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Pre-Assault Diagnoses Associated with Post-Assault Emergency Department Visits After Recent  
Sexual Assault

by

Jessica Prince

Under the Direction of Amanda Gilmore, Ph.D.

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

in the College of Arts and Sciences

Georgia State University

2023

## ABSTRACT

The current study evaluated the associations between pre-assault factors, assault characteristics, and multiple sexual assault medical forensic exams (SAMFEs) on emergency department visits one-year post-SAMFE. Characteristics associated with individuals who frequent the emergency department at higher rates have been well established; however, factors associated with greater emergency department visits following a recent sexual assault (SA) are largely unknown. The current study included a medical record review of 123 individuals who received a SAMFE at a hospital in the southeastern United States. Demographic variables, characteristics of the SA, pre-SA diagnoses, frequency of SAMFEs, and post-SAMFE emergency department visits were examined. Results indicated that alcohol or drug use during an assault was associated with fewer emergency department visits post-SAMFE. Substance use and injury disorders pre-SAMFE were positively associated with post-SAMFE emergency department visits. Findings provide important insight for prevention strategies to target mental and physical health concerns after recent SA to mitigate risk trajectories.

INDEX WORDS: Sexual assault, Emergency department, Psychiatric diagnoses, Prevention

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2023

Pre-Assault Diagnoses Associated with Post-Assault Emergency Department Visits After  
Recent Sexual Assault

by

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Georgia State University

December 2023

## **DEDICATION**

This proposal is dedicated to my family, friends, and partner for their continued support of my graduate school endeavors. I am grateful for their kindness, patience, and love as I pursue new opportunities and milestones.

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I would like to express my gratitude towards several individuals who provided me support and encouragement throughout the thesis process. First, I am extremely grateful to my committee chair, Dr. Amanda Gilmore, for her invaluable mentorship and guidance over the last two years. Second, I would like to thank Dr. Grace McKee for her support in navigating statistical techniques, guiding my methodology, and her contributions to data collection and data cleaning. I would also like to thank Dr. Amanda Gilmore, Dr. Grace McKee, and Dr. Kathy Gill-Hopple for their contributions to the dataset and their advice on the methodology. In addition, I would like to thank the entire Alcohol and Sexual Assault Prevention Lab. Being surrounded by so many innovative and collaborative individuals has encouraged and inspired me each step of the way.

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## **LIST OF ABBREVIATIONS**

Sexual assault = SA

Sexual assault medical forensic exam = SAMFE

Post-traumatic stress disorder = PTSD

## 1 INTRODUCTION

### 1.1 Emergency Department Care

Within the United States, individuals who frequent emergency departments at higher rates than others have worse physical and mental health outcomes (Krieg et al., 2016; Verelst et al., 2012; Yamamoto et al., 1995). Research has found several individual and systemic level characteristics such as low socioeconomic status, high school education or less, minoritized racial identity, identifying as a woman, and being uninsured or insured by Medicaid contribute to higher rates of emergency department care (Mandelberg et al., 2000). However, some research suggests that Medicare patients only use the emergency department at higher rates than others when they do not have access to a primary care physician (Lowe et al., 2005). Other research posits that chronic health conditions, psychiatric disorders, alcohol and drug-related concerns, and sustained injuries are associated with more frequent emergency department visits (Fuda & Immekus, 2006; Hunt et al., 2006; Krieg et al., 2016; Sun et al., 2003). This could be due to pervasive social inequities and insufficient access to preventative healthcare. Further, within the United States healthcare system, there are significant disparities in obtaining adequate mental health support, particularly for individuals actively having a mental health crisis (Heyland & Johnson, 2017). Other barriers such as transportation, discrimination, medical mistrust, and poor health communication also contribute to not getting adequate, routine healthcare. This often leaves emergency departments as the primary, and in some cases, the only place individuals can go while having a medical, psychiatric, or substance use related emergency.

Further, higher rates of emergency department use can be associated with adverse clinical outcomes, such as medical comorbidities, acute mental illness, physical injury, and an inability to follow up with a healthcare provider (Sun et al., 2003). While a wide breadth of research has

identified risk factors and outcomes associated with more frequent emergency department visits, research has yet to examine risk factors within the context of survivors of recent SA.

Based on existing research for individuals who frequent emergency departments at higher rates, there may be specific demographic, medical, and assault related characteristics that significantly increase the likelihood of a survivor of SA returning to the emergency department after a SA; however, these characteristics have yet to be identified. Research to date has only identified characteristics associated with greater emergency care usage immediately following a SA (Vogt et al., 2022). For example, Vogt and colleagues (2022) found that female, younger (18-25 years old), and lower-income individuals were more likely to present to an emergency department following a SA. Other research has correlated knowing the perpetrator of the event, substance use involvement, perpetrator threatening survivor, and signs of physical trauma with emergency department utilization immediately following an assault. Research has yet to examine factors associated with greater emergency department visits in the year following a SA. There may be important systemic and health related factors prior to an assault that may provide novel insight into more severe sequelae associated with greater emergency department utilization among survivors of SA.

Moreover, SA characteristics such as injury, weapon use, and intimate partner involvement may provide important insight into better understanding repeated emergency care following a SA. Additionally, examining factors prior to an assault may inform gaps such as mental health support in the current healthcare system. These factors could partially explain why some survivors seek more frequent emergency care in the year following a SA. Understanding risk factors prior to and during an assault that increases the likelihood of emergency care

following an assault may provide pertinent evidence for secondary prevention programs to minimize the need for repeated care within emergency department settings.

## **1.2 Sexual Assault and Emergency Department Care**

SA is defined as nonconsensual sexual activity or contact, including unwanted sexual contact, sexual coercion, attempted and completed rape (Holland et al., 2018; Smith et al., 2017). SA is a pervasive public health issue across the United States, causing significant negative health consequences (Dworkin et al., 2020; Kimerling et al., 2007; Newins et al., 2021; Santaularia et al., 2014; Short, 2019; Young-Wolff; 2018). Current estimates suggest that one in five women and one in fourteen men will experience a completed or attempted rape in their lifetime (Smith et al., 2018). Based on data from the Federal Bureau of Investigation, national reported rapes and SAs have increased significantly over the last twenty years (FBI Crime Report, 2022). Recent data assessed emergency department utilization trends in the United States after a recent SA and found that SA-related emergency department visits increased by more than 1533.0% from 2006 to 2019 (Vogt, 2022). This may be partially due to federal mandates by the Violence Against Women Act in 2005 for states to provide sexual assault medical exams (SAMFEs) free of charge regardless of if the survivor formally reports SA to the police (Zweig et al., 2014).

SAMFEs provide medical care, referral services, and documentation and evidence of the assault for survivors of sexual violence. SAMFEs are typically conducted in an emergency hospital setting within 72 to 96 hours of the assault. The forensic evidence collection of the SAMFE includes collecting physical evidence (e.g., blood, saliva, seminal fluid), documenting injuries, interviewing survivors, and conducting a toxicology report if necessary. The medical examination includes assessing and treating injuries, conducting STI and pregnancy testing, providing emergency contraception if needed, connecting survivors to mental health services,



and providing access to any follow-up care needed. Ultimately, SAMFEs aim to enhance data collection and documentation methods for criminal prosecution and provide survivors with more effective post-assault care (e.g., medical and psychological services). SAMFEs are conducted by SA nurse examiners who receive extensive training in forensic evidence collection, medical care specific to SAs, and crisis intervention. The implementation of SAMFE programs throughout the United States has led emergency departments to be the primary setting for comprehensive care and treatment for SA related concerns. While evidence suggests that SA nurse examiner programs improve forensic effectiveness, legal outcomes, and psychological support during the SAMFE (Campbell et al., 2005; Cannon et al., 2021), significant gaps remain in evaluating the quality of mental health care provided during the exam. Recent research has begun examining characteristics associated with more acute mental health concerns during a SAMFE to assist in care coordination post-SA (Gilmore et al., 2020). Much of the research evaluating SA nurse examiner programs focuses on criminal justice outcomes (Campbell et al., 2014; Campbell et al., 2012; Tiry et al., 2020), while the empirical evidence for psychological outcomes remains scant. As such, the current study will evaluate assault characteristics and pre-assault factors and their association with future emergency care among individuals who received a SAMFE.

The literature to date has primarily focused on specific demographic and event related characteristics that lead to survivors utilizing the emergency department *immediately* following a SA for a SAMFE, while less is known about how these factors influence future emergency department utilization in the year following a SAMFE. Some research has found that more acute characteristics of an assault such as sustained injury and vaginal or anal penetration, may increase the likelihood of a survivor seeking a SAMFE (Avegno et al., 2009). Research has determined several other factors correlated to a higher likelihood of seeking a SAMFE including,

younger in age, female, lower income individuals, a desire to report to the police, psychological concerns, and substance use concerns (Avegno et al., 2009; McFarlane et al., 2005). While this work is integral to further identifying risk factors associated with SAMFEs, additional research is needed to understand risk factors that predict long-term emergency service utilization following a SAMFE.

Further understanding risk factors associated with survivors seeking greater emergency care long-term may help to inform healthcare strategies that improve access to medical and mental health care in outpatient settings, which in turn may decrease the need for more frequent emergency care. Given that prior research has preliminarily established factors associated with SAMFEs, the current study will instead focus on predictors associated with emergency department visits within the year *after* a SAMFE. A better understanding of how survivors engage with emergency care in the year following a SA may highlight important existing gaps (i.e., lack of trauma-informed mental health support, psychoeducation, and evidence-based interventions) during follow up care that could promote positive healing and recovery post-assault. Additionally, identifying individual and system level factors that are associated with greater emergency service utilization in the year after experiencing a SAMFE could provide novel understanding to inform prevention efforts to intervene and prevent problems associated with more frequent emergency department utilization such as psychiatric disorders, less financial resources, being uninsured, chronic health conditions, and having insufficient access to routine healthcare (Fuda & Immekus, 2006; Hunt et al., 2006; Krieg et al., 2016; Lowe et al., 2005; Sun et al., 2003).

### **1.3 Premorbid Mental Health Problems and Substance Use Problems**

There also remain gaps in understanding premorbid factors that may increase the likelihood of emergency service utilization in the year following a SAMFE. Literature has found a bidirectional association between SA and mental health problems (Dworkin et al., 2017; Grubaugh et al., 2011; Miles et al., 2022). Further, SA can both increase vulnerabilities to developing a mental health disorder and exacerbate preexisting mental health problems among survivors of SA (Brooker & Durmaz, 2015). Rates of mental health diagnoses prior to a SA vary across research studies ranging from 21-46% (Brooker & Durmaz, 2015; Miles et al., 2022). Survivors with preexisting mental health problems may be at an increased risk for worse negative mental and physical health outcomes following a SA; however, more research is needed to understand the underpinnings of this association. Specifically, prior evidence suggests that the link between SA and mental and physical health problems such as depression, posttraumatic stress disorder, suicidality, injury, and hazardous alcohol and drug use could increase the likelihood of healthcare utilization due to ongoing health complications resulting from a SA (Newins et al., 2021; Ullman & Brecklin, 2003). Some research posits that because adult survivors of SA are likely to have experienced previous traumas, the cumulative psychological impact may increase one's vulnerability to long-term negative health outcomes (Dworkin et al., 2017). Other recent research found that among survivors who presented to the emergency department following a SA, those with preexisting mental health problems reported experiencing more severe injury and violence during a SA, which could increase the risk for long-term health complications (Miles et al., 2022). Therefore, while casual mechanisms have not yet been fully established, there are robust findings that premorbid psychological concerns are associated with more severe SA characteristics and long-term negative health outcomes. Importantly, SA is

always the fault of the assailant(s), who should be the primary focus for reducing rates of SA and negative health outcomes among survivors. However, until the perpetration of sexual violence is eradicated entirely, researchers must continue to discover data driven associations between survivor characteristics, SA characteristics, and negative health outcomes to equip and support the protection of survivors. Research to date has yet to examine the influence of pre-SAMFE diagnoses on increased emergency department utilization post-SAMFE.

#### **1.4 SA Characteristics**

SAs that involve more severe characteristics such as genital or anal injury, strangulation, domestic violence related assault, and alcohol or drug involvement are associated with worse physical and mental health outcomes following the assault (Peter-Hagene & Ullman, 2015). This may lead to a greater vulnerability for future injury or medical complications, which may increase the risk of future emergency department visits in the year following a SAMFE. For example, survivors of SA who sustain a significant injury during an assault often have several follow up medical visits with healthcare providers for months after the assault to resolve their injuries. Additionally, other research has shown that both more violent assaults and alcohol-related assaults result in greater post-traumatic stress symptoms (PTSD) among survivors of SA (Peter-Hagene & Ullman, 2015). SAs perpetrated by an intimate partner are more likely to occur repeatedly and involve more injuries which may also put a survivor at risk of repeated emergency department visits following SA (Dutton et al., 2005). This may suggest that these adverse health outcomes resulting from more severe assault characteristics may increase an individual's risk of needing future emergency care in the year following a SAMFE.

The proposed study assessed if specific event-related assault characteristics such as genital injury, non-genital injury, SA perpetrated by an intimate partner, or alcohol or drug use

involvement predicted higher emergency department visits in the year following a SAMFE. Identifying features of an assault that may significantly predict greater use of emergency care in the year following a SAMFE will provide preliminary evidence for healthcare providers to offer tailored support at the time of the SAMFE to minimize subsequent risk trajectories.

