medical syndromes, and future assaults (Resnick et al., 1997).

2.1. National Surveys

Two national surveys are reviewed. They estimate various types of phenomena, including estimates of annual rates of interpersonal violence. The surveys are the National Violence against Women Survey (NVAWS) jointly sponsored by the National Institute of Justice and the Centers for Disease Control and Prevention (CDC) and, secondly, the National Crime Victim Survey (NCVS) from the Bureau of Justice Statistics. These surveys will be reviewed and their relevance to the study of rape summarized.

The CDC describes the NVAWS as survey surveillance, a cross sectional systematic method of data collection taken directly from a representative sample of the population of interest for analysis and interpretation (Basile & Saltzman, 2002). The NCVS is more traditional surveillance. The NCVS involves systematic, ongoing collection analysis, and interpretation of data from stratified census tract households. Typically, traditional surveillance uses sources such as medical records from emergency departments, police departments, or rape crisis centers. Service agencies may not have staff to assure removal of identifiers to shield patient confidentiality and to extract and transfer data from medical records into a data base for analysis. Rape crisis centers are also bound by strict confidentiality rules, and fewer data are available from such centers. Sexual violence information from other service agency records is thought to be limited as well, because victims are not known or identified as sexual violence victims, and documentation of sexual violence information is inadequate for surveillance purposes. Thus, the NVAWS and the NCVS both contain large amounts of data that are relevant to the field of rape research and important variables (Basile & Saltzman, 2002).

2.1.1. National Violence against Women Survey (NVAWS)

The NVAWS was designed by researchers at the Center for Policy Research and conducted from November 1995 to May 1996. National random digit dialing of telephone

numbers resulted in a sample of 8,000 women and 8,000 men who were 18 years of age and older in the US (Tjaden & Thoennes, 2000a). Survey questions were introduced as personal safety questions, and included questions about violence, coping with fear and emotional abuse suffered from partners or spouses, abuse as children, physical assault as an adult, including rape and stalking. Those who had been victims were asked detailed questions about the characteristics and consequences of victimization such as frequency and duration of violent relationship with the perpetrator (Tjaden & Thoennes, 2000a).

Questions about rape were adapted from the National Women's Study conducted by the National Victim Center, to screen for rape (Appendix B). In addition, those who responded affirmatively to the acts of victimization were questioned about their relationship with the perpetrator and other victim and forensic characteristics, such as use of alcohol, use of weapons, physical harm or threats, injuries, use of health and justice system services and time from work lost after the rape. Reliability and validity testing was not provided for the set of questions on rape. Questions on sexual violence were considered to have face validity and considered to be reliable if they were the behavioral descriptions of rape, rather than the word rape (Tjaden & Thoennes, 2000a). Rape is defined by the NVAWS as "an event that occurred without the victim's consent, that involved the use or threat of force to penetrate the victim's vagina or anus by penis, tongue, fingers, or object, or the victim's mouth by penis. The definition included both attempted and completed rape" (Tjaden & Thoennes, 2000a, p. 4).

The NVAWS used numerous techniques to protect the confidentiality of the informants and minimize the potential future harm of those who reiterated a traumatic event. An external contractor was used to administer the telephone surveys. The contractor was experienced in the

use of sensitive survey questions and cognizant of the need to protect privacy and safety of participant.

Working residential telephone numbers were obtained with random-digit-dialing. Each number was automatically assigned an identification number for the interviewer use in subsequent coding and editing. Interviewers signed confidentiality agreements specifying that they would not reveal information about respondents. Interviewer introduction included informing respondents about the personal nature of the interview questions, and that participation was voluntary. Respondents were given a toll-free number to call to verify the legitimacy of the project and to call if the interview was interrupted. If respondents appeared to be distressed, supervisors were contacted, and intervened if necessary and provided referrals to local rape hotlines. At the conclusion of the interview, additional comments were solicited and respondents were told to call the toll-free number if they had questions or wanted to discuss their experience further.

One limitation of a telephone survey is that only households with telephones are included, and homes with no telephones are not included, thereby eliminating certain people, such as the homeless, the very poor, institutionalized people, or those in rural areas (Tjaden & Thoennes, 2000a).

The NVAWS prevalence (persons in a demographic group) and incidence (separate number of events) of rape are discussed. The survey also collected data on physical assault and stalking. Rape defined as forced vaginal, oral, and anal sex, was reported by 17.6% of the women. Some victims experienced more than one rape in one year, thus incidence is greater than prevalence. An estimated 302,091 women are raped per year. Women averaged 2.9 rapes in one

year resulting in an incidence of 876, 064 rapes against women each year. Thus the annual rate of victimization is 8.7 per 1000 women over 18 years of age (Tjaden & Thoennes, 2000a).

Youth are disproportionately represented in the rape statistics. The NVAWS reports that, of those who had ever been raped, 21.6% of the women were younger than 12 when they experienced their first rape, and 32.4% of young women were between 12 and 17 years of age. Thus, 54% of the female rape victims were under 18 when they had their first rape experience (Tjaden & Thoennes, 2000a).

Annual victimization rates in the NVAWS were based on only 24 women reporting multiple rapes in one year. The small number along with the elimination of households without telephones may have resulted in underestimates of rape (Tjaden & Thoennes, 2000a).

Racial diversity was addressed by asking respondents how they would classify themselves. Women who were raped self-identified as white (17.7%), African-American (18.8%), Asian or Pacific Islander (6.8%), American Indian or Alaska Native (34.1%), and mixed race (24.4%). Hispanic (14.6%) and non-Hispanic descent was an additional ethnic assessment. Rape rates were significantly different among the racial groups, with American Indian/Alaska Native women more likely than white or African-American women to report rape (Tukey's B, $p \leq .05$). Mixed race women were more likely than white women to report rape. The small number of reports from Asian/Pacific Islander women who reported rape made it impossible to test for statistical differences. Women who identify themselves as Hispanic (all races) were significantly less likely to report that they had been raped than women who were non-Hispanic (Tukey's B, $p \leq .05$). The racial differences in victimization prevalence clearly indicates a need to be specific when comparing races, as the differences diminish when groups are combined in victimization studies (Tjaden & Thoennes, 2000a).

The relationships between victims and their perpetrators are reported in the NVAWS. The risk of rape from an intimate partner is higher than from a stranger. The NVAWS estimates that 201,394 women over 18 years of age were raped in one year by an intimate partner, with an average of 1.6 rapes. Thus, there is an estimated incidence of 322,230 intimate partner rapes annually in all ages (Tjaden & Thoennes, 2000a). Minors are more likely to be raped by perpetrators who are an acquaintance (46.7%), relatives (38.5%), and current or former intimate partner (15%). Most rapes of women under 18 years of age (99.2%) were by males (Tjaden & Thoennes, 2000a).

Overall, the NVAWS found that rape was the second most frequently reported violent act next to physical assault. Women are ten times more likely than men to be raped and 9.6% of women reported being raped since the age of 18. Most (61.9%) are raped by intimates (current or former spouse, cohabiting partner, boyfriend or date), while 21.3% were raped by an acquaintance, 16.7% raped by a stranger and 6.5% were raped by a relative (Tjaden & Thoennes, 2000a).

The likelihood of injury from rape is high because it is a violent crime. Rape is also accompanied by physical assault 41.4% of the time. Rape-related physical assaults, such as slapping, hitting, kicking, biting, choking, hitting with an object, beatings and the use of a gun or other weapon are experienced by 362,690 women annually. Thus both completed or attempted penetration as well as the physical force are often associated with rape and can lead to injury (Tjaden & Thoennes, 2000a).

Victims who disclosed that they were injured were asked to describe the injury and if medical care was sought. Injury from the most recent rape was assessed. Approximately one third of women (31.5%) reported injury other than rape itself. For the most part, injuries were

minor (scratches, bruises, welts, weapon inflicted wounds, broken bones, or concussions) (Tjaden & Thoennes, 2000a).

Characteristics of the victim, perpetrator, and the rape incident were evaluated with bivariable analysis. The characteristics included the following: race as white or non-white, victim under or over 30 years of age, event in the home or elsewhere, current or former intimate relationship, threats to harm or kill the victim or someone close to them, perpetrator use of a weapon, perpetrator use of drugs, and if the rape was completed or attempted. The outcome of the bivariable analysis was injury or no injury (Tjaden & Thoennes, 2000a).

Logistic regressions were conducted to determine which variables increased the odds of injury. Rates of injury increased with a known perpetrator, rape in their homes, completed rape, use of threats of harm or death, perpetrator use of a weapon, and perpetrator use of drugs or alcohol. The risk of injury was decreased if the victim used drugs or alcohol. No relationship was found between risk of injury and age or race. The variable most likely to predict injury among adult female rape victims was the threat of harm or death to the victim or someone close to the victim, indicating that threats should be taken seriously (Tjaden & Thoennes, 2000a).

The most frequent report of medical treatment received for a rape injury was hospitalization, for 81.9% of the women. Half of the women were treated in an emergency setting, 36.8% received other outpatient services and 13.2% spent at least one inpatient night in the hospital. More than half of the women (54.8%) saw a physician outside of the hospital setting (Tjaden & Thoennes, 2000a). Although over 80% of women who were injured went to the hospital, less than one fifth reported the event to police

Conclusions drawn from the survey are that violence against women should be treated as a significant social problem. Rape should be viewed as a crime committed against youth and

adults. Studies are needed to determine why the prevalence of rape varies among different racial and ethnic groups. Intimate partner violence is greater for women and is primarily perpetrated by men. The medical community should receive comprehensive training about medical needs of female victims of rape (Tjaden & Thoennes, 2000a).

2.1.2. Bureau of Justice Statistics National Crime Victim Survey (NCVS)

The National Crime Victimization Survey (NCVS) is sponsored by the Bureau of Justice Statistics, and is the largest national survey sponsored by the government. The NCVS involves the systematic, ongoing collection, analysis, and interpretation of data. Individuals in US Census Bureau housing units in a stratified multistage cluster sample are interviewed every 6 months for three years. The NCVS collects detailed information about the crimes of robbery, assault, larceny, burglary, motor vehicle theft, and rape. Screening questions for rape were revised in the redesigned NCVS in 1993 to more accurately estimate incidence of rape and violence perpetrated by intimates and family members (Bachman, 2000).

The Bureau of Justice Statistics uses the following definition of rape. “Rape is forced sexual intercourse, including both psychological coercion and physical force. Forced sexual intercourse means vaginal, anal, or oral penetration by the perpetrator(s). The forced sexual intercourse category includes incidents where the penetration is from a foreign object such as a bottle” (Bachman, 2000, p. 4).

Methods used to estimate crime incidence in NVAWS and NCVS yield very different estimates, and Bachman (2000) attempts to make them as comparable as possible. Bachman explains that the major difference between the NCVS and the NVAWS is that NCVS data is bounded: initial interviews set a time reference (bounding) and only incidents that occurred within each of the most recent past six month time frames are asked about, and the NCVS

interview focuses on those events. The NVAWS respondents were interviewed only once, so there is no bounding. Bachman stresses that there is no way to compare the two survey methods. Although all researchers agree that rape is underreported, and results are underestimated by any method, the use of bounding is thought to produce higher victimization rates (Bachman, 2000).

The NCVS records numerous incidents of victimization as a series crime if the event occurred within one six month time period. In order to compare to the NVAWS, all victimizations in a series were counted individually. In addition, for comparisons, the NCVS data were restricted to include respondents 18 years of age and older, as did the NVAWS.

In the NVAWS, the inclusion of events that occurred without the victim's consent involved the use of or threat of force to penetrate the vagina or anus by a penis, tongue, finger or object or the victim's mouth by penis. Each affirmative answer to one of the five questions was classified as a victim of each. The NCVS used definitions for completed and attempted rape, and an exact explication of what was meant was not provided to respondents. Thus the incorporation of the conceptual meanings into the interview questions resulted in different behaviors being included and different answers by respondents.

The NCVS is criticized for the lack of protection of clients in screening for violence, because recalling events may cause emotional trauma. The NVAWS provided a toll-free number for respondents to call if they needed to hang up during an interview if they felt they were in danger. The NVAWS interviewers were also to contact a supervisor at the first sign a respondent was distraught (Bachman, 2000).

Multiple perpetrator events are not assessed in the NVAWS or in the NCVS. Only lone perpetrator crimes were assessed so as to get at the nature of their relationship. The NVAWS did not assess multiple perpetrators, but assumed one per each affirmative answer (Bachman, 2000).

The NCVS data are weighted, so a standard weighting formula was applied to the NVAWS data in order to extrapolate and estimate the number of victimizations experienced by an adult. The confidence levels around the point estimates of rape do not overlap, indicating that the number of rapes uncovered by the NVAWS (876,064; 95% CI = 443,772, 1,308,356) is significantly higher than the NVCS (268,640; 95% CI = 193,110, 344,170) (Bachman, 2000). The two surveys uncovered similar rates of physical assault however.

The most general difference between the two surveys is the context in which the information is obtained from respondents (Bachman, 2000). The NVAWS assessed a variety of personal and safety-related issues. The NCVS obtained information about crimes. Questions are similar but the presentation and cuing strategies are different, and a warm-up effect is at work in the NVAWS. The NCVS questions have short cues for eliciting reports of rape with a single question. The NVAWS uses several behaviorally specific questions to uncover a wide range of behaviors that meet the legal definition of rape in most states. The behavioral specific questions are thought to be associated with greater disclosure by respondents compared to the one question about sexual intercourse in the NCVS.

Another difference in the two surveys is the sampling methods. For the NCVS, the US Census Bureau interviewers select housing units from a stratified multistage cluster sample. Interviews are conducted with all individuals in one household 12 years of age and older every 6 months for three years, including those living in dormitories, but not those living in correctional institutions. Included in the sample was 45,000 housing units and 90,000 persons. The first and the fifth interviews are conducted in person and the remainder by telephone. The live solicitation is thought to be related to the high response rate of 96% compared to 72% for the NVAWS (Bachman, 2000).

The NCVS resulted in a larger number of other perpetrators than the intimate partner. One reason may be that the households with no telephones may be lower income households and there is some indication that higher violence occurs in lower income households. Thus live interviews might access the individuals with no telephone. Another issue is that when the NCVS interviewer is in a home doing a personal interview, it may not allow for the respondent to report abuse, if the abuser is from the same household. In the NVAWS, only one person per household was interviewed by telephone only.

In summary, Bachman's comparison of the two surveys has implications for policy makers, researchers and the media. Professionals need to be apprised of the methodological differences in these two surveys as they publicize and monitor the health care needs and cost of violent crime. However, both surveys clearly reveal that rape and physical assault are likely to be at the hands of a known person or intimate partner. Both the NVAWS and the NCVS also point out that young women, the economically deprived, and women living alone are more often victims. Both also reveal that intimate partners use a weapon 20% of the time, which leads to injuries. Despite difference in the surveys and their findings, rape is a substantial problem that should be addressed through theoretically guided research that will help to better explain and understand the issue, eradicating stereotypes, victim fears of reporting and seeking care, and guide prevention efforts.

2.2. Variables

2.2.1. Regional Setting

Literature comparing different samples of women and injuries from rape, or including diverse regional samples was limited. Research on the NCVS data included geographical regions of the US (Catalano, 2004). Four regions, Northeast, Midwest, South and West were included. There are no definitive borders stated for the regions, but clearly different rates of violent crime are reported. Higher rates of assault occur in the West, but are similar in the other regions. Rape is more common in the Midwest, followed by the South, the West, the South and the fewest in the Northeast. Catalano also categorized residence location as urban, suburban or rural. Urban residents experienced crime at a higher rate than suburban, and weapons of all types were reported in 20% rapes. Thirty per cent of women were raped by strangers, and the rest by current or past intimates or acquaintances (Catalano, 2004).

2.2.2. Victim Characteristics

Victim characteristics are personal history about the rape victim and the perpetrator that help to explain the event (Basile, 2003). The characteristics may be demographic data, such as age and race, or past history of rape or abuse. While they may be found to contribute to the likelihood of rape or injury to different degrees in various studies, their value may be more or less significant when examined in combination with other variables and with forensic characteristics. A third variable that may influence behaviors and outcomes from rape is the victim's relationship with the perpetrator. These three variables, age, race and relationship are frequently included in the extant literature and help understand rape and the interplay between many variables.

2.2.2.1. Victim Characteristics: Age

Age is standard demographic information gathered during a health care visit and is one of the recommended minimum data elements for rape research by the CDC. Age is an important characteristic to include for several reasons. Specific age groups of women are at higher risk for rape because of their psychological stage of development and their age-associated activities. Also, self-esteem and maturity of judgment influences activities and behaviors that place women in dangerous situations putting them more at risk for rape. Older women who are more frail, live alone, and have limited mobility may be more vulnerable to victimization and injury, even though they are at less risk of rape. Maturity, family and relationship stability increase with age and there are less risk-taking behaviors.

Additionally, women at both ends of the age continuum may be more likely to incur injury with a sexual act. The younger women may experience injury due to lack of previous sexual experience. Older women have medical conditions and physiological changes making them more susceptible to injury from rape. Research reports are reviewed that examined injury from rape in different age groups.

The NVAWS reports that 21.6% of women were younger than 12 when they experienced their first rape, and 32.4% were between 12 and 17 years of age. Although 54% of first rapes are experienced under the age of 18, over half are estimated to occur in young women over 12 years of age (Tjaden & Thoennes, 2000a). Injury with rape was reported to be more frequent in adolescent women (Jones, Rossman, Wynn, Dunnuck, & Schwartz, 2003).

Rates of rape appear to be similar in students and non-students who are 18-24 years of age (3.8% versus 4.1%) (Baum & Klaus, 2005). The report found that rape victims in college are more likely to be female than male (6% versus 1.4%) compared to those not in college (7.9%

versus 0.4%). Rape victims in college are more likely to be white (4.0%) or Hispanic (4.6%) rather than other races/ethnicities (black 3.2% or other 2.1%) but the non-white racial categories include fewer than 10 persons. Also the non-students who reported rape included 4.5% whites, 4.9% blacks, 3.6% other, and 1.9% Hispanics (Baum & Klaus, 2005).

One Minnesota study used a cross-sectional design to assess adolescents ($N = 81, 247$) in the 9th and 12th grades. The youth anonymously completed a survey designed to assess health-related attitudes, experiences and behaviors. Self-report measures were used to assess date violence and date rape (Ackard & Neumark-Sztainer, 2002). The questions on date violence and rape included two questions: “Have you ever been the victim of violence on a date?” and “Have you ever been the victim of date rape?” They were then asked if none or both or either type of violence had occurred (Ackard & Neumark-Sztainer, 2002).

Most of the young women (91.4%) reported no violence or rape. Of the 4.2% ($n = 1718$) who reported violence on a date, 1.4% ($n = 589$) had been raped, and 3% of girls ($n = 1216$) reported both violence and rape on a date. A higher percentage of young women in 12th grade (11.5%) reported experiencing some type of date-related violence compared to 9th graders (6.7%). In addition, many of the youth who reported these events of date-related victimization, also reported multiple other abuses by an adult. The majority of adolescents had not experienced any date-related violence and had also not experienced any other abuse by an adult (Ackard & Neumark-Sztainer, 2002).

Although the sample size was large, the sample of students was primarily Caucasian and results cannot be generalized to the larger population. Also, the design looked at associations, but not cause and effect. The wording of the questions was a limitation of the study, because many adolescents might not have responded to or been able to identify types of violence such as rape.

Descriptions of behaviors that comprise rape are a more accurate assessment. The authors also noted that the lack of a measure of socioeconomic status and small size for some cells were limitations (Ackard & Neumark-Sztainer, 2002). To add to the observation, the use of date violence or rape was a limitation because most rapes of adolescents were committed by someone known to them, the teens may not consider that they were on a date, and the term may have led to reduced reports of violence.

Ackard's study reports low rates of violence, and is compared to Brener's study with higher prevalence rates of rape for young women, which are more in agreement with the NVAWS. Earlier reports had found a higher incidence of rape (Koss, Gidycz, & Wisniewski, 1987) in young women and were thought to be exaggerated estimates of rape. College-aged women are reported to be at highest risk of incurring injury. Whether or not women attend college may have an association with previous victimization (Abrams, Tendayi, Masser, & Bohner, 2003; Koss, 1993; Sachs & Chu, 2002).

Twenty percent of female college students from 148 institutions (18 to 24 years of age) ($N = 4,838$) were represented in another study (Brener, McMahon, Warren, & Douglas, 1999). Brener's question "During your life, have you ever been forced to have sexual intercourse against your will?" was followed by a question about the time frame for the first and last time forced sex had occurred. Notably, 71% of the women reported the first rape before the age of 18, and most in their teenage years, with only 16% before the age of 12. Retrospective reporting of rape and the use of a single screening question for rape is less than ideal (Brener et al., 1999).

Brener and colleagues (1999) found women who had forced sexual intercourse had increased 1.5% to 2.7% odds of engaging in high risk behaviors, such as drinking and use of drugs. The association of violence related health behaviors helps to explain subsequent health

problems (Resnick et al., 1997). Violent assault leads to acute physical injury, increased stress, and increased risk of mental and physical health problems. Current health problems in the young women were highly associated with their history of rape (Brener et al., 1999).

Both the Ackard (2002) and Brener (1999) studies correlated violence to subsequent psychological disorders and high risk behaviors, such as eating disorders and suicide attempts. Physical and sexual abuse violates the body and may create difficulties in the integration of a positive body image into the sense of self, at a time of adolescent development when normative body transition is desirable. Both studies conclude that there is a need to support early prevention efforts prior to high school to reduce the occurrence and ill effects of dating violence. Specifically the studies both promote the tailored intervention programs incorporating community and parental support to strategize about reducing high-risk situations for youth.

One limitation in both studies is the use of a single question about rape or violence. Adolescents may not understand or define occurrences as violence or rape. The National Victim Center (1992) reports that two thirds to three fourths of adolescent rapes involve an acquaintance or relative (Muram, Hostetler, Jones, & Speck, 1995; Peipert & Domagalski, 1994). Acquaintance rape and lack of understanding of violent behaviors leads to acceptance or normalization of events and fears of reporting. Screening for rape with direct questions that explain violent behaviors and providing acute medical care after rape is recommended for pediatricians and other health care providers who care for adolescents (Kaplan et al., 2001). Women may identify an event as rape differently as they get older (Katz, Street, & Arias, 1997) if they witnessed aspects of the women's movement and public awareness of issues surrounding rape or if they received higher education.

The prevalence of overall violence in adolescence, and the lack of sexual experience puts them at a higher risk of incurring injury with rape (Acierno et al., 2001; Kaplan et al., 2001; Kroner & Weekes, 1996; March, 1993). Intercourse is more likely to occur as girls progress and mature into adolescents and adults. The younger sexually inexperienced adolescents were more likely to incur genital injury with rape than adult women who have had intercourse (Biggs, Stermac, & Divinsky, 1998).

A sample of 18 to 49 year old women ($N = 1599$) were evaluated in randomized, sociodemographically representative telephone surveys to assess the relationship of violence to gynecologic problems (Plichta & Abraham, 1996). Rape was reported by 3.7% of women overall with married women reporting the lowest rate (1.2%). Limitations included the fact that data were cross-sectional self-reports, and causality cannot be inferred, only associations among the variables.

Among women who had select gynecologic problems, more than half reported childhood abuse, two-fifths reported being a victim of violent crime in the past five years and more than two-fifths reported partner abuse (Plichta & Abraham, 1996). Sexual abuse or being a victim of recent rape tripled the odds of women being diagnosed with a gynecologic problem. The relationship of past abuse with the pain and injury of subsequent rape was not known.

White, middle to upper middle class women who were surviving members of the Rancho Bernardo Heart and Chronic Disease Study were interviewed in 1992 in a follow-up study. The women had a mean age of 75 years ($N = 826$) and risks were calculated for 11 common chronic medical conditions. Sexual assault was reported by 12.7% of the women, with repeated exposure reported by 21.9% of the women (Stein & Barrett-Connor, 2000). One single question was asked in the in-person interview: "In your lifetime, has anyone ever tried to pressure or force you to

have unwanted sexual contact?” Having a history of sexual assault was associated with increased risk for two of the health conditions: arthritis and breast cancer. Multiple episodes of sexual assault carried a two to three fold increase in the risk of these conditions when compared with a single episode. While these data replicate findings of other studies on associations between sexual victimization and health problems, they also present a higher percentage of sexual victimization in an older age group of women.

In a subset of the National Women’s Study, characteristics of recent assaults against younger adults (18 to 34 years of age; $n = 2,669$) are compared with distant assaults against older adults (55 to 89 years of age; $n = 549$) (Acierno et al., 2001). In order to enhance contrast between the older and younger age groups, the middle group of 35 to 54 year old women, were excluded as they were considered to be more heterogeneous.

Phone calls were placed randomly and if women agreed to be interviewed in Acierno’s study (2001), the women were contacted twice more over the following two years. Rape behaviors were clearly defined, and any knowledge of the perpetrator, use of a weapon, threats during the event, and injury were assessed (Acierno et al., 2001).

The average age for the first rape was around 14 years of age for the under 34 and the over 55 groups. Assault characteristics of the first rape event were no different in the two age groups of women regarding the context and characteristics of rape, other than the subjective feeling of life threat. One half of the younger women compared to one third of the older women reported thinking that their lives were in danger. Both groups reported similar risk of injury. Few of the women were intoxicated. One third to one half indicated that their perpetrator was probably under the influence of alcohol or drugs. One fifth of the younger and one third of the

older group reported repeated rape. However, less than one fifth of the women reported the rape to the police (Acierno et al., 2001).

The affirmative sexual assault responses are much greater in Acierno's study than in Stein and Barrett-Connor's. The difference may be due to the fact that the women were interviewed in person in Stein and Barrett-Connor's study but telephone interviews were used in Acierno's study, with more specific behavioral definitions of rape.