### **1.5 Revictimization As a Risk Factor for Post-Assault Emergency Department Care**

Prior evidence suggests that individuals who experience SA are at an increased risk of being revictimized, and experiencing subsequent SA and the rate of sexual revictimization ranges from 47.9% - 82% (Boney-McCoy & Finkelhor, 1995; Classen et al., 2005; Grauerholz, 2000; Russell, 1986; Sorenson et al., 1987; Walker et al., 2019; Young & Furman, 2007). Moreover, research has established certain factors that are associated with repeated SA (Davis et al., 2002; Dworkin, 2020; Grauerholz, 2000; Sorenson et al., 1991; Ullman & Brecklin, 2003; Walker et al., 2019), which may increase the risk of returning to the emergency department after a SAMFE. For example, SA perpetrated by an intimate partner is more likely to recur, thus putting one at risk for increased injury and psychological care following the assault (Ullman, 2005). Additionally, given the deleterious effects of SA, survivors of SA are at risk of developing mental health disorders such as depression, anxiety, and PTSD, an established risk factor for revictimization following a SA (Creighton & Jones, 2012). While there remain significant gaps and competing evidence about the processes underlying the reasons why perpetrators target people with victimization histories, some research has found that the following are associated with a risk of revictimization: less assertive self-perceptions, being more attentive to the needs of others than their own, posttraumatic stress symptoms, and more avoidant coping behaviors to cope with the assault (Breitenbecher, 2001; Cappell & Greeley, 1987; Folkman & Moskowitz, 2004; Macy, 2007; Moos & Holahan, 2003).

Although revictimization has been widely studied, less is known about survivors who receive multiple SAMFEs. Given research that SA characteristics tend to be more severe for individuals who receive a SAMFE in an emergency department (Avegno et al., 2009), it is likely that survivors who receive multiple SAMFEs have worse health outcomes. However, research has yet to evaluate whether preexisting mental health and substance use concerns prior to an assault impact the likelihood of emergency care utilization post-SAMFE. The current study will address these gaps by evaluating the moderating effect of multiple SAMFEs on diagnoses in the year pre-SA and assault characteristics on post-SAMFE emergency department visit frequency.

## **1.6 Substance Use and Sexual Assault**

Survivors of SA are at an increased risk for developing a substance use disorder compared to individuals without a history of SA (Burnam et al., 1998; Dworkin, 2020; Karlsson & Zielinski, 2020; Kilpatrick et al., 1997; Wilsnack, et al., 1997, Ullman et al., 2013). Research suggests that substance use can function as an avoidant coping mechanism in response to post-traumatic stress, depressive symptoms, shame, and guilt (Cappell & Greely, 1987; Khantzian, 1997; Ullman et al., 2013). Traumatic events can disrupt emotion regulation abilities and may increase substance use behaviors to reduce or dampen trauma symptoms in the short-term (Cappell & Greely, 1987; Ullman et al., 2013). Similarly, the self-medication hypothesis posits that substance use may be negatively reinforced by momentary reductions in psychological distress in the wake of trauma (Cappell & Greely, 1987; Luciano, et al., 2021). Using substances to cope can be at least partially effective in the short term; however, in the long term, problematic drinking may continue, chronic PTSD can develop, and the likelihood of revictimization is exacerbated (Najdowski & Ullman, 2011; Ullman, et al., 2013). Therefore, increases in substance use following a SA may increase a survivor's vulnerability to

experiencing greater injury, psychiatric concerns, and ultimately additional instances of sexual victimization.

Much of the research to date focuses on increased substance use after SA (Davis et al., 2019; Schneider et al., 2009; Tripodi & Pettus-Davis, 2013), while less evidence exists for understanding how problematic substance use prior to a SA impacts health outcomes following a SA. Further, even less literature exists for understanding how a preexisting substance use disorder exacerbates the need for additional emergency department services following a SAMFE. The disproportionately high rates of underlying substance use among SA survivors could put some survivors at an increased risk for future injury and psychological crises following a SAMFE. This may result in the need for increased emergency care.

Given the risk of revictimization among survivors, it is likely that many survivors that receive a SAMFE following a SA in adulthood have a prior history of traumatic experiences. Survivors that experience multiple sexual traumas are at a greater risk for negative health outcomes, including increased problem drinking (Kilpatrick et al., 1997). As such, according to the drinking to cope theory, some survivors with previous exposure to trauma may have developed substance use behaviors to cope with trauma symptoms (Kilpatrick et al., 1997; Nishith et al., 2000). Therefore, substance use concerns may develop or reignite as a method to cope with trauma symptoms following a SA. Research has shown that alcohol misuse is associated with more risky behaviors, and greater injuries can increase the risk of sexual assault (Corte & Sommers, 2005; Lorenz & Ullman, 2016; Perkins, 2002). Survivors of a recent SA may be more vulnerable to increased alcohol or drug use, which may exacerbate their risk for injury, psychiatric concerns, or medical emergencies leading to a potential increased risk for post-SAMFE emergency department utilization.

SAs that involve alcohol or drug use are more likely to lead to injury and sometimes even death (Abbey et al., 2001; Fiorentin & Logan, 2019; Lawyer, et al., 2010). A study by Ullman and colleagues (1999) showed that sexual victimization severity is positively associated with substance use during the assault. Similarly, another study from the National Violence Against Women Survey found that among college students, assaults were more severe among survivors that reported alcohol intoxication during the assault (Tjaden & Thoennes, 2000). This indicates that individuals with underlying substance misuse may experience more severe physical injury during a SA, which may result in the need for greater emergency care after the SAMFE.

To our knowledge, there has yet to be research examining the impact of preexisting substance misuse on the frequency of emergency care following a SA. To this end, the current study aims to fill this gap by examining this association. Based on research suggesting that substance misuse is associated with more acute injury and repeated victimization, we hypothesize that preexisting substance misuse coupled with a recent SA may exacerbate the likelihood that a survivor may return to the emergency department more frequently in the year following a SAMFE.

### **1.7 Injury-Related Diagnoses and Sexual Assault**

Physical injury, both intentional and unintentional, and injury diagnoses have been established as correlates associated with emergency department use (Rockett et al., 2012). Research has identified alcohol and drug use as two strong predictors of injury-related visits to the emergency department (Cherpitel et al., 2013). Individuals with SA histories may engage in more risky behaviors, such as substance misuse as a way to cope with psychological distress resulting from trauma (Littleton et al., 2013). Therefore, individuals with a previous injury diagnosis in addition to experiencing a recent SA may be at a particular increased risk for future



injury, leading to more emergency department visits post-assault.

Additionally, survivors with premorbid mental and physical health concerns prior to a SA may be at an even greater likelihood for repeated emergency care following an assault. This may be a result of trauma and injury symptoms related to the SA exacerbating prior mental or physical health concerns and thereby increasing the risk for emergency services. While the literature has identified sustained injury and substance use concerns as risk factors for emergency department utilization, no research to date has examined these characteristics prospectively within the context of survivors of SA (Hunt et al., 2006; Krieg et al., 2016). Understanding premorbid factors prior to a SA that put individuals at greater risk of utilizing emergency services is important developing of interventions that seek to mitigate risk trajectories. The current study will address these gaps by assessing the relationship between injuries in the year prior to SA and the number of emergency department visits in the year after SA.

### **1.8 Aims of the Present Study**

The current study examined the associations between event-related characteristics of a recent SA and the number of emergency department visits in the year following a SAMFE among survivors. This study also examined the associations between pre-assault substance use and injury-related diagnoses and the number of emergency department visits following a recent SA. Lastly, the study examined whether multiple SAMFEs among survivors of SA moderates the association between assault characteristics and pre-SAMFE diagnoses on post-SAMFE emergency department visits. The current study addressed these gaps in the literature by determining specific factors before and during a SA that are associated with increased emergency care in the year following a SAMFE.

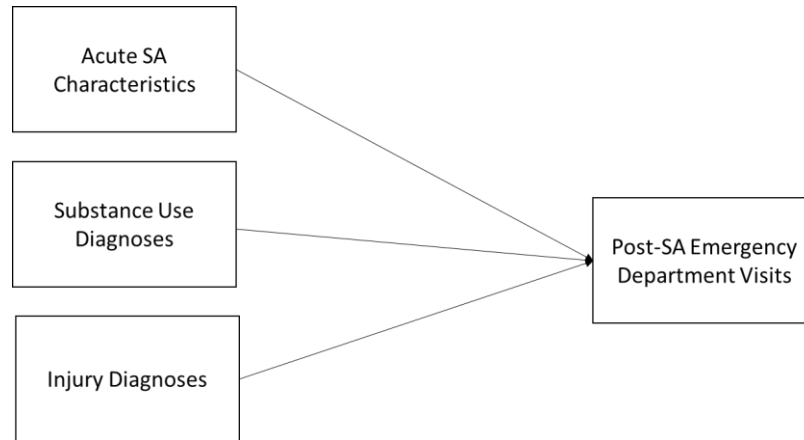
### ***1.8.1 Aim 1***

The current study examined pre-SAMFE diagnoses, SA characteristics, and post-assault emergency department visits and asked: Are SA characteristics, substance use diagnoses, and injury-related diagnoses associated with a greater number of emergency department visits following a SAMFE?

**Hypothesis 1:** Acute features of the SA (i.e., genital injury, non-genital injury, SA perpetrated by an intimate partner, alcohol or drug use involvement) will be associated with a greater number of emergency department visits in the year following the SAMFE.

**Hypothesis 2:** Substance use diagnoses in the year prior to the SAMFE will be significantly associated with post-SA emergency department visits, such that a substance use diagnosis pre-SAMFE will be linked to a greater number of emergency department visits in the year following the SAMFE.

**Hypothesis 3:** Injury related diagnoses in the year prior to the SAMFE will be significantly associated with post-SA emergency department visits, such that a substance use diagnosis pre-SAMFE will be linked to a greater number of emergency department visits in the year following the SAMFE.



*Figure 1. A conceptual model for factors predicted to be associated with post-assault emergency department visits.*

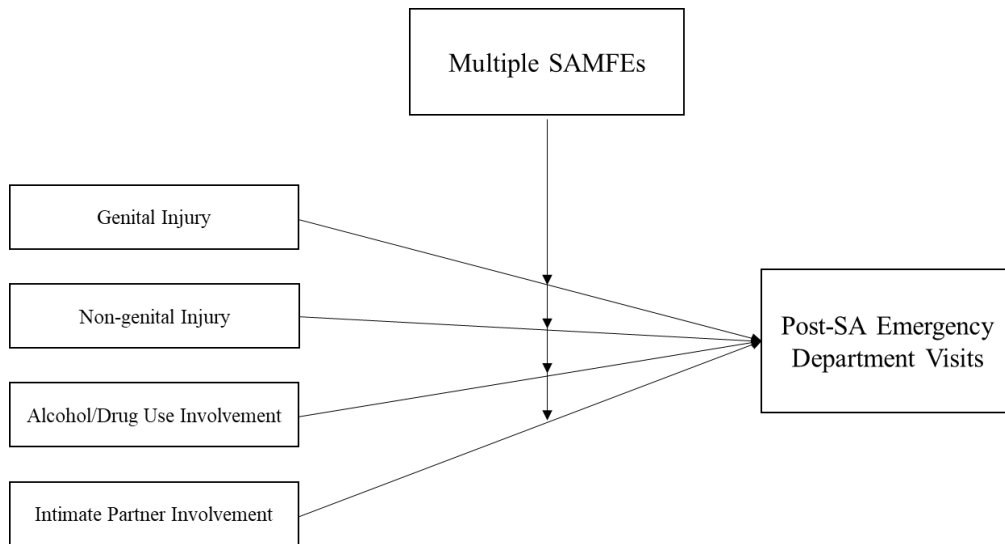
### **1.8.2 Exploratory Aim**

Do multiple SAMFEs moderate the associations among acute features of the SA, substance use diagnoses, and injury-related diagnoses with the number of emergency department visits in the year following the SAMFE?

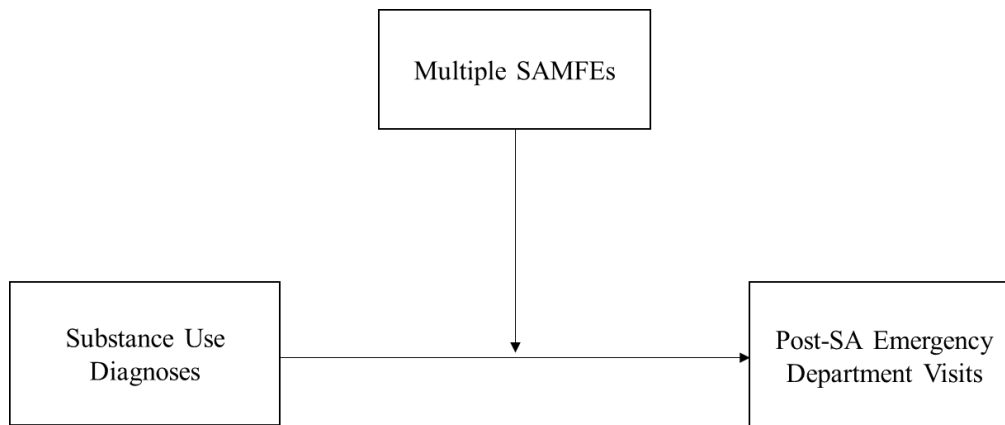
**Hypothesis 4:** Acute features of the SA will be more strongly associated with emergency department visits in the year following the SAMFE among those with multiple SAMFEs compared to one SAMFE.

**Hypothesis 5:** The associations between substance use diagnoses in the year prior to the SAMFE will be more strongly associated with emergency department visits in the year following the SAMFE among those with multiple SAMFEs compared to one SAMFE.

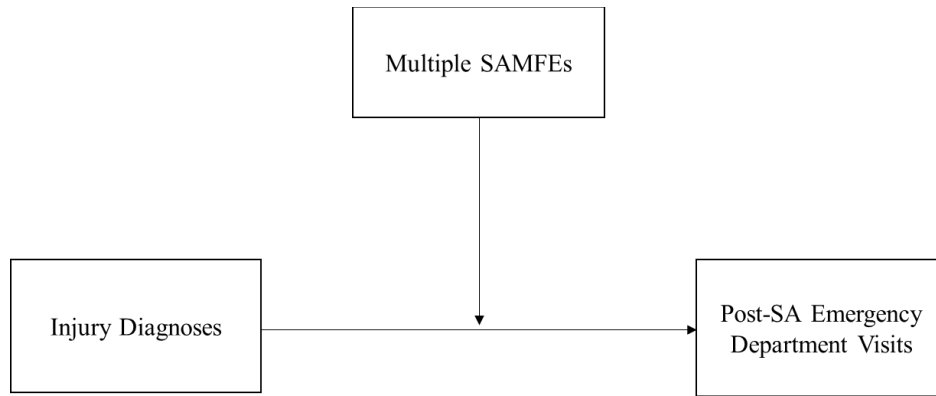
**Hypothesis 6:** The associations between injury-related diagnoses in the year prior to the SAMFE will be more strongly associated with emergency department visits in the year following the SAMFE among those with multiple SAMFEs compared to one SAMFE.



*Figure 2. Model for multiple SAMFEs moderating the association between acute SA characteristics and post-assault emergency department visits.*



*Figure 3. Model for multiple SAMFEs moderating the association between pre-SAMFE substance use diagnoses and post-assault emergency department visits.*



*Figure 4. Model for multiple SAMFEs moderating the association between injury-related diagnoses and post-assault emergency department visits.*

## 2 METHODS

### 2.1 Participants

Data for the current study were collected within a larger study at a large academic medical center in the southeastern United States. The study sample included 123 adults who received a SAMFE ranging from 18 to 67 ( $M=31.52$ ,  $SD=11.78$ ), and 94.3% identified as female. Survivors in this study identified as White ( $n=87$ , 70.7%), Black ( $n=33$ , 26.8%), Asian ( $n=1$ , 0.8%), Latine ( $n=3$ , 2.4%), and other ( $n=2$ , 1.6%). Among study participants, 59.3% did not have health insurance coverage, 26% were insured by Medicaid, 10.6% had private health insurance, and 4.1% had pending insurance at the time of the SAMFE.

### 2.2 Procedure

The current study used a retrospective cohort design. All study procedures were approved by the Institutional Review Board prior to data access, and all participants consented to the use of their medical records for research. Following study approval, the electronic medical records were accessed for all individuals aged 18 or older receiving a SAMFE within 120 hours of the assault between July 1, 2014 to May 15, 2018. We only included participants in this study who had hospital data one year before and one year after the SAMFE. Data used to assess assault characteristics, diagnoses prior to receiving a SAMFE, and the number of emergency department visits in one year following a SAMFE were collected through participants' electronic medical record. Demographic information was obtained directly from the electronic medical record and paired with the SA nurse examiner notes, described below. After pairing, individual medical record numbers were replaced by randomly generated personal identification numbers in order to protect confidentiality. All electronic medical record data has been collected and secondary data analysis methods were used to retrospectively evaluate this data.

## **2.3 Measures**

### ***2.3.1 Demographics.***

Demographic information, including race, ethnicity, gender, and age at time of first SAMFE visit was acquired directly from each participant's electronic medical record. Given the lack of variability across racial categories, race was condensed into three categories: 1.

White/Caucasian, 2. Black/African American, 3. Other.

### ***2.3.2 Multiple SAMFEs***

Multiple SAMFE data was assessed by the number of SAMFEs conducted at the same medical center as detailed in the participants' electronic medical record. This was measured as a dichotomous variable where only one SAMFE was coded as zero and more than one SAMFE was coded as one.

### ***2.3.3 Visits Prior to SAMFE***

The number of visits to the same hospital in the year prior to the SAMFE was assessed directly from each participant's electronic medical record. These visits include all visits to any department or clinic within the hospital (e.g., outpatient clinics, emergency department visits, inpatient care, etc.). Participants included in this study had at least one visit in the year prior to the SAMFE and this was measured as a continuous variable.

### ***2.3.4 Assault Characteristics***

Assault characteristics were identified by SA nurse examiners at the time of the SAMFE. This included if the assault involved alcohol or drug intoxication, genital injury, non-genital injury, or if the assault was perpetrated by an intimate partner. Each characteristic was coded as a dichotomous variable where no endorsement of the characteristic equaled zero and endorsement of the characteristic equaled one.

### 2.3.5 Substance Use Diagnoses One Year Prior to SAMFE

Substance use diagnoses were obtained from each participant's electronic medical record in the year prior to the SAMFE using the International Classification of Diseases-9 (ICD-9) and ICD-10 codes (see Table 1). Only diagnoses that were given in outpatient or inpatient clinics at the same hospital were a part of the electronic medical record. This was measured as a dichotomous variable where no substance use diagnoses prior to a SAMFE were coded as zero and one or more substance use diagnoses prior to a SAMFE were coded as one.

*Table 1. International Classification of Diseases 9/10 categories for substance use diagnoses*

Contact with and (suspected) exposure to environmental tobacco smoke (acute) (chronic)
Accidental poisoning by antidepressants(E854.0)
Accidental poisoning by barbiturates
Accidental poisoning by other opiates and related narcotics
Accidental poisoning by unspecified tranquilizer
Acute alcoholic intoxication in alcoholism, unspecified
Adverse effect of antiviral drugs, initial encounter
Adverse effect of other opioids, initial encounter
Adverse effect of unspecified systemic antibiotic, initial encounter
Alcohol abuse with intoxication, uncomplicated
Alcohol abuse with intoxication, unspecified
Alcohol abuse, continuous
Alcohol abuse, episodic
Alcohol abuse, in remission
Alcohol abuse, uncomplicated
Alcohol abuse, unspecified
Alcohol dependence with alcohol-induced mood disorder
Alcohol dependence with alcohol-induced psychotic disorder with hallucinations
Alcohol dependence with intoxication, unspecified
Alcohol dependence with withdrawal delirium
Alcohol dependence with withdrawal with perceptual disturbance
Alcohol dependence with withdrawal, uncomplicated
Alcohol dependence with withdrawal, unspecified
Alcohol dependence, in remission
Alcohol dependence, uncomplicated
Alcohol induced acute pancreatitis
Alcohol use complicating the puerperium
Alcohol withdrawal
Alcoholic hepatitis without ascites



Alcoholic liver damage, unspecified
Blood alcohol level of 100-119 mg/100 ml
Blood alcohol level of 120-199 mg/100 ml
Blood alcohol level of 200-239 mg/100 ml
Blood alcohol level of 20-39 mg/100 ml
Blood alcohol level of 240 mg/100 ml or more
Blood alcohol level of 40-59 mg/100 ml
Blood alcohol level of 60-79 mg/100 ml
Blood alcohol level of 80-99 mg/100 ml
Blood alcohol level of less than 20 mg/100 ml
Cannabis abuse, uncomplicated
Cannabis abuse, unspecified
Cannabis dependence with psychotic disorder, unspecified
Cannabis dependence, in remission
Cannabis dependence, uncomplicated
Cannabis use, unspecified with psychotic disorder, unspecified
Cannabis use, unspecified, uncomplicated
Cocaine abuse with cocaine-induced mood disorder
Cocaine abuse with cocaine-induced psychotic disorder, unspecified
Cocaine abuse with intoxication, unspecified
Cocaine abuse, continuous
Cocaine abuse, in remission
Cocaine abuse, uncomplicated
Cocaine abuse, unspecified
Cocaine dependence with cocaine-induced mood disorder
Cocaine dependence with cocaine-induced psychotic disorder, unspecified
Cocaine dependence with intoxication with perceptual disturbance
Cocaine dependence with intoxication, uncomplicated
Cocaine dependence with intoxication, unspecified
Cocaine dependence with unspecified cocaine-induced disorder
Cocaine dependence with withdrawal
Cocaine dependence, in remission
Cocaine dependence, uncomplicated
Cocaine dependence, unspecified
Cocaine use, unspecified with cocaine-induced mood disorder
Cocaine use, unspecified with cocaine-induced psychotic disorder with hallucinations
Cocaine use, unspecified, uncomplicated
Combinations of drug dependence excluding opioid type drug, continuous
Combinations of drug dependence excluding opioid type drug, unspecified
Combinations of opioid type drug with any other drug dependence, unspecified
Drug dependence, antepartum
Drug dependence, antepartum(648.33)
Drug dependence, postpartum

Drug induced akathisia
Drug induced constipation
Drug use complicating childbirth
Drug use complicating pregnancy, third trimester
Drug use complicating the puerperium
Drug withdrawal
Drug-induced mood disorder
Drug-induced polyneuropathy
Inhalant abuse, uncomplicated
Nicotine dependence, cigarettes, uncomplicated
Nicotine dependence, other tobacco product, uncomplicated
Nicotine dependence, unspecified, uncomplicated
Opioid abuse with intoxication, unspecified
Opioid abuse with opioid-induced mood disorder
Opioid abuse, continuous
Opioid abuse, in remission
Opioid abuse, uncomplicated
Opioid abuse, unspecified
Opioid dependence with opioid-induced mood disorder
Opioid dependence with opioid-induced psychotic disorder, unspecified
Opioid dependence with unspecified opioid-induced disorder
Opioid dependence with withdrawal
Opioid dependence, in remission
Opioid dependence, uncomplicated
Opioid type dependence, unspecified
Opioid use, unspecified with opioid-induced mood disorder
Opioid use, unspecified, uncomplicated
Other and unspecified alcohol dependence, continuous drinking behavior
Other and unspecified alcohol dependence, unspecified drinking behavior
Other drug-induced pancytopenia
Other psychoactive substance abuse, uncomplicated
Other psychoactive substance dependence with psychoactive substance-induced mood disorder
Other psychoactive substance dependence with psychoactive substance-induced psychotic disorder with hallucinations
Other psychoactive substance dependence with psychoactive substance-induced psychotic disorder, unspecified
Other psychoactive substance dependence, uncomplicated
Other psychoactive substance use, unspecified with psychoactive substance-induced mood disorder
Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic disorder, unspecified
Other psychoactive substance use, unspecified, uncomplicated
Other specified drug dependence, unspecified

Other stimulant abuse with intoxication with perceptual disturbance
Other stimulant abuse, uncomplicated
Other stimulant dependence with stimulant-induced mood disorder
Other stimulant dependence with stimulant-induced psychotic disorder, unspecified
Other stimulant dependence with withdrawal
Other stimulant dependence, in remission
Other stimulant dependence, uncomplicated
Other stimulant use, unspecified with withdrawal
Other stimulant use, unspecified, uncomplicated
Other, mixed, or unspecified nondependent drug abuse, unspecified
Poisoning by barbiturates
Poisoning by barbiturates, undetermined whether accidentally or purposely inflicted
Poisoning by benzodiazepine-based tranquilizers
Poisoning by benzodiazepines, accidental (unintentional), initial encounter
Poisoning by benzodiazepines, intentional self-harm, initial encounter
Poisoning by cannabis (derivatives), accidental (unintentional), initial encounter
Poisoning by cocaine
Poisoning by cocaine, accidental (unintentional), initial encounter
Poisoning by heroin
Poisoning by heroin, accidental (unintentional), initial encounter
Poisoning by heroin, intentional self-harm, initial encounter
Poisoning by methadone, accidental (unintentional), initial encounter
Poisoning by opiates and related narcotics, other
Poisoning by opium (alkaloids), unspecified
Poisoning by other antidepressants
Poisoning by other antiepileptic and sedative-hypnotic drugs, intentional self-harm, initial encounter
Poisoning by other antipsychotics and neuroleptics, intentional self-harm, initial encounter
Poisoning by other tranquilizers
Poisoning by selective serotonin and norepinephrine reuptake inhibitors, intentional self-harm, initial encounter
Poisoning by selective serotonin reuptake inhibitors, intentional self-harm, initial encounter
Poisoning by unspecified drugs, medicaments and biological substances, intentional self-harm, initial encounter
Poisoning by unspecified drugs, medicaments and biological substances, undetermined, initial encounter
Poisoning by unspecified narcotics, accidental (unintentional), initial encounter
Sedative, hypnotic or anxiolytic abuse, uncomplicated
Sedative, hypnotic or anxiolytic abuse, unspecified
Sedative, hypnotic or anxiolytic dependence, unspecified
Sedative, hypnotic, or anxiolytic use, unspecified, uncomplicated
Smoking (tobacco) complicating childbirth
Smoking (tobacco) complicating pregnancy, first trimester

Smoking (tobacco) complicating pregnancy, second trimester
Smoking (tobacco) complicating pregnancy, third trimester
Smoking (tobacco) complicating pregnancy, unspecified trimester
Smoking (tobacco) complicating the puerperium
Substance abuse in family
Suicide and self-inflicted poisoning by barbiturates
Suicide and self-inflicted poisoning by other specified drugs and medicinal substances
Suicide and self-inflicted poisoning by tranquilizers and other psychotropic agents
Tobacco use disorder
Tobacco use disorder complicating pregnancy, childbirth, or the puerperium, antepartum condition or complication
Tobacco use disorder complicating pregnancy, childbirth, or the puerperium, delivered, with or without mention of antepartum condition
Tobacco use disorder complicating pregnancy, childbirth, or the puerperium, postpartum condition or complication
Toxic effect of ethanol, accidental (unintentional), initial encounter
Toxic effect of ethanol, intentional self-harm, initial encounter
Toxic effect of unspecified substance, intentional self-harm, initial encounter
Unspecified drug dependence, unspecified
Unspecified drug or medicinal substance causing adverse effect in therapeutic use
Unspecified drug-induced mental disorder

### ***2.3.6 Injury-Related Diagnoses One Year Prior to SAMFE.***

Injury-related diagnoses were obtained from each participant's electronic medical record using a list of ICD-9 and ICD-10 codes (see Table 2). Injury-related diagnoses in this study were conceptualized as diagnoses indicating specific physical harm or referring to injury. This was measured as a dichotomous variable where no injury-related diagnoses prior to a SAMFE was coded as zero and one or more injury-related diagnoses prior to a SAMFE was coded as one.