For the older women the percentage of different types of rape ranged from 5.3% for vaginal rape to 0.2% for anal rape. In the younger group they ranged from 14.4% for vaginal rape to 2.1% for anal rape. While reported prevalence was different in the two age groups, the characteristics of rape were not. The researchers surmised that violence was lower during the years that the older sample was under 35 years of age. On the other hand, older women could be reluctant to report the actual severity because of the fear of consequences, memory bias, or prohibitions against reporting such personal and private information (Acierno et al., 2001).

Violence against the elderly is reported in some studies to be more vicious in nature than those against younger persons (Nelson, Nygren, McInerney, & Klein, 2004; Safarik, Jarvis, & Nussbaum, 2002; Voelker, 2002).

Klaus summarizes that the elderly are more likely to face a perpetrator who has a weapon than victims 64 years of age and under (30.2% versus 25.7%). The elderly are less likely to resist threats and attacks than victims 64 years of age and under (55.5% versus 71%). The elderly are more likely to face a perpetrator who is a stranger (53% versus 46%) The elderly are less than the younger group to receive serious injury (2.8% versus 3.3%), less likely to suffer a minor injury (18.7% versus 21.2%), and less likely to receive rape injury (0.3% versus 1.2%) (Klaus, 2005). However, Klaus cautions that there are only 10 cases of rape included in the study.

The elderly were more likely to live alone, to be attacked in their own homes, and to be victimized by strangers. The elderly were less likely to defend themselves because they were less strong or able to flee. Hence some researchers claim they were more likely to be injured in the (Polluck, 1988).

In summary, research on age associated with rape indicates that age groups at extremes of the age continuum may be at higher risk for injury with rape. Studies differ in prevalence rates, but over all, rape and injury were much higher for the adolescent age group. Age based studies of rape are warranted to analyze characteristics that vary with age groups (Acierno et al., 2001). Elderly women routinely compose the smallest age group in rape studies and are less likely to report rape, whether they are injured or not (Acierno et al., 2001). Although the likelihood of rape decreases with age, the injuries experienced by older women may be more serious (Voelker, 2002). It is not known if research findings in adolescent and young adult victim populations would be applicable to elderly victims of crime (Acierno, Resnick, Kilpatrick, & Stark-Riemer, 2003). Some research reports more violent assaults on older women, however, there was a paucity of research on older women and considering age as a variable is warranted in future studies (Acierno et al., 2001).

2.2.2.2. Victim Characteristics: Ethnicity

Most survey or clinical research includes race or ethnicity as a variable, and among the studies that find racial or ethnic differences in rape victimization, there are divergent findings. The divergence in findings is partially due to methodological differences in how race is determined and how it is categorized for analysis: white/nonwhite, the specification of each minority compared to white or the use of ethnicity for Hispanic/non-Hispanic. Rates of reporting may be different in minority groups due to cultural differences in the level of acceptance of

behaviors that constitute rape. Variation in the level of trust of law enforcement and health care providers may also vary according to race and region of the US and within communities in one city. Cultural differences are implied for racial and ethnic group responses which further blur the understanding that race plays in the prediction of rape-related injury.

The NCVS reported that African-Americans were at a greater risk of violent victimization than whites or other racial groups, but does not offer any further racial breakdown for rape victimization rates (Catalano, 2004). The NCVS reported further that Hispanics were at a greater risk of violent victimization than non-Hispanics (Ringel, 1997).

There was little difference in the NVAWS between women grouped as white (17.7%) and non-white (19.8%) (Tjaden & Thoennes, 2000a). However, the NVAWS does report differences among racial groups: African-American (18.8%), Asian or Pacific Islander (6.8%), American Indian or Alaska Native (34.1%), or mixed race (24.4%) (Tjaden & Thoennes, 2000a). The rates of rape from NVAWS were significantly different between the racial group pairs, with American Indian/Alaska Native women more likely than white or African-American women to report rape (Tukey's B, $p \leq .05$). Mixed race women were more likely than white women to report rape. Few reports exist from Asian/Pacific Islander women, making it impossible to test for statistical differences. Women who identified themselves as Hispanic (all races) were significantly less likely to report they had been raped than women who were non-Hispanic (Tukey's B, $p \leq .05$). Racial differences in rape rates indicate a need to be specific when comparing races, as the differences diminish when groups were combined (Tjaden & Thoennes, 2000a).

The higher incidence of rape in American Indian women was studied further by Hamby (2004), in a brief overview of literature on the topic. Hamby cautioned that rates varied from 12% to 49% across the 560 federally recognized tribes in the US, and not all studies found higher

rates in American Indian women, so that blanket assumptions cannot be made (Hamby, 2004). Hamby addressed the various barriers to care-seeking behaviors in American Indian women. Barriers take on a unique meaning and challenge to tribal women. Some of these barriers were prejudice and victim blaming by white staff, care providers and researchers. Conflicting values, language, economic and geographic barriers, the effects of community size on confidentiality, stigma and perception of choice of whether to report or seek care were additional barriers. There was also a fear of law enforcement and community justice systems and a lack of funding (Hamby, 2004). These barriers affect how women understand behaviors that define rape and the reporting of rape.

Young women in one study who reported date rape were comprised of very different racial/ethnic breakdowns: Caucasian (7.4%), American Indian (6.8%), and Mexican American (6.7%) women reported the highest rates of date violence only. Mexican American (4.2%) and American Indian (3.7%) women reported the highest rates of date rape. White women in ethnic groups of Caucasian (9%), Puerto Rican (6.3%), and Mexican American (6.0 %) reported the highest rates of both date violence and rape (Ackard & Neumark-Sztainer, 2002).

Little difference by race for three types of victimization (physical, sexual, and co-victimization) was found by Smith and colleagues. Rates of sexual victimization were similar for white women (74.8%) and black women (81.1%). The risk of physical or sexual violence increased slightly throughout their college years (Smith, White, & Holland, 2003).

Brener and colleagues reported that 72% of the young white women were forced to have intercourse as undergraduates, 3% of the black women, 7% of the Hispanic women, and 8% of the women in other racial groups. The association of race may have been linked with age, region of the US and a variety of other variables (Brener et al., 1999). Racial differences in women who

were raped and in college may represent a unique subset of each racial group and may have led to differences in college and non-college samples.

Past survey reports, African Americans admit to victimization but do not call report to law enforcement, so the full impact of the association between ethnicity and rape would be difficult to assess (Clay-Warner, 2002; Hanson et al., 2003). Although some research reported significant associations between black victims and higher levels of violence, these studies were often based on univariate analysis (Rennison & Planty, 2003a). Interactions with other variables such as socioeconomic status and region of the US may reduce the significance of race. Other researchers claim that the majority of research on risk factors has been conducted with Caucasian samples of college-aged women and cannot be generalized to others (Rickert, Vaughan, & Wiemann, 2002).

In summary, race and ethnicity were available in data collection and as yet have an unclear role in violence victimization and injury. It is imperative that race and ethnicity be included in future research. Racial and ethnic content of different regional settings in the US will help reveal differences in the acute and long-term injury in the women who are victims of crime. Small numbers of one racial group in one city may be quite different in another region. Conversely, as evident in the American Indian communities, large numbers of one ethnic or racial group may report rape behaviors and their injuries and be affected by a different set of variables. More importantly, an expanded understanding of ethnicity in combination with other variables may reveal information on injury outcomes from rape that would be otherwise unknown and be critical in prevention and intervention efforts.

2.2.2.3. Victim Characteristics: Unknown Perpetrator

Rape is most often perpetrated by someone known to the victim, such as an acquaintance, date, current or former partner or spouse (Basile, 2002; Rennison, 2003c; Tjaden & Thoennes, 2000b). The NVAWS and the NCVS report the highest number of rapes perpetrated by friends or acquaintances (22% and 46%, respectively) and intimates (41% and 33%, respectively). Rape by an unknown perpetrator or stranger rape was included in fewer research studies and was reported to be less than one in five rapes in both surveys.

Relationships are closely linked with age, and dating and marital relationships increase with age. The relationship between victim and perpetrator may mask the victim's ability to identify an event as rape particularly with increased closeness of the relationship. Also, the degree of force required to rape someone may be greater in known relationships, leading to more injury. Stranger rapes while fewer in number, may be more likely to result in injury. The associations between relationship, age and other variables are important to include in future research to help clarify divergent findings.

In a longitudinal study of adolescent and college aged women, researchers examined the link between co-occurring physical violence and rape throughout adolescence and college with dates or romantic partners (Smith et al., 2003). Two cohorts of university women ($N = 1569$) completed surveys over four years of college. Women were white (70.9%), black (25.3%), and other ethnic groups (3.8%). The prevalence of victimization over time in dating relationships, the impact of childhood and high school victimization on college victimization, and if women who were physically assaulted in one year were likely to experience rape victimization in the same year.

Each survey covered a time span that did not overlap with the others: childhood, adolescence and each four years of college. Adolescent and college physical abuse was assessed with a modified version of the violence subscale of the Conflict Tactics Scale (CTS) (Strauss, 1979). The participants were asked if someone they dated had hit or thrown something at them or threatened to do so, or pushed, grabbed, or shoved them, hit or attempted to hit them with a hand or fist or something hard.

Sexual victimization was assessed by sexual behaviors described in the Sexual Experiences Survey: none, consensual only, unwanted contact, verbal coercion, and attempted rape or rape (Koss & Oros, 1982). Sexual experience categories were used to capture a range of coercive experiences (Smith et al., 2003).

No sexual violence in high school was reported by 33.3% of the women, and the percentage increased to 71% by the fourth year of college, with a lifetime average of 12%. Of women who experienced any violence with a date (66.7%), physical violence only was experienced by 16.9%, sexual violence only by 23.8%, and co-victimization with both types of violence experienced by 26.1%. An 88% lifetime rate of physical or sexual violence with a date was reported, and similar rates of one type of violence: any physical violence (77.8%) and any sexual violence (79.2%) (Smith et al., 2003).

In young women who were physically victimized during adolescence, 25.4% were verbally threatened and 5.5% were hit. The numbers increased by the fourth year of college to 42.3% and 13.3%, respectively. The percentage confirms findings in other research (Humphrey & White, 2000). Similarly, the percentages of adolescent women who reported attempted rape (7.4%) and forcible rape (13.0%) increased by their fourth college year to 11.8% and 21.1%, respectively (Smith et al., 2003).

Survival analysis indicated that adolescent physical victimization significantly increased the risk of physical victimization in college (Hazard Ratio, [*HR*] given no adolescent victimization = 0.09, 0.03, and >0.01: *HR* with victimization = 0.25, 0.10, and 0.03 for years one, two and three of college, respectively). Adolescents who were sexually assaulted were at greater risk of physical assault (*HR* = 0.18, 0.06, and < 0.010) relative to those who were not sexually assaulted (*HR* = 0.05, 0.02, and 0.02 for years one, two and three of college, respectively). Adolescent co-victimization increased the risk of college physical assault (*HR* = 0.34, 0.14, and <0.01 for years one, two and three of college, respectively). Being sexually victimized during the first year of college did not increase the risk of physical victimization during that time. Adolescent physical victimization without sexual victimization increased the risk of victimization in college (*HR* = 0.14, 0.07, and 0.06 for years one, two and three of college, respectively) (Smith et al., 2003).

Any type of childhood victimization or physical victimization in adolescence increased the likelihood of victimization in the last three years of college (*HR* = 0.44, 0.13, and, 0.01 for years one, two and three of college, respectively). The second most at-risk group was women who had been victimized in adolescence but not childhood (Smith et al., 2003).

The relative risk of being victimized in college given prior victimization in adolescence was 2.96. The overall risk of victimization decreased over time, but relative risk of being physically victimized rose over the four years of college in those who had been physically victimized in the immediate preceding year and there was a trend for increasing odds of co-victimization over time (Smith et al., 2003).

Limitations of Smith's study (2003) included the lack of stranger victimization as a comparison, the use of self-reports, and retrospective self-reports for the child and adolescence

surveys. In addition, the sample included only women in college, which eliminated the experiences of women in the same age group who were not in college. Although 73% of the young women provided data that was useful, participants who dropped out of the study may have been different than those who remained in the study.

Another limitation was that the modifications of the CTS behaviorally defined rape. Some of the behaviors may have been considered acceptable behaviors for some young women. Tolerance or acceptance of behaviors may vary, depending on the relationship with the perpetrator, how the relationship changes over time, their culture and socioeconomic status and context.

Implications put forth by the authors are that dating violence in adolescence is preventable. Early intervention for those at risk may prevent later violence and it is critical for interventions to address co-victimization and re-victimization. Yet many women who experience violence come from low risk populations, indicating there is a need to identify environmental and social factors that place women at risk. Understanding the link between adolescent victimization and later victimizations, and demonstrate a pattern of escalation from verbal coercion to higher level violence in college and greater injury with escalation over time.

Similarly, Coker and colleagues estimated the frequency and correlates of intimate partner violence in an older aged sample (2000). They studied violence by type (physical, sexual battering, or emotional abuse) among women 18 to 65 years of age; ($N = 1401$) who attended university-based family practice clinics (Coker, Smith, McKeown, & King, 2000). In a cross-sectional design, a brief survey was used in the clinic with women who had an intimate relationship with a man for longer than three months.

Intimate partner violence was characterized by the most recent type of violence the women experienced with a shortened version of the Abuse Assessment Screen (McFarlane, Parker, Soeken, & Bullock, 1992). The 25-item Index of Spouse Abuse-Physical (ISA) (Attala & Hudson, 1994; Hudson, 1991) was reduced to 12 items (alpha = 0.91) three of which were used to assess sexual violence: 1) your partner hurts you badly while you are having sex, 2) your partner physically forces you to have sex and 3) your partner injures your breasts or genitals. These items loaded onto one factor as the measure for sexual violence, separate from physical violence.

McFarlane and colleagues (1992) used the Women's Experience with Battering (WEB) scale to assess battering (alpha = 0.99) (Smith, Earp, & DeVellis, 1995). The WEB scale quantifies the level of psychological vulnerability women experience in their relationship.

Past violence was assessed by three items to screen for physical, sexual, and emotional violence by an intimate male partner in a modified version of the Abuse Assessment Screen: 1) Did a male partner hit, slap, kick or otherwise physically hurt you? 2) Did you ever feel emotionally abused in a past intimate relationship? and 3) Did a male partner force you to have sexual activities against your will? The researchers wanted to assess if the severity of violence increased from past to present relationships. More than half of the 772 women (55.1%) experienced some type of violence in an intimate relationship. Of these women ($n = 597$) 77.3% experienced physical or sexual violence. Intimate partner violence was more common in recent past relationships rather than current relationships (33.0% and 14.8%, respectively) for all types of violence. Correlates of violence across all violence types included insurance status, divorced or separated, and history of violence in the family of origin, use of alcohol and unemployment

were correlated with all types of violence as was increasing age of the perpetrator, and age difference of more than 10 years (Coker et al., 2000).

Most importantly, 7.7% of women involved in a relationship and 17.7% in their most recent relationship experienced sexual violence. Women who experience physical and sexual violence had higher physical violence and higher battering scores than women who experienced physical but not sexual violence. Sexual violence may be a marker of more severe violence and a marker of violence escalation confirming previous research (Koss, 1992; Koss et al., 1987; Smith et al., 2003).

Limitations of the study included the definition of sexual violence and behaviors other than rape. The limitations made it unclear how severe the sexual violence was, and it was not the researchers' primary interest. The lack of stranger incidence and correlates for comparisons, and the use of self-reports also limited the generalization of these results.

In Basile (2002) a national poll using random telephone surveys questioned women over 18 years of age about sexual coercion. Out of 11,108 respondents, 602 women were asked about unwanted sexual experiences using a continuum of sexual coercion experiences that had not been previously assessed (Basile, 2002). The continuum included unwanted sex as a result of money being spent on the victim to unwanted sex by force or threats of force (rape). Unwanted sex by force or threat of force was used to estimate wife rape. Prevalence of various types of sexual coercion faced by women in relationships and the results of rape were the primary interest (Basile, 2002) .

Basile reported that force (7%) or threat of force (3%) preceded unwanted sex for women with their current partner, but many experienced more coercion in the past relationships than in the present (17% and 12%, respectively) (Basile, 2002). Coerced sex was slightly more prevalent

among married women than among the entire sample of women. Thirteen percent of married women were raped by their current spouse (9% by force and 4% by threat of force). The percentage increased to 34% for women who had past experiences with rape (20% and 14%, respectively).

Logistic regressions were conducted to test associations between race, income, education, and children in the home (Basile, 2002) . None of the variables were significantly associated with any of the types of coerced sex in the total sample or in the married group. The researcher concluded that all types of sexual coercion by intimate partners cut across all boundaries and may become more dangerous over time.

Limitations of Basile's study (2002) included the fact that sexual coercion was assessed in the current relationship. Prior experiences of coerced sex were only revealed for women who had not confirmed past coercion. Longitudinal research on sexual coercion by intimates might uncover the changes in different types of coercion over time.

Characteristics of rape that were associated with injury were examined in young women 15 years of age and older ($N = 819$) who reported rape and received a forensic examination in an urban emergency setting (Sugar, Fine, & Eckert, 2004). The majority (62%) were raped by friends or acquaintances (Odds ratio [OR] = 1.94, 95% CI = 1.18, 3.03) but those raped by a stranger or intimate partner had more general body injury (OR = 2.38, 95% CI = 1.65, 3.43) (Sugar et al., 2004).

Characteristics of rape in women ($n = 404$) who were under 20 years of age and women over 20 years of age were compared (Peipert & Domagalski, 1994). Variables of race, relationship, location, type of assault, and weapon use were compared. The greatest difference between the younger and older groups of women was the percentage of stranger rapes. Stranger

rapes doubled for the over 20 age group of women. The majority of the adolescents (77%) were raped by a person they labeled as an acquaintance or a relative, and the older group was significantly different (56 %, $p < 0.0001$) (Peipert & Domagalski, 1994).

No correlation between relationship and the occurrence of physical injury was reported in other studies (Schei, Sidenius, Lundvall, & Ottesen, 2003; Sugar et al., 2004), however stranger rapes of women with major psychiatric diagnosis were more correlated with injury (Eckert, Sugar, & Fine, 2002). Stranger rapes were reported to be more highly correlated with violent inflicted injuries from strangers and partners (Kroner & Weekes, 1996).

Young victims in 9th grade were more likely to report a family member as the most recent perpetrator, and the perpetrator was more likely to be a friend or date in older adolescents (Ackard & Neumark-Sztainer, 2002; Jones, Rossman, Wynn et al., 2003). More victim blame was attributed to the victim in situations of acquaintance rape than stranger rape (Abrams et al., 2003). Thus, the age of the victim and relationship with the perpetrator may result in differences in treatment of the victim by health care and legal professionals and promote negative social reactions toward victims (Nisith, Mechanic, & Resick, 2000).

Current research reports 39% of rapes are committed by a stranger (Riggs, Houry, Long, Markovich, & Feldhaus, 2000). Others report 54% of rapes committed by strangers and 6% of perpetrators known to the victim (Tintinalli & Hoelzer, 1985). Still others report that 49% of perpetrators were strangers and 20% were known to the victims (Cartwright, 1987). Classic rape research may have been based on less accurate screening and less public awareness that may account for the differences in victim- relationship and rape injury results (Tintinalli & Hoelzer, 1985). Severity of violence and sexual violence appear to escalate over time for women in abusive relationships. Previously raped women, who are at a higher risk of re-victimization may

also be at risk for worse injury and poorer health over the long term. The bulk of the literature is focused on the women who have been raped by someone who is not a stranger, and further exploration of stranger rape as a predictor variable in research is needed.

In summary, age and victim-perpetrator relationship are closely linked, since relationship status changes as women get older. Thus age and relationship are highly relevant to rape research and could be significant predictors of injury. Research reports on the predictive value of age and victim-perpetrator relationship to rape-related injury have led to divergent results and most research focuses on intimate partner or acquaintance violence. It is possible that more information about unknown perpetrators may be revealed when interactions with other victim and forensic characteristics are considered.

2.2.3. Forensic Characteristics

Forensic characteristics do not include personal victim characteristics, but clarify another perspective of the rape. The variables may vary from study to study, and many overlap. For this research study the forensic characteristic variables (time from rape to examinations, weapon presence, multiple perpetrators, and use of forensic evidence kit) were selected from the extant literature. The forensic characteristics may help to explain the context (background or environment of a situation) of the rape and advance clinicians' and researchers' understanding of the experience of rape for women and the rape-related injury.

2.2.3.1. Forensic Characteristics: Time from Rape to Examinations

National surveys revealed that over 80% of women who perceived themselves as injured sought care at a hospital following rape (Rennison, 2002b). The length of time that passed after a rape until a forensic examination was performed was influenced by several variables that may be correlated. Time from rape to examination was based on community response to reported rapes,

the recommendations of the first contact person, and noticeable injury (Rennison, 2002b). When and to whom women report rape influences if and when forensic examinations are performed and if physical findings documented. Regional practices of law enforcement escorting women to the hospital depend on regional protocols and the concerted community efforts to improve victim services with a Sexual Assault Response Team (SART). The shorter the time frame from rape to examination, the greater the likelihood clinicians will examine and document findings. Thus, this time from rape to examinations may be related to victim choice, community response and education, and existence of a SART. Therefore time from rape to examinations can be highly correlated to whether injury is perceived by the victim, documented by first responders, documented by clinical examiners.

For those women who are seen in clinical settings where the community SART is active, there is a greater likelihood of forensic examinations being done in less than 24 hours. Whether injury is found within 24 hours or after 24 hours may be correlated with making a report to law enforcement (Jones, Rossman, Wynn et al., 2003). Victims, hospital staff, and law enforcement are aware of the importance of forensic examination and medical care following rape.

A higher likelihood of injury was reported in women who sought medical care within 24 hours of the rape (Sachs & Chu, 2002; Sugar et al., 2004). Care-seeking within the first 24 hours is the time frame when women who report rape will be most likely to go to a hospital.

Injuries may include physical non-genital complaints as well as genital injuries. The highly vascular nature of the genital area allows the abrasions and small lacerations from rape to heal rapidly. Other physical findings, such as bruises or abrasions, may remain visible after 24 hours. In summary, physical assessment of rape victims by clinicians in the acute time frame of less than 24 hours makes theoretical sense if the goal is to visualize and document acute injuries

that may have evidentiary value for prosecution. Time from assault to examinations is an important variable to include in a predictive model for rape injury. It is related to community SART efforts and reputation, victim trust of law enforcement, community practices with health care systems, if victims are escorted to the hospital based on severity of injury, victim age and other variables.

2.2.3.2. Forensic Characteristics: Weapon Presence

The NVAWS and the NCVS reported similar rates of weapon presence for intimate partner perpetrators of physical assault, but not for rape (13% and 15%, respectively) (Bachman, 2000). The presence of a weapon in the commission of a crime implies threat and induces fear in victims, whether the weapon is used to inflict injury or not. Fear and threat associated with victimization influenced negative health responses to rape, may be linked with greater injury, fear and stress that affect health over the long term (Bachman, 2000).

Rapes committed by perpetrators with any weapon accounted for 8% of rapes. The perpetrator had a weapon in 69% of completed rapes and 31% of attempted rapes. However, the completed and attempted rapes occurred in similar amounts if the perpetrators did not have a weapon (71% of completed and 29% of attempted rapes) (Perkins, 2003).

The NCVS estimates also showed a higher rate of violence involving firearms in black and Hispanic victims, between the ages of 15 and 24, than with all weapons. Others have found that younger age, victim-perpetrator relationship and weapon use were related (Kroner & Weekes, 1996).

Although most rapes do not include weapon inflicted injuries, the presence or use of a weapon is an important forensic characteristic to consider. The presence of a weapon during a rape was less likely than with other violent crimes (7%) and the presence of a weapon was an

indicator of a higher level of violence and control. Four percent of rape victims face an perpetrator with a firearm, and 2% were confronted by a perpetrator with a knife (Rennison & Rand, 2003b).

Clay-Warner (2002) examined a national probability sample of victims to determine if interactions between situational factors and protective factors had an impact on rape outcomes. The NCVS data and definitions were used for completed rape as an injury and attempted rape (no penetration) and included additional injury.

The situational factors included weapon, bystander, residence, known perpetrator, and alcohol or drug use. The protective actions were coded into three variables representing physical protective actions (used or threatened physical force with or without a weapon, chased or ran away from the perpetrator) forceful verbal protective action (tried to get attention, scared or warned off the perpetrator or screamed), and non-forceful verbal protective action (reasoned with argued with or tried to persuade or appease the perpetrator). All of the women ($N = 317$) took some form of self-protective action (Clay-Warner, 2002).

Results included the significant correlation between forceful verbal and non-forceful protective action ($r = 0.14$; $p < 0.01$) and forceful verbal and physical protective action ($r = 0.20$; $p < 0.01$). Perpetrator use of weapons was correlated with perpetrator use of alcohol or drugs ($r = 0.14$; $p < 0.05$) and with a stranger rape ($r = -0.16$; $p < 0.01$). Bivariate analysis indicated that only a known perpetrator was significantly related to non-forceful verbal protective action ($r = 0.13$; $p < 0.05$). Multivariate regression analysis showed that demographic characteristics were not predictive of outcome. Women who reported using protective actions were significantly less likely to report completed as opposed to attempted rape ($p < 0.001$). There was an 81% reduction

in likelihood of injury (defined as completed rape) for women who used physical protective action, and a suggestion that verbal protective strategies are not effective (Clay-Warner, 2002).

Clay-Warner (2002) reported that weapon use and absence of a bystander predicted completed rape, indicating that no witnesses or observers of the rape and greater threat and control with a weapon are related to injury. The effectiveness of physical protective action did not hold when the perpetrator had a weapon. The victim use of non-forceful verbal protective action and use of a weapon predicted completed rape. The presence of a bystander and non-forceful verbal protective action were related to attempted rape only. Victim-perpetrator relationship was not significantly associated with completed rape (Clay-Warner, 2002). The author concluded that documentation of victim behaviors and environmental issues are important in the analysis to gain an understanding of the factors related to injury.