*Table 2. International Classification of Diseases 9/10 categories for injury-related diagnoses*

Contact with hot engines, machinery and tools, initial encounter
Diaper dermatitis
Encounter for examination and observation following alleged adult physical abuse
Other dentofacial anomalies
Other superficial bite of right thigh, initial encounter
Shoulder and upper arm, insect bite, nonvenomous, without mention of infection(912.4)
Abrasion of abdominal wall, initial encounter
Abrasion of left elbow, initial encounter

Abrasion of left forearm, initial encounter
Abrasion of left upper arm, initial encounter
Abrasion of lip, initial encounter
Abrasion of lower back and pelvis, initial encounter
Abrasion of nose, initial encounter
Abrasion of other part of head, initial encounter
Abrasion of other specified part of neck, initial encounter
Abrasion of right elbow, initial encounter
Abrasion of right eyelid and periocular area, initial encounter
Abrasion of right forearm, initial encounter
Abrasion of right shoulder, initial encounter
Abrasion of right upper arm, initial encounter
Abrasion of unspecified part of head, initial encounter
Abrasion of unspecified part of neck, initial encounter
Abrasion or friction burn of other, multiple, and unspecified sites, without mention of infection
Abrasion, left knee, initial encounter
Abrasion, left lower leg, initial encounter
Abrasion, right hip, initial encounter
Abrasion, right knee, initial encounter
Abrasion, right lower leg, initial encounter
Accident caused by knives, swords, and daggers
Accident caused by other hand tools and implements
Accident caused by other specified cutting and piercing instruments or objects
Accident caused by unspecified firearm missile
Accidental bite by another person, initial encounter
Accidental fall from bed
Accidental fall on or from other stairs or steps
Achilles tendinitis, right leg
Anterior dislocation of right humerus, initial encounter
Assault by blunt object, initial encounter
Assault by cutting and piercing instrument
Assault by handgun
Assault by other and unspecified firearm
Assault by other bodily force, initial encounter
Assault by other bodily force, subsequent encounter
Assault by other sharp object, initial encounter
Assault by other specified means
Assault by other specified means, initial encounter
Assault by smoke, fire and flames, initial encounter
Assault by strike against or bumped into by another person, initial encounter
Assault by unarmed brawl or fight, initial encounter
Assault by unspecified means
Bite of nonvenomous arthropod

Bite of nonvenomous arthropod(E906.4)
Bitten by dog, initial encounter
Bitten or stung by nonvenomous insect and other nonvenomous arthropods, initial encounter
Blister (nonthermal), right foot, initial encounter
Burn of unspecified degree of left ankle, initial encounter
Burn of unspecified degree of left forearm, initial encounter
Burn of unspecified degree of left palm, initial encounter
Burn of unspecified degree of right forearm, initial encounter
Burn of unspecified degree of right hand, unspecified site, initial encounter
Burn of unspecified degree of right lower leg, initial encounter
Burns involving less than 10% of body surface
Car driver injured in collision with fixed or stationary object in traffic accident, initial encounter
Car driver injured in collision with other type car in traffic accident, initial encounter
Car driver injured in noncollision transport accident in traffic accident, initial encounter
Car occupant (driver) (passenger) injured in unspecified traffic accident, initial encounter
Car passenger injured in collision with other type car in traffic accident, initial encounter
Caught, crushed, jammed, or pinched between moving objects, initial encounter
Caught, crushed, jammed, or pinched between stationary objects, initial encounter
Closed fracture of unspecified part of fibula with tibia
Closed fracture of unspecified phalanx or phalanges of hand
Complete rotator cuff tear or rupture of right shoulder, not specified as traumatic
Compression of brain
Concussion with loss of consciousness of 30 minutes or less, initial encounter
Concussion with loss of consciousness of unspecified duration
Concussion with no loss of consciousness
Contact with knife, initial encounter
Contact with other nonpowered hand tool, initial encounter
Contact with other nonpowered hand tool, subsequent encounter
Contact with other sharp object, undetermined intent, initial encounter
Contusion of abdominal wall, initial encounter
Contusion of chest wall
Contusion of eyeball and orbital tissues, right eye, initial encounter
Contusion of face, scalp, and neck except eye(s)
Contusion of knee
Contusion of left eyelid and periocular area, initial encounter
Contusion of left hand, initial encounter
Contusion of left knee, initial encounter
Contusion of left lower leg, initial encounter
Contusion of left shoulder, initial encounter
Contusion of left thigh, initial encounter
Contusion of left thumb without damage to nail, initial encounter
Contusion of left upper arm, initial encounter

Contusion of lower back and pelvis, initial encounter
Contusion of multiple sites, not elsewhere classified
Contusion of other part of head, initial encounter
Contusion of other part of head, subsequent encounter
Contusion of right elbow, initial encounter
Contusion of right hand, initial encounter
Contusion of right lower leg, initial encounter
Contusion of right upper arm, initial encounter
Contusion of scalp, initial encounter
Contusion of unspecified back wall of thorax, initial encounter
Contusion of unspecified front wall of thorax, initial encounter
Contusion of unspecified part of head, initial encounter
Contusion of unspecified part of lower limb
Contusion of unspecified part of neck, initial encounter
Contusion of wrist
Cracked tooth
Cramp and spasm
Cutaneous abscess of abdominal wall
Cutaneous abscess of buttock
Cutaneous abscess of face
Cutaneous abscess of left axilla
Cutaneous abscess of left hand
Cutaneous abscess of left upper limb
Cutaneous abscess of right axilla
Cutaneous abscess of right lower limb
Displaced bicondylar fracture of left tibia, subsequent encounter for closed fracture with delayed healing
Displaced fracture of lateral end of left clavicle, initial encounter for closed fracture
Displaced fracture of lateral end of left clavicle, subsequent encounter for fracture with routine healing
Displaced fracture of lateral malleolus of right fibula, initial encounter for closed fracture
Displaced fracture of shaft of left clavicle, subsequent encounter for fracture with routine healing
Displaced oblique fracture of shaft of left fibula, initial encounter for closed fracture
Displacement of intervertebral disc, site unspecified, without myelopathy
Displacement of lumbar intervertebral disc without myelopathy
Disruption of cesarean delivery wound
Elbow, forearm, and wrist, abrasion or friction burn, without mention of infection
Electrocution and nonfatal effects of electric current
Erythema due to burn (first degree) of unspecified site of hand
Fall (on) (from) other stairs and steps, initial encounter
Fall (on) (from) unspecified stairs and steps, initial encounter
Fall from bed, initial encounter

Fall on same level from slipping, tripping and stumbling with subsequent striking against furniture, initial encounter
Fall on same level from slipping, tripping and stumbling with subsequent striking against other object, initial encounter
Fall on same level from slipping, tripping and stumbling with subsequent striking against other sharp object, initial encounter
Fall on same level from slipping, tripping and stumbling without subsequent striking against object, initial encounter
Fall on same level, unspecified, initial encounter
Fall resulting in striking against sharp object
Fracture of alveolus of maxilla, initial encounter for closed fracture
Fracture of nasal bones, initial encounter for closed fracture
Fracture of one rib, left side, initial encounter for closed fracture
Fracture of one rib, right side, initial encounter for closed fracture
Fracture of orbital floor, right side, initial encounter for closed fracture
Fracture of other bone following insertion of orthopedic implant, joint prosthesis, or bone plate
Fracture of other specified skull and facial bones, right side, initial encounter for closed fracture
Fracture of other specified skull and facial bones, unspecified side, subsequent encounter for fracture with routine healing
Fracture of unspecified part of left clavicle, subsequent encounter for fracture with routine healing
Fracture, cause unspecified
Hemorrhage of anus and rectum
Hemorrhage of rectum and anus
Hemorrhage, not elsewhere classified
Hemorrhage, unspecified
Incomplete rotator cuff tear or rupture of right shoulder, not specified as traumatic
Injury due to legal intervention by other specified means
Injury of conjunctiva and corneal abrasion without foreign body, left eye, initial encounter
Injury of conjunctiva and corneal abrasion without foreign body, left eye, subsequent encounter
Injury of face and neck
Injury, other and unspecified, elbow, forearm, and wrist
Injury, other and unspecified, hand, except finger
Injury, other and unspecified, unspecified site
Injury, poisoning and certain other consequences of external causes complicating pregnancy, third trimester
Injury, unspecified
Insect bite (nonvenomous) of left upper arm, initial encounter
Insect bite (nonvenomous) of lower back and pelvis, initial encounter
Insect bite (nonvenomous) of right upper arm, initial encounter
Insect bite (nonvenomous), left lower leg, initial encounter
Insect bite (nonvenomous), right lower leg, initial encounter



Laceration of other flexor muscle, fascia and tendon at forearm level, left arm, initial encounter
Laceration without foreign body of left elbow, initial encounter
Laceration without foreign body of left forearm, initial encounter
Laceration without foreign body of left forearm, subsequent encounter
Laceration without foreign body of left hand, initial encounter
Laceration without foreign body of left wrist, initial encounter
Laceration without foreign body of oral cavity, initial encounter
Laceration without foreign body of right eyelid and periocular area, initial encounter
Laceration without foreign body of right forearm, initial encounter
Laceration without foreign body of right index finger with damage to nail, initial encounter
Laceration without foreign body of right middle finger without damage to nail, initial encounter
Laceration without foreign body of right wrist, initial encounter
Laceration without foreign body of scalp, initial encounter
Laceration without foreign body of unspecified upper arm, initial encounter
Laceration without foreign body, left thigh, initial encounter
Laceration without foreign body, right knee, initial encounter
Laceration without foreign body, right thigh, initial encounter
Malar and maxillary bones, closed fracture
Maxillary fracture, left side, initial encounter for closed fracture
Motorcycle driver injured in collision with car, pick-up truck or van in traffic accident, initial encounter
Motorcycle passenger injured in collision with car, pick-up truck or van in traffic accident, initial encounter
Nondisplaced fracture of distal phalanx of right great toe, initial encounter for closed fracture
Nondisplaced fracture of first metatarsal bone, right foot, initial encounter for closed fracture
Nondisplaced fracture of proximal phalanx of right lesser toe(s), initial encounter for closed fracture
Nonunion of fracture
Open bite of unspecified part of neck, initial encounter
Open wound of abdominal wall, anterior, without mention of complication
Open wound of abdominal wall, lateral, without mention of complication
Open wound of back, without mention of complication
Open wound of buttock, without mention of complication
Open wound of finger(s) , without mention of complication
Open wound of foot except toe(s) alone, without mention of complication
Open wound of hip and thigh, without mention of complication
Open wound of lip, without mention of complication
Open wound of other and unspecified parts of neck, without mention of complication
Open wound of tooth (broken) (fractured) (due to trauma), without mention of complication
Open wound of wrist, without mention of complication
Open wound(s) (multiple) of unspecified site(s), complicated

Open wound(s) (multiple) of unspecified site(s), without mention of complication
Other accident caused by striking against or being struck accidentally by objects or persons with or without subsequent fall
Other accident resulting from conflagration in other and unspecified building or structure
Other accidental fall from one level to another
Other and unspecified open wound of head without mention of complication
Other and unspecified superficial injury of elbow, forearm, and wrist, without mention of infection
Other fall
Other fall from one level to another, initial encounter
Other fracture of right lower leg, initial encounter for closed fracture
Other fracture of shaft of left fibula, subsequent encounter for closed fracture with routine healing
Other injuries of right eye and orbit, initial encounter
Other injury of abdomen
Other injury of unspecified body region
Other injury of unspecified body region, initial encounter
Other instability, left shoulder
Other specified injuries of head, initial encounter
Other sprain of right shoulder joint, initial encounter
Passenger injured in collision with unspecified motor vehicles in traffic accident, initial encounter
Pedal cycle driver injured in collision with car, pick-up truck or van in traffic accident, initial encounter
Pedal cycle driver injured in noncollision transport accident in nontraffic accident, initial encounter
Pedestrian injured in traffic accident involving unspecified motor vehicles, initial encounter
Pedestrian injured in unspecified transport accident, subsequent encounter
Peritoneum injury with open wound into cavity
Person injured in other specified noncollision transport accidents involving motor vehicle (traffic), initial encounter
Person injured in unspecified motor-vehicle accident, traffic, initial encounter
Postconcussional syndrome
Puncture wound without foreign body of left hand, initial encounter
Puncture wound without foreign body of left upper arm, initial encounter
Rectum injury without mention of open wound into cavity
Recurrent dislocation of shoulder joint
Recurrent dislocation, unspecified shoulder
Second-degree perineal laceration, with delivery
Sprain and strain of other specified sites of shoulder and upper arm
Sprain and strain of unspecified site of shoulder and upper arm
Sprain of ankle, unspecified site
Sprain of ligaments of cervical spine, initial encounter
Sprain of lumbar region