Several studies reported various results from analyses performed on a sample of women ($N = 819$) seen for rape examinations (Eckert et al., 2002; Sugar et al., 2004). Weapon presence was reported for nearly one fourth of the perpetrators. The use of a weapon and outdoor assaults were both associated with more frequent injury (OR = 2.46, 95% CI = 1.70, 3.57; OR = 2.68, 95% CI = 1.86, 3.88) (Sugar et al., 2004).

Further analyses on the women revealed that 118 had one major psychiatric diagnosis and 93 had two or more psychiatric diagnoses (Eckert et al., 2002). The number of women with a psychiatric diagnosis who received a forensic examination within the 24 hours of the rape was similar to the entire group. However, there were characteristics that differed between the two groups of women. Those with a psychiatric diagnosis were more likely to be assaulted by a stranger (39% versus 23%: $p < 0.001$) and have multiple perpetrators (23% versus 15%, $p < 0.02$). The women with mental illness reported assaults that involved more than one body orifice,

more anal contact, more hitting, and more weapon use than women with no mental illness. The increase in types of violence led to a significantly different percentage of body trauma in the women with mental illness than the women without mental illness (59% versus 52%; $p = 0.01$), however the difference in genital trauma experienced by the two groups was not significant (Eckert et al., 2002).

In summary, presence or use of a weapon during completed or attempted rape indicates use of force or need to control the victim. The value of weapon presence or use may be related to victim characteristics and behaviors, medical history, forensic examination time and may be a useful predictor of rape-related injury.

2.2.3.3. Forensic Characteristics: Multiple Perpetrators

More than one perpetrator in rape cases could add to the amount of and types of rape-related injury. Having more than one perpetrator may be related to age and the associated activities, victim-perpetrator relationship as well as co-existing medical conditions, substance use, location, and the motivation of victims or perpetrators. In the NCVS, only single perpetrator rapes were studied, so that the victim-perpetrator relationship could be examined as a variable (Bachman, 2000). The NVAWS assumed that all rapes were single perpetrator events, and did not attempt to ascertain if there were victimizations with more than one perpetrator (Bachman, 2000).

Isolated surveys attempted to examine the severity of rape in single and multiple perpetrator rapes. Women who had been raped by more than one person were more likely to report to law enforcement and to experience more violent injury (Gidycz & Koss, 1990). Greater violence and injury in crime victims led to worse adjustment and negative health results (D. G. Kilpatrick et al., 1988; Resick, Jordan, Girelli, Hutter, & Marhoeffer-Dvorak, 1988; Ullman,

1999). Researchers reported that women with psychiatric diagnoses were more likely to be raped by multiple perpetrators and to experience more violence (Eckert et al., 2002).

2.2.3.4. Forensic Characteristics: Use of Forensic Evidence Kit

One of the key dimensions of the institutional health care response to rape is the use of the evidence kit. Use of the evidence kit includes a protocol that guides injury assessment and documentation as part of the standardized objective medical-legal evidence collection (Lewis, DiNitto, Nelson, Just, & Campbell-Ruggaard, 2003). Program evaluations indicate that the kit and protocols are considered to be helpful by nurses who used them (Lewis et al., 2003). Standardized procedures minimize time and treatment difficulties for victims and benefit the multidisciplinary team involved in management of rape victims and should enhance prosecution. However, research reports that diverse discretionary practices exist among forensic examiners, despite protocols and evidence kits. Reducing the value of standardized procedures includes the documentation of injury (Parnis & Du Mont, 2002). Trained sexual assault nurses in one study indicated that some items should not be routinely collected as evidence and they were less likely to consider physical injury or sperm extremely important to positive legal outcomes (Du Mont & Parnis, 2003). Accuracy of clinical assessment and documentation of injuries may also depend on the length of time the clinician has worked with the protocol, examination techniques, and the use of technological equipment for magnification and photodocumentation.

The formation of a SART in many communities may create standardized management services that include forensic examination and evidence collection along with police and advocacy involvement as recommended in the National Protocol of Sexual Assault Medical Forensic Examinations (USDOJ, 2004). All members of the team are expected to be educated similarly for rape victim management. Standardized training that addresses the use of

standardized procedures for physical examination and evidence collection following rape will inform practitioners of the value of the procedures and their relationship to documented injury (Ledray, 2002). Data from different regional settings of the US will clarify characteristics that differ in different areas with diverse practices and populations of women.

2.2.4. Injury

Physical injury may be the result of rape for many women. Physical or genital injury increases with the level of violence, and injury may be related to the severity of trauma and a variety of other variables. Objective documentation of medical and forensic history and clinical observation of physical injuries with rape victims who receive medical care is one way that researchers and interventionists can understand the physical violence associated with rape, the associations among the injuries and various victim and forensic characteristics, and proceed to expand the knowledge of physical injury and the association with long term health.

Categories of sexual violence, injury, and the data elements recommended by the CDC justifies their measurement and importance in rape research (Basile & Saltzman, 2002). Data elements should be defined and documented similarly across data sources because the degree or amount of injury is thought to have an impact upon the legal decisions made in rape cases. In addition, women report physical injury and sexual penetration, completed or attempted, at similar rates (38% and 39%, respectively). For this research study the use of the term rape includes completed and attempted rape as defined by behavioral acts on the data collection forms used by clinicians, and injury refers to all physical and genital injury.

Several cross-sectional studies were based on data from female patients (15-87 years of age; *SD* 11.7 years) seen in an urban Emergency Department (ED) who reported rape and had a examination (*N* = 819) (Eckert et al., 2002; Sugar, Eckert, & Fine, 2001; Sugar et al., 2004). The

purpose of one study was to determine which patient factors and assault characteristics were related to injury. The researchers hypothesized that stranger assaults, multiple perpetrators, and older age would be associated with higher frequency of trauma (Sugar et al., 2004).

A standardized chart review form was used to abstract data for Sugar's analysis (2004). Logistic regressions were performed with body trauma and genital trauma as the outcomes. Variables included patient reports of being hit, attempted strangulation, substance use by patient, and perpetrator relationship to patient, age, prior intercourse, time from rape to examination, anal rape, and body trauma (Sugar et al., 2004).

Sugar's results revealed that 425 women had injury, yet few required emergency medical intervention. Bruises and abrasions were the most frequent injuries, although 38 women were admitted for medical or surgical intervention and 31 women were admitted to psychiatric services. Most women (77%) were examined within 24 hours of the assault and had a higher rate of body injury than those examined later (OR = 1.70, 95% CI = 1.21, 2.38). Most were assaulted by friends or acquaintances (62%), however assaults by strangers or intimate partners resulted in more general body injury than friends or acquaintances (OR = 2.38, 95% CI = 1.65, 3.43; OR = 1.94, 95% CI = 1.18, 3.03, respectively). A single perpetrator was reported in 77% of the cases and two or more perpetrators in 16% of the cases. Assaults by more than one person resulted in more frequent general body injury (OR = 1.54, 95% CI = 1.05, 2.27). Weapon presence was reported by nearly one fourth of the women, and weapon presence and outdoor assaults were both associated with more frequent injury (OR = 2.46, 95% CI = 1.70, 3.57; OR = 2.68, 95% CI = 1.86, 3.88). Women experiencing oral and anal assault also had a higher frequency of general body injury (OR = 1.67, 95% CI = 1.19, 1.34; OR = 1.73, 95% CI = 1.19, 2.52, respectively). Increasing age was significantly associated with general body injury ($p < 0.001$). In the bivariate

analysis, preexisting psychiatric diagnosis and recent substance use by the victims were associated with body injury (OR = 1.49, 95% CI = 1.09, 2.05; OR = 1.45, 95% CI = 1.10, 1.90, respectively) (Sugar et al., 2004).

Genital examinations were completed in 92.7% of the women in Sugar's study (2004). Patient refusal of examination was associated with prior psychiatric diagnosis (11% versus 6%, $p = 0.009$) and homelessness (15% versus 7%, $p = 0.004$) but not substance use, relationship or body injury. Twenty per cent of women had genital or anal injury.

Women examined within 24 hours of the assault had a significantly higher rate of genital injury (OR = 1.83, 95% CI = 1.14, 2.95). Women with body trauma had a higher rate of genital trauma (OR = 1.63, 95% CI = 1.17, 2.27). Genital injury was more prevalent in women under 20 years of age and in women over 49 years of age ($p = 0.005$). Relationship and multiple perpetrators were not associated with genital injury (Sugar et al., 2004).

Limitations of Sugar's (2004) study include the fact that large urban hospital studies may not apply to those in less populated areas, without SART and community awareness of the importance of forensic examinations. Also, only one third of women seek care after rape, and the research may not represent women who do not seek care. The use of colposcopy and other visual enhancement and magnification techniques may allow documentation of more injury than other studies (Lenahan, Ernst, & Johnson, 1998; L. Slaughter, Brown, & Crowley, 1997).

Injury was found in 60% of the women reporting rape, but body injury was much more common than genital injury, consistent with previous research (Bowyer & Dalton, 1997; Cartwright, 1987). Age at both extremes of the age continuum was most highly correlated to genital injury and was more commonly found in women examined within 24 hours of the assault. The level of injury was not greater with multiple perpetrators and external anal examinations did

not reveal injury in the majority of cases with anal penetration, indicating internal examinations may be necessary.

Another prospective analyses of data from forensic rape examinations was conducted to examine predictors of genito-rectal injury in female victims of rape ($n = 209$) (Sachs & Chu, 2002). Women in the study were menstruating females who sought care within 72 hours of the assault. Excluded were women who had consenting sexual intercourse within 72 hours or reported attempted rape only (no penetration). Variables were race, education, marital status, victim-perpetrator relationship, and victim's use of alcohol. Additional characteristics included level of force, victim's loss of consciousness, position of victim during assault, rectal penetration, time of the day, day of the week, victim resistance, and time between assault and examinations. Sexual assault examiners (nurse practitioners) extracted the information from the original medical records (Sachs & Chu, 2002).

Genito-rectal injury was associated with time from rape to examination ($p = 0.023$), victim level of education ($p = 0.046$), victim marital status ($p = 0.088$) and rectal penetration ($p = 0.0005$). Controlling for important covariates in the logistic regression showed an increase in the risk of genito-rectal injury with a rape to examination time of less than 24 hours (OR = 7.47, 95% CI = 1.78, 31.35), physical/verbal resistance (OR = 5.96, 95% CI = 1.21, 29.36), rectal penetration (OR = 7.47, 95%, CI = 1.05, 53.07) and greater than high school education (OR = 7.13, 95% CI = 1.03, 49.65). Less likelihood of injury trends were reported for divorced, separated, or widowed victims than single women (OR = 0.12, 95% CI = 0.01 to 1.08) (Sachs & Chu, 2002).

Limitations of the Sachs and Chu study (2002) are the small sample size, and only women who reported rape in one urban area are included, and may not be applicable to the

majority of women in other regions of the US. Distress may cause patients to give the wrong information to interviewers. Record keeping and documentation may vary among examiners. Ongoing research will help to explain the most predictive variables, although retrospective examination of data limits the choices. In addition, research analysis should check for interactions among variables (Sachs & Chu, 2002). Variables significantly related to injury in this study are recommended to be used in future studies with predictive models. The variables included rape to examination time interval of less than 24 hours, physical/verbal resistance, rectal penetration and greater than high school education (Sachs & Chu, 2002).

A comparative case-series analysis evaluated patterns of anogenital injury documented with forensic rape examinations in an urban community rape center. Patient demographics and assault characteristics in adolescents who were 13 to 17 years of age ($n = 437$; 57%) were compared to women older than 17 years of age ($n = 329$; 43%) (Jones, Rossman, Wynn et al., 2003).

The demographic and injury information were obtained from medical records by a trained research nurse. Demographic variables included age, ethnicity, marital status, alcohol or drug use in less than 24 hours, last consenting intercourse, filing of a police report, time interval from assault to examination, history of previous sexual assault, multiple perpetrators, and the victim-perpetrator relationship. Assault characteristics included type of sexual assault, location, type of coercion, nongenital injuries, anogenital injuries, or no injuries (Jones, Rossman, Wynn et al., 2003).

Adolescents, compared to their adult counterparts, were less likely to report using drugs or alcohol (41% versus 54%, $p < 0.001$), more likely to be assaulted by an acquaintance or relative (84% versus 50%, $p < 0.001$), more likely to delay seeking treatment (17 hours versus 12

hours, $p < 0.001$), more likely to be assaulted in the perpetrator's home (46% versus 15%, $p < 0.001$), less likely to involve use of weapons (26% versus 7%, $p < 0.001$) (Jones, Rossman, Wynn et al., 2003). Adolescents were less likely to report coercion (22% versus 41%, $p < 0.001$). Adult women had more nongenital injuries (55% versus 33%, $p < 0.001$). Anogenital injuries were documented in 273 (83%) of the adolescents compared to 280 (64%) of the women ($p < 0.0001$). There was also a statistical difference in the genital sites of injury for adolescents and adult women ($p < 0.001$) (Jones, Rossman, Wynn et al., 2003).

The limitations of Jones' (2003) study are that a high degree of substance use in women reporting rape may impact what women remember and the degree of injury. In addition, national surveys and community research relate the lack of reporting by rape victims (Feldhaus, Houry, & Kaminsky, 2000) and Jones' data reflect only women who had a medical examination. Jones and colleagues address the fact that the work of multiple examiners was included in the study (2003). Despite national attempts to standardize SANE education, differences in training and experience may lead to variation in documentation of clinical findings.

Crandall and colleagues found 3513 women (3.8%) with International Classification of Diseases coding of intentional injury in a 14 state hospital discharge data base. The head, neck and face were the most common body part injured. Women with intentional injury were injured at a significantly younger age than women with accidental injuries. Upper body injuries occurred at significantly different rates as well (Crandall, Nathens, & Rivara, 2004). While, not research on rape victims, the study does indicate the value of improving health care provider knowledge of intentional injury associated with interpersonal violence.

More longitudinal studies with victims of interpersonal violence are needed to examine prevention and intervention effectiveness. Also, more studies may help reach victims of

violence who are harder to reach, such as inner city youth, the homeless, the elderly, and males, as well as racial groups whose clinical findings and long-term outcomes may differ.

In summary, the physical and genital injury related to rape may be related to a number of subsequent health problems for victims. Women's physical and genital injuries may be a measure of the violence they endured at the hands of the perpetrator. In addition, "...Women who were injured during assault or who perceived that their lives were in danger were more likely to develop PTSD than similarly victimized women without these crime characteristics" (Acierno, et al., 1999, p. 544). The importance of rape injury and severity extends far beyond the acute episode of rape and the forensic examination. Increased knowledge of the roles of multiple variables and their interactions related to injury in different populations of women will expand the understanding of rape-related injury and its effects.

2.3. Summary

There are gaps remaining in the knowledge and understanding of the impact of rape. Extant research informs us about increased risk of rape, incidence and prevalence, and long term health effects that exist for some women. Women report to law enforcement one third of the time, and fewer still seek medical care (Rennison, 2002b). The significance of the problem is demonstrated in the incidence and prevalence as gathered through national surveys, and yet the full scope of the problem is not fully displayed in survey data. As research continues to document the impact of rape with negative mental and physical health effects many years after the event, there is a greater awareness regarding the fact that the impact of rape may span a woman's lifetime.

Past literature informs researchers about risks such as younger age and the associated activities and behaviors that may lead to some women being at higher risk for victimization. This

may be partially related to developmental transitions, risk-taking, lack of, or low self-perception of risk. As women mature and settle into professional and family lives, behaviors associated with the risks experienced by adolescent women become less prevalent.

A past history of sexual victimization puts women at risk for future victimization (Acierno et al., 1999; Ackard & Neumark-Sztainer, 2002; Arata, 2002; Marx, Calhoun, Wilson, & Myerson, 2001; Nisith et al., 2000). Health risk behaviors are vulnerabilities that may further add to the risk of negative health consequences after rape. Following rape, victims are more likely than those who have not been raped, to report increased behaviors such as smoking, alcohol and drug use, early initiation of sexual intercourse, multiple partners, weapon carrying, and failure to use seat belts (Brenner et al., 1999). Individual and contextual factors are linked with negative health behaviors after rape for one third of women in one study (Campbell, Sefl, & Ahrens, 2004) and more researchers are recognizing the fact that altered health behaviors impact health after rape.

The level of violence experienced as physical or genital injury, compounds poor health and is associated with physical and psychological health problems (McCauley et al., 1998). Women who are injured, or who perceived their lives in danger, are more likely to develop mental health problems than those who did not fear for their lives (Resnick et al., 1997).

Rape and exposure to other types of violence add to the risk of PTSD and other psychological disorders (D. G. Kilpatrick et al., 2003). Physical, cognitive, and behavioral responses consistent with PTSD may follow rape, and rape victims have long been thought to constitute the largest proportion of PTSD sufferers (Steketee & Foa, 1987). A past history of rape has been documented to affect every system of the body (Bottomly et al., 1999; Gold et al.,

1999; Golding et al., 1997; Leserman et al., 1996; Leserman et al., 1997; Petrak et al., 1995; Plichta & Abraham, 1996).

Thus, the scope of rape encompasses incidence and prevalence, risks, and long term health consequences over a lifetime, with the gaps in knowledge being somewhere in between. The incidence of rape and post-rape pathology are not ubiquitous, and research findings are divergent, with trends in opposite directions. Researchers and clinicians do not yet have a clear picture of which women will seek care or report health problems acutely or later in life. Health care professionals and health systems are not fully addressing women's needs following rape. Most importantly, utilization of the acute assessment of women with rape-related injury may inform intervention development for women who will have poorer health.

Clinicians are well-positioned to intervene and provide care for the women who seek forensic examinations after rape. A better understanding of the differences in adolescent and adult women's responses to rape initially and over time is needed in order to develop effective preventive interventions and treatment for those who will benefit the most.

Known risks of being raped, such as mental illness, youth and substance use, are linked with increased injury. Injury severity is linked with long term health. An analytical approach that explores multiple relationships among variables with health and legal outcomes is the logical progression to better understand rape-related injury, its relationship to long term health and to guide future intervention development (Acierno et al., 2001; Acierno et al., 1999). The study will help to understand adolescent and adult women who have rape-related injury by exploring the role of variables of victim characteristics of age, ethnicity, known or unknown perpetrators and forensic characteristics of time from rape to examination, weapon presence, multiple perpetrators, and use of the forensic evidence kit.

3. METHODS

Chapter three presents the steps, procedures and strategies for the acquisition and analysis of data to address the research questions. The settings of the original data collection, the sample, and Protection of Human Rights issues are presented, in addition to the data collection, procedures, data preparation, and the data analysis plan.

The purpose of this secondary data analysis was to identify predictors of physical injury (setting, victim characteristics, and forensic characteristics) in females over 12 years of age, adolescent and adult women, who have a medical history of rape by a male and are examined in the emergency department (ED).

An additional objective was to explore effects of different settings on variables. The influence of regional settings, victim characteristics (age, ethnicity, known or unknown perpetrator) and forensic characteristics (time from rape to examination, weapon presence, multiple perpetrators, and the use of forensic evidence kit) on the outcome of documented injury were explored. The following research questions were addressed.

1. Which victim variables and forensic variables are most highly correlated with the outcome of injury status?
2. What are the interaction effects between victim and forensic predictor variables when predicting injury status?
3. What is the best model of victim and forensic variables, including individual and interaction effects, as predictors of injury status?

3.1. Research Design

This secondary analysis included cross-sectional data from forensic medical records from three settings in different regions of the US. The medical records included information on women who were raped and elected to access health care and/or forensic evidence collection in a health care setting where a forensic examiner was available to perform the forensic examination. Data elements included standard medical history and physical examination information. Many were factors identified in the extant literature as having associations with women's rape-related physical injury. The factors used in this analysis were data elements that were present consistently across all of the data sets from different regions. The variables were examined individually and as a group to help clinicians and researchers understand the extent to which setting, age, ethnicity, known or unknown perpetrator, time from rape to examination, weapon presence, use of the evidence kit, and multiple perpetrators predict outcomes of physical injury after rape. To achieve the purpose of the study and answer the research questions, logistic regression techniques were utilized to assess the predictive value of variables in the best fitting and most parsimonious model to explain the relationships among the predictive variables and categorical outcome of injury (yes/no).

Secondary analysis of cross-sectional data collected by forensic examiners allowed for analysis of a large amount of diverse data on adolescent and adult females, 13 to 89 years of age, who were raped by a male. Secondary analysis involves the use of previously gathered data to explore new questions and relationships (Polit & Hungler, 1995). The information obtained during the medical forensic examination of a rape victim is extensive and is far more data than is used for one research project. Secondary analysis allows for an efficient and economical method of utilizing data already in existence, and eliminates the costly, time-consuming data collection aspect of a research project. The major limitation of secondary analysis is that the researcher is

not able to go back to the original source of the data to verify or confirm information or gather additional information.

There are several reasons that this type of approach was considered important. First, forensic medical records contain unique information that was not stored in medical records departments of health institutions. Forensic records were used in the investigation of criminal allegations and resolution of criminal acts and had evidentiary value. The information from forensic interviews and examinations included unique information about the individuals and the crimes that were not documented in routine medical visits. Most importantly however is that the information included in forensic data bases was from clinicians' documentation and not self-reports or surveys. Clinician documentation was considered a verification or corroboration of the self-report or patient history upon which a clinical forensic examination was performed. The majority of the examinations took place at an acute or emergency health care setting at a visit within 3-4 days of the rape specifically for evidence collection and treatment related to a presenting complaint of rape.

Secondly, since there were fairly standard education and data collection by forensic examiners, the inclusion of data sets from several settings allowed the researcher to view large amounts of data and include data elements that are similar across all regions. Third, the data sets included cross-sectional data from a unique point in time, the only time that an examiner could assess and document physical findings from the post-rape physical examination. The forensic evidentiary examinations were conducted following a report of rape, prior to disintegration or disturbance of the evidence, most often within 72 hours, the acute time frame that was critical to understanding physical findings. Longitudinal data were not included in the data sets.

In summary, the secondary analysis of data in this research study allowed for examination of large amounts of similar clinical data elements collected in a fairly standard way by clinicians during a unique time window of opportunity after a woman had been raped. The amount of data allowed for evaluation of descriptive information, assessment of interactions and univariate and multivariate models in predicting injury outcomes in various regions of the US. Clinical data based research on women reporting rape may produce findings that differ from and build on what is known from national surveys and self-reports.

A secondary analysis approach was used with existing cross-sectional data sets that were combined (pooled) and contained a combination of continuous and categorical (nominal and ordinal) variables. Data were originally collected during the physical examinations of rape victims performed by forensic examiners, most often Sexual Assault Nurse Examiners (SANE) in three different regional settings in the US between March, 1997 and November 2003. The examiners attended a standardized educational training program and clinical practicum prior to performing examinations of rape victims.

3.2. Settings

3.2.1. Setting A

Setting A was the most diverse geographically, a multi-state area in the northeastern US, which included rural areas and small towns in counties along the Vermont and New Hampshire border, and a small amount of data from surrounding states. Approximately 700,000 urban dwellers in small cities and 500,000 rural dwellers live in the counties whose hospital data were represented in this data set. The presence of a forensic examiner in the hospital, the quality of examinations and documentation, and access to hospital care varied by community and hospital. The amount

and quality of information on patients seen in the ED and submitted to the sexual assault data base also varied.

3.2.2. Setting B

Setting B was a metropolitan city on the southern coast of California. The population in the 2003 census included 1,226,753 people in the area served by the two medical centers that are designated providers of services for rape victims. There has been a strong collaborative community involvement and team approach with the Sexual Assault Response Team (SART) established by the County Board of Supervisors in 1990. The SART involves health care providers, multiple law enforcement agencies, and victim advocacy professionals.

3.2.3. Setting C

Setting C was one large city hospital on the southern coast of Louisiana that primarily served an urban metropolitan area. The population in the 2003 census was 469,032 in the metropolitan area. One university medical center hospital served as the designated provider of services for rape victims. There was a strong collaborative community involvement and the SART team approach in this setting as well since 1995.

In summary, the data in the study were from three diverse geographic regions of the US, rural areas with small cities and large cities and several medical centers. The examiners, mostly nurses, were responsible for the care and forensic examination and documentation of findings with rape victims in all settings. However other health care providers may have participated as designated providers in some areas. Data collection instruments were different but contained common data elements. Variables that were consistent across all three sites were used in the analysis.

3.3. Sample

Women included in the study were aware of the need to seek a forensic medical examination after rape, and were able to access the forensic services in their communities. The women self-selected to seek medical care after rape. The cases had to be entered into the databases. Cases included females from 13 to 89 years of age, who were raped by one or more male perpetrators. Males and children 12 years of age and under were excluded.

Prior to conducting analysis, decisions were made during screening to determine which cases would be used for analysis and which would be eliminated. Cases and variables that were consistent across the data sets were chosen and cases were eliminated to meet the purpose of the study. In the original data set acquired from Setting A, there were 850 cases. Eliminated cases included 57 male victims, 59 who reported female only or male and female perpetrators, and 114 cases were children under the age of 13 years. Elimination of cases that did not meet inclusion criteria left 620 women. In the original data set acquired from Setting B, there were 1603 women included between ages 13 and 88 years of age who had been raped by male perpetrators. Only one case that did not meet inclusion criteria was eliminated, a child under 13 years of age that had inadvertently been included in the data provided for this study. From Setting C, the original data set provided for this study included 1404 cases, however this included 246 child cases that were eliminated. An additional 62 were eliminated because injuries were not included in the data base, either because the findings were not documented by the forensic examiner, or the data input had not been completed at the time the data were provided for this study. This left 1096 cases from Setting C.

3.4. Protection of Human Rights

The criteria for Human Subjects Protection for exempt and expedited review was met as set forth by section 45 CFR 46.101 (b) (4) of the Institutional Review Board (IRB) at the University of Pittsburgh. Approval for preliminary study was obtained in March, 2004 (IRB# 0403104). Setting A did not require additional IRB requirements nor did Setting B. An IRB submission was required for Setting C, and was obtained from Louisiana State University Health Science Center in September, 2004 (IRB# 6129). The IRB approval was for a preliminary study and was followed by a modification letter for dissertation research.

3.5. Data Collection

After obtaining permission for use of de-identified data from Settings A and B, and IRB approval criteria were met for Setting C, the data elements selected as variables to include in this research were extracted from the data bases by the coordinators of sexual assault services at the three settings. Data were placed into Excel or Access files and sent to the researcher via electronic mail or the US Postal Service. Files were entered into an SPSS data editor for data management, editing, and analysis.

The steps in data acquisition include:

- Data from three different regional Settings A, B, and C were documented in the medical or forensic chart by the forensic examiners utilizing a data form when women sought care in the Emergency Department (ED) after rape. Data collection instruments varied among Settings A, B, and C (Appendix D) but contained many similar data elements.
- Data were sent to sexual assault services coordinators in Settings A, B, and C.

- The sexual assault services coordinators entered data into their computer data bases. Selected data that were extracted for entering into the computer varied among the settings.
- Data were sent to the researcher by electronic mail or computer disk via US Postal Service.

3.6. Variables

The data in this study were combined (pooled); continuous and categorical (nominal and ordinal) variables extracted from the forensic data collection instruments from each site. The Center for Disease Control and Prevention (CDC) has designated minimum data elements as the case number, source, age, ethnicity, relationship, location and injury. Expanded data elements include the multiple perpetrators, evidence collection, and weapons (Basile, 2002). Thus inclusion of these data elements as variables met the national recommendations for research on rape and sexual assault (Basile, 2002).

3.6.1. Dependent Variables

The dependent variable was a binary outcome of documented injury status coded as no injury (0) and all injury (1). No injury indicated that the forensic examiner who examined the woman did not document visible injury. All injury included bodily non-genital injury or ano-genital injury. Bodily non-genital injury was defined as bruising, abrasions, lacerations, tears, bitemarks, burns, and contusions to all body areas except the ano-genital area. Genital injury is defined as bruising, abrasions, lacerations, tears, bitemarks, burns, and contusions to the ano-genital area of the body. All injury includes the combined count of women with any type of injury, to include bodily non-genital and genital injuries. Cases in which injury status was not documented or put into the data base may have represented cases with no injury, however they were not included in the analysis.

The binary version of injury outcome was used rather than multiple categories of injury. Collapsing the dependent variable was thought to be a way to preserve as many cases as possible and not lose data due to the inconsistent manner of documenting physical injuries among settings. The injury data on some cases from Setting C were entered in an inconsistent manner. Some cases were documented as having trauma and injury but it was not possible to assess which type of injury or if injury was either bodily or genital or both.

Collapsing the injury outcome may have led to a loss of information regarding levels of injury. Categorizing injury from minor trauma to major trauma, and differentiating physical and genital injuries, may have revealed additional information about which predictor variables were associated with different types or levels of injury. Cases were preserved with a binary outcome, but there was a loss of information regarding categories of injury

3.6.2. Independent Variables

Independent variables included regional setting, victim characteristics of age, ethnicity, and known or unknown perpetrator, and forensic characteristics of time from rape to examination, weapon presence, multiple perpetrators, and the use of a forensic evidence kit. The data were a combination of categorical and continuous variables.

3.6.2.1. Independent Variables: Regional Setting

The variable of regional setting included three geographic and ethnically diverse areas. The settings were categorical and helped to explain differences in characteristics of victims and outcomes in different regions of the US. Setting B (0) included the largest number of cases, Setting C (1) the second largest set, and Setting A (2) had the fewest cases in the data set.

3.6.2.2. Independent Variables: Victim Characteristics

Victim characteristic variables were personal information about the women. Age of the victim was the only continuous variable. Age was examined as a continuous variable for relationships with injury status and to determine if the relationships with injury outcomes vary in different age groups. A grouped version of age was also formed: adolescents (less than 20 years of age), women from 20 to 29 years of age, women from 30 to 39 years of age, women from 40 to 49 years of age, and over 49 years of age. Most rape occurs in women less than 25 years of age, and research on rape-related injury is primarily conducted with younger age groups rather than older age groups, about whom much less is known (Acierno et al., 2001; Acierno et al., 2003).

Victim characteristic variables that are categorical included ethnicity and unknown perpetrator. Ethnicity of the victim included three categories: Caucasian = 0, African-American = 1, and Other = 2, which included Hispanic, Native American, Asian and others.

The unknown perpetrator was coded as a binary variable: known perpetrator or a non-stranger = 0, and if they were a stranger, yes = 1. Strangers were not known to the victim. The non-stranger category was defined as current or former intimate partner, related as a parent, step-parent, sibling, or other relative, and acquainted however briefly, as a friend, neighbor, co-worker, schoolmate, or roommate.

3.6.2.3. Independent Variables: Forensic Characteristics

Forensic characteristic variables clarify the context of the rape from another perspective to expand the understanding of the experience and the associated risk of injury. The forensic variables were categorical and included time from rape to examination, weapon presence, multiple perpetrators, and use of the forensic evidence kit.

Weapon presence was defined as a perpetrator with no weapon present = 0, and yes for weapon presence and/or use = 1. Perpetrator number was defined as one = 0 and two or more perpetrators = 1. Use of the evidence kit was defined as not used = 0 and used = 1. The only forensic variable with more than one category was the time from the rape to the examination. Examination time frames included less than 24 hours = 0, 24 to 48 hours = 1, 49 to 72 hours = 2, and more than 72 hours = 3.

3.7. Data Analysis

The steps used in screening for missing data, and dealing with missing and inaccurate data are presented. Assumptions that are not met and the remedial procedures are discussed. The methods used to create descriptive data about the samples are described. Additional issues of particular importance for logistic regression, such as outliers, multicollinearity among possible predictor variables, and adequacy of expected frequencies are addressed. Data analysis was conducted using SPSS for Windows (version 13, SPSS Inc, Chicago, IL).

Multicollinearity, or near linear dependencies among the predictor variables, was examined and the sample had few high standard errors of the parameter estimates. A condition index indicates when a high standard error of the parameter estimate is uncertain, and indicates that a proportion of variance of one independent variable is dependent on another. Multicollinearity, or a high condition index would indicate redundancy or that two variables are measuring the same concept (Tabachnick & Fidell, 2001).

Cell frequencies were checked to assure that no more than 20% of the expected frequencies were greater than one and less than five. Few observations or expected frequencies in some variable categories led to recoding and collapsing into fewer categories. With multiple ethnicities, Hispanic, Native American, Asian and other groups were small, so they were

grouped together, resulting in three ethnic categories: Caucasian, African-American, and Other. Similarly, there were very few numbers of multiple perpetrator rapes greater than two, so the variable was collapsed to one and more than one.

3.7.1. Data Screening

Several procedures comprised data screening. Assessment and management of missing data were conducted. The creation of variables and whether data met statistical assumptions for the planned analysis is presented. Variables not included in the analysis, and issues that can affect the data are explained.

3.7.1.1. Missing Data

Missing data were assessed to understand their influence in the primary analysis and how best to manage the missing data. First, the data were examined by direct visualization for missing data. For data that were missing, the coordinators at the offices where the data originated were contacted for clarification and to see if the data were available. Individuals who may influence the documentation and accuracy of data included the patient who may not have provided the information, the forensic examiner and other staff who asked the medical and forensic interview questions, examined the rape victims and documented information in the chart. Also there were the coordinators in whose offices the clinical documentation of the clinical visit are stored or filed. The coordinators put data into the computer data base for storage prior to it being sent to the researcher, who was the final person involved in transfer of the data.

The second step was direct visualization through missing value analysis. All data that were missing were represented with user-defined codes (99). Whether missing data were missing at random or non-randomly missing could have been critical to the analysis. Non-random missing data could have affected the generalizability of results. Random patterns of missing data

were not expected to affect the results in this large sample (Tabachnick & Fidell, 2001). The means of missing and non-missing data were compared and no reliable differences were found. Decisions for management and substitution or imputation of missing values were made based on missing value analysis.

Values were missing for four variables: ethnic categories ($n = 71$; 2.1%), multiple perpetrators ($n = 229$; 6.9%), unknown perpetrator ($n = 164$; 5%), and time from rape to examination ($n = 47$; 1.4%). Cases with one missing value ($n = 314$; 9.5%) out-numbered cases with two missing values ($n = 93$; 3%), and there were three cases (0.0009%) with three missing values. This left a total of 2908 cases with no missing values. With 12% missing at least one value, a decision was made to further explore the relationships of the missing values to the other variables, to avoid loss of these data.

Evaluation of data to determine whether values are missing at random determined how best to manage the missing data. One method used was that a variable was constructed for missing (1) and non-missing (0) for each of the four variables with missing data. Reliable differences in the missing and nonmissing groups resulted in low η^2 scores and indicated that there was not a significant difference in the groups whether the particular value was missing or not.

Univariate and multivariate logistic regressions were run to evaluate if the other independent variables predicted the missing data, with missingness modeled as the dependent variable. Multivariate logistic regressions were run to evaluate the significance of the entire group of predictors of missing values, and to compare to the univariate models.

For the unknown perpetrator variable, the significant univariate predictors of missing values were African-American ($p = .000$), weapon presence ($p = .000$), and multiple perpetrators

($p = 0.000$). Other ethnicity ($p = 0.002$), time from rape to examination of <24 hours ($p = 0.006$), use of the evidence kit ($p = 0.000$), and injury status ($p = 0.000$) were protective factors of missing unknown perpetrator values. In the multivariate model only multiple perpetrators was a significant predictor ($p = 0.001$). Other ethnicity ($p = 0.043$), and use of evidence kit ($p = 0.001$) were protective of missingness.

Missing unknown perpetrator values were predicted by missing multiple perpetrators ($p = 0.000$) and missing time from rape to examination values ($p = 0.017$). In the multivariate model using all variables of missing values, the missing multiple perpetrators ($p = 0.000$) and missing time from rape to examination values ($p = 0.013$) remained significant. In addition, missing ethnicity was a significant predictor ($p = 0.052$).

Missing values for the multiple perpetrators variable were predicted by the Setting C ($p = 0.033$), weapon presence ($p = 0.001$), and unknown perpetrator ($p = 0.026$) in the univariate analysis. The use of the evidence kit was a protective factor ($p = 0.034$). In the multivariate model, unknown perpetrator remained significant ($p = 0.026$). Setting was a significant protective factor. Missing multiple perpetrator values were predicted by missing unknown perpetrator values ($p = 0.000$), and the relationship held in the multivariate model of missing data.

Missing time from rape to examination values were related to presence of injury as a protective factor in a univariate analysis ($p = 0.005$) and in the multivariate model ($p = 0.013$). Missing time from rape to examination values was predicted by missing unknown perpetrator values ($p = 0.017$) in a univariate analysis and in the multivariate model ($p = 0.041$).

Missing ethnicity values were predicted by multiple perpetrators ($p = 0.000$) and Setting C was a protective factor ($p = 0.053$). In the multivariate model, the multiple perpetrators

variable remained a significant predictor of missing values ($p = 0.000$). Missing ethnicity values were not significantly related to missingness in other variables.

Following assessment of missing data and its influence on the analysis, several methods of managing the missing data were considered. Cases with missing data could have been deleted, if not crucial to the analysis (when more than 50% of the data are missing for one case). Deleting cases with missing data could reduce the cases per cell, and result in smaller numbers in some of the categories, such as unknown perpetrator, multiple perpetrators or other ethnicity.

For the ethnicity variable, deleting cases could have resulted in a loss of data of particular importance because the ethnic categories had been collapsed or reduced from five ethnic groups into Caucasian and African American and Other. Too few cases could lead to large parameter estimates and standard errors.

There were no cases with 50% of the values missing. Although missing values were scattered throughout the cases and variables, deletion was not likely to have affected the analysis in this large sample (Tabachnick & Fidell, 2001). Based on the fact that there were several significant predictors of missing values among the group, and there were predictors of missing values among the four variables, the decision was made not to delete the cases.

The decision to delete as few cases as possible meant that missing data would have to be estimated or imputed to substitute for the missing values. Regression was the most appropriate imputation method for the missing data in this sample of women. Cases with complete data are used to generate a regression equation for the cases with missing data. The equation is used to predict the missing values for incomplete cases. This method is convenient with SPSS and more objective than guessing and not as blind as inserting a grand mean. The scores may fit together when the missing value is predicted from other scores, the variance may be reduced, and good

variables must be available in the data (Tabachnick & Fidell, 2001). There were few cases with missing values, and the estimated values were not out of range from the complete cases, making them acceptable for retention in the analysis, so it was not necessary to delete cases with missing values.

3.7.1.2. Creation of Variables

Cells with a small number of cases included several categorical variables which were collapsed into a smaller number of categories. This allowed for more information to be gained from the analysis and avoided the problem of large parameter estimates and standard errors that could have occurred if there are too few cases relative to the predictor variable.

Ethnicity included five ethnic groups originally: Caucasian, African American, Hispanic, Native American, Asian, and other. Due to the small number of women in the Hispanic, Native American, Asian and other categories, the ethnicities were collapsed into three categories: Caucasian, African American, and other (anyone who was not Caucasian or African American).

Victim and perpetrator relationship categories were dissimilar in three data bases from the three settings. However, the category of stranger was always included, as well as various levels of non-stranger relationships such as current or past intimate partner, or spouse, fiancé, relative, acquaintance, date, and friend. Also, many women categorized a known perpetrator in several categories, such as a spouse would be a relative. A date might be a relative or fiancé and intimate partner. Based on the mixed answers, a decision was made to include non-stranger and stranger as the two categories.

The outcome variable of injury included no injury and any injury (ano-genital and bodily injury). Cases with no injury outcome in either status documented were not included in the analysis.

3.7.1.3. Statistical Assumptions

For binary logistic regression, there were no assumptions of linearity, normality, and homogeneity of variance; however, normality and linearity may enhance power (Tabachnick & Fidell, 2001). A linear relationship is assumed between the continuous predictor variables and the logit transformation of the outcome variable. Age was the only continuous predictor variable included in the analysis. Several functional forms of age (linear, squared, and Log₁₀) were used to transform and evaluate age and are presented in Table 1.

Table 1. Univariate Analysis of Functional Forms of Age

Functional Form of Age		Test				
		b (SE)	Wald χ^2	p-value	Exp (b) OR	95% CI
1.	Age (continuous)	0.00 (0.00)	0.70	.40	1.00	1.00, 1.01
2.	Age Groups					
	13-19	0			1.00	
	20-29	0.14 (0.10)	1.92	.17	1.14	0.95, 1.38
	30-39	0.13 (0.12)	1.12	.29	1.13	0.90, 1.43
	40-49	0.12 (0.14)	0.67	.41	1.12	0.85, 1.49
	50 and over	0.24 (0.23)	1.15	.29	1.28	0.82, 2.00
3.	Age (linear)	0.01 (0.01)	0.98	.32	1.01	0.99, 1.02
	Age squared (quadratic)	0.00 (0.00)	0.64	.42	1.00	1.00, 1.00
4.	Age (Log ₁₀)	0.21 (0.25)	0.74	.39	1.24	0.76, 2.01

To examine the linear relationship of age with the outcome of injury status, age groups of women in their teens, twenties, thirties, forties, and women over 49 were formed and the log odds of injury at the age group midpoints were plotted. The log odds ratios (b) were positive but did not have a significant relationship with injury status nor did any of the functional forms of

age. The significance of linearity of age as a predictor of injury or a protective factor was not demonstrated with this large sample of women.

Based on these findings and the fact that the beta coefficients varied slightly, the original continuous form of age was retained for this analysis. The continuous form of age was retained because it was most informative and understandable as well.

With the continuous and categorical variables, the outliers were assessed by examining residuals. Plots for the continuous form of age were examined for large numbers of cases in the extremes. Cases with standardized scores for each predictor of less than -3.29 or greater than 3.29 ($p < .001$, 2-tailed) were considered outliers for continuous predictors (Tabachnick & Fidell, 2001). With this large sample a few scores in excess of these parameters were expected.

Univariate outliers may also be multivariate outliers. Multivariate outliers were assessed with plots that examined scores that lie outside the cluster of scores around the centroid. Mahalanobis distance measure was used to examine the probability of a case being a multivariate outlier using the χ^2 distribution with degrees of freedom based on the number of variables considered simultaneously. There were 44 multivariate outliers however deletion of the values did not affect results and were not removed.

3.7.1.4. Predictor Variables not in the Model

The variables chosen for the model were included in the minimal and expanded data elements recommended by CDC for sexual assault research (Basile & Saltzman, 2002) and were found consistently in the extant literature. The data in this study were from the documentation by forensic examiners, and could be limited. Although the victim's history of the event is included in medical documentation, the full subjective statements or narratives that are often more

revealing were not included. However, the clinician examination and documentation is always based on patient, parent, or police report that a rape occurred.

The models of risk, response and recovery after rape include an exhaustive group of variables. Thus, a limitation of this research is that there are important variables not included in the research study, and there are variables included that may not be listed in past predictive models. Primarily, the use of cognitive, psychological, emotional, personality, and behavioral assessments not included in surveillance data (Basile & Saltzman, 2002) were also not available and not routinely collected in the evidentiary examination performed on rape victims. Variables also not included are past medical history and victimization, but have been studied extensively in past research. Also not included in this model were longitudinal aspects of chronic health sequelae and the effects of interventions the women may or may not have used.

3.7.1.5. Clinician Differences and Location

Information gathered during a clinical visit and documented by a variety of clinicians was included in the data analyzed in this research study. The clinicians' experiences and skill levels in different locations were unavoidably varied. Despite a standardized national protocol for evaluation of sexual assault victims, and standardized education guidelines, the differences in education, experience, and clinical skill could have resulted in variations in the techniques and documentation of injury.

The variables were selected for this study that were consistent across data sets, were found in the literature and were recommended by the CDC. There were other variables and ways of documenting that varied in different settings. Results of these analyses would be generalizable to other similar samples of women who had forensic examinations following rape.

3.7.1.6. Chain of Communication

With the secondary analysis approach, there was a limitation due to the transfer of data from the clinic coordinators to the researcher. Examiners performed examinations, documented findings, transferred data to coordinators who then extracted the information from the forensic medical records at the different clinical sites and put it into the computerized data base. Coordinators or another person extracted and transferred the data requested to the researcher. These steps in the process of accessing and analyzing de-identified data could have led to loss or incorrectly entered and transferred data.

3.8. Data Analysis Procedures

The primary analysis was conducted with direct binary logistic regression as a method to explain or predict injury status based on the group of independent variables. Logistic regression considers the value of each of the predictors, given the other predictors in the model. Multivariate analysis of the effects of groups of predictors was able to clarify the significance and interactions of variables in the prediction of injury. The odds of injury was expressed as an odds ratio (OR) within the 95% confidence intervals (95% CI). The OR is the increase (or decrease if less than one) in the ratio of the odds of a woman being in the injury group to the odds of being in the no injury group. The OR approximates how likely or unlikely it is for the woman to have an outcome of injury or no injury. The logit is the linear portion of the regression equation, based on the best combination of predictors, used to find the odds of being in one outcome group or the other (Tabachnick & Fidell, 2001).

The dependent variable was a dichotomous injury variable (with a dummy variable as the reference group) for the purpose of quantifying the mean of the outcome given the value of each

independent variable. This conditional mean is the expected value of the dependent variable or the outcome given a certain value of the independent variable (Hosmer & Lemeshow, 2000).

For all nominal independent variables, in the indicator variable, the reference group (0) is usually the group with the most responses, and the others responses were coded one, two or three. The reference group was the group or category of a variable to which the others were compared. The no responses were coded as zero. For example the variable unknown perpetrator was defined as stranger, so that the reference group would be the largest group, a known perpetrator (0). If the answer was an unknown perpetrator (1) the perpetrator was a stranger. The larger group was the reference and the unknown perpetrator category was measured by how much it differed from the reference group. The regression coefficient β is the mean for known perpetrator minus the mean for unknown perpetrator.

3.8.1. Research Question One

The first question addressed which setting, victim variables and forensic variables were most highly correlated to the outcome of injury status, and was answered by univariate logistic regression. Each predictor variable was assessed individually for its value in predicting injury status. Tables display the parameter estimates, Wald χ^2 test, significance and odds ratios (OR). With two-way contingency tables using the χ^2 test of independence, categorical predictor variables were screened one at a time to examine associations with injury status. A large χ^2 value relative to the degrees of freedom indicated a significant association between the independent predictor variable and injury, indicating that this variable should be included in the model.

For dichotomous and polychotomous independent variables, univariate logistic regressions were conducted with each predictor individually to obtain unadjusted estimates and confidence intervals, as measures of the association with the outcome. The ORs were computed

and defined as the ratio of the odds of injury (1) compared to the odds of no injury (0) in women who reported rape.

3.8.2. Research Question Two

The second question asked what were the interaction effects between setting, victim variables and forensic predictor variables when predicting injury status. The question was answered by performing multivariate logistic regression analysis procedures. Interaction effects take into account the non-additivity of effects in a regression model. The association of a predictor variable and the outcome depends on the level of another predictor variable (Tabachnick & Fidell, 2001). The main effects and significant interaction effects were used as terms in the logistic model.

Non-additivity was tested by modeling two-way interactions between setting and all other variables, and victim characteristic variables with the forensic characteristics. Interactions between variables theoretically made sense and the exploration of interactions proceeded with caution due to the possibility of overfitting (Menard, 2002). The purpose of examining interaction effects was to include significant interaction effects in the full model assessment and account for as much prediction of injury as possible with the variables in the study.

3.8.3. Research Question Three

The third question asked what was the best model, based on setting, victim variables and forensic variables, including individual and interaction effects as predictors of injury status. The question was answered by performing logistic regression analysis that assessed the value or contribution of each predictor variable, given the other predictors in the model. One of the benefits of using the logistic regression was the flexibility that allows meaningful interpretation

and prediction of two or more outcomes from a mixture of continuous or categorical predictor variables.

The full model was tested with all the predictor and interaction effects in the model. The maximum likelihood method was used to determine the ability of a group of variables to predict the likelihood of injury and clarify the best fitting model with all predictors compared to the constant-only model. The method provides estimates of conditional probability of outcome with all predictors (Tabachnick & Fidell, 2001). The Pearson χ^2 was used to estimate the individual OR and 95% CI and significance of each variable in association with the outcome.

Multivariate logistic regression was used to test the full model with all of the predictors, whether or not they are significant, since univariate analysis cannot estimate the value of all the variables together in predicting the outcome. The constant-only model, with no predictors, is compared to the full model with the constant plus all predictors. If there is no improvement in the model with the addition of predictors they are unrelated to outcome (Tabachnick & Fidell, 2001). With a large sample size, Tabachnick and Fidell (2001) advise that almost any difference in models may be reliable (significant).

Statistical significance between the fitted model and observed frequencies (representing the perfect model) may not mean it is a poor model with the large sample in this study. The effect of the large sample size is more likely to result in significance of the full model, and the goal would be to achieve nonsignificance, indicating that the predictors are not different from the perfect predictive model (Tabachnick & Fidell, 2001).

Assessing the fit of the estimated logistic regression model assures that during the preliminary model-building stage, the meaningful variables are contained in the model and that they are in correct functional form (Hosmer & Lemeshow, 2000). Summary measures of fit and

diagnostics are functions of the residual, or difference between the observed and fitted values. This was represented by the difference between the Pearson residual and the deviance residual (Hosmer & Lemeshow, 2000). The Hosmer-Lemeshow goodness-of-fit test statistic was presented and is easy to interpret. However, as Hosmer and Lemeshow (2000) suggest, prior to acceptance of a model fit, analysis of individual residuals and diagnostic statistics were performed.

Several models with eight variables and interaction terms and the adjusted ORs were included. The full model included all eight variables and fourteen significant interaction terms. The forward stepwise logistic regression where all variables and interactions with a p -value of 0.15 were added to the model in a forward fashion. The backward logistic regression was performed also, and proceeded backward through a series of iterations deleting variables with a p -value of 0.15 from the model. The less stringent p -value allowed for retention of variables than might be important in the model. Furthermore, Hosmer and Lemeshow (2000) state that stepwise methods are valuable in the early stages of model building especially when there are many clinically plausible interactions generated from the main effects.

The likelihood ratio test or Model χ^2 and the Wald test, were used to examine model statistics. The likelihood ratio test looks for a reliable difference between the full model with and without each predictor. The Wald test, based on the χ^2 distribution and use of beta weights procedure, tested for significance of the individual parameter estimates and the OR with 95% confidence levels.

Residual diagnostics procedures were the final step in analysis. The models were compared to identify cases for which the model works poorly or cases that exert influence on estimated parameters (Menard, 2002). Outliers were identified by viewing residual patterns or

changes in Pearson χ^2 or standardized residuals attributed to deleting a case, changes in the deviance residuals or predicted probability of being in the correct group, leverage values that are far from the mean, and changes in the logistic regression coefficients attributed to deleting a case, Cook's distance, or Mahalanobis distance (Menard, 2002; Tabachnick & Fidell, 2001). These diagnostic procedures were conducted and recommended plots created (Hosmer & Lemeshow, 2000; Menard, 2002). The six plots created included the following: χ^2 change versus the predicted probability, deviance change scores versus predicted probability, the β change scores versus predicted probability, χ^2 change versus the leverage scores, deviance change scores versus leverage scores, and the β change scores versus leverage scores (Hosmer & Lemeshow, 2000; Menard, 2002). The plots demonstrated that there were outliers, and the outliers exerted little influence on the model parameter estimates.