Sprain of unspecified ligament of left ankle, initial encounter
Sprain of unspecified ligament of right ankle, initial encounter
Strain of muscle, fascia and tendon at neck level, initial encounter
Strain of unspecified muscle, fascia and tendon at shoulder and upper arm level, left arm, initial encounter
Striking against or struck accidentally by objects or persons in sports without subsequent fall
Striking against or struck accidentally by other stationary object without subsequent fall
Striking against or struck by other objects, initial encounter
Striking against other object with subsequent fall, initial encounter
Striking against unspecified object with subsequent fall, initial encounter
Thoracic or lumbosacral neuritis or radiculitis, unspecified
Trunk abrasion or friction burn, without mention of infection
Unspecified car occupant injured in collision with other type car in traffic accident, initial encounter
Unspecified fall
Unspecified fall, initial encounter
Unspecified fracture of shaft of left tibia, subsequent encounter for open fracture type I or II with delayed healing
Unspecified fracture of upper end of left tibia, subsequent encounter for open fracture type IIIA, IIIB, or IIIC with nonunion
Unspecified injury of face, initial encounter
Unspecified injury of head, initial encounter
Unspecified injury of left ankle, initial encounter
Unspecified injury of left wrist, hand and finger(s), initial encounter
Unspecified injury of right ankle, initial encounter
Unspecified injury of right eye and orbit, initial encounter
Unspecified injury of right foot, initial encounter
Unspecified injury of right wrist, hand and finger(s), initial encounter
Unspecified injury of thorax, initial encounter
Unspecified injury of unspecified kidney, initial encounter
Unspecified open wound, left foot, subsequent encounter
Unspecified physical fracture of lower end of right tibia, subsequent encounter for fracture with routine healing
Unspecified rotator cuff tear or rupture of left shoulder, not specified as traumatic
Unspecified sprain of right wrist, initial encounter

### ***2.3.7 Emergency Department Visits One Year After SAMFE.***

Visits to the same medical center for emergency department visits within a year following SAMFE were collected directly from each participant's electronic medical record. The

number of emergency department visits in the one-year post-assault was measured as a continuous variable.

## **2.4 Data Analysis**

### ***2.4.1 Descriptive Statistics***

Descriptive and frequency statistics were conducted for each proposed study variable to assess variance, skewness, kurtosis, and normal distribution using IBM SPSS Version 28. The dependent variable, emergency department visits post-assault, was skewed and clustered at zero; therefore, nonlinear models were used due to account for violations in assumptions. Bivariate correlations were conducted to examine the strength and directionality of the associations among the study variables with the p-value set a  $p > .05$ .

### ***2.4.2 Power Analysis***

A post-hoc Monte Carlo simulation power analysis was conducted in Mplus version 8.1 (Muthén & Muthén, 1998-2017). To estimate the number of participants needed to have 80% power to detect significant effects on the primary outcome variable utilizing the predictor variables with a negative binomial model, data were simulated using conservative social science estimates of effect size (Goldbach et al., 2014; Carvalho et al., 2011; Cohen, 1988). The simulations were replicated 100,000 times to stabilize the effects and were estimated with a robust maximum likelihood estimator to account for non-normality. These simulations estimated that for the primary aims, the current sample had sufficient power to detect medium to large effects at the .05 alpha level of each predictor on the outcome variable simultaneously in one model.

As for the exploratory aims, data were simulated using the same estimates of effect size. The simulations were replicated 100,000 times to stabilize the effects and were estimated

utilizing a robust maximum likelihood estimator to account for non-normality. Simulations estimated that the sample was insufficient to detect small, medium, or large interactive effects at the .05 alpha level. Simulations revealed that 160 participants were needed to detect medium to large effects and 210 participants were necessary to detect small effects at the .05 alpha level. Therefore, the sample used for this study has sufficient power to detect medium to large effects for the primary aims; however, the exploratory aim is underpowered, thus findings should be interpreted cautiously.

### ***2.4.3 Model Fit***

Given the overdispersal and zero-inflated nature of the dependent variable, the study compared three different statistical model types to assess which statistical test best fit the data. Model fit was examined across the following statistical tests, a negative binomial regression, a zero-inflated Poisson regression, and a zero-inflated negative binomial regression. Within each of these models, emergency department visits one-year post-assault was entered as the dependent variable, and SA characteristics, substance use diagnoses, injury-related diagnoses pre-SAMFE, and multiple SAMFEs were entered as the predictor variables where parameters were estimated using a numerical maximum likelihood method. Demographic variables including age, sex, race, number of emergency department visits prior to SAMFE, and insurance status were controlled for by entering them into each model as covariates. Predictor variables, pre-SA substance use diagnoses, pre-SA injury-related diagnoses were dichotomized where having no diagnoses was coded as zero and one or more diagnoses was coded as one. This was done to mitigate diagnosis inflation in the dataset where some participants had a considerable number of substance use diagnoses which are not interpretable for the current analyses. Additionally, multiple SAMFEs was dichotomized where only one SAMFE was coded as zero and more than one SAMFE was

coded as one. SA characteristics were entered into the respective models as dichotomized variables where no endorsement of the characteristics was coded as zero and endorsement of the characteristic was coded as one. Model fit was determined by the Bayes Information Criterion (BIC), the Akaike Information Criterion (AIC), and the log-likelihood (Burnham & Anderson, 2004). When comparing each of the models, the model with the lowest BIC and AIC value was determined as the best fitting model.

Cases where follow up data was missing for the year post-SA was excluded from the analyses. Analyses were conducted using IBM SPSS Statistics 25 and Mplus Version 8. The model fit statistics revealed that a negative binomial regression model best fit the data; therefore, a negative binomial regression was used to assess the study aims (see Table 3-4).

*Table 3. Fit of Models Tested for Aim 1.*

Model Name	AIC	BIC
Negative binomial	3389.19	3450.45
Zero inflated Poisson	3495.83	3569.33
Zero inflated negative binomial	3396.51	3473.07

*Note.* AIC = Akaike information criterion; BIC = Bayesian information criterion

*Table 4. Fit of Models Tested for Exploratory Aim.*

Model Name	AIC	BIC
Negative binomial	4170.34	4249.16
Zero inflated Poisson	4186.92	4310.11
Zero inflated negative binomial	4177.32	4286.45

*Note.* AIC = Akaike information criterion; BIC = Bayesian information criterion

#### **2.4.4 Analyses for Aim 1**

**Hypothesis 1-3.** Acute SA characteristics during an assault, a pre-SAMFE substance use disorder, and pre-SAMFE injury-related disorder will each predict a greater number of emergency department visits in the year following the SAMFE.

Characteristics of the assault such as genital injury, non-genital injury, SA perpetrated by a partner, alcohol or drug involvement were each entered as predictor variables in a negative

binomial regression model. Additionally, a pre-SAMFE substance use disorder and pre-SAMFE injury-related diagnosis were entered as predictor variables with emergency department visits one-year post-assault as the dependent variable. Demographic variables such as age, sex, race (dummy coded with non-Latine White as the reference group), number of visits prior to the SAMFE, and health insurance status (dummy coded with private insurance as the reference group) were entered as covariates in the regression model. Beta coefficients and incident rate ratios were used to examine the direction and strength of the main effects between SA characteristics and pre-SAMFE diagnoses on emergency department visits using a p-value of  $<.05$  to indicate statistical significance. Estimated marginal means were computed to evaluate the predicted frequency in emergency department visits among those with and without SA characteristics, a pre-SA substance use diagnosis, and a pre-SA injury-related diagnosis. Individuals missing data on one or more of these variables were removed listwise from the analysis.

#### *2.4.5 Analyses for Exploratory*

**Hypothesis 4-6:** Acute features of the SA, pre-SAMFE substance use disorders, and pre-SAMFE injury disorders will be more strongly associated with emergency department visits in the year following the SAMFE among those with multiple SAMFEs compared to one SAMFE.

A separate negative binomial regression was conducted to examine the interaction effects of multiple SAMFEs on the associations between SA characteristics and pre-SAMFE diagnoses on post-SAMFE emergency department visits. In this model, demographic variables including age, sex, race (dummy coded with non-Latine White as the reference group), number of visits prior to the SAMFE, and health insurance status (dummy coded with private insurance as the

reference group) were entered as covariates and emergency department visits one year after the SAMFE was entered as the outcome variable. Predictors from aim one including genital injury, non-genital injury, alcohol or drug involvement, intimate partner involvement, pre-SAMFE substance use diagnoses, and pre-SAMFE injury diagnoses were entered as predictors.

Additionally, six interaction terms were entered to examine the interactions between multiple SAMFEs and SA characteristics, multiple SAMFEs and pre-SAMFE substance use diagnoses, and multiple SAMFEs and pre-SAMFE injury diagnoses. Beta coefficients and incidence rate ratios were used to examine the direction and strength of whether multiple SAMFEs modified the effect between SA characteristics, pre-SAMFE diagnoses and emergency department visits using a p-value of  $<.05$  to indicate statistical significance. Given insufficient power due to the sample size, effect sizes were computed to evaluate the potential directionality of the associations among interactions for those variables that were approaching significance. Based on prior published research (Chen et al., 2010), the current study used the odds ratio coefficient as a measure of effect size where a value of one was equal to no effect. While the evidence is somewhat limited for computing effect sizes for negative binomial models, some research suggests that a rate ratio of 1.50 is considered small, a rate ratio of 2.50 is considered medium, and a rate ratio of 4.30 is a large effect (Chen et al., 2010). This has been found to map on to Cohen's convention of effect size where a small is 0.1, medium is 0.3, and large is 0.5. For rate ratio values less than one, the reciprocal was computed to have an interpretable effect size. For example, a rate ratio of .50 would be equal to an effect size value of two, indicating a small to medium effect size.



### 3 RESULTS

#### 3.1 Descriptive Statistics

Approximately 59% of the study sample were individuals without health insurance coverage and approximately 70% of participants reported one or more emergency department visits in the year following a SAMFE. Additionally, the frequency of emergency department visits in the year after a SAMFE ranged from 0-25 visits, and 33.3% of participants had three or more emergency department visits in the following year. Descriptive statistics among key study variables are shown below (Table 5-6). Pearson correlations revealed significant associations among key study variables. Notably, gender was significantly related to post-SA emergency department visits such that men were more likely to have greater post-SA emergency department visits compared to women. Additionally, older individuals were more likely to have a pre-SAMFE substance use diagnosis ( $r(121)=.23, p=.03$ ). Alcohol or drug intoxication during an assault was negatively associated with intimate partner involvement ( $r(121)=-.30, p<.01$ ), pre-SAMFE injury diagnoses ( $r(121)=-.20, p=.02$ ), visits pre-SAMFE ( $r(121)=-.25, p=.02$ ), and emergency department visits post-assault ( $r(121)=-.24, p<.01$ ). Interestingly, having a substance use disorder prior to the SAMFE was not significantly correlated with alcohol or drug involvement during the assault ( $r(121)=.07, p=.14$ ). Post-SAMFE emergency department visits were positively associated with pre-SAMFE injury diagnoses ( $r(121)=.39, p<.01$ ), pre-SAMFE substance use diagnoses  $r(121)=.36, p<.01$ , pre-SAMFE visits  $r(121)=.44, p<.01$ , and multiple SAMFEs  $r(121)=.37, p<.01$ . Pre-SAMFE injury-related diagnoses were positively associated with pre-SAMFE substance use diagnoses  $r(121)=.31, p<.01$ , pre-SAMFE visits  $r(121)=.38, p<.01$ , and multiple SAMFEs  $r(121)=.20, p<.02$ . Lastly, the number of visits in the year prior to the SAMFE was positively associated with multiple SAMFEs  $r(121)=.20, p<.02$  and post-

SAMFE emergency department visits  $r(121)=.44, p<.01$ . Bivariate correlations among study variables are shown below (Table 7).

*Table 5. Descriptive statistics of the sample of sexual assault survivors from forensic exams at a southeastern U.S. hospital*

<b>Demographics</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Race</b>		
Asian	1	0.80
Black	33	26.80
White	87	70.70
Other	2	1.60
<b>Ethnicity</b>		
Hispanic/Latine	3	2.40
Non-Hispanic/Latine	120	97.60
<b>Sex</b>		
Female	116	94.30
Male	7	5.70
<b>Age</b>	M=31.52	SD=11.78
<b>Insurance Status</b>		
Medicaid	32	26.00
Pending	5	4.10
Private	13	10.60
Uninsured	73	59.30
<b>Number of SAMFEs</b>		
One	105	85.40
Multiple	18	14.60
<b>Prior substance use diagnosis</b>		
No	67	54.50
Yes	56	45.50
<b>Prior injury-related diagnosis</b>		
No	81	65.90
Yes	42	34.10
<b>Number of Visits in the Year Prior to SAMFE</b>	M=6.41	SD=9.43
<b>Post-SA Emergency Department Visits</b>	M=2.52	SD=3.84

*Table 6. Sexual assault characteristics*

<b>SA Characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Genital Injury</b>		

No	82	66.70
Yes	41	33.30
<b>Non-genital Injury</b>		
No	69	56.10
Yes	54	43.90
<b>SA Perpetrated by a Partner</b>		
No	107	87.00
Yes	16	13.00
<b>Alcohol/Drug Use Involvement</b>		
No	53	43.10
Yes	70	56.90

Table 7. Correlations among study variables

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Age	--	.01	.02	.08	-.12	.06	<b>.23*</b>	.09	.09	-.04	.12
2. Sex (Male)		--	-.03	-.15	-.07	.01	-.01	.05	.01	.13	<b>.20*</b>
3. Genital Injury			--	.10	.06	-.02	.05	.11	-.07	.13	.12
4. Nongenital Injury				--	.14	-.10	.11	.09	.01	.12	.02
5. Alcohol/drug use					--	<b>-.30**</b>	.07	<b>-.20*</b>	<b>-.25*</b>	-.09	<b>-.24**</b>
6. Domestic violence						--	-.06	.03	.01	-.15	-.08
7. Pre-SA Substance Use Dx							--	<b>.31**</b>	.17	.14	<b>.36**</b>
8. Pre-SA Injury-related Dx								--	<b>.38**</b>	<b>.20*</b>	<b>.39**</b>
9. Number of Visits Pre-SAMFE									--	<b>.20*</b>	<b>.44**</b>
10. Multiple SAMFEs										--	<b>.37**</b>
11. Post-SA ED Visits											--

Note: Dx = diagnoses; ED = emergency department; \* =  $p < .05$ , \*\* =  $p < .01$ .