3.8.4. Minimum detectable effect size

These cross-sectional data were pre-existing and were collected from 1997 to 2003 and the original data were not collected by the researcher. The sample size was 3318 adolescent and adult women from the three regional settings.

The PASS program (NCSS, 2003) is used to estimate effect size (W), a measure of the magnitude of the χ^2 that is to be detected with the degrees of freedom of the χ^2 distribution. The program allows for samples size ranges to be calculated by the program and the size was entered in groups of 500. The power was set at 0.80 and the level of significance (α) set to .05.

The PASS program bases the effect size for binary logistic regression on the χ^2 table, and requests the degrees of freedom. The data have variables with two to four categories including the categorical outcome variable. This results in 2 by 4, 3 by 4, or 4 by 4 contingency table, with 3, 6, or 9 degrees of freedom for the OR based on the χ^2 distribution.

A sample size of 3120 achieved 80% power to detect an effect size (W) of 0.06 using three degrees of freedom with a significance level (alpha) of 0.05. A sample size of 3120 achieved 80% power to detect an effect size (W) of 0.06 using five degrees of freedom with a significance level (alpha) of 0.05. A sample size of 3120 achieved 80% power to detect an effect size (W) of 0.07 using seven degrees of freedom with a significance level (alpha) of 0.05. A sample size of 3120 achieved 80% power to detect an effect size (W) of 0.07 using nine degrees of freedom with a significance level (alpha) of 0.05.

The effect size for the logistic regression model with binary outcome was based on the χ^2 table with varying degrees of freedom. The greatest predictive value of the model was with the large sample and fewest degrees of freedom (J. Cohen, 1988).

3.8.5. Limitations of Secondary Data Analysis

There are limitations to the secondary analysis approach. With a large secondary data set it could be possible to find significant predictors that would not be significant in a smaller sample.

The data bases in this study were created in the past from clinical documentation in 1997 to 2003 and there is no way to go back to the original source and verify or check that data were entered correctly or to gather additional data. Also, the data are de-identified which makes the information untraceable by the researcher.

3.9. Summary

In summary, adolescent and adult women who seek medical forensic examinations after rape comprises the existing data bases that were used a secondary analysis. The three settings where the original data were collected were diverse regions of the US. The purpose of this secondary data analysis was to identify predictors of physical injury (setting, victim characteristics, and forensic characteristics) in females over 12 years of age, adolescent and adult

women, who have a medical history of rape by a male perpetrator and are examined in the emergency Department (ED).

Data included as variables were among the CDC recommended data elements to be collected in rape research. The variables of regional setting, victim characteristics (age, ethnicity, and known or unknown relationship) and forensic characteristics (time from rape to examination, weapon presence, multiple perpetrators, and the use of forensic evidence kit) are not found in the scientific literature as a predictive model. The variables individually or in small groups are found in the extant literature on predictors of rape injury, but with divergent results and commonly in smaller self-report samples, not clinician documentation. Assessment of the predictive value of the variables individually and jointly will inform researchers how influential the variables are on the odds of rape-related injury occurring for women.

4. RESULTS

Chapter four presents the results of descriptive information on the sample of adolescent and adult women 13 to 89 years of age with injury documented after rape who sought medical forensic examinations in the Emergency Department (ED). Descriptive findings for the settings, and the victim and forensic characteristics, results related to each of the research questions are presented.

Data came from three different geographic settings. In the sample of 3318 women, there were 620 women (18.7%) from Setting A, which included small city hospitals and rural communities along the Vermont and New Hampshire border. There were 1602 women (48.3%) from the two large hospitals in Setting B in a metropolitan city along the southern coast of California. Setting C included also were 1096 women (33%) from a metropolitan city on the coast of Louisiana.

4.1. Descriptive Results

Descriptive results for the sample for categorical and continuous characteristics were described by frequencies and percentages. The victim characteristic variables allow for a better understanding of the age and ethnic and relationship characteristics of the sample, and whether results would be generalizable to the population at large or if they are limited in their applicability.

Age was described continuously with percentages of the total sample within the age groups. Age dispersion included the formation of age groups of women in their teens, twenties, thirties, forties and women over 49. Percentages of the total sample for each age group are presented. Rape is more prevalent in women under 25 years of age, and understanding the predictors of injury in the older age groups, although fewer in number, was the primary reason age groups were created.

Table 2. Descriptive Results

Variable	Setting			Total
	A* <i>n</i> = 620	B** <i>n</i> = 1602	C*** <i>n</i> = 1096	<i>n</i> = 3318
Age				
13-19	324 (52.3%)	415 (25.9%)	351 (32%)	1090 (32.9%)
20-29	151 (24.4%)	628 (39.2%)	393 (36%)	1172 (35.3%)
30-39	81 (13.1%)	320 (20%)	181 (16.5%)	582 (17.8%)
40-49	45 (7.3%)	178 (11.1%)	128 (11.7%)	351 (10.6%)
50 and over	19 (3.1%)	61 (3.8%)	43 (3.9%)	123 (3.7%)
Ethnicity				
Caucasian	574 (92.6%)	962 (60%)	417 (38%)	1953 (58.9%)
African American	13 (2.1%)	187 (11.7%)	647 (59%)	847 (25.5%)
Hispanic	6 (1.0%)	338 (21.7%)	1 (0.1%)	345 (10.4%)
Native American	18 (1.8%)	8 (0.5%)	11 (0.9%)	30 (0.9%)
Asian	5 (0.8%)	64 (4%)	3 (0.3%)	72 (2.2%)
Perpetrator unknown				
Stranger	164 (26.5%)	395 (24.7%)	424 (38.7%)	987 (29.2%)
Perpetrator known	456 (73.5%)	1207 (60%)	508 (46.4%)	2171 (65.4%)

* Age range from 13 to 87; *M* = 23.59; *SD* = 11.1

** Age range from 13 to 88; *M* = 27.64; *SD* = 11.06

*** Age range from 13 to 89; *M* = 26.91; *SD* = 10.85

Table 2. Descriptive Results continued

Time from rape to examination				
< 24 hours	387 (62.4%)	1318 (82.3%)	888 (81%)	2593 (78.1%)
24-48 hours	84 (13.5%)	133 (8.3%)	86 (7.8%)	303 (9.1%)
49-72 hours	53 (8.7%)	48 (3%)	43 (3.9%)	145 (4.4%)
> 72 hours	95 (15.3%)	73 (4.6%)	62 (5.7%)	230 (6.9%)
Weapon presence				
No	585 (94.4%)	1409 (88%)	518 (47.3%)	2512 (75.7)
Yes	35 (5.6%)	193 (12%)	578 (52.7%)	806 (24.3%)
Number of perpetrators				
One	511 ((82.4%)	1377 (86%)	802 (73.2%)	2692 (81.1%)
More than one	109 (17.6%)	109 (6.8%)	179 (16.3%)	397 (12%)
Evidence kit used				
No	96 (15.5%)	0	78 (7.1%)	174 (5.2%)
Yes	524 (84.5%)	1602 (100%)	1018 (92.9%)	3144 (94.8%)
Injury				
None	70 (7.8%)	293 (18.3%)	457 (41.7%)	820 (24.7%)
Any injury	550 (92.2%)	1309 (81.7%)	639 (58.3%)	2498 (75.3%)

4.2. Victim Characteristic Variables

The sample included 3318 women from 13 to 89 years of age ($M = 26.6$; $SD = 11.1$). Most of the women were in the 13-19 and 20-29 year old groups (32.9% and 35.3%, respectively).

Age groups included 1090 (32.9%) young women who were 13 to 19 years of age, 1172 (35.3%) women who were 20 to 29 years of age, and 582 (17.8%) women who were 30 to 39 years of age. Women 40 to 49 years of age ($n = 351$; 10.6%), and women over 50 years of age ($n = 123$; 3.7%) comprised a smaller proportion of the sample. Further examination of women over 50 years of age revealed that 27 women were over 60, 10 women were over 70, and 9 women were over 80.

Setting A differed slightly from the other settings with a higher percentage of women in the 13-19 year old group (53.3%) and 24.4% in the 20-29 year old group. Setting B (13-19 = 25.9%; 39.2% = 20-29) and Setting C (32% = 13-19; 36% = 20-29) were more similar to the total sample with their highest percentage of women in their twenties. Women in their 30s ranged from 13% to 20% in all three settings. In all settings, women over 40 years of age accounted for less than 15% of the group.

The sample was primarily Caucasian ($n = 1953$; 58.9%) and 847 African American (25.5%). The remainder were Asian ($n = 72$; 2.2%), Hispanic ($n = 345$; 10.4%), Native American women ($n = 30$; .9%). Few women self-identified as “other” ethnic categories.

Although over half of the women in the sample were Caucasian, the percentage varied significantly among the settings with a $\chi^2 (4, n = 3318) = 1247.33, p = .00$, from 92.6% in Setting A to less than half as many in Setting C (38%). The reverse was true for African American women, who composed nearly 60% of Setting C, but only 2.1% in Setting A. Although the Hispanic ethnic group was small in the total sample, there were 21.7% Hispanic women in Setting B, and only 1% or less from the other two settings.

The majority of the sample of women ($n = 2171$; 65.4%) reported that they had been raped by a man who was known to them, with the remaining 983 women being raped by a stranger. However the percentage of women who reported being raped by a stranger varied significantly among the settings ($\chi^2 [2, n = 3318] = 114.86, p = .00$). Nearly three fourths of the women in Setting A knew the perpetrator, but the opposite was true in Setting C, where less than half of the women ($n = 46.4%$) were raped by a known perpetrator.

4.3. Forensic Characteristic Variables

The majority of women were examined within 24 hours of the rape ($n = 2627$). In all of the settings the majority of women received a forensic examination within 24 hours of the rape, however there were differences across the settings ($\chi^2 [6, n = 3318] = 150.15, p = .00$). Setting A however, had fewer (62.4%) than Setting B (82.3%) and Setting C (81%). Less than 15% of the women in each setting received a forensic examination in the other time frame categories (24 to 48 hours, 49 to 72 hours, and more than 72 hours).

Weapon presence was documented for 806 women in the sample (24.3%). There were 2512 cases in the sample (78.1%) in which no weapon was present. In Settings A and B, far fewer weapons were present at the time of the rape (5.6% and 12%, respectively), however weapons were present for 52.7% of the rapes in Setting C ($\chi^2 [2, n = 3318] = 730.02, p = .00$).

The majority of women reported one perpetrator (81.1%). The information for multiple perpetrators was missing for 229 cases. Multiple perpetrators were reported by 12.9% of the women. In all settings the number of women reporting multiple perpetrators was less than 18% ($\chi^2 [2, n = 3318] = 80.72, p = .00$).

Evidence collection kits were used for 3144 (94.8%) of cases in the total sample. Only 5.2% did not have standard evidence collection procedures performed with the forensic sexual assault medical examination. The evidence kit was used for all of the women in Setting B data. However, the percentages were somewhat lower in Setting A and Setting C (84.5% and 92.9%, respectively) ($\chi^2 [2, n = 3318] = 227.22, p = .00$).

4.4. Outcome Variable of Injury Status

Most of the women in the total sample had documented all types of injury in 2498 women (75.3%), and no injury in 820 cases, and the differences varied across regional settings (24.7%)

($\chi^2 [2, n = 3318] = 265.48, p = .00$). Further description of injury status included 603 women with bodily injury alone (18.2%), 1114 women with genital injury alone (33.6%), and 781 women (23.5%) with bodily and genital injury documented.

4.5. Research Question One

Research question one asked which of the victim and forensic variables were most highly correlated with the outcome of injury status. Results of analysis related to this question are presented. Univariate logistic regression analysis conducted with each of the variables one at a time examined the relationship of each variable to injury status. Table 3 displays the parameter estimates, Wald χ^2 test results, the p-values, and the unadjusted odds ratios (OR) of women being injured or not. When the unadjusted OR was less than one, it indicated a protective effect on injury occurrence. Conversely, when the OR was one or more, there was an increased risk of the woman being injured.

Several of the variables had significant unadjusted ORs. Several regions were significant, relative to setting B. Setting C was a significant protective effect on injury (OR = 0.31; 95% CI = 0.26, 0.37). Setting A was a significant risk factor for injury (OR = 1.76; 95% CI = 1.33, 2.33).

Relative to Caucasian ethnic category, African American was a significant protective effect on injury (OR = 0.31; 95 % CI = 0.26, 0.37). Multiple perpetrators was a significant protective effect on injury (OR = 0.74; 95% CI = 0.59, 0.93). Weapon presence was also a significant protective effect (OR = 0.54; 95% CI = 0.46, 0.65). The continuous variable of age, or ethnic category of other (not being Caucasian or African American), the time from rape to examination, being raped by a stranger, and the use of the evidence kit were not statistically significant in the univariate logistic regression analysis.

Table 3. Univariate Logistic Regression Results

Variable	b (SE)	Wald χ^2	p-value	OR	95% CI for OR
Setting		246.70	.001		
B*				1.00	
C	-1.16 (0.09)	170.16	.001	0.31	0.26, 0.37
A	0.57 (0.14)	15.72	.001	1.76	1.33, 2.33
Age (continuous)	0.00 (0.00)	0.70	.40	1.00	1.00, 1.01
Ethnicity		181.98	.001		
Caucasian*				1.00	
African American	-1.16 0 (.09)	167.69	.001	0.31	0.26, 0.37
Other	0.00 (0.13)	0.00	1.00	1.00	0.77, 1.30
Perpetrator unknown					
No*				1.00	
Yes	0.05 (0.09)	0.35	.56	1.05	0.89, 1.25
Time from Rape to Examination		3.05	.38		
<24 hours*				1.00	
24-48 hours	0.15 (0.15)	1.12	.29	1.17	0.88, 1.55
48-72 hours	-0.22 (0.19)	1.44	.23	0.80	0.56, 1.15
> 72 hours	-0.08 (0.16)	0.26	.61	0.90	0.68, 1.25
Multiple perpetrators					
No*				1.00	
Yes	-0.30 (0.12)	6.67	.01	0.74	0.59, 0.93

* Reference category

Table 3. Univariate Logistic Regression Results continued

Weapon						
No*					1.00	
Yes	-0.61 (0.09)	47.20	.001	.54		0.46, 0.65
Evidence Kit used						
No*					1.00	
Yes	-0.10 (0.19)	0.29	.59	.91		0.63, 1.30

* Reference category

Multivariate logistic regression analysis was conducted including all potential predictors in the model to predict injury, and Table 4 displays the parameter estimates, Wald χ^2 test results, the p-values, and the adjusted odds ratios (OR) of women being in the injury group. The following summary highlights changes in the p-values of predictor variables from univariate logistic regression and the main effects model.

All settings were significant in the univariate logistic regressions and remained so in the full model containing all of the potential predictors. Setting A remained a significant predictor and Setting C remained a significant protective effect on injury in the main effects model. Being African American remained a significant protective effect on injury. Having an unknown perpetrator was not statistically significant in the univariate model but became a significant predictive risk factor (OR = 1.35; 95% CI = 1.12, 1.63) in the full model.

The time frame of greater than 72 hours became a significant protective effect in the main effects model (OR = 0.68; 95% CI = 0.63, 1.03). Age remained non-significant in both models, in addition to the ethnicity category of other and use of the evidence kit. Multiple perpetrators and weapon presence were significant in the univariate models but became non-significant in the

full model. These changes in significance levels may be due to interactions among the variables and when considering the effects of all potential predictors jointly.

Table 4. Multivariate Logistic Regression Results with All Predictors Included

Variable	b (SE)	Wald χ^2	p-value	OR	95% CI for OR
Setting		109.77	.001		
B*				1.00	
C	-0.99 (0.12)	72.18	.001	0.37	0.30, 0.47
A	0.55 (0.15)	12.69	.001	1.73	1.28, 2.34
Age (continuous)	0.00 (0.00)	1.09	.30	1.00	0.10, 1.01
Ethnicity		30.53	.001		
Caucasian*				1.00	
African American	-0.58 (0.10)	30.22	.001	0.56	0.46, 0.69
Other	-0.07 (0.14)	0.24	.62	0.93	0.71, 1.23
Perpetrator unknown					
No*				1.00	
Yes	0.30 (0.10)	9.82	.001	1.35	1.12, 1.63
Time from Rape to Examination		8.03	.05		
<24 hours*				1.00	
24-48 hours	0.05 (0.15)	0.09	.77	1.05	0.77, 1.41
49-72 hours	-0.37 (0.20)	3.39	.07	0.69	0.47, 1.02
> 72 hours	-0.39 (0.18)	4.82	.03	0.68	0.48, 0.96

* Reference category

**Table 4. Multivariate Logistic Regression Results with All Predictors Included (Main Effects Only Model)
continued**

Multiple perpetrators					
No*				1.00	
Yes	-0.22 (0.13)	2.96	.09	0.81	0.63, 1.03
Weapon					
No*				1.00	
Yes	0.07 (0.11)	0.42	.52	1.07	0.87, 1.32
Evidence Kit used					
No*				1.00	
Yes	-0.26 (0.21)	1.49	.22	0.77	0.51, 1.17

* Reference category

4.6. Research Question Two

Research question two asked about the interaction effects between the variables in predicting injury status. Interactions between region and all variables, and interactions between each victim characteristic and each forensic characteristic resulted in 14 significant interaction effects that are displayed in Table 5. Nine of the significant interactions included regional setting and four included ethnicity, while five included the time from rape to examination.

Regional setting modified the effect of age on injury outcome. The effect of age on risk of injury depends on regional setting, and was predictive of injury in Setting C but protective in Setting A.

Regional setting modified the effect of ethnic category other on injury outcome. The effect of other ethnicity on the risk of injury depends on regional setting, and women who were not Caucasian or African American experienced a protective effect on injury in Setting A.

Regional setting modified the effect of weapon presence on injury. The effect of examination time frame of 49-72 hours on the risk of injury depends on regional setting, and the 49-72 hour time frame was protective in Setting A.

Regional setting modified the effect of multiple perpetrators on injury outcome. The effect of multiple perpetrators on the risk of injury depends on regional setting and was protective in Setting A.

Regional setting modified the effect of use of an evidence kit on injury outcome. The effect of using an evidence kit on the risk of injury depends on setting and was a predictive of injury in Setting C.

Age modified the effect of weapon presence on injury outcome. The effect of weapon presence on the risk of injury depends on age, and was predictive of injury.

Ethnicity modified the effect of examination time of 24-48 hours on injury outcome. The effect of the 24-48 hour time frame depended on ethnicity and was predictive of injury for African American.

African American modified the effect of multiple perpetrators on injury outcome. The effect of multiple perpetrators on injury depended on ethnicity and was predictive of injury for African Americans.

Having a stranger modified the effect of multiple perpetrators on injury outcome. The effect of a stranger as a perpetrator on the risk of injury depended on multiple perpetrators and was predictive of injury.

The ethnic category of other modified the effect of the extended examination timeframe of >72 hours on injury outcome. The effect of ethnicity on the risk of injury depended on the

time frame of >72 hours and was protective for women who were non-Caucasian and not African American.

The summary of interactions with predictive and protective effects indicates the importance of examining modifying effects in predictive models of injury. Injury prevalence varies among women from different settings and ethnic backgrounds with examinations performed at different time frames following rape. Furthermore examining higher order interactions may be valuable in order to reveal the value of combinations of variables in predicting injury in women after rape.

Table 5. Significant Interaction Effects among Setting, Victim and Forensic Characteristic Variables

Interaction Effects	b (SE)	Wald χ^2	p-value	OR	95% CI for OR
Setting C by Age	0.03 (0.00)	12.38	.001	1.03	1.01, 1.05
Setting A by Age	-0.02 (0.01)	4.63	.03	0.98	0.96, 1.00
Setting A by Other Ethnicity	-1.12 (0.52)	4.65	.03	0.33	0.12, 0.90
Setting A by Weapon Presence	-1.07 (0.47)	5.04	.03	0.35	0.14, 0.87
Setting A by Rape to Examination Time of 49-72 hours	-1.18 (0.53)	4.94	.03	0.31	0.11, 0.87
Setting C by Rape to Examination Time of >72 hours	1.15 (0.37)	9.52	.001	3.14	1.16, 6.51
Setting A by Rape to Examination Time of >72 hours	2.20 (0.60)	13.34	.001	9.01	2.77, 29.31
Setting A by Multiple Perpetrators	-0.93 (0.36)	6.63	.01	0.39	0.19, 0.80

**Table 5. Significant Interaction Effects among Setting, Victim and Forensic Characteristic Variables
continued**

Setting C by Use of Evidence Kit	1.86 (0.65)	8.13	.001	6.40	1.79, 22.93
Age by Weapon Presence	0.04 (0.01)	14.46	.001	1.04	1.02, 1.05
African American by Rape to Examination Time of 24-48 hours	0.88 (0.34)	6.70	.01	2.41	1.24, 4.68
African American by Multiple Perpetrators	0.58 (0.26)	5.07	.02	1.78	1.08, 2.95
Other Ethnicity by Rape to Examination Time of >72 hours	-1.16 (0.46)	0.46	.01	0.31	0.13, 0.77
Unknown Perpetrator by Multiple Perpetrators	0.70 (0.25)	7.73	.001	2.01	1.23, 3.28

4.7. Research Question Three

Research question number three asks which is the best predictive model including individual and interaction effects, as predictors of injury. Predictors involved in significant interactions were included in the full model but were not directly interpretable. All interactions that were significant in the full model were included in the reduced models. Use of the evidence kit was not statistically significant and was not involved in significant interactions in the full model and was not included in the reduced models (Table 6). Significant interactions in the reduced models are presented.

Regional setting modified the effect of age on injury outcome. The effect of age on the risk of injury depends on regional setting, and was predictive of injury in Setting C.

Regional setting modified the effect of the ethnic category of other on injury outcome. The effect of the ethnicity of other on the risk of injury depends on regional setting, and was but protective in Setting A.

Regional setting modified the effect of weapon presence on injury outcome. The effect of weapon presence on the risk of injury depends on regional setting, and was protective of injury in Setting A.

Regional setting modified the effect of the rape to examination time on injury outcome. The effect of rape to examination time frame of 49-72 hours on the risk of injury depends on regional setting, and was protective in Setting A. The effect of the time frame of >72 hours on the risk of injury depends on regional setting, and was predictive of injury in Setting C and in Setting A.

Regional setting modified the effect of multiple perpetrators on injury outcome. The effect of multiple perpetrators on the risk of injury depends on regional setting, and was but protective of injury in Setting A.

The ethnicity of African American modified the effect of examination time of 24-48 hours on injury outcome. The effect of the 24-48 hour time frame depended on ethnicity and was predictive of injury for African American.

Having a stranger perpetrator modified the effect of multiple perpetrators on injury outcome. The effect of a having a stranger as a perpetrator on the risk of injury depended on multiple perpetrators and was predictive of injury.

Of the total group of all interactions, only the 14 significant interactions are presented in Table 5. In the full model with all significant interactions and all variables, nine interactions remained significant. The nine remained significant in the reduced models in Table 6. Only one variable, use of the evidence kit, and one non-significant interaction, Setting C by use of the evidence kit, were dropped from the full model prior to running the forward stepwise and backward regression analyses.

Table 6. Univariate, Full, Forward Stepwise, and Backward Logistic Regression Results

Predictor	Model			
	Univariate OR (95% CI)	Full OR (95% CI)	Forward OR (95% CI)	Backward OR (95% CI)
Setting				
B	1.00	1.00	1.00	1.00
C	0.31 (0.26, 0.37)*	0.06 (0.01, 0.25)*	0.18 (0.10, 0.32)*	0.18 (0.10, 0.32)*
A	1.76 (1.33, 2.33)*	3.83 (1.72, 8.52)*	4.30 (1.94, 9.53)*	5.00 (1.94, 9.53)*
Age (continuous)	1.00 (1.00, 1.01)	0.99 (0.98, 1.00)	0.99 (0.98, 1.00)	0.99 (0.98, 1.00)
Ethnicity				
Caucasian	1.00	1.00	1.00	1.00
African American	0.31 (0.21, 0.37)*	0.49 (0.34, 0.70)*	0.49 (0.34, 0.70)*	0.49 (0.34, 0.70)*
Other	1.0 (0.77, 1.30)	0.96 (0.68, 1.36)	0.96 (0.67, 1.36)	0.96 (0.67, 1.36)
Perpetrator unknown				
No	1.00	1.00	1.00	1.00
Yes	1.05 (0.89, 1.25)	1.26 (1.02, 1.55)*	1.26 (1.02, 1.55)*	1.26 (1.02, 1.55)*

Table 6. Univariate, Full, Forward Stepwise, and Backward Logistic Regression Results continued

Time from Rape to Examination				
<24 hours	1.00	1.00	1.00	1.00
24-48 hours	1.17 (0.88, 1.55)	0.72 (0.43, 1.20)	0.72 (0.43, 1.20)	0.72 (0.43, 1.20)
49-72 hours	0.80 (0.56, 1.15)	1.02 (0.42, 2.49)	1.02 (0.42, 2.50)	1.02 (0.42, 2.50)
> 72 hours	0.90 (0.68, 1.25)	0.36 (0.19, 0.67)*	0.36 (0.19, 0.67)*	0.36 (0.19, 0.67)*
Multiple perpetrators				
No	1.00	1.00	1.00	1.00
Yes	0.74 (0.59, 0.93)*	0.54 (0.32, 0.91)*	0.56 (0.32, 0.91)*	0.56 (0.32, 0.91)*
Weapon Presence				
No	1.00	1.00	1.00	1.00
Yes	0.54 (0.46, 0.65)*	0.70 (0.34, 1.44)	0.70 (0.34, 0.1.43)	0.70 (0.34, 0.1.43)
Use of evidence kit				
No	1.00	1.00	1.00	1.00
Yes	0.91 (0.63, 1.30)	0.39 (0.11, 1.39)	**	**

* = *p*-value significant at <0.05. ** = Use of evidence kit was non-significant individually and in one interaction and was not included in the forward stepwise and backward models

Table 6. Univariate, Full, Forward Stepwise, and Backward Logistic Regression Results continued

Setting C by Age	1.03 (1.01, 1.05)*	1.02 (1.00, 1.04)*	1.02 (1.00, 1.04)*	1.02 (1.00, 1.04)*
Setting A by Age	0.98 (0.96, 1.00)	0.98 (0.96, 1.00)	0.98 (0.96, 1.00)	0.98 (0.96, 1.00)
Setting A by Other Ethnicity	0.33 (0.12, 0.90)*	0.34 (0.11, 1.02)*	0.34 (0.11, 0.99)*	0.34 (0.11, 0.99)*
Setting A by Weapon Presence	0.35 (0.14, 0.87)*	0.32 (0.12, 0.87)*	0.33 (0.12, 0.88)*	0.33 (0.12, 0.88)*
Setting A by Time from Rape to Examination 48- 72 hours	0.31 (0.11, 0.87)*	0.29 (0.09, 0.90)*	0.28 (0.09, 0.87)*	0.28 (0.09, 0.87)*
Setting C by Time from Rape to Examination > 72 hours	3.14 (1.16, 6.51)*	3.55 (1.39, 9.07)*	3.36 (1.34, 8.46)*	3.36 (1.34, 8.46)*
Setting A by Time from Rape to Examination >72 hours	9.01 (2.77, 29.31)*	4.81 (1.30, 17.72)*	6.81(1.98, 23.48)*	6.81(1.98, 23.48)*
Setting A by Multiple Perpetrators	0.39 (0.19, 0.80)*	0.36 (0.17, 0.78)*	0.35 (0.16, 0.76)*	0.35 (0.16, 0.76)*
Age by Weapon Presence	1.04 (1.02, 1.05)*	1.02 (1.00, 1.04)*	1.02 (1.00, 1.04)*	1.02 (1.00, 1.04)*
African American by Time from Rape to Examination 24-48 hours	2.41 (1.24, 4.68)*	2.61 (1.13, 6.01)*	2.63 (1.14, 6.06)*	2.63 (1.14, 6.06)*
African American by Multiple Perpetrators	1.78 (1.08, 2.95)*	1.05 (0.58, 1.91)	1.05 (0.58, 1.91)	1.05 (0.58, 1.91)

Table 6. Univariate, Full, Forward Stepwise, and Backward Logistic Regression Results continued

Other Ethnicity by Time from Rape to Examination > 72 hours	0.31 (0.13, 0.77)*	0.69 (0.26, 1.86)	0.69 (0.26, 1.86)	0.69 (0.26, 1.86)
Unknown Perpetrator by Multiple Perpetrators	2.01 (1.23, 3.28)*	1.83 (1.10, 3.03)*	1.84 (1.11, 3.05)*	1.84 (1.11, 3.05)*

* = *p*-value significant at <0.05. ** = Use of evidence kit was non-significant individually and in one interaction and was not included in the forward stepwise and backward models

The interactions that were non-significant in the full and reduced models were Setting A by age, age by weapon presence, African American by multiple perpetrators, the ethnic category of other by rape to examination time >72 hours.

The test of the full model tests whether the full model with all of the variables and interactions tests contributes to risk of injury outcome. The full model is compared to the constant-only model. With the Model χ^2 of 423.45 ($df = 39, p = .001$), it indicates that adding the predictors and interactions is significantly different from the constant only model.

With the significant Model χ^2 result, it indicates that the model is not different from the perfect predictive model, in which all injury is reliably predicted with the group of variables. The Hosmer-Lemeshow χ^2 test is a more robust goodness-of-fit test of the model in logistic regression and a good fitting model should be non-significant. The Hosmer-Lemeshow $\chi^2 = 20.85$ ($df = 8, p = .008$). The model testing for the full model did not achieve desirable results and a more reliable and parsimonious model was an important focus of the additional analyses.

Prior to conducting the forward stepwise logistic regression, one variable, use of the evidence kit and one non-significant interaction that included evidence kit were eliminated. The Model χ^2 420.30 ($df = 37, p = .001$) was also significant in the forward stepwise model. However, the Hosmer-Lemeshow $\chi^2 = (df = 7, p = .57)$ had more desirable results. The forward stepwise model of predicting injury was more reliable and parsimonious than the full model.

The backward logistic regression results included the Model $\chi^2 = 398.12$ ($df = 22, p = .001$) which was significant. The Hosmer-Lemeshow χ^2 test = 7.47 ($df = 7, p = .38$) was not significant. The backward logistic regression model appeared to be an improved fit over the full model and with fewer variables.

All multivariate models had Model χ^2 values that indicated that addition of predictor variables to the model was significantly different from the constant only model. However the Hosmer-Lemeshow χ^2 test results indicate that the forward and backward stepwise models are more parsimonious and reliable in predicting injury with fewer degrees of freedom and improved Model χ^2 and Hosmer-Lemeshow χ^2 test.

The Cox-Snell and Nagelkerke R^2 tests are also included in Table 7 and are based on comparisons of the predicted values from the fitted model to the constant only model, and do not assess goodness-of-fit (Hosmer & Lemeshow, 2000). Because R^2 values are typically low in logistic regression, they are not recommended as a summary measure of good fit. Hosmer and Lemeshow suggest that they may be useful in early stages of model building to compare models (2000). The Cox-Snell and Nagelkerke R^2 remained very similar in each of the models in this study.

Table 7. Model Statistics

Model	Test	
Full Model	Model χ^2	423.45 ($df = 39, p = .001$)
	Hosmer-Lemeshow χ^2	20.85 ($df = 8, p = .01$)
	R^2 Cox-Snell	.12
	R^2 Nagelkerke	.18
Forward Stepwise Logistic Model	Model χ^2	387.26 ($df = 18, p = .001$)
	Hosmer-Lemeshow χ^2	5.72 ($df = 7, p = .57$)
	R^2 Cox-Snell	.11
	R^2 Nagelkerke	.16
Backward Elimination Logistic Model	Model χ^2	398.12 ($df = 22, p = .001$)
	Hosmer-Lemeshow χ^2	7.47 ($df = 7, p = .38$)
	R^2 Cox-Snell	.11
	R^2 Nagelkerke	.17

4.8. Regression Diagnostics

The final step in model assessment was to examine the regression diagnostics, to assess whether the fit of the model was supported by covariate patterns. Outliers could influence the fit of the model and identify those women for whom the model does not work.

Only 1% of the residuals ($n = 60$) were outliers and omission of outliers made little difference in the fit of the model, indicating that the extreme values did not influence the predictive value. To diagnose outliers and extreme values that may influence the fit of the model, the Pearson residual, studentized residual, leverage, Cook's distance, deviance and χ^2 change and deviance change were calculated.

Outliers were identified by deviance scores and χ^2 change scores of more than four. There were 60 women in this group, all with no injury; 26 from Setting B, and 33 from Setting A. There were 52 women who were Caucasian, 30 who were raped by a stranger, 21 women who were under 21 years of age, 19 who were from 21 to 29, 10 who were from 31 to 39, five who were from 41 to 49, two were between 51 and 59, and one was 62, 63, and 72 years of age. Assessment of the outliers indicated that the model may not fit all women in the sample well. The cases that were outliers were women with no injury documented and were diverse in age ethnicity and relationship to their perpetrators.

5. DISCUSSION

Chapter five compares the findings related to each of the research questions as they relate to the current literature. Descriptive results are incorporated into the discussion of logistic regression results. Study limitations are addressed. Finally, the implications for practice and future research with women who experience rape are discussed.

5.1. Research Question One

Research question one asked which variables were most highly correlated with the outcome of injury status. Direct univariate regression results included several statistically significant relationships between the predictors and the outcome of injury. Setting, ethnicity, multiple perpetrators, and weapon presence were significant variables in the univariate analysis, while age, multiple perpetrators, time from rape to examination, and use of the evidence kit were not significant.

5.1.1. Setting

Regional settings had significant relationships to injury. Setting A (Vermont and New Hampshire border) was a significant predictor of injury (OR = 1.76, CI = 1.33, 2.33) and Setting A had the highest percentage of injury. This finding is consistent with Catalano's research findings based on NCVS data. Catalano reported that the fewest rapes were reported in the Northeast and in rural areas (2004), which described the Vermont and New Hampshire border. Notably, Catalano did not report injury by clinicians, only crime prevalence.

Setting B is a large urban area in southern California and had the highest number of rapes reported for a forensic examination in the shortest span of years (1998 to 2001) and a high rate of injury. Catalano reported that personal crime was the highest in the west, but rape prevalence was the highest in the Midwest (Catalano, 2004). Also, rapes are more often reported in suburban

areas. Southern California has many urban centers, but also has a great many suburban centers and the addresses of victims are not known.

Unique issues that vary by region could impact reporting and forensic examination practices. California has had a very well developed government supported and socially marketed statewide Sexual Assault program and protocol with law enforcement involvement for over 20 years. The multi-disciplinary team was involved with the standardized education and training statewide, and the team communicates continuously from trauma to trial to improve outcomes. Having the team approach, with health care, advocacy, and law enforcement, may lead to a greater awareness and sensitivity over time. Greater community awareness and involvement may increase victim reporting, being escorted to hospitals and receiving examinations by health care providers. When communities are more aware of forensic issues that affect the community health and welfare, it is more likely to be reflected in the health and legal policies and allocation of financial and human resources to address the problem. This may account for the high number of women reporting from Setting B.

Setting C was a large urban hospital with a strong active Sexual Assault response in the community, and a large amount of rape victims seen in the ED. Setting C had the lowest amount of injury in this research and was a significant protective factor (OR = -1.16, CI = 0.26, 0.37) People visiting the hospital for examinations after rape may have been a mix of urban, suburban and rural, since the hospital drew patients from outside the city. The hospital had a long-standing history of being the main charity hospital and major trauma center. Catalano reported the prevalence of rape in the south at a rate mid way between the other regions which supports the findings in this research (Catalano, 2004).

Reported rapes in the ED in this study were dispersed approximately the same manner that is consistent with national surveys of rape prevalence. Regional setting may be of importance in rape research because of characteristics of the region that are not included in the model, such as community financial and human resources responsible for addressing rape. Of equal importance is the workforce, lifestyle, income, family structure and influence, and social norms for women and non-Caucasian ethnicities in different regions. Such variables along with legal or justice system effects can influence women's decisions to report rape and seek a forensic examination.

Data used in this research included only women who chose to seek health care after rape, or were encouraged to do so by their support systems, the community, and the law enforcement personnel with whom they interacted. The setting in this research may impact outcomes because of the interactions between predictor variables.

5.1.2. Victim Characteristic Variables

Consistent with national surveys, this research did not find age related to likelihood of injury (Tjaden & Thoennes, 2000a). Other research that included age as a variable reported the descriptive information and not victim perpetrator relationships. In this research study, most of the women were young, which is in line with national reports that described rape as a tragedy of youth (Center for Victims, 1992).

Regarding injury, adolescents are reported to be at higher risk (Acierno et al., 2001; Biggs et al., 1998; Kaplan et al., 2001; Kroner & Weekes, 1996). Rape is more prevalent in youth and the lack of sexual experience and intercourse may place them at higher risk for incurring genital injury. At the other end of the age continuum, one could assume that as women's age increased, although rape is less likely, injury would be more common. However

Acierno and colleagues did not find assault characteristics such as injury and reporting to differ by age (Acierno et al., 2001).

The settings with the highest number of women over 20 had less injury documented. Setting A had the highest number of injuries documented, but more adolescent women under 21 years of age. Creating equal age group sizes in comparison age groups might reveal a relationship of age and injury outcome differences that are not disclosed with this large group of primarily young women.

There are other interesting aspects related to regional setting that could alter the age dispersion and the likelihood of injury. In Setting A, the counties with the highest numbers of police reports of rape also had colleges with active sexual assault services. The college services provide advocacy, counseling and prevention services. The forensic examinations were not a part of the services provided to the college women, nor are examinations encouraged. Hence a large number of women in college age range may not be included because of competitive services and resources for rape victims in a community that provide different services with a focus that is not focused on forensic examination and physical health assessment.

Setting may modify age effects. There may be modifying effects of other variables in the sample, which differ by setting. The women may be less likely to seek a forensic examination after rape if they perceive barriers from law enforcement, family values, and other factors. If there were perceived barriers by older women they may elect not to seek help. There is often a focus on youth being more vulnerable and in need of help and protective services, so it is possible that there was a greater urgency by school, law enforcement, and health care to promote forensic examinations for youth.

The significance of age might be revealed in interactions and in multivariate analysis. It also might be important to look at the significance of age in different regions or ethnic groups. Moreover, the value of the variables may be elucidated more clearly in research within the specific age groups.

The ethnic categories of Caucasian and African American were statistically significant as univariate predictors. Caucasian was a significant predictor of injury, which could be due to the fact that the majority of the women were Caucasian and the majority of women with injury were Caucasian.

One fourth of the women in the sample were African American (25.5%; $n = 847$). African American was protective (OR = -1.16, CI = 0.26, 0.37). This finding could be due to the fact that in Setting C with the most African American women, there was the least amount of injury documented. This finding is in opposition to national surveys which reported violent victimization overall was more prevalent in African Americans, and Hispanics were at higher risk than non-Hispanics for violent victimization in NCVS data (Ringel, 1997). Specifically for rape, African Americans were equally likely to report rape as Caucasians (Catalano, 2004).

Challenging the finding that being African American is protective of injury should be pursued in future samples. It may be misleading in this sample, because within one setting or with matched comparison groups, the protective effect may not hold. The NVAWS reported significantly different rates of rape between racial group pairs. Native American women were more likely than white or African American women to report rape. Mixed race women were more likely than white women to report rape. Hispanic women were more likely to report rape than white women (Tjaden & Thoennes, 2000a). Matched comparison ethnic groups might allow

for discovering differences in likelihood of injury per ethnicity in different regions or age groups that is not available with these analyses.

Specifically for injury, an early study examining risks associated with injury from resisting rape, found that women who experienced completed rape were more likely to be black and women with physical injury requiring medical attention were more likely to be black (Marchbanks, Kung-Jong, & Mercy, 1990). The NCVS data reported that African Americans, American Indians, and Hispanics were injured during a crime at higher rates than Caucasians and Asians (Perkins, 2001). However, only one third of attempted or completed rape victims sought medical care, perhaps because the injuries were minor, or not noticeable to them (Rennison, 2002b). The ethnic breakdown of women who do not seek care is not reported by Rennison, but others claim that there is no relationship between injury, age, and race in the women who reported being injured (Tjaden & Thoennes, 2000a).

Ethnic groups report rape and seek health care in different percentages in different settings. Rates of sexual victimization, but not injury, were self-reported to be similar for white women (74.8%) and African American women (81.1%) by some researchers (Smith et al., 2003). Reports of rape, and reasons why women seek medical care may be specifically related to ethnicity and regional setting where they live. To understand the relationship of ethnicity to injury may involve high order interaction and a model expanded to include more variables not in this model. Brener reported that racial differences in college women who were raped may be related to the fact that they were in college, which may be a class or socioeconomic issue (1999), and is a further indication of countless variables involved. Ethnicity, age and socioeconomic status are important variables to include in future research.

Few studies based on clinician documentation of injury used ethnicity as a variable. Diverse findings are reported in several studies. Some research did not report ethnicity to be significantly related to injury (Sachs & Chu, 2002; Sugar et al., 2004) and others have found a correlation between ethnicity and injury (Cartwright, 1987). Several studies provide a limited description of ethnic characteristics of the samples of women examined but no further breakdown or predictive values were reported (L. Slaughter & Brown, 1991; L. Slaughter et al., 1997; Sugar et al., 2004).

The impact of race alone may be difficult to assess and could vary by setting, community, economic status or class, and a compilation of other factors, so that multivariate analyses might be of greater value than univariate analyses alone (Clay-Warner, 2002; Scott, Lefley, & Hicks, 1993). Most importantly, the majority of research on rape victims is conducted on Caucasian women so it seems particularly appropriate to conduct multivariate analyses to examine interactions between ethnicity and other variables to understand the potential modifying effects.

The high incidence of rape in one ethnic group in one region of the US may not be the same for all people in that ethnic group. Hamby warns against assumptions that all Native American women's experiences of rape are the same (2004). Another consideration is that in national surveys and in clinician data bases there are small percentages of most minorities other than African American. To fully understand the experience of rape among women in a particular ethnic group, researchers may need to conduct research on rape within one racial group, such as the work done with Native American women by Hamby (2004) and the National Sexual Violence Resource Center (NSVRC, 2000).

Having an unknown perpetrator or a stranger was not a significant predictor of injury in this research study. Over 65% of the women reported that they had been raped by a man who

was known to them. Nearly three fourths of the women in Setting A knew their perpetrator, 60% knew the perpetrator in Setting B and 46% in Setting C.

Stranger rape is far less common in national surveys and accounted for less than one in five women in the NVAWS and the NCVS and, in relation to injury, univariate analysis indicated that rape victims were more likely to be injured if the perpetrator was a current or former intimate partner, or if the perpetrator threatened to harm or kill the victim or someone close to them (Tjaden & Thoennes, 2000a). Others report that women are most often raped by someone known to them (Basile, 2002; Rennison & Planty, 2003a; Tjaden & Thoennes, 2000b).

The effect of stranger or unknown perpetrator on injury may be modified by age, as fewer stranger rapes were reported in Setting A where there was a high percentage of adolescents. Although findings in this research do not indicate significance, it may be that the impact would be revealed with multivariate and interaction effects or examining age groups who were likely to be with acquaintances in their social activities.

However the location of Setting C, in New Orleans, with the highest reports of stranger rape, may have been related to the promotion of alcohol and the party atmosphere with the tourist trade. Distinct contextual characteristics allow for different prevalence rates and reporting rates which ultimately influence who received a forensic examination and has injuries documented.

5.1.3. Forensic Characteristic Variables

The individual time frames from rape to examination categories were not significant predictors of injury in the univariate regression analysis. It was more common for the women seeking health care to do so in an acute time frame, during which time it theoretically makes sense that the forensic examiner would be more likely to note injury.

Studies on clinician documentation of injury do not always include a time frame, and when included, the time frames are different. Comparison is made more difficult by the fact that time frame is seldom reported as a predictor variable, but a descriptive characteristic. Studies that included time frame are also often focused on the presence of ano-genital injury in small samples of women (Adams, Girardin, & Faugno, 2000; Bowyer & Dalton, 1997; Jones, Rossman, Hartman, & Alexander, 2003; Jones, Rossman, Wynn et al., 2003; McCauley, Gorman, & Guzinski, 1986; L. Slaughter et al., 1997). The majority of research does not include non-genital injury, and yet, it is the non-genital injury that is likely to be visible after several days have passed. Bruising on arms, neck, or shoulders that was not evident acutely may be darker in color and more easily observed after a few days.

Percentages of women with different patterns of injury seen within 48 hours of the rape were presented by Slaughter and Brown ($n = 131$) with the use of colposcopy and toluidine blue dye (1991). Time after examinations was presented for descriptive purposes in Slaughter's sample and no correlations to injury were reported. Another study by Slaughter and colleagues reported on 311 rape victims, of which 69% had anogenital injury (1997). Of women injured, 73% ($n = 156$) were seen within 24 hours of the rape, 8% ($n = 16$) examined between 24 to 48 hours, and 19% ($n = 41$) were examined after 72 hours. Comparisons and correlations were not reported related to the time frames and injury.

Examinations of 214 female adolescents (14-17 years of age) within 72 hours of rape resulted in 59% of the young women having ano-genital injuries documented with the use of colposcopy and toluidine blue dye to enhance visualization of minor injuries (Adams et al., 2000). It is possible that the rate of injury would be higher or a correlation between time and injury if the women had been seen early within the 72 hour time frame, whether or not the dye

and magnification were used. Adams and colleagues also found that women describing physical symptoms were more likely to be older and to have a higher number of non-genital injuries.

Adolescents were reported to be more likely to delay medical care than older women (17 hours and 12 hours, respectively, $p < 0.001$) (Jones, Rossman, Wynn et al., 2003). Younger women ($n = 27$; 83%) had less ano-genital injury documented than older women ($n = 280$; 64%). Jones' analysis focused on significant differences between younger and older women on a variety of variables, but did not include predictive value of the time frame and age to injury. If younger women are more likely to delay examination, it follows that minor injuries may have healed and the younger women may have less injury documented in later time frames.

Sachs and Chu (2002) conducted a series of univariate logistic regressions to evaluate the significance of variables associated with genitorectal injury ($n = 169$). The time interval from rape to examination was significantly associated with injury ($p = 0.02$). When controlling for important covariates, there was an increase in injury documented when women were examined within 24 hours of rape (OR = 7.47, 95% CI = 1.78, 31.35). Other significant predictors were educational status of the victim, verbal or physical resistance, and rectal penetration. Sachs and Chu note that in their small sample, testing of interactions and multivariate analysis was also not feasible.

Several research reports evaluated both general body trauma and genital-anal trauma. Variables associated with body and genital injury were analyzed in logistic regressions in a sample of women ($n = 819$) (Sugar et al., 2004). Women examined within 24 hours of the rape had significantly higher rates of bodily injury and genital injury than those examined in later time frames. Twenty percent of women examined ($n = 165$) had genital-anal injury. Bodily injury was documented for 52% ($n = 425$). Similar to this research the most common injuries

were minor (77%) and were more likely for women who were examined within 24 hours of the rape. Minor injuries, lacerations, abrasions and contusions were the primary physical findings in an analysis of rape victims ($n = 1076$), with more physical trauma (67%) than genital trauma (57%) (Riggs et al., 2000).

The likelihood of injuries being minor in the majority of women, particularly injuries in the highly vascular genital area, means that they may be healed within a short time frame. Women with minor injuries seen sooner rather than later would result in increased documentation of injuries when they are examined in less than 24 hours. The importance of including a categorical variable of time from rape to examination in future research may be more informative with the later time frames, and with a wider range of categories of injury. More severe injuries and multiple injuries may be more likely to be noted with examinations in later time frames. Severity of injury may play a role in whether women report the crime to the police or seek health care. With physical injury and genital injury women were more likely to report to police (Bachman, 1993). Also the identification and documentation of injury that women may not be aware of, could lead to reporting to police. Most importantly is that learning the significance of variables associated to injury in the forensic examination may lead to improved documentation and links to follow-up information for longitudinal research after injury.

The time frame in which women seek a forensic examination after rape may be influenced by age, ethnicity, and the regional setting. The effects of time frame on injury may also depend on social marketing, the community knowledge and acceptance of sexual assault services, outreach to populations at risk, and perceptions of injury, variables which may be important to add to future analysis. Seeking medical care was influenced by community responses to rape,

whether first responders suggested an examination, or if injury was noticeable in national surveys (Rennison, 2002b).

Having multiple perpetrators may induce more fear, and allow the perpetrator to exert more control over the victim. Multiple perpetrators had a significant protective effect on injury in this research study (OR = 0.74; 95% CI = 0.59, 0.93). There were only 12% ($n = 397$) of the cases with more than one perpetrator. Multiple perpetrators may exert more control over the victim leading to compliance, less struggle, and less injury. Other research reports that having multiple perpetrators was not related to genital or non-genital injury (Cartwright, 1987; Sugar et al., 2004; Thompson, Simon, Saltzman, & Mercy, 1999).

In opposition to this research, several studies indicated that women who experienced a rape with more than one perpetrator were more likely to report to police and had more injury (Gidycz & Koss, 1990). Women with vulnerabilities such as mental illness were more likely to be raped by more than one perpetrator (Eckert et al., 2002). The NCVS and the NVAWS did not take into account the number of perpetrators or ask women about the number of perpetrators in interviews (Bachman, 2000). Others describe differences among demographic and assault characteristics for multiple perpetrator rapes, but did not assess the relationships to injury (Jones, Rossman, Wynn et al., 2003).

Understanding the relationship of the multiple perpetrators to injury may only be revealed with multivariate analysis and assessing the modifying effects of other victim and assault characteristics, such as trust, fear, and perceptions of control, relationship with perpetrator, and other physical and mental health characteristics. Although multiple perpetrator assaults were fewer, the divergent research results indicate that further inclusion of the variable to assess multiple perpetrator assaults is needed. More violent assaults may lead to more injury.

Evaluating the multiple perpetrator assaults as a separate group might be warranted in future research.

Weapon presence was reported by 24% ($n = 906$) of the total sample, and was a significant protective effect on injury (OR = 0.54; CI = 0.46, 0.65). Weapon presence was reported in more than 52% of the cases in Setting C, but less than 13% in the other two settings.

Less injury with a weapon present, similar to when there are multiple perpetrators, seems counterintuitive. However the protective effect may be for the same reasons. Women may perceive a greater threat of harm, when a weapon is present. There could be a greater perception of threat, more fear, and more compliance with a perpetrator's demands, resulting in less injury.

The findings in this research were similar to results reported by Thaden and Thoennes (2002) on the NVAWS data that weapon presence was not predictive of injury with rape. Similarly, the bivariate analysis of weapon use and injury in physically assaulted women revealed that weapons were a significant protective factor against injury ($n = 247$) (Thompson et al., 1999). Significant predictors reported by Thompson in 1999 included the use of self-protective measures, income less than \$29,999, attending high school, being over 35 years of age, presence of witnesses, and the victim-perpetrator relationship. Others also reported the presence of a weapon was not significantly related to four injury outcomes: completed rape, physical injury, physical injury requiring hospitalization, and completed rape with physical injury requiring medical attention (Marchbanks et al., 1990).

Conversely, others have reported weapon presence was a significant predictor of injury with rape (Tjaden & Thoennes, 2000a). Studies using the NCVS data reveal many more women had injury when weapons were present (75%) than with unarmed perpetrators (50%) (Perkins, 2003). Research on clinician documentation of injuries reported a correlation between weapons

and injury (Cartwright, 1987). Weapons were used in 24% of rapes ($n = 164$) and had a significant relationship to injury (OR = 2.46, 95% CI = 1.70, 3.37) (Sugar et al., 2004).