## 3.2 Results for Aim 1

### 3.2.1 SA Characteristics and Post-SAMFE Emergency Department Visits

SA characteristics revealed that approximately 33% of survivors experienced genital injuries, 44% experienced non-genital injuries, 13% were assaulted by an intimate partner, and 57% experienced alcohol or drug intoxication during the assault. The overall negative binomial

regression model predicting post-SAMFE emergency department visits from SA characteristics and pre-SAMFE diagnoses while controlling for demographic factors was significant ( $\chi^2(12)=62.21, p<.01$ ). Covariates including age, sex, racial identification, insurance status, and the number of visits to the same medical center in the year prior to the SAMFE did not reveal significant associations with post-SAMFE emergency department visits (see Table 8). Notably, genital injury ( $b=.07, IRR=1.07; p=.80$ ), non-genital injury ( $b=.34, IRR=1.40; p=.23$ ), and intimate partner involvement during the assault ( $b=-.42, IRR=.66, p=.25$ ) were not significantly associated with emergency department visits post-assault (see Table 8). Contrary to hypothesis one, alcohol or drug intoxication during the assault negatively predicted post-SAMFE emergency department visits ( $b=-.73, IRR=.48; p<.01$ ; see Table 8), such that alcohol or drug intoxication during the assault predicted fewer emergency department visits in the year following the SAMFE. The IIR indicates that for survivors who were intoxicated by alcohol or drugs during an assault, the incidence rate of emergency department visits post-SAMFE decreases by 52%. Estimated marginal means suggest that on average, survivors who experienced alcohol or drug intoxication during the assault were predicted to have only 1.96 emergency department visits in the year post-SAMFE (see Table 9). In comparison, survivors who did not experience alcohol or drug intoxication during the assault were predicted to have 4.06 post-SAMFE emergency department visits (see Table 9).

### **3.2.2 Pre-SA Substance Use Diagnoses, Pre-SA Injury-Related Diagnoses, and Post-Sexual Assault Emergency Department Visits**

Approximately 46% of the sample had a substance use diagnosis and 34% had an injury diagnosis prior to the SAMFE. The negative binomial model predicting post-SAMFE emergency

department visits from SA characteristics, substance use and injury related diagnoses pre-SAMFE while controlling for demographic factors revealed significant effects.

Pre-SAMFE substance use diagnoses significantly predicted greater emergency department visits after the SAMFE ( $IRR=3.39$ ;  $p<.01$ ; see Table 8). This suggests that having a substance use disorder prior to the SAMFE was associated with a 3.39-fold increase in the number of emergency department visits in the year following a SAMFE compared to those without a substance use disorder. Estimated marginal means suggest that on average, survivors with a pre-SAMFE substance use disorder were predicted to have 5.19 emergency department visits in the year post-SAMFE (see Table 9). In comparison, survivors without a substance use disorder pre-SA were predicted to have only 1.53 post-SAMFE emergency department visits (see Table 9).

Similarly, pre-SAMFE injury-related diagnoses significantly predicted more frequent emergency department visits ( $IRR=1.72$ ;  $p=.04$ ; see Table 8). This indicates that having an injury disorder pre-SAMFE was associated with a 1.72-fold increase in the number of emergency department visits in the year following a SAMFE compared to those without an injury disorder. Estimated marginal means suggest that on average, survivors with a pre-SAMFE injury-related disorder were predicted to have 3.69 ED visits in the year post-SAMFE (see Table 9). In comparison, survivors without an injury-related disorder pre-SAMFE were predicted to have only 2.15 post-SA ED visits (see Table 9).

*Table 8. Main effect model predicting post-SA emergency department visits*

Variable	ED Visits					
	<i>B</i>	<i>SE</i>	<i>IRR</i>	<i>p-value</i>	<i>95% CI</i>	
Age	.01	.01	1.01	.25	.99	1.03
Female (vs. male)	.68	.48	1.97	.16	.77	5.05
Race						

Black/African American <sup>1</sup>	.51	.30	1.66	.09	.92	2.99
Other than Black or White <sup>1</sup>	.45	.77	1.57	.56	.34	7.15
<b>Insurance Status</b>						
No Insurance/Medicaid <sup>2</sup>	-.02	.43	.98	.96	.42	2.23
Pending <sup>2</sup>	-.47	.78	.63	.55	.14	2.88
Number of Visits Pre-SAMFE	.03	.01	1.04	.06	1.01	1.06
Genital Injury	.07	.26	1.07	.80	.64	1.77
Non-genital Injury	.34	.28	1.40	.23	.81	2.40
<b>Alcohol/Drug Involvement</b>	<b>-.73**</b>	<b>.27</b>	<b>.48</b>	<b>&lt;.01</b>	<b>.28</b>	<b>.83</b>
Intimate Partner Involvement	-.42	.36	.66	.25	.32	1.34
<b>Pre-SA Substance Use Diagnosis</b>	<b>1.22**</b>	<b>.26</b>	<b>3.39</b>	<b>&lt;.01</b>	<b>2.03</b>	<b>5.65</b>
<b>Pre-SA Injury Diagnosis</b>	<b>.54*</b>	<b>.27</b>	<b>1.72</b>	<b>.04</b>	<b>1.02</b>	<b>2.90</b>

Notes: \* =  $p < .05$ ; \*\* =  $p < .01$ ; <sup>1</sup>Referent group is non-Latine White; <sup>2</sup>Referent group is private insurance

Table 9. Estimated Marginal Means

Variable	ED Visits			
	Mean	SE	95% CI	
<b>Alcohol/Drug Use Involvement</b>				
Yes	1.96	1.18	.60	6.39
No	4.06	2.49	1.22	13.52
<b>Pre-SA Substance Use Disorder</b>				
Yes	5.19	3.11	1.60	16.78
No	1.53	.94	.46	5.12
<b>Pre-SA Injury Disorder</b>				
Yes	3.69	2.31	1.08	12.61
No	2.15	1.27	.68	6.82

### 3.3 Results for Exploratory Aim

#### 3.3.1 Sexual Assault Characteristics, Multiple SAMFEs, and Post-SAMFE

##### Emergency Department Visits

Among the study participants, approximately 15% had multiple SAMFEs compared to approximately 85% who only had one SAMFE. The overall model examining the moderating

effects of multiple SAMFEs on SA characteristics, pre-SAMFE disorders and post-assault emergency department visits was significant ( $\chi^2(11)=59.85, p<.01$ ). Demographic variables including age, sex, racial identification, insurance status, and the number of visits to the same medical center in the year prior to the SAMFE did not reveal significant associations with post-SAMFE emergency department visits (see Table 10). Contrary to hypothesis four, the associations between SA characteristics and post-SAMFE emergency department visits were not significantly moderated by multiple SAMFEs. Specifically, among individuals with multiple SAMFEs, sustaining a genital injury ( $b=-.40, IRR=67; p=.57$ ) was not significantly associated with the frequency of emergency department visits following the SAMFE. The interaction between genital injury and multiple SAMFEs revealed a small effect size of  $OR=1.49$ . Among individuals with multiple SAMFEs, sustaining a non-genital injury ( $b=1.2, IRR=3.33; p=.18$ ) was not significantly associated with post-SAMFE emergency department visits. However, a computed effect size revealed a medium to large effect size of  $OR=3.33$ . For individuals with multiple SAMFEs, alcohol or drug use involvement ( $b=-.57, IRR=56; p=.49$ ) did not significantly predict emergency department visits post-SAMFE, and the computed effect size revealed a small effect of  $OR=1.79$ . Among the study participants, no one endorsed having more than one SAMFE and an intimate partner being involved in the SA; therefore, interaction effects examining the influence of multiple SAMFEs among those who experienced intimate partner involvement could not be assessed and was removed from the regression model.

### **3.3.2 Substance Use Diagnoses, Injury Diagnoses, Multiple SAMFEs, and Post-Sexual Assault Emergency Department Visits**

The negative binomial regression assessing interactions indicated that multiple SAMFEs was not a significant moderator on the association between pre-SAMFE substance use diagnoses



and post-SAMFE emergency department visits ( $b=-.29$ ,  $IRR=.75$ ;  $p=.71$ ; see Table 10).

Similarly, multiple SAMFEs did not significantly moderate the association between pre-SAMFE injury-related diagnoses and post-SAMFE emergency department visits ( $b=.53$ ,  $IRR=1.70$ ;  $p=.54$ ; see Table 10). The interaction between genital injury and multiple SAMFEs revealed a small effect size of  $OR=1.49$ . Similarly, the interaction between a substance use diagnosis and having multiple SAMFEs revealed a small effect size of  $OR=1.33$ . Similarly, the interaction between an injury diagnosis and multiple SAMFEs revealed a small effect size of  $OR=1.70$ .

Table 10. Interaction model predicting post-SA emergency department visits.

Variable	ED Visits					
	<i>B</i>	<i>SE</i>	<i>IRR</i>	<i>p-value</i>	<i>95% CI</i>	
Age	.01	.01	1.01	.38	.99	1.03
Female (vs. Males)	-.62	.51	1.87	.22	.69	5.05
Race						
Black/African American <sup>1</sup>	.52	.32	1.69	.10	.90	3.17
Other than Black or White <sup>1</sup>	.27	.79	1.31	.73	.28	6.14
Insurance Status						
No Insurance/Medicaid <sup>2</sup>	-.03	.44	.97	.94	.41	2.29
Pending <sup>2</sup>	-.58	.82	.56	.48	.11	2.82
Number of Visits Pre-SAMFE	.03	.01	1.03	.06	1.01	1.06
Genital Injury	.01	.29	1.01	.98	.57	1.80
Non-genital Injury	.01	.30	1.01	.97	.56	1.83
Alcohol/Drug Involvement	-.50	.31	.61	.10	.33	1.11
Intimate Partner Involvement	-.24	.37	.79	.52	.38	1.63
Pre-SA Injury Diagnosis	.43	.30	1.53	.15	.85	2.75
<b>Pre-SA Substance Use Diagnosis</b>	<b>1.44**</b>	<b>.30</b>	<b>4.21</b>	<b>&lt;.01</b>	<b>2.33</b>	<b>7.60</b>
Multiple SAMFEs (vs. only one)	.07	1.25	1.07	.96	.09	12.42
Genital Injury X Multiple SAMFEs	-.40	.71	.67	.57	.17	2.71
Non-genital Injury X Multiple SAMFEs	1.2	.91	3.33	.18	.57	19.68
Alcohol/Drug Involvement X Multiple SAMFEs	-.57	.84	.56	.49	.11	2.91

IPV Involvement X Multiple SAMFEs	--	--	--	--	--	--
Substance Use Dxs X Multiple SAMFEs	-.29	.80	.75	.70	.16	3.56
Injury Dxs X Multiple SAMFEs	.53	.87	1.70	.54	.31	9.36

Notes: Dxs = diagnoses; IPV = intimate partner violence; \* =  $p < .05$ ; \*\* =  $p < .01$ ; <sup>1</sup>Referent group is non-Latine White; <sup>2</sup>Referent group is private insurance. No one in the sample had more than one SAMFE and had IPV involvement during the assault; therefore, IPV involvement X SAMFEs interaction was removed from the analysis.

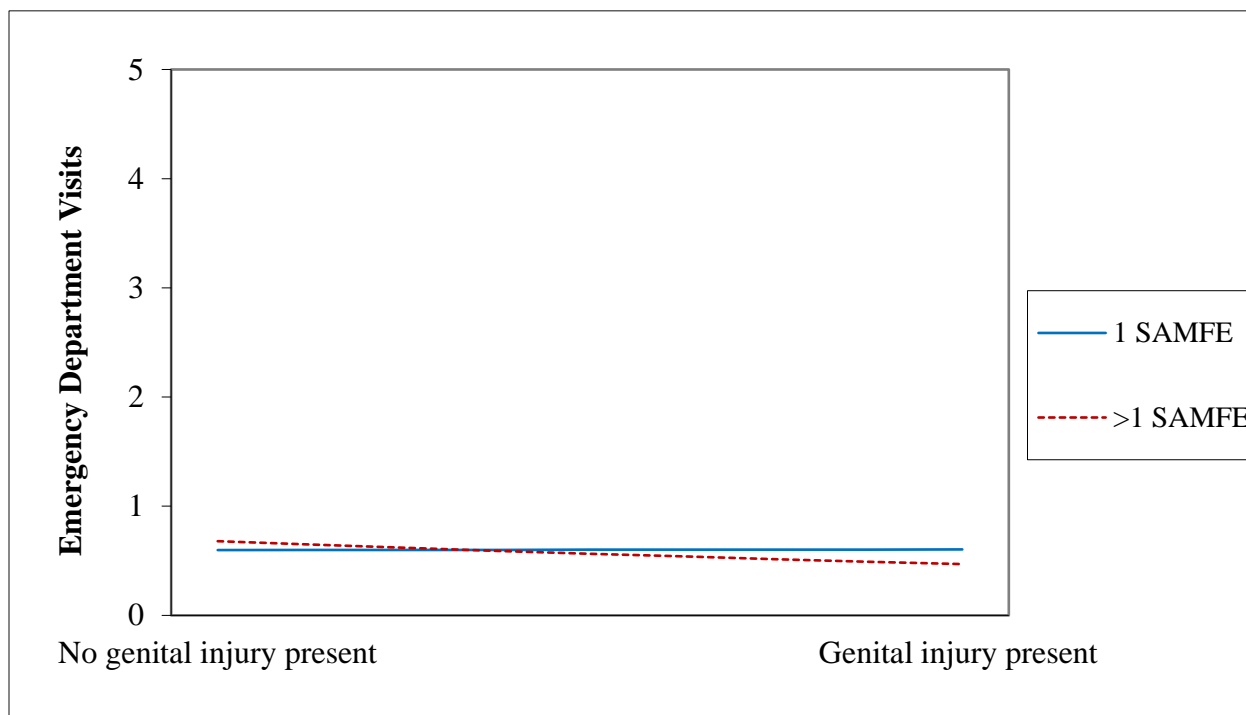


Figure 5. Moderating Effect of Multiple SAMFEs on the Association between Genital Injury and Post-SAMFE Emergency Department Visits

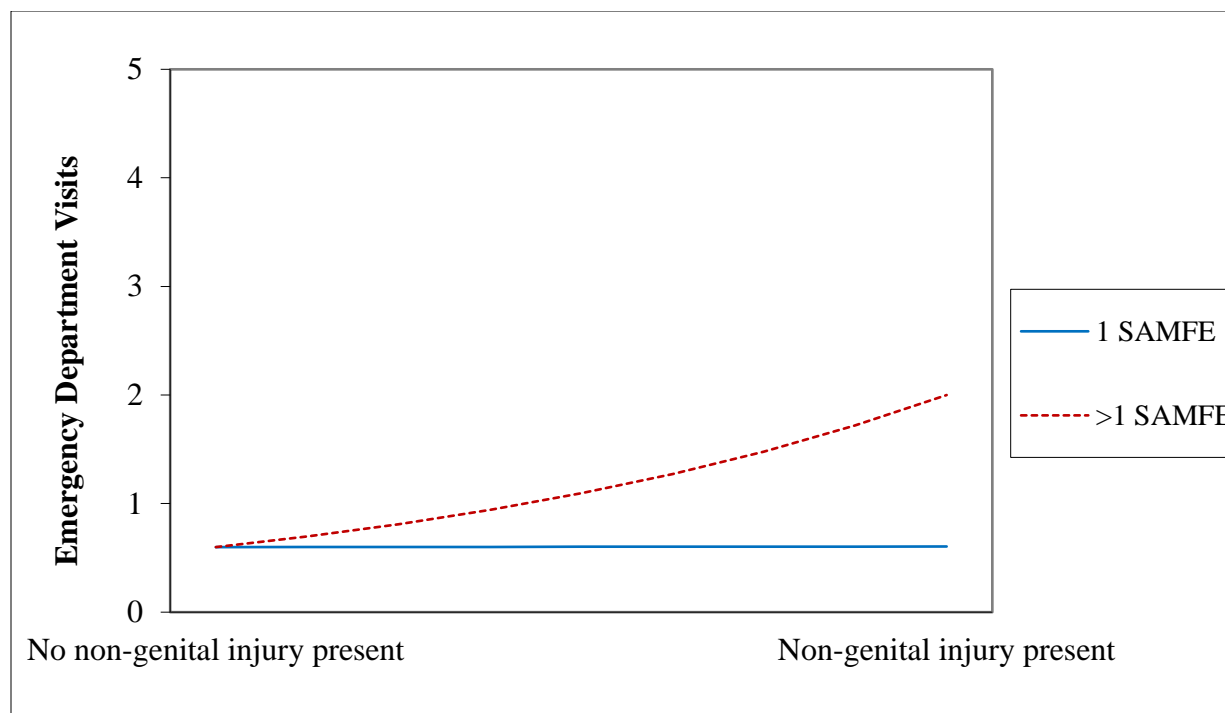


Figure 6. Moderating Effect of Multiple SAMFEs on the Association between Non-genital Injury and Post-SAMFE Emergency Department Visits

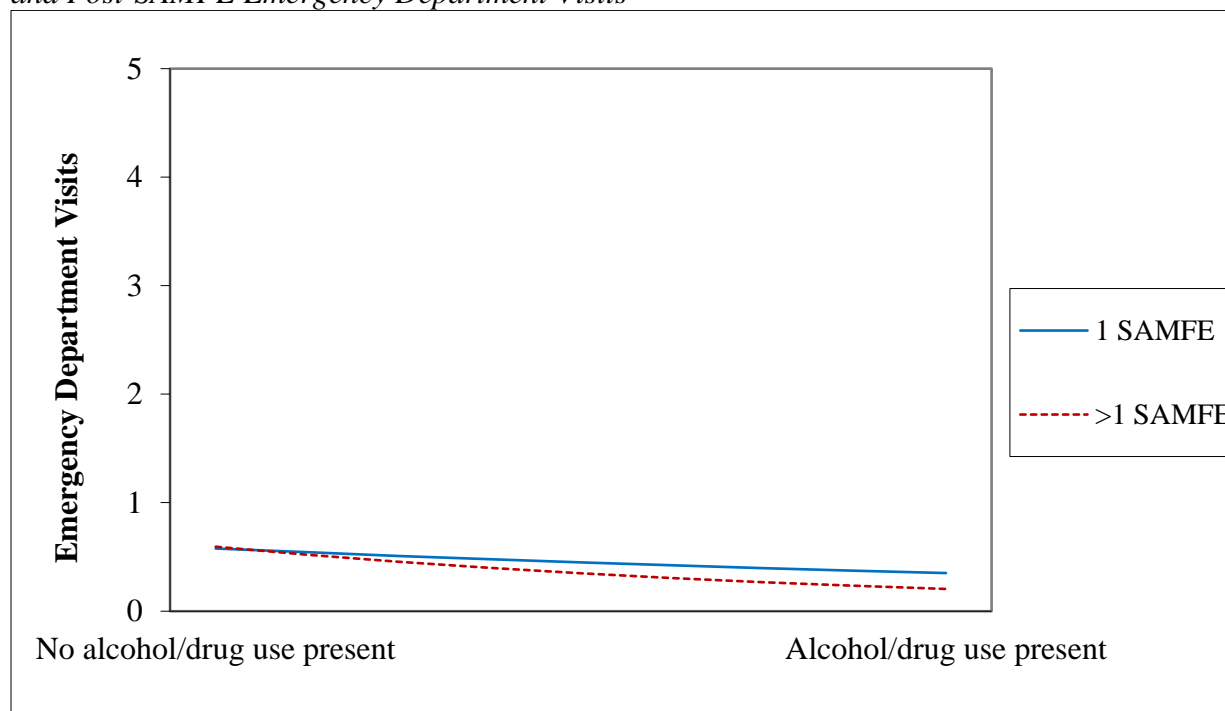


Figure 7. Moderating Effect of Multiple SAMFEs on the Association between Alcohol/Drug Use and Post-SAMFE Emergency Department Visits

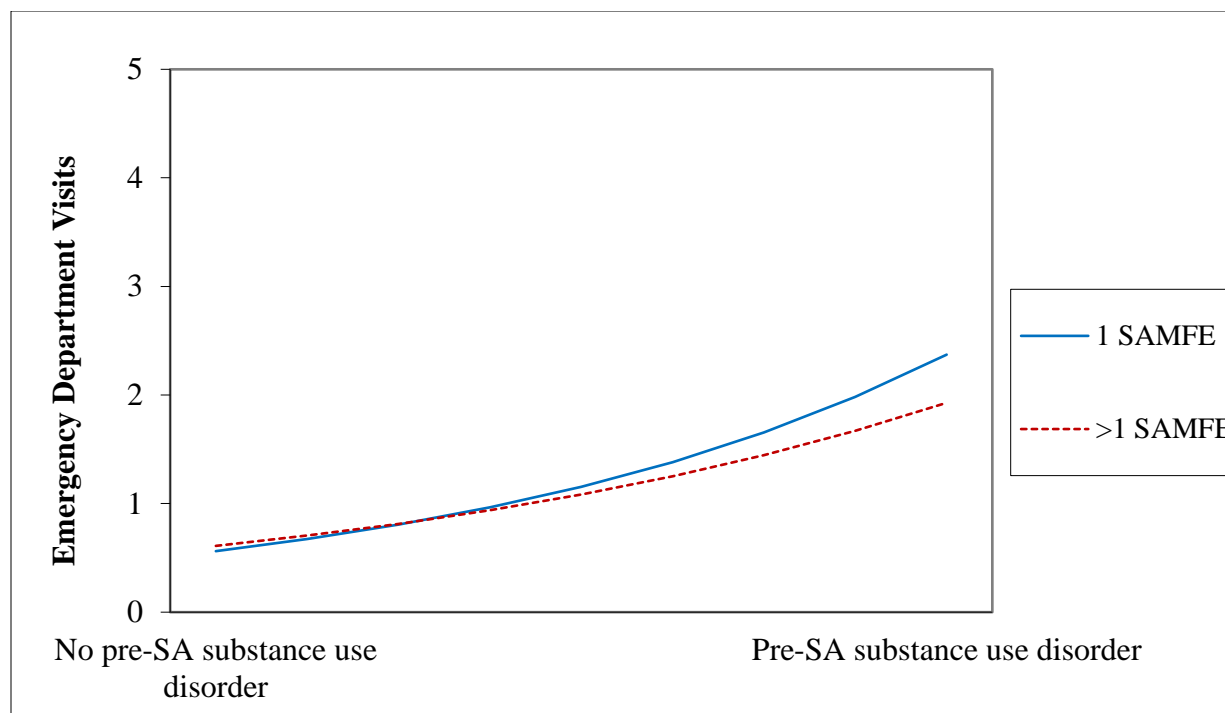


Figure 8. Moderating Effect of Multiple SAMFEs on the Association between Pre-SA Substance Use Disorder and Post-SAMFE Emergency Department Visits

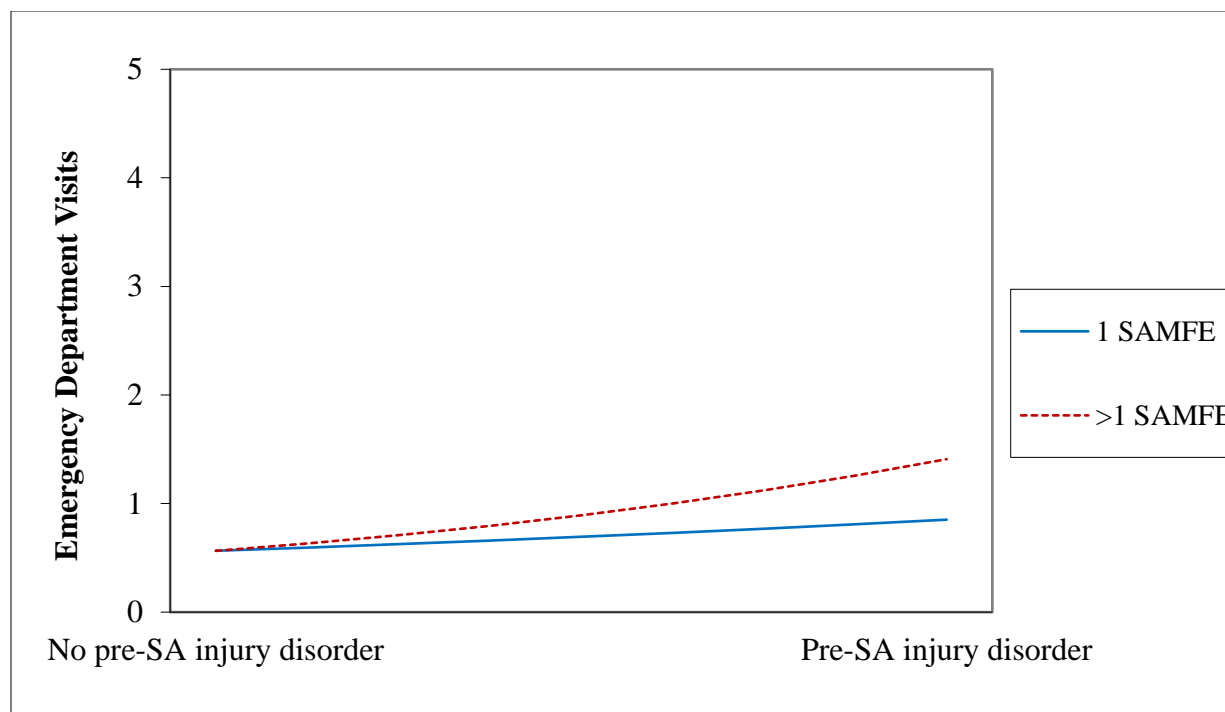


Figure 9. Moderating Effect of Multiple SAMFEs on the Association between Pre-SA Injury Disorder and Post-SAMFE Emergency Department Visits

#### 4 DISCUSSION

The primary aims of the current study were to examine the role of SA characteristics during an assault, substance use and injury-related diagnoses prior to a SAMFE, and multiple SAMFEs on the utilization of post-assault emergency department care in the year following a SA. These questions were investigated using a retrospective cohort design in a sample of 123 adults who received a SAMFE exam at an academic medical center. Hypotheses were partially supported and indicate that substance use disorders and injury disorders prior to a SAMFE were significantly associated with a greater number of emergency department visits in the year following a SAMFE. Contrarily, alcohol involvement during the assault was associated with significantly fewer emergency department visits following the SAMFE. Findings support extant literature on risk factors that are associated with greater emergency department utilization (Fuda & Immekus, 2006; Hunt et al., 2006; Krieg et al., 2016; Sun et al., 2003), but extends this research by examining these risk factors among a sample of survivors of SA who had recently received a SAMFE. Given that alcohol or drug intoxication during the assault was associated with significantly less emergency department visits in the year following a SAMFE, additional research is warranted to further investigate mechanisms contributing to this finding. Overall, findings highlight that survivors who frequent the emergency department more often post-SAMFE are more likely to have substance use and injury concerns pre-SAMFE. They are also more likely to have more than one SAMFE, which suggests a potential increased risk for revictimization. As a result, when SA nurse examiners see recent SA survivors for a SAMFE, they could identify factors in the medical record that place individuals at risk for high emergency care utilization in the next year including substance use and injury related disorders. Evidence based injury prevention and substance use treatment may be important to minimize the risk of

emergency department utilization post-SAMFE.