In summary, weapon presence research has yielded divergent results. A small percentage of weapons were in this research study, and the majority were in the setting C with the least injury documented. Weapons were used more frequently in rape of adult women than adolescents, indicating there might be a modifying effect of age, which is consistent with Perkins' report (2003) that weapon presence increases with age of the perpetrator. Perkins' research does not include age of their victims however and one can only assume that most perpetrators committed crimes against someone in their own age group. Thus, it may be important to include setting, age, information about the perpetrator, and different categories of injury in future multivariate analysis and to evaluate the modifying effects of variables on injury.

Evidence collection kits were used for almost all of the women in this sample ($n = 3144$; 94.8%). The evidence kit was used with all of the women in Setting B. However, the percentages were slightly less in Setting A and Setting C (84.5% and 92.9%, respectively). The sexual assault evidence collection kits serve as a standardized protocol for evidence collection procedures performed on rape victims. Most of the injury was found with women on whom the evidence kit was used, but the kit was also used with the majority of women who had no injury documented. In future studies it may not be a worthwhile predictor to use unless multivariate and modifying effects can be evaluated more extensively, and it maybe that examiner characteristics are of greater values.

5.2. Research Question Two

Research question two asked about the interaction effects between regional setting and victim and forensic predictor variables in predicting injury status. There were 14 significant

interaction effects (Table 5) that were included in the multivariate logistic regression models. With all main effects included in the model, there were nine significant interactions that involved regional setting and four that involved ethnicity, and five that included time from rape to examination.

None of the reviewed published research reported interaction effects as predictors of injury from rape, limiting the ability to compare to other studies in this regard. The NVAWS provides information on bivariate and multivariate regressions with multiple victim and forensic characteristics, but not interactions and the NVAWS does not report clinician documented injuries of rape victims.

Risks for physical and genital-anal trauma were independently assessed with bivariate and multivariate logistic regressions in other reports, but no interactions were presented in research on clinician reports (Marchbanks et al., 1990; Sugar et al., 2004). Perhaps the small amount of cases available for analysis was the reason for not testing interactions, as Sachs and Chu mention (2002). Thompson and colleagues (1999) examined univariate and multivariate regressions including interaction terms to examine the risk of physical assault injury, but not rape.

The effects of age on the risk of injury depended on the regional setting. Age was not significant in the univariate model, but age was predictive of injury in setting C and protective in Setting A. This makes sense in light of the fact that there were fewer adolescent women than women 21 to 29 year olds in Setting C. In Setting A however, the adolescents outnumbered the 21-29 year olds by more than two to one, making age protective. Although fewer injuries were documented in Setting C, the likelihood of injury was greater with age.

Setting modified the effect of time from rape to examination on injury outcomes. Women in Setting A who were seen in the 48 to 72 hour time frame experienced a protective effect. Over 60% had their examination in less than 24 hours, and most had injury documented. There were only 53 women (8.7%) who had their examination in the 48 to 72 hour time frame, which may have accounted for the protective effect. As time passed, the most commonly experienced minor injuries would not be seen by a health care provider.

Conversely, women in Setting A and Setting C who were examined after 72 hours ($n = 95$; 15.3% and $n = 62$; 5.7%, respectively) were more likely to have injury documented. Despite the small numbers in the distant time frames, injury was significantly more likely. Injury documentation after several days could be related to several issues. Women may have had more severe injuries that had not yet healed and became more noticeable to them. Concern over injuries might influence their decision to seek an examination despite the passage of time. The passage of time also allows for others to see injuries, such as bruising in visible areas, and show concern or support and urge the women to report and seek an examination.

The effect of the ethnic category other on the risk of injury depended on setting and was protective in Setting A, where less than 4% the women were non-Caucasian or non-African American. With independent analysis on all of the women in the sample in this ethnic category ($n = 447$, 13%) the significant effects may vary greatly.

Regional Setting A modified the effect of weapon presence on injury. The effect weapons on injury depended on Setting and was protective in Setting A. There were few weapons reported by the women in Setting A ($n = 35$, 5.6%) and few had injuries. This may have been related to age also, with the majority of the women in Setting A being young and the use of weapons have been reported more often with increasing age (Perkins, 2003).

In addition, Setting A modified the effect of multiple perpetrators on injury. The effect of multiple perpetrators on injury depended on Setting and in Setting A was protective. There were few multiple perpetrator rapes in this setting which may have been related to age and having a known perpetrator. Most of the women were young, and had single perpetrators who were known to them. Again, with three way interactions and independent analysis of each setting, the relationships would be more informative.

The cases with multiple perpetrators and weapons would seem to be more violent situations, and yet they are protective. Rather than the violence resulting in more injury, the effect of control should be considered. The greater the threat and control, women may be more compliant with the perpetrator's wishes and have less injury. It may be that conducting three-way interactions with age, weapon, and setting to predict injury would reveal the relationships of the group interactions.

Ethnicity modified the effects of several predictors on the risk of injury. The effect of delayed examinations (in the 24 to 48 hour time frame) on injury depended on women being African American and was protective. Since most African Americans were in Setting C, it may have been related to the management of victims in this setting that led to delayed examinations that revealed injuries. It could also be that despite the delay the African American women had more severe injuries which were visible after 24 hours. Nearly 60% of women from Setting C were African American, three times as many as Setting B. It would be important to assess in future research studies why this group of women delayed forensic examinations, and if this finding could exist in other communities with non-Caucasian women crime victims. In addition, it could be that the community and law enforcement response did not support immediate care for rape victims or that there was mistrust of the system by the victims which led to a delay.

Ethnicity modified the effects of multiple perpetrators on the risk of injury. The effect of multiple perpetrators on injury depended on being an African American woman and was predictive of injury. The majority of African American women were in Setting C, and Louisiana has the highest violent crime rate of all the states (USDOJ, 2005). It is not surprising that more multiple perpetrator rapes resulted in injury with African American women, most of whom were in Setting C. It would be important to know the effects of other variables: the community response, attitudes toward responding law enforcement officers toward the victim ethnicity,

Ethnicity modified the effect of examinations performed after 72 hours of the risk of injury. The later time frame effect on injury depended on being in the ethnic category of other and was protective. There were few women in this ethnic category and there were few women in this examination time frame. Why the women of other ethnicities might have delayed or not reported rape is in need of further investigation, and could be due to social and cultural norms, expectations of women's behavior, and perceptions of prejudice or difficulty communicating with law enforcement or health care personnel. Marginalized women may be of minority groups about whom little is known.

The interactions or modifying effects of variable pairs on outcome, and inclusion of significant interaction effects may help account for injury. The modifying effects indicated that the variables in the model might reveal very different findings if applied independently in each setting in independent analyses. In the settings there are more than the geographic locations that differ. The ages and ethnicities of the victims, and crime characteristics may account for some of the differences. Further evaluation of the effects of three-way interactions may reveal diverse new findings and help clarify the significance of these variables. Despite recommendations to evaluate interactions effects, interactions are not routinely reported in research.

5.3. Research Question Three

Research question three asked which is the best predictive model including individual and interaction effects as predictors of injury status. All of the variables that were involved in significant interactions were included in the multivariate logistic regression analyses but were not directly interpretable. Direct logistic regression, forward stepwise, and the backward elimination logistic regressions were conducted to assess which variables as a group were significant predictors of injury, given the other variables in the model.

5.3.1. Full Logistic Regression Model

The full model included all of the variables and interactions. The results of the full model included a significant Model χ^2 of 423.45 ($df = 39$, $p = .00$), indicating that the full model was significantly different from the constant only model in predicting injury. This research seeks to find a model that includes predictors that are related in injury. Adding other predictors that account for injury could improve the model χ^2 bringing it more into line with the perfect predictive model. Improvement of the χ^2 may also occur with reduced models of prediction (Menard, 2002). For the full model, the Hosmer-Lemeshow χ^2 test was significant ($df = 8$, 20.85, $p = .01$). As the Hosmer-Lemeshow χ^2 test is a more robust goodness-of-fit test of the model in logistic regression, a good fitting model should be non-significant.

A more reliable and parsimonious reduced model was a focus in the remaining analyses. One variable, use of the evidence kit, was non-significant and was not involved in any significant interactions so it was dropped from the subsequent forward stepwise and backward elimination models.

5.3.2. Forward Stepwise Logistic Regression Model

The forward stepwise regression and backward elimination regressions produced the same results and compared reduced models to the full model (Table 6). The main effects were not

directly interpretable in the reduced models, but seven significant interactions included regional setting. Ethnicity was involved in two significant interactions, and age in only one. Time from rape to examination was involved in four significant interactions. Weapon presence and having an unknown perpetrator were each involved in one significant interaction and multiple perpetrators in two.

In the forward stepwise model the result of the Model χ^2 387.26 ($df = 18, p = .00$) remained significant. The full model was significantly different from the constant only model in predicting injury. However, the more robust Hosmer-Lemeshow χ^2 test was 5.72 ($df = 7, .57$) with the preferable non-significant results. With the reduction in variables an improved or more parsimonious model emerged.

5.3.3. Backward Elimination Model

The backward elimination regression model included all variables initially and proceeded through iterations, but by a process of elimination, it dropped or eliminated variables that were not significant at each step. Moving backward, after nine iterations, the variables of age, and weapon presence were eliminated, along with an additional five non-significant interactions.

The result of the Model χ^2 remained significant at 398.12 ($df = 22, p = .00$). Despite the elimination of variables, the model remained significantly different from the constant-only model. The more robust Hosmer-Lemeshow χ^2 test for the backward model was non-significant at 7.47 ($df = 7, p = .38$).

The forward stepwise model and the backward elimination model led to the conclusion that the forward model is the most parsimonious for this set of variables. The variable of age was consistently non-significant across all models and aside from univariate significance, weapon presence.

The full extent of the violence and aggression that is associated with rape can be more efficiently evaluated when bodily injury, not just genital injury is evaluated, and both may account for serious long-term negative health outcomes. Sexual and physical assault injury outcomes have been reported to be related to the same predictor variables. The use of multivariate models to examine injury outcomes has often focused on genital-anal trauma (Marchbanks et al., 1990; L. Slaughter & Brown, 1991; L. Slaughter et al., 1997; Sugar et al., 2004), but several studies report on genital and physical assault injury (Thompson et al., 1999).

McFarlane and colleagues claim that it is nearly impossible to find a large sample of women who have experienced sexual assault and not physical violence in their intimate partner studies. Although they used a small sample ($n = 100$), it was ethnically diverse. Male partners who were sexually and physically violent were the most aggressive in their sexual violence toward female partners (Marshall & Holtzworth-Munroe, 2002). Slaughter (1997) reports that 74% of the women who reported rape and had nongenital injury also had genital injury, but only 61% of women without nongenital injury also had genital injury.

Whether completed or attempted, rape is a violent crime, so that all types of injury are critical in the documentation and ongoing research. It is for this reason that the complete physical assessment should remain the standard in education of sexual assault examiners and, not just a genital examination. Evaluation of all types of injury as the outcome may alter research results by demonstrating larger amounts and wider ranges of injury that impact on women's health after rape. In addition, including new variables in data collection and documentation records will allow researchers to deepen the understanding of factors related in injury from rape.

In summary, it seems particularly important to look at variables such as multiple perpetrators, stranger rape, and weapons as well as regional and ethnic differences, particularly

with a large enough sample to assess interactions and account for the variation in injury. Multivariate models in research have the ability to answer more questions about women who are raped and the context of the crime. The impact of groups of variables on the injury outcomes, and adding to the variables in the model, or looking at one ethnic group at a time should be a focus of future research. The fact that so many significant interaction effects involved the settings indicates that further study in multiple settings, in addition to other variables may reveal distinct differences in the women and factors that are related to injury they sustain at the time of rape.

5.4. Implications

Implications of the research findings and recommendations for future research and practice are presented. Results presented in this dissertation research expand what is known about women's rape-related injury in the existing literature. The literature evaluating predictive models of injury is scarce, and even fewer research reports on predictors of clinician documented injury from forensic examination. Answering the research questions in this study confirmed the severity of violence with documented injury, and expanded predictive models of women's rape-related injury. The valuable information can be useful in the refinement and improvement of data collection methods, and can be useful to the courts. From clinical documentation of women's experiences of rape, questions were derived, research conducted. Research results can be translated into practice reforming guidelines and ultimately, effective translational research will improve women's health after rape.

Rape-related injury outcomes are a measure of the severity of violence women endure at the hands of their perpetrator. More details of trauma that can enable researchers to better assess the magnitude or severity of the event may offer greater explanatory value regarding health

prediction after rape (Koss et al., 1991; Read, Stern, Wolfe, & Ouimette, 1997; Stein & Barrett-Connor, 2000). More severe victimization and greater perceived threat are related to more negative reactions upon disclosure of the rape and higher risk of PTSD (Ullman & Filipas, 2001). Women who perceived a life threat and physical injury were more likely to develop PTSD (Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993). Injury and life threat interact as predictors of PTSD (D. B. Kilpatrick, Saunders, Amick-McMullan, & Best, 1989). Because injury and PTSD, and the myriad other physical and mental health problems that plague victims are related, then assessing the mediating effects of variables is critical. Forensic examinations of women who experience rape places clinicians in a position to initiate a relationship with the victim. Rape is the starting point of alterations in women's health. However, it can also be the point for initiation of research on a variety of predictors that effect injury, reporting to law enforcement, accessing advocacy and health care services that will improve women's health after rape.

Building multivariate models may require revising clinical tools, additional questions for victims, standardizing assessment to include more past history, initiating mandatory outreach and follow-up guidelines, providing additional education and treatment information for informed decision-making. Clinicians are in a key position to determine patient preference for treatment and to improve adherence to the chosen treatment while involved in the patient-focused acute forensic examination (Roy-Byrne, Berliner, J., Zatzick, & Pitman, 2003). Most rape and crime victims want treatment. The feasibility of assessing preference during the acute visit has been demonstrated and allows for a time to intervene with necessary patient education on treatment therapies, allow choices, and link with resources and schedule follow-up visits (Roy-Byrne et al., 2003). Furthermore, threats, weapons and experiencing injury are characteristics significantly

correlated with women choosing treatment after rape and physical assault (Roy-Byrne et al., 2003). The implications of improving the understanding of women with further research on predictors of injury will inform the development of tailored interventions and expand choices after rape for diverse women.

Rape is a forensic health care issue, with the legal system to help resolve criminal matters, and the health care providers to help resolve the patient health care issues for the crime victim. Community, legal, and government policies addressing the legal issues have bypassed the health care policy changes needed within health care systems to improve management of rape victims. Health care provider education is a constant need, and specialized forensic education and assured availability of experts to provide patient-centered care for victims and perform forensic examinations does not exist in all health care systems. System administration, local institutional policies, and practice guidelines at the clinician level all must assure that staff are educated and have access to equipment and resources in order to collect evidence and have open relationships with law enforcement.

The other components are acute and preventive health care of victims, which are in the purview of the health care providers. Health care policy must address victim related research that will help improve patient care choices, treatment facilities, experts, and associated staff. Just as the evidence collected in rape cases must sustain courtroom scrutiny, the health care provided to victims should achieve or bypass the standard of care. Data collected by front-line clinicians exists for years within current health care organization databases, with overworked staff that have inadequate preparation or time to conduct analysis on their patient population to improve data collection methods and utilize the information to address patient health outcomes.

Utilization of clinical data in research to inform practice and improve patient outcomes is the purpose of translational research. Expanding research regarding victims' health can inform practice as well as system needs in each community. The dynamics must include education of health care providers, but also less obstructive views toward research with trauma victims, welcome access to databases and increased support of clinician, researcher and statistician partnerships.

As this research demonstrates, multiple common data elements exist across all data bases, and understanding the differences in the individual and in the contextual nature of rape will inform the development of interventions. Health care policy can allow for ongoing data collection with standardized data collection programs and data elements to include victim and contextual information. In addition, data on incidence and prevalence and associated problems that directly influence actions, behaviors, and decisions made by victims and the communities in which they live (Longest, 2002). Allocation of resources included in policy may enhance education, payment systems for staffing, or expansion of services for victims, while regulatory policies can assure safety and access to care for victims.

In the long run, health issues have an economic impact, and when issues have detrimental effects on the health and safety of half of the nation, their families are also impacted. Health policy is an intervention that can affect the way that institutions and health care providers address education and research to improve recognition of injuries, the impact that injury has on health and care for victims. Improved understanding of injuries and health issues related to rape and violence can also be useful for improving coding procedures, effect policy development, and ultimately to promote reimbursement for violence related long-term care visits.

Rape is estimated to be reported by one third of the victims, while one fifth of women receive therapeutic intervention following rape (Kimerling & Calhoun, 1994). Women may fear reporting because of exposure in their community, leading to further victimization. They may fear law enforcement and the burdensome and confusing legal system, which may include many professionals of a different ethnicity or religious persuasion. Social marketing of services for victims should be incorporated into policy at all levels, be addressed to professionals and the communities, and is a worthy topic for future research (Boehm & Itzhaky, 2004).

There are multiple differences in the roles and benefits of the health care providers, law enforcement, and advocacy groups. The service providers for rape victims may not understand each others' distinctive roles, the services for children, adolescents, adults, elderly, and the programs and hospitals for victims to report and access health care. Confusion undoubtedly exists also for women in the communities and society at large who may need to access the services following rape. In order to increase the utilization of a service for rape victims, public service announcements, in-service trainings for public servants, programs and health care service locations to meet victims' needs must be known in the community. Ongoing public education and promotion provided to schools, college campuses, hospitals, churches, clinics, and cultural and community centers may increase reporting, expose negative myths, reinforce the importance of risks, and after effects of rape, health care and treatments after rape, and victim benefits.

Recommendations for future rape research include addressing diversity in the sample and different geographic regions. Many studies examine ethnicity as a variable in various health outcomes research. All types of diversity, not just ethnicity should also be included in victim studies. The differences in age, ethnicity, region, and interactions among them, may be linked with risks for violence and injury, and future health outcomes disparities of those who have been

victims of violence. Regional settings, income and education levels, zip codes and other and other constitutional and contextual variables should also be (Murdoch, Hodges, Cowper, Fortier, & vanRyn, 2003; Sampson, Morenoff, & Raudenbush, 2005).

Recommendations for future research include longitudinal research and links with psychological and biological correlates. Research that initiates at the time of the acute forensic examination, evaluates care provider rapport, resource referrals, and subsequent adherence to therapy and treatment outcomes will be beneficial. This type of research could build on what is known, and examine women with and without injury in different age, regional, ethnic, and treatment groups over time. There was a great deal of research that assessed health management and treatment of health care problems in women who had experienced rape or abuse in their past. There was no literature reviewed that evaluated women from the acute examination forward to evaluate differences in health or treatments based on adherence. In addition, linking the biological, physical and psychological outcomes at the acute forensic examination and collecting the same data over time would inform researchers and clinicians about the development of changes over time. It is an area that has received too little attention and may provide key linkages between poor health experienced by some women, and not others, after rape.

In summary, this research expands the current knowledge on predictors of all rape-related injury with multivariate model testing. The research incorporates known predictors and confirms a large group of significant predictors of injury. More importantly, modifying or interaction effects among the predictors of injury indicate combinations of variables that predict more violent injuries for women. The modifying effects of groups of variables may be different for women who live in different areas of the US. Future research may expand variables in models in order to understand modifying effects on acute injury. Improving the understanding of rape

victims in the acute time frame can have an impact on assessment and evaluation of women after rape and inform and enhance preventive treatment interventions. Recommendations for practice offer practice, policy, research and marketing opportunities.

5.5. Limitations

There are limitations related to the data which will be presented. Secondly, there are also methods related limitations that will be presented.

There were a limited number of predictor variables included in this research. Data elements were common to all the databases from the different regions. They were also data elements recommended by the CDC. However these did not include cognitive, psychological, emotional, personality, and behavioral variables, which were not collected routinely by clinicians performing the forensic examinations. Incorporating a more diverse array of variables in future studies on women who have been raped may reveal important findings regarding injury and other outcomes.

Despite the terms being common in all databases, the terminology used to ask questions may be different for every provider in the different settings. Although all of the women were English speaking in this study, and forensic examiner education follows fairly standard guidelines, the forms used and the terms used by clinicians may vary from place to place. By the same token, victims may or may not answer for their own reasons, and based on their understanding of what the examiner asked.

Survey data and self-reports used in rape research are not directly comparable to clinician documentation of clinical findings. There are limited reports that used clinician documentation of symptoms or injury from rape. A vast array of types of research were reviewed and compared to this study. There are pros and cons to self-report data and clinician data. The subjective self

reports take into account vast numbers of women's perceptions about injury. However, the predominance of rape-related injuries were minor, and makes it likely that women could be injured, not be aware of it and hence not be counted in national surveys. Minor injuries for many women may not be a cause for seeking medical care. Unless told by a clinician that an injury is present, however minor, the accuracy of self-reports may be lower than actual numbers. Although self-reports may be lower, only one third of women report rape and receive an examination by a forensic examiner. Both limitations may confuse the actual history of injury.

Another limitation involved the fact that this study sample included women who chose to seek health care and a forensic examination after rape. The sample could not be said to represent all women who are raped, because a good many were not seen by a health care provider. The information from survey and self-report data may be a more accurate representation of all women who are raped.

Clinical findings and documentation of injury may depend on the clinician education, knowledge, and years of forensic experience, and number of examinations performed. Also a limitation is the fact that the skill and time taken to perform the forensic examination may vary depending on the setting in which the forensic examinations are performed. Differences in acuity of patients, Emergency Department (ED) volume, in addition to skill and confidence of the examiner may affect the length of time taken to perform an examination with more or less accuracy or brevity. The settings varied from one large ED in the south, and two large hospital ED settings in California, to multiple smaller hospitals in the northeast. The use of visual enhancement equipment such as colposcopy, light sources, and nuclear staining dye visualization and magnification techniques varied among the settings.

There were also limitations to the use of a secondary analysis approach. There were differences in methods of data transfer from clinical examination documentation to the data base to the researcher, methods of data extraction medical records, and methods putting information into the computer are all ways in which data may be altered. In addition, when cells were missing data or the information unclear, there was no way to return to the clinical site or the examiner to obtain or verify the data.

Although most of the variables were significantly related to injury, the interactions were limited to two-way interactions. Three-way interactions were not run, but may have revealed more significant mediation effects of variables on injury. Expanding the characteristic variables and performing more regressions on interactions and multivariate models would provide more information.

The assessment of a predictive model with the set of categorical predictor variables was thought to be the analytical method to provide the most information on this set of variables. However, a variety of other analyses could also be interesting. Individual analyses within the individual regional settings, and comparing the value of variables in each setting would be interesting, and assessment of the predictors in smaller racial groups or age groups might reveal differences that were limited with the current methods.

With large or small samples there are limitations in what can be learned with the data analysis. One limitation is that all predictors could appear significant with the large sample, even though in reality they are not. Also there is a risk that significant variables in smaller samples, for instance in African American women or in women who were over 50 years of age, may not appear significant in very large samples.

In summary, the purpose of the study was to identify predictors of physical injury (setting, victim characteristics, and forensic characteristics) in females over 12 years of age, adolescent and adult women, who have a medical history of rape by a male and are examined in the emergency Department (ED). Answering the research questions confirmed known predictor variables, revealed mediating effects not previously reported in the literature, demonstrated the benefits of combining front-line clinicians and researcher skills in a collaborative effort. This research has far-reaching potential for enhancing clinical practice and data collection, maximizing what can be learned from women the acute forensic examination, initiating new lines of research on treatment preferences and longitudinal research that can improve women's health.

APPENDIX A

STATE DEFINITIONS OF PENETRATION FOR SEX CRIMES

STATE DEFINITIONS OF PENETRATION FOR SEX CRIMES

STATE	PENETRATION TYPE FOR SEXUAL ACTS/ INTERCOURSE			DOES CRIME REQUIRE EMISSION OF SEMEN?	PENETRATION TYPE FOR DEVIATE SEXUAL ACTS/CONTACT			THINGS INSERTED AS COVERED BY STATUTE					
	Vaginal	Anal	Oral		Vaginal	Anal	Oral	Penis	Tongue	Finger	Foreign object	Other	Any body part
ALABAMA	X			NO		X	X	X	X			X ¹	
ALASKA ²													
ARIZONA ³	X ⁴	X	X					X	X	X	X	X	
ARKANSAS	X ⁵					X	X	X			X		X
CALIFORNIA	X	X	X					X	X		X ⁶	X ⁷	X
COLORADO	X	X	X	NO				X	X	X	X		
CONNECTICUT	X	X	X	NO				X	X		X		
DELAWARE	X	X	X	NO				X	X		X	X ⁸	X
D.C.	X	X	X	NO				X	X	X	X		
FLORIDA	X	X	X					X			X		
GEORGIA	X	X	X			X ⁹	X	X			X		
HAWAII	X	X	X	NO				X	X	X	X		X
IDAHO	X	X	X					X				X ¹⁰	
ILLINOIS	X	X	X	NO				X	X		X	X ¹¹	X
INDIANA	X					X	X	X	X		X		
IOWA	X	X	X					X	X	X		X ¹²	
KANSAS	X					X	X	X	X	X	X		
KENTUCKY	X			NO		X	X	X	X		X		
LOUISIANA	X	X	X	NO				X	X		X ¹³		X

¹ In cases of sexual abuse, any "touching of intimate parts" is sexual contact.

² "Sexual act means sexual penetration or sexual contact." No other definition is provided (11.41.470).

³ "Sexual intercourse" (penetration into the penis, vulva, or anus by any body part, object, or through masturbatory contact with the penis or vulva) and "oral sexual contact" (with the penis, vulva, or anus) are used in sexual assault statutes, while "sexual contact" is involved in sexual abuse (13-1401).