#### **4.1 SA Characteristics, Pre-SAMFE Diagnoses, and Emergency Department Visits**

Results showed that age, sex, race, and health insurance status were not significantly associated with an increase in emergency department visits in the year following a SAMFE. Health insurance was examined as a proxy for socioeconomic status; however, many patients did not report their health insurance status because the SAMFEs were covered by the state at 100%. As a result, the “uninsured” insurance category is conflated by individuals who chose not to report their insurance coverage. Given this, it is unsurprising that significant findings among health insurance did not emerge in the data and study results surrounding insurance status should be interpreted with caution. Previous research (Lowe et al., 2005) suggests that Medicaid patients who have access to a primary care physician or other medical clinic options typically use the emergency department at rates comparable to individuals with private insurance. However, other factors such as chronic health conditions, higher risk for injury, and systemic barriers such as a lack of transportation and health education may have a stronger influence on emergency department utilization among Medicaid or uninsured patients (Mandelberg et al., 2000). Current research has mixed findings on whether less resourced individuals are more likely to frequent the emergency department at higher rates (Fuda & Immekus, 2005; Taubman et al., 2014); therefore, future research with individuals receiving a SAMFE should obtain information about income, education, and employment to further examine the role of socioeconomic status on long-term emergency department utilization after SAMFE.

Contrary to hypothesis one, the main effects model revealed that genital injury, non-genital injury, and intimate partner involvement during the assault were not significantly associated with post-SAMFE emergency department visits. These findings were surprising given

that previous literature show greater injury and intimate partner involvement during an assault are associated with increased risk for future injury and victimization (Ullman, 2005). However, it is possible that survivors may have sought emergency department care at other hospitals or sought emergency care more than a year after the SAMFE, which was not assessed in the current analyses. It is also possible that survivors who experienced injury or intimate partner involvement during the SA did not have any additional injuries or medical concerns that would prompt them to seek emergency care.

The number of visits in the year prior to the SAMFE was not associated with post-SAMFE emergency department visits in the main effects model. This was surprising as it was expected that more frequent visits to the same hospital prior to the SAMFE would be associated with an increased risk for more visits to the same hospital post-SAMFE. There was a significant positive bivariate correlation between number of visits before and after the SAMFE. However, when included in a larger model, it is possible that the other variables examined might be more important factors associated with number of visits after the SAMFE. Alcohol or drug involvement during the assault was significantly associated with emergency department visits during the year following a SAMFE; however, the directionality of the association was contrary to the original hypothesis. As such, alcohol or drug use involvement during the assault was associated with significantly less emergency department visits in the year following the SAMFE compared to those without. Notably, having a substance use diagnosis prior to the SAMFE was associated with a 3.39-fold increase in emergency department visits post-SAMFE. This suggests that while having pre-SAMFE substance use concerns put a survivor at increased risk for greater emergency department visits, acute drug or alcohol intoxication during the assault is associated with less emergency department visits. These findings may be explained in part by invalidating

or discriminatory practices by medical providers during the SAMFE. Extant research has identified institutional biases, stereotypes, and stigma toward survivors of SA as a risk factor for survivors not reporting SA formally to the police or seeking a SAMFE (Downing et al., 2023; Zinzow et al., 2015). Furthermore, many survivors who are intoxicated by drugs or alcohol during a SA report experiencing blame, being seen as less credible, or being invalidated in medical, academic, and legal settings (Hammock & Richardson, 1997; Richardson & Campbell, 1982; Stormo, Lang, & Stritzke, 1997; Wenger & Bornstein, 2006). Therefore, it is possible that survivors who were intoxicated by drugs or alcohol during the assault may have experienced invalidation or judgment from medical providers during the SAMFE, which may have deterred them from seeking future emergency care or SAMFEs when needed.

This poses a concerning public health risk given prior evidence providing support that invalidating and negative reactions to disclosures of SA are linked with increased negative outcomes including posttraumatic stress, problem drinking, depression, social isolation, self-concealment, and maladaptive coping (Borja et al., 2006; Littleton, 2010; Matthews, 2011; Orchowski, 2009; Ullman & Filipas, 2005; Ullman & Najdowski, 2011; Ullman & Siegel, 1995; Ullman et al., 2008; Ullman et al., 2007). Moreover, providing survivors with invalidating reactions during a SAMFE not only increases their vulnerabilities to negative mental health outcomes but may also reduce their ability to obtain the necessary care by health professionals to support their mental and physical health concerns. This may leave some survivors forced to choose between potentially experiencing more harm by seeking medical care or not obtaining the healthcare they need to prevent exposures to potential harm. Given this discrepant finding between pre-SAMFE substance use and acute alcohol or drug intoxication during the SA, more research is needed to understand the causal mechanisms that are associated with more frequent



emergency department utilization among survivors of a recent SA with substance use factors. Research may benefit from qualitatively assessing survivors' experiences with medical providers during a SAMFE, especially when alcohol or drug characteristics are present. Findings also may indirectly point to the need for trainings among medical providers on best practices for supporting survivors during a SAMFE.

Although injury during a SA was not associated with increased emergency department visits following a SAMFE, an injury diagnosis prior to the SAMFE was associated with a 1.57-fold increase in emergency department visits. This is consistent with extant research correlating previous injuries to a greater likelihood of experiencing future injury. Additionally, it is possible that injury diagnoses prior to the SAMFE were a result of previous experiences of victimization. Rates of revictimization range from 49-82% (Boney-McCoy & Finkelhor, 1995; Classen et al., 2005; Grauerholz, 2000; Russell, 1986; Sorenson et al., 1987; Walker et al., 2019; Young & Furman, 2007), and might in part account for increases in emergency department utilization after a SAMFE among those with a prior injury diagnosis. Findings suggest that targeted interventions for individuals who present to the emergency department for a SAMFE who have a history of injury or substance use diagnoses may be advantageous in preventing future medical emergencies that require emergency department care. Further, if medical personnel are able to see in a patient's medical chart specific risk factors such as a prior substance use disorder and a prior injury disorder, staff may be able to intervene to mitigate the risk for future emergency department care.

#### **4.2 The Role of Multiple SAMFEs**

Within the exploratory aim, multiple SAMFEs were not significantly associated with pre-SAMFE diagnoses, SA characteristics, or emergency department visits post-assault. The

moderation model examining the impact of multiple SAMFEs on the association between pre-SAMFE diagnoses and SA characteristics on post-SAMFE emergency department visits did not provide significant findings. However, simple slopes and effect size estimates were computed for each interaction term in order to assess potential directionality if power were to be adequate. Effect size estimates did report a medium to large effect for the interaction between non-genital injury and multiple SAMFEs on post-SAMFE emergency department visits. The association between non-genital injury and post-SAMFE emergency department visits was stronger among those with multiple SAMFEs compared to those with only one SAMFE. Given the interaction was not statistically significant, results should be interpreted cautiously; however, the large effect size may suggest that with a larger sample ( $n > 210$ ), having multiple SAMFEs in addition to sustaining a non-genital injury may put a survivor at an increased risk for a greater number of emergency department visits in the year following a SA compared to those with only one SAMFE (see Figure 6). Similarly, simple slope calculations revealed a similar effect among pre-SAMFE injury diagnoses and multiple SAMFEs, where pre-SAMFE injury diagnoses were more strongly associated with more emergency department visits post-SAMFE among those with multiple SAMFEs compared to one. However, the effect size for the interaction term was small; therefore, it is unknown if a larger sample size would decrease the likelihood of making a type II error. The directionality of the simple slope effects was in line with the study hypotheses and suggest a potential indirect pathway where an injury during or prior to a SAMFE may increase a survivor's vulnerability to being revictimized, and thus returning to the emergency department in the year following the SAMFE (see Figure 9).

All other interactions revealed small effects. Simple slope calculations revealed nonsignificant differences among interactions (see Figure 5, 7, 8). This may be in part due to the

extremely limited sample size among those with multiple SAMFEs, genital injury, intimate partner involvement, alcohol or drug intoxication. However, it is also possible that even if the analyses were adequately powered, multiple SAMFEs may not significantly moderate the associations between pre-SAMFE diagnoses, SA characteristics and post-SAMFE emergency department visits.

### **4.3 Strengths, Limitations, and Future Directions**

The proposed study utilized a retrospective medical record review which allows for conclusions to be made regarding the onset of diagnoses prior to a SAMFE and their influence on emergency department visits post-SAMFE. Second, this study was an emergency department record review; therefore, implications derived from this study result from real-world assessments within a hospital setting. The following study provides significant contributions to understanding emergency department utilization among a high-risk group. Additionally, this study provides preliminary support for risk factors both prior to a SAMFE and during a SA that may partially increase vulnerabilities for more frequent ED visits among individuals who received a SAMFE.

Despite these notable strengths, the proposed findings from the current study should be interpreted in the context of several important limitations. First, because the data are observational, causality cannot be inferred. Second, some demographic variables like socioeconomic status and education achieved, which could partially explain the use of the emergency department, were not available in the data. Based on research suggesting that access to a primary care physician is protective against emergency department utilization among Medicaid patients (Cheung et al., 2012; Lowe et al., 2005), future research should consider including primary care data as a potential factor influencing future emergency department visits post-SAMFE. Additionally, study data was collected from electronic medical records which has

several limitations including that it does not have self-report data, some variables relating to participant demographics (e.g., race and ethnicity), SA characteristics were limited, and the pre-SAMFE diagnoses may not necessarily have been derived from clinical interviews.

Substance use disorders prior to the SAMFE likely ranged in severity and drug type. This study did not account for the heterogeneity across substance use types; therefore, caution should be made when generalizing substance use findings across all substance use disorders. There were a limited number of men who completed a SAMFE; therefore, it was not possible to examine gender differences. The lack of significance among the interaction model may be due to diminished power due to sample size. Additionally, we only had access to electronic medical records for one hospital; therefore, it is possible that some participants sought emergency department care at other facilities. Future research should increase sample sizes and examine these associations in different areas and hospitals around the United States. Lastly, some research (Sun et al., 2003) has used a “frequent emergency department visit” variable, conceptualizing “frequent” as three or more emergency department visits per year. Given the dispersal of our data, we chose to model emergency department visits as a continuous variable. Future research may benefit from examining these SA characteristics and pre-SAMFE diagnoses across different categorical frequencies of emergency department utilization.

## CONCLUSION AND IMPLICATIONS

The current study aimed to understand factors that contribute to higher rates of emergency department visits in the year following a SAMFE among survivors of a recent SA. Findings revealed that diagnostic characteristics such as injury and substance use disorders and SA characteristics such as alcohol or drug intoxication during the assault are significantly associated with emergency department visits following a SAMFE. This research is novel in that it combines literature examining emergency department frequency among a sample of survivors of SA who received a SAMFE. As a result, this study adds to the body of literature examining risk factors and health outcomes such as emergency department utilization among individuals who have experienced SA. Given that both injury and substance use disorders pre-SAMFE were associated with more emergency department visits post-SAMFE, prevention efforts to maximize access to mental and physical health care may be an effective strategy for reducing the risk of repeated emergency department visits within the context of survivors of SA. Specifically, efforts such as having SA nurse examiners identify risk factors in an individual's electronic medical record that increases their risk of future emergency department utilization post-SAMFE may be advantageous. Other prevention efforts may include integrating evidence-based injury prevention and substance use treatment in a hospital setting to reduce the risk of increased emergency department utilization among survivors of SA.

Lastly, data from this study suggest that while having a prior substance use disorder puts one at an increased risk for greater emergency department utilization, alcohol or drug use during the assault decreases the likelihood of emergency department utilization. This finding is novel and warrants future research to replicate this in a larger, more diverse sample across multiple hospitals in the United States. Future research should attempt to provide empirical evidence to

explain the causal mechanisms for the association between pre-SAMFE diagnoses and post-SAMFE emergency department visits.

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