⁴ Penetration of the vulva is sufficient (13-1401).

⁵ Penetration of the labia majora is sufficient (5-14-101, 1B, 9).

⁶ "Foreign object" includes "any part of the body except a sexual organ" (Section 289).

⁷ See Section 289, part K(3) for definition of "unknown objects."

⁸ "Sexual penetration" may also involve the placement of a "sexual device" inside the mouth of another person (Section 761).

⁹ Anal/oral penetration is a crime of sodomy, not rape (16-6-2)

¹⁰ Penetration in rape requires oral, vaginal, or anal penetration of a female by a penis (18-6101). For lewd conduct with a minor and sexual battery or a minor, sexual penetration may include, but is not limited to, genital-genital contact, oral-genital contact, anal-genital contact, oral-anal contact, manual-anal contact, or manual-genital contact (18-508 and 18-508A).

¹¹ "Sexual penetration" may also include the "intrusion, however slight" of an animal into the sex organ or anus of another person (721 ILCS 5/12-12).

¹² "Sexual act" also includes "use of artificial sexual organs or substitutes thereof in contact with the genitalia or anus" (702.17).

¹³ While not included in the rape statutes, contact between the anus or genitals of one person and any "instrumentality or any part of the body" of another person is considered penetration during sexual battery (14.42.2).



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	Vaginal	Anal	Oral		Vaginal	Anal	Oral	Penis	Tongue	Finger	Foreign object	Other	Any body part
MAINE	X	X	X					X	X		X	X ¹⁴	
MARYLAND ¹⁵	X	X	X	NO				X	X		X		
MASSACHUSETTS	X			NO		X	X	X	X	X	X		X
MICHIGAN	X	X	X	NO				X	X		X		X
MINNESOTA	X	X	X	NO				X	X		X		X
MISSISSIPPI ¹⁶	X	X	X					X	X		X		X
MISSOURI	X			NO		X	X	X	X	X	X		
MONTANA	X	X	X					X			X		X
NEBRASKA	X	X	X	NO				X	X		X		X ¹⁷
NEVADA	X	X	X					X	X		X		X
NEW HAMPSHIRE	X	X	X	NO				X	X		X		X ¹⁸
NEW JERSEY	X	X	X					X	X	X	X	X ¹⁹	
NEW MEXICO	X	X	X	NO				X	X		X		
NEW YORK	X					X ²⁰	X	X	X		X ²¹		
NORTH CAROLINA ²²	X	X	X					X	X		X		
NORTH DAKOTA	X	X	X	NO				X	X		X		X
OHIO	X	X	X					X	X		X		X
OKLAHOMA	X	X						X			X		X ²³
OREGON	X			NO		X	X	X	X		X ²⁴		

¹⁴ "Sexual act" also includes "any act between a person and an animal being used by another person which act involves direct physical contact between the genitals of one and the mouth or anus of the other, or direct physical contact between the genitals of one and the genitals of the other (Section 251).

¹⁵ Maryland distinguishes between "vaginal intercourse" (genital copulation including penetration of the vagina) and "sexual acts" (analingus, cunnilingus, fellatio, anal intercourse, object penetration). The former is used in rape statutes, while the latter is used in laws against "sexual offenses" (3-301). See Section 22 for emission requirements for "sexual intercourse."

¹⁶ Penetration for rape requires intercourse, while penetration for sexual battery includes "cunnilingus, fellatio, buggery, or pederasty, any penetration of the genital or anal openings of another person's body" (97-3-97).

¹⁷ "Sexual penetration" also includes "any intrusion, however slight, of any part of the actor or victim's body" (28-318).

¹⁸ "Sexual penetration" includes "any intrusion, however slight, of any part of the actor's body or any object manipulated by the actor into genital openings of the victim's body" and "any intrusion, however slight, of any part of the victim's body into genital or anal openings of the actor's body" (632-A:1).

¹⁹ "Sexual penetration" also includes "insertion of the hand, finger, or object into the anus or vagina either by the actor or upon the actor's instruction" (2C:14-1).

²⁰ Deviate sexual intercourse without consent is considered sexual misconduct (130.20).

²¹ Insertion of a foreign object is considered aggravated 3rd degree sexual abuse (130.66). "Foreign object" is defined as "any instrument or article which, when inserted in the vagina, urethra, penis, or rectum, is capable of causing physical injury" (130.00).

²² Rape requires vaginal intercourse, while "sexual offenses" require "sexual acts" which include cunnilingus, fellatio, analingus, anal intercourse, and penetration by any object into the genital or anal opening of another person (14-27.1).

²³ Rape by instrumentation involves "any inanimate object or any part of the human body" (21 Okla. Statute 1111.1).

²⁴ Penetration with "any object other than the penis or mouth of the actor" is considered unlawful sexual penetration (163.411).



STATE DEFINITIONS OF PENETRATION FOR SEX CRIMES

STATE	PENETRATION TYPE FOR SEXUAL ACTS/ INTERCOURSE			DOES CRIME REQUIRE EMISSION OF SEMEN?	PENETRATION TYPE FOR DEVIATE SEXUAL ACTS/CONTACT			THINGS INSERTED AS COVERED BY STATUTE					
	Vaginal	Anal	Oral		Vaginal	Anal	Oral	Penis	Tongue	Finger	Foreign object	Other	Any body part
PENNSYLVANIA ²⁵	X	X	X	NO		X	X	X	X		X		
RHODE ISLAND	X	X	X	NO				X	X		X ²⁶		X
SOUTH CAROLINA	X	X	X					X	X		X		X
SOUTH DAKOTA	X	X	X					X	X		X		X
TENNESSEE	X	X	X	NO				X	X		X		X ²⁷
TEXAS	X					X	X	X	X		X ²⁸		
UTAH	X					X ²⁹	X	X	X		X		
VERMONT	X	X	X					X	X		X		X
VIRGINIA	X					X ³⁰	X	X	X		X ³¹		
WASHINGTON	X	X	X					X	X		X		
WEST VIRGINIA	X	X	X					X	X		X ³²		
WISCONSIN	X	X	X	NO				X	X		X		X ³³
WYOMING	X	X	X	NO				X	X		X		X

²⁵ "Sexual intercourse," in addition to its "ordinary meaning, includes intercourse per os or per anus. Deviate sexual intercourse" means intercourse "per per os or per anus between human beings and any form of sexual intercourse with an animal" as well as penetration of the genitals or anus of another person with a foreign object (18 Pa. C.S. 3101).

²⁶ "Sexual penetration" includes "intrusion, however slight, by any part of a person's body or of any object into the genital or anal openings of another person's body, or the victim's own body upon the accuser's instruction" (R.I. Gen. Laws 11-37-1).

²⁷ "Sexual penetration" includes "intrusion, however slight, by any part of a person's body or by any object into the genital or anal openings of the victim, defendant, or any other person's body" (Tenn. Code 39-13-501).

²⁸ Penetration of the genitals or the anus of another person with an object is considered deviate sexual intercourse (21.01).

²⁹ Oral and anal intercourses are classified as sodomy (Utah Code 76-5-403).

³⁰ Oral and anal intercourses are classified as sodomy (Va. Code 18.2-67.1).

³¹ Object sexual penetration includes both inanimate and animate objects (Va. Code 18.2-67.2).

³² "Sexual intrusion" is defined as "any act between persons involving penetration, however slight, of the female sex organ or of the anus of any person by an object" in order to degrade, humiliate, or gratify desire (W.Va. Code 61-8B-1).

³³ "Sexual intercourse" also includes "intrusion, however slight, of any part of a person's body or of any object into the genital or anal opening either by the defendant or upon the defendant's instruction" (Wis. Statute 940.225).



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APPENDIX B
SCREENING QUESTIONS IN NATIONAL SURVEYS

NVAWS Screening Questions on Rape

(Tjaden & Thoennes, 2000a)

1. Has a man or boy ever made you have sex by using force or threatening to harm you or someone close to you? Just so there is not mistake, by sex we mean putting a penis on your vagina. (women only)
2. Has anyone, male or female, ever made you have oral sex by using force or threat of force? Just so there is no mistake, by oral sex we mean that a man or boy put his penis in your mouth or someone, male or female, penetrated you vagina or anus with their mouth or penis.
3. Has anyone ever made you have anal sex by using force or threat of harm? Just so there is not mistake, by anal sex we mean that a man or boy put his penis in your anus.
4. Has anyone, male or female, ever put fingers or objects in your vagina or anus against your will or by using force or threats?
5. Has anyone, male or female, ever attempted to make you have vaginal, oral, or anal sex against your will, but intercourse or penetration did not occur?

NCVS Screening Questions on Rape

(Bachman, 2000)

1. Other than any incidents already mentioned, has anyone attacked or threatened you in any of these ways:

With any weapon, for instance, a gun or a knife

With anything like a baseball bat, frying pan, scissors, or a stick

By something thrown, such as a rock or bottle

Include any grabbing, punching, or choking

Any rape, attempted rape or other type of sexual attack

Any face-to-face threats

OR

Any attack or threat or use of force by anyone at all?

Please mention it even if you are not certain it was a crime.

2. Other than any incident already mentioned, have you been forced or coerced to engage in unwanted sexual activity by

a. Someone you didn't know before

b. A casual acquaintance OR

c. Someone you know well?

APPENDIX C

DATA COLLECTION INSTRUMENTS IN SETTING A, B, AND C

Setting A Northeast US

Sexual Assault Database Questions

Please fill in all requested data:

The month the patient was seen.

1. The year the patient was seen.
2. The state in which the patient was seen.
3. The state in which the patient was assaulted.
4. The county in which the assault occurred.
Name of city/town the assault occurred if you do not know county.
5. Age of the patient.
6. Sex of the victim.
7. Sex of perpetrator.
8. Multiple perpetrators.
9. Ethnicity of victim.
10. Does the patient speak a primary language other than English?
11. Does the patient fall into any of the following categories: mentally emotionally challenged, physically/medially challenged, elder? or
Lesbian/gay/bisexual/transgender, immigrant, migrant farm worker, at risk
(incarcerated, prostitute, substance abuser)?
12. Were services provided to any of the following secondary victims in this case: parent, significant other/partner, other?
13. What was the victim's relationship to the perpetrator: married to perpetrator? (currently or formerly), related to perpetrator (by blood or marriage, ie parent, step-parent, sibling, other relative), currently or formerly in intimate relationship with perpetrator (boyfriend/girlfriend), acquainted with perpetrator (friend, neighbor, co-worker, schoolmate, roommate), unknown to perpetrator, type of relations unknown.
14. Time between assault and examination <24hours, 24-48 hours, 48-72 hours, >72 hours.
15. Was the crime reported to law enforcement?
16. Was a colposcope used in the examination?
17. Was a condom used by the perpetrator?
18. Was an evidence collection kit used?
19. Was, if any weapon was used, gun, knife, other?
20. Was alcohol consumption a co-occurring factor?
21. Was non-alcohol related drug-facilitated sexual assault suspected?
22. Was non-genital trauma present at the time of the examination (defined as bruising, abrasions, lacerations, tears, bite marks, burns, contusions, etc.) to all but the ano-genital area?
23. Was genital trauma present at the time of the examination (defined as bruising, abrasions, lacerations, tears, bite marks, burns, contusions, etc.) to any aspect of the ano-genital area?
24. For currency of practice documentation purposes only, please note the SANE ID number of the individual completing the examination.

Setting B Southern California

County of San Diego Office of Public Health Division of Emergency Medical Services SEXUAL ASSAULT RESPONSE TEAM DATA FORM

GENERAL INFORMATION	AGENCY CASE #
Law Enforcement Information:	Medical:
Agency: _____	Facility: -CHHC-CCP -PPH-SART -UCMC-SART
Sheriff's Station: _____	SAFE: _____
Detective: _____	Advocacy:
Specialized Investigative Unit:	Present: -No -Yes Agency: _____
- Sex Crimes -D.V. -Child Abuse -None -Unk	Advocate's Name: _____
- Other: _____	VICTIM'S CONSENT TO SHARE DATA -YES -NO

SUSPECT INFORMATION

Sex: -M -F -Unk
Ethnicity: ___ American Indian ___ Black ___ White ___ Asian ___ Hispanic ___ Unk ___ Other _____
Military Affiliation (suspect): -No -Yes -Unk

Acts	Drinking Alcohol		Using Drugs		Threat of Weapon		Weapon Seen		*Weapon	V-Injured by Weapon
	-No	-Yes -Unk	-No	-Yes -Unk	-No	-Yes	-No	-Yes		-No -Yes -Unk
Suspect #1	-No	-Yes -Unk	-No	-Yes -Unk	-No	-Yes	-No	-Yes		-No -Yes -Unk
Suspect #2	-No	-Yes -Unk	-No	-Yes -Unk	-No	-Yes	-No	-Yes		-No -Yes -Unk
Suspect #3	-No	-Yes -Unk	-No	-Yes -Unk	-No	-Yes	-No	-Yes		-No -Yes -Unk
Suspect #4	-No	-Yes -Unk	-No	-Yes -Unk	-No	-Yes	-No	-Yes		-No -Yes -Unk

V=Victim *Weapon Type 1=Gun, 2=Knife, 3=Other: Describe in column

Victim/Suspect Relationship: - UNKNOWN
 (Check the first applicable status. In the event of multiple suspects choose the one with the closest relationship to the victim.)

- | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Acquaintance:</p> <ol style="list-style-type: none"> 1. ___ Cohabitant 2. ___ Former Cohabitant 3. ___ Fiancé 4. ___ Dating Relationship 5. ___ Former Dating Relationship 6. ___ Roommate 7. ___ Inmate 8. Other Acquaintance _____ <p>Brief Encounter:</p> <ol style="list-style-type: none"> 9. ___ Internet Acquaintance 10. ___ Known < 12 hours 11. ___ Known 12-24 hours 12. ___ Known >24 hours | <p>Relative:</p> <ol style="list-style-type: none"> 1. ___ Spouse 2. ___ Former Spouse 3. ___ Father 4. ___ Mother 5. ___ Both Parents 6. ___ Steplather 7. ___ Stepmother 8. ___ Brother 9. ___ Sister 10. ___ Son 11. ___ Daughter 12. Other Family Member _____ | <p>Care Giver:</p> <ol style="list-style-type: none"> 1. ___ Father's Significant Other 2. ___ Mother's Significant Other 3. ___ Foster Father 4. ___ Foster Mother 5. ___ Babysitter 6. ___ Family Friend 7. ___ Institution Staff (e.g.nurses aid) 8. Other Care Giver _____ |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
- Victim/Suspect have child together: -No -Yes -Unk

- STRANGER:**
1. ___ Never Met
 2. ___ Never Met but Seen Before

COMMENTS: _____

**County of San Diego Office of Public Health
Division of Emergency Medical Services
SEXUAL ASSAULT RESPONSE TEAM DATA FORM**

GENERAL INFORMATION	AGENCY CASE #
Law Enforcement Information:	Medical:
Agency: _____	Facility: -CHHC-CCP -PPH-SART -UCMC-SART
Sheriff's Station: _____	SAFE: _____
Detective: _____	Advocacy:
Specialized Investigative Unit:	Present: -No -Yes Agency: _____
- Sex Crimes -D.V. -Child Abuse -None -Unk	Advocate's Name: _____
- Other: _____	VICTIM'S CONSENT TO SHARE DATA -YES -NO

SUSPECT INFORMATION

Sex: -M -F -Unk

Ethnicity: ___American Indian ___Black ___White ___Asian ___Hispanic ___Unk ___Other _____

Military Affiliation (suspect): -No -Yes -Unk

Acts	Multiple Suspects: -No -Yes -Unk			If yes, Number of Suspects: _____ -Unk				V-Injured by Weapon		
	Drinking Alcohol	Using Drugs	Threat of Weapon	Weapon Seen	Weapon			-No	-Yes	-Unk
Suspect #1	-No -Yes -Unk	-No -Yes -Unk	-No -Yes	-No -Yes				-No	-Yes	-Unk
Suspect #2	-No -Yes -Unk	-No -Yes -Unk	-No -Yes	-No -Yes				-No	-Yes	-Unk
Suspect #3	-No -Yes -Unk	-No -Yes -Unk	-No -Yes	-No -Yes				-No	-Yes	-Unk
Suspect #4	-No -Yes -Unk	-No -Yes -Unk	-No -Yes	-No -Yes				-No	-Yes	-Unk

V=Victim *Weapon Type 1=Gun, 2=Knife, 3=Other: Describes in column

Victim/Suspect Relationship: - UNKNOWN
(Check the first applicable status. In the event of multiple suspects choose the one with the closest relationship to the victim.)

<p>Acquaintance:</p> <ol style="list-style-type: none"> 1. ___ Cohabitant 2. ___ Former Cohabitant 3. ___ Fiancé 4. ___ Dating Relationship 5. ___ Former Dating Relationship 6. ___ Roommate 7. ___ Inmate 8. Other Acquaintance _____ <p>Brief Encounter:</p> <ol style="list-style-type: none"> 9. ___ Internet Acquaintance 10. ___ Known < 12 hours 11. ___ Known 12-24 hours 12. ___ Known >24 hours 	<p>Relative:</p> <ol style="list-style-type: none"> 1. ___ Spouse 2. ___ Former Spouse 3. ___ Father 4. ___ Mother 5. ___ Both Parents 6. ___ Steplather 7. ___ Stepmother 8. ___ Brother 9. ___ Sister 10. ___ Son 11. ___ Daughter 12. Other Family Member _____ <p>Victim/Suspect have child together: -No -Yes -Unk</p>	<p>Care Giver:</p> <ol style="list-style-type: none"> 1. ___ Father's Significant Other 2. ___ Mother's Significant Other 3. ___ Foster Father 4. ___ Foster Mother 5. ___ Babysitter 6. ___ Family Friend 7. ___ Institution Staff (e.g.nurses aid) 8. Other Care Giver _____
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

STRANGER:

1. ___ Never Met
2. ___ Never Met but Seen Before

COMMENTS: _____

SART Exam Findings	Agency Case #
---------------------------	----------------------

No positive visible physical findings

Ab Abrasion Bd Blood Bi Bite Bu Burn Ec Ecchymosis (bruise) Er Erythema (redness) In Induration
 La Laceration Pe Petechiae SI Suction Injuries Sw Swelling Te Tenderness OI Other Injury Unk Unknown

FEMALE GENITAL INJURIES	Ab	Bd	Bi	Bu	Ec	Er	In	La	Pe	SI	Sw	Te	OI	Unk
Mons Pubis														
Labia Majora														
Labia Minora														
Clitoral hood/clitoris/surrounding tissue														
Urethral meatus/periorathral tissue														
Perihymenal Tissue (vestibule)														
Hymen														
Fossa Navicularis														
Posterior Fourchette														
Vagina														
Cervix														
MALE GENITAL INJURIES	Ab	Bd	Bi	Bu	Ec	Er	In	La	Pe	SI	Sw	Te	OI	Unk
Foreskin Circumcised <input type="checkbox"/> No <input type="checkbox"/> Yes														
Shaft														
Glans														
Urethral Meatus														
Scrotum														
ANUS/RECTAL INJURIES	Ab	Bd	Bi	Bu	Ec	Er	In	La	Pe	SI	Sw	Te	OI	Unk
Perineum														
Perianal Skin														
Anal Verge/Folds/Rugae														
Rectum														
BODY INJURIES	Ab	Bd	Bi	Bu	Ec	Er	In	La	Pe	SI	Sw	Te	OI	Unk
Mouth/Lips														
Head/Neck														
Chest/Breasts														
Abdomen/Pubic area														
Back/Flank area														
Buttocks														
Arms/Hands														
Legs/Feet														
MISC. FINDINGS	Ab	Bd	Bi	Bu	Ec	Er	In	La	Pe	SI	Sw	Te	OI	Unk

HRSA:EMS-113 June 3, 2002

Setting C Southern Louisiana

Alleged Sexual Assault Data Form

Name of Hospital: _____ Victim's I.D. No. _____

- Instructions:
1. Request immediate consultation with Department of OB-GYN or appropriate department.
 2. If victim is not with a police officer and consents, call police.
 3. Inform local crisis intervention council or other appropriate person or organization for counseling.

1. Identification

_____ am pm F M _____
 Date Time admitted to ER Sex Birthdate

Name of Victim _____ Telephone: Day _____
 Address _____ Evening _____
 City _____ State _____ Zip _____
 Contact (if no phone) _____ Phone: _____

2. Consent

I _____ consent and authorize Dr. _____
(print full name of victim) (print full name of doctor)
 and/or the Medical Staff of _____ Hospital to obtain history, perform
 on me a physical examination, and collect and analyze laboratory material. This permission
 includes the taking of photographs if such is indicated in the judgement of the examining
 physician.

I DO DO NOT authorize this Hospital to supply laboratory specimens, photographs and
 copies of all medical reports pertinent to this visit to the appropriate law enforcement agency.

Victim's Signature _____ Date _____
 Witness Signature _____ Title _____
 Witness Address _____ City _____ State _____
 Parent or Guardian Signature (if applicable) _____
 Address _____ City _____ State _____

3. Responding Law Enforcement Agent

Name _____ Identification _____

4. History

Description of the incident

1. Date of the Assault _____ 2. Time _____ a.m. p.m.

3. Location _____

4. No. of Assailants _____ 5. Race _____ 6. Sex _____

7. Attacker: Known Unknown Relative

8. Were any threats used? Yes No

if yes, knife gun choke fists verbal threats restraints blindfold

other: _____

9. Was there penetration of:

	Penetration			Ejaculation		
	Attempted	Actual	Unsure	Yes	No	Unsure
Vagina	<input type="checkbox"/>					
Anus	<input type="checkbox"/>					
Mouth	<input type="checkbox"/>					

10. Was a condom used? Yes No Not Sure

11. Did other types of penetration occur?

	Yes	No	Unsure
Digital	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Foreign Object	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: (specify) _____			

12. Since the assault, has the victim . . . ?

	Yes		No	
Douched	<input type="checkbox"/>	<input type="checkbox"/>	Bathed or Showered	<input type="checkbox"/>
Urinated	<input type="checkbox"/>	<input type="checkbox"/>	Eaten	<input type="checkbox"/>
Gargled	<input type="checkbox"/>	<input type="checkbox"/>	Drunk	<input type="checkbox"/>
Defecated	<input type="checkbox"/>	<input type="checkbox"/>	Changed Clothes	<input type="checkbox"/>

13. Were there any medications, drugs, or alcohol taken before or after the assault?

Yes Amount _____ Type _____ No Not Known

APPENDIX D

IRB FORMS

IRB FORMS: University of Pittsburgh, Pittsburgh, PA



University of Pittsburgh Institutional Review Board

Exempt and Expedited Reviews
Christopher M. Ryan, Ph.D., Vice Chair

Multiple Project Assurance: M-1259

3500 Fifth Avenue
Suite 105
Pittsburgh, PA 15213
Phone: 412.383.1480
Fax: 412.383.1146
e-mail: irbexempt@msx.upmc.edu

TO: Patricia Crane
FROM: Christopher M. Ryan, Ph.D., Vice Chair *Chris*
DATE: March 30, 2004
PROTOCOL: Predictors of Injury Following Sexual Assault
IRB Number: 0403104

The above-referenced protocol has been reviewed by the University of Pittsburgh Institutional Review Board. Based on the information provided in the IRB protocol, this project meets all the necessary criteria for an exemption, and is hereby designated as "exempt" under section 45 CFR 46.101(b)(4).

The regulations of the University of Pittsburgh IRB require that exempt protocols be re-reviewed every three years. If you wish to continue the research after that time, a new application must be submitted.

- If any modifications are made to this project, please submit an 'exempt modification' form to the IRB.
- Please advise the IRB when your project has been completed so that it may be officially terminated in the IRB database.
- This research study may be audited by the University of Pittsburgh Research Conduct and Compliance Office.

Approval Date: 03/30/2004
Renewal Date: 03/30/2007

CR:ky

IRB FORMS: Louisiana State University Medical Center, New Orleans

Nov 23 2005 10:44AM OFFICE OF RESEARCH SERVIC 2257632860

P. 2

This form must be returned no later than:

Louisiana State University Medical Center in New Orleans
Institutional Review Board (IRB)
Re-approval Form

The following information is required in order for you to maintain IRB approval. Complete this form and submit it with a copy of the current consent form.

Only typed forms will be accepted.

1. Is the study still in progress?
 YES The study is active, awaiting dissertation defense.
 NO The study is completed and should be closed.

Upon renewal and after dissertation defense further research on this data may continue.

NOTE: ANSWERS TO QUESTIONS #2 AND #3 MUST BE CUMULATIVE FROM THE ONSET OF THE STUDY.

2. Number of subjects entered into the study.
1096 rape cases of adult women from LSU sexual assault data base from Charity Hospital ED.

3. Number of subjects who voluntarily withdrew from the study.
None. This is secondary analysis of data collected from 2000 to 2003

4. Adverse Reactions (Attach additional sheet if necessary)

None. This study is secondary analysis of cross-sectional de-identified data from the sexual assault data base that had been kept by Deborah Travis, MN, RN. Thus there is not a consent form.

5. Results of the study thus far. (Attach additional sheet if necessary)
These data were part of a dissertation study for Patricia A. Crane will be defended Dec 8, 2005 at the University of Pittsburgh School of Nursing. A copy will be published on line after that. A copy of the dissertation can be provided at your request.

6. Changes in risk/benefit ratio based on study results. (Attach additional sheet if necessary)

None

7. The board is available for consultation with you at any time concerning problems within its purview. If an appointment with the Board is desired, please indicate. Appointment needed

Re-approved for project period FROM: 19 Oct 05 TO: 18 Oct 06

Principal Investigator

Date

Kenneth E. Kratz
Kenneth E. Kratz, Ph.D., Chairman

Return Both Forms To:

IRB Office
Resource Center, Room 206 E
433 Bolivar Street
New Orleans, La 70112

IRB1 692

Expedited Review

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