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Factors Associated with Poisoning and Suicide-Related Diagnoses After a Sexual Assault

Alyssa Bartlett

ABSTRACT

FACTORS ASSOCIATED WITH POISONING AND SUICIDE-RELATED DIAGNOSES AFTER A SEXUAL ASSAULT

By

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12/10/2021

Introduction: More than 43% of women report experiencing sexual violence during their lifetime. Experiencing SA, especially violent SA, is associated with depression, substance abuse, suicidal ideation, and suicide attempt. Receiving a SA medical forensic exam (SAMFE) in the emergency department is typically the first line of acute care after an assault, providing an opportunity for prescribing necessary medications, forensic evidence collection, and treating physical injuries. Little is currently known how procedures during the exam and characteristics of the SA itself predict suicidal behavior and overdoses after an assault.

Methods: Participants included women who received a SAMFE within 120 hours of an assault (n=239). Information on demographic characteristics, medications prescribed during their SAMFE visit, and SA characteristics as well as information on poisoning and suicide-related diagnoses were collected from the electronic medical record.

Analysis: An initial logistic regression was performed to assess whether receiving prescription psychiatric medication during SAMFE visits predicted suicide-related diagnoses. A latent class analysis was also performed to identify classes of assault survivors' experiences. The identified classes were then assessed for differences in proportions of suicide-related and poisoning diagnoses in the year following the exam.

Results: Women who received psychiatric prescription medication during a SAMFE had 5.41 times greater odds of receiving a suicide-related diagnosis within one year (p=0.007). The latent class analysis identified two classes of assault severity among survivors. Survivors in Class 1 had more typically assaults, while survivors in Class 2 experienced more violent assaults with a higher probability of experiencing anal penetration, genital and non-genital injury, and weapon use. A two-proportion z-test found that Class 2 comprised a higher proportion of poisoning diagnoses in the sample (p=0.029).

Conclusion: These findings highlight the prescribing of psychiatric medication or documenting characteristics of severe SA as markers for suicide and self-harm interventions. Future studies should focus on developing these interventions for implementation in acute care settings and promote the ease of follow-up psychological care after an assault.

FACTORS ASSOCIATED WITH SUICIDE-RELATED AND POISONING DIAGNOSES AFTER A RECENT SEXUAL ASSAULT

by

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Author's Statement Page

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Chapter I: Introduction

Background

In the United States, more than 43% of women have reported experiencing sexual violence, with 1 in 5 women experiencing rape or attempted rape in their lifetime (Smith et al., 2018). These assaults have a cumulative lifetime economic burden of $3.1 trillion, with most cost contributed by a loss of productivity and medical costs (Peterson et al., 2017). Further, the frequent occurrence of sexual assault (SA) is especially alarming, given the debilitating psychological impact it has on survivors. Indeed, SA and rape seem to have a greater mental health effect than other types of trauma and are associated with greater risk for post-traumatic stress disorder (PTSD), depression, anxiety, and substance abuse (Dworkin et al., 2017). Survivors of SA also tend to have a significantly greater risk of suicidal ideation and attempts (Dworkin et al., 2017). Further, the worsened mental health outcomes from acute psychological stress may predict later suicide-related diagnoses. More severe assaults, characterized by more genital and non-genital injury, the presence of a weapon, intimate partner violence, and anal penetration, have also shown significantly higher odds of PTSD symptoms and distress after the assault (Jaffe et al., 2017; Weaver & Clum, 1995; Zilkens et al., 2017). Although it is not clear who is at heightened risk for suicidal thoughts and behaviors after SA, it is possible that the prevalence of psychiatric symptomatology, as well as experiencing a more severe or violent assault, may exacerbate the effects of SA on mental health, resulting in increased suicidality and overdoses.

Because of the pervasive and potentially traumatic nature of SA, clinical management of survivors has become a frequent topic of discussion due to the potential to treat not only

physical injuries but also other medical and psychological issues stemming from the assault (Campbell et al., 2013; Cybulska, 2013; Diamond et al., 2017; Freedman, 2020; Reeves, 2015). Typically, acute care after SA occurs in the emergency department during a SA medical forensic examination (SAMFE). SAMFEs are available at no cost to all survivors and there is published guidance on what examinations should entail. Though SAMFEs administered by specialized medical professionals have the benefit of executing acute care of survivors, research on the mental health needs of women during and immediately after the SAMFE is a nascent but emerging field.

Aims and Objectives

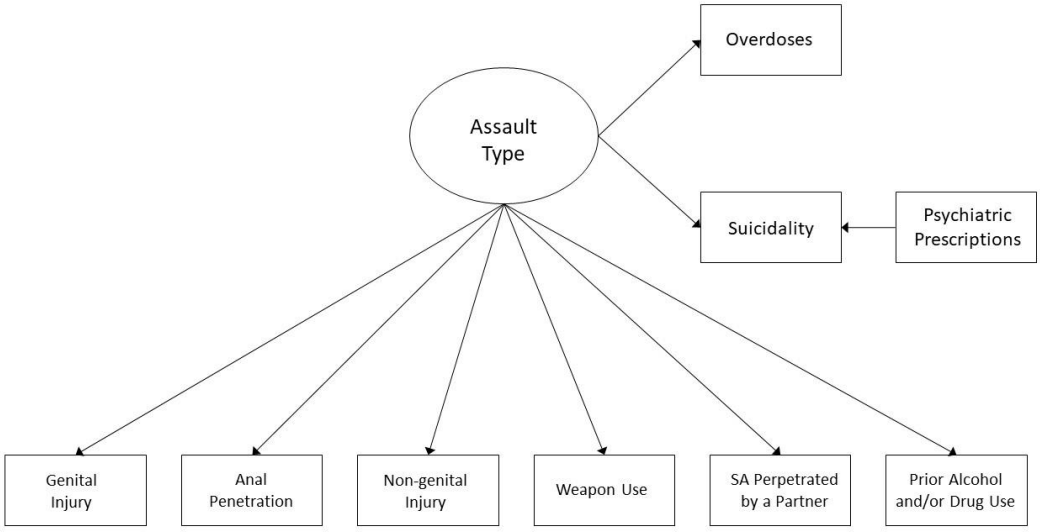
The overall objective of this research is to elucidate how factors related to the SA and SAMFE administration can affect long-term suicidal behavior and substance use. The current study examines potential factors possibly associated with suicidal ideation and behavior in the year after receiving the SAMFE. Factors examined include psychiatric medications prescribed the same day of the SAMFE at the emergency department and assault characteristics including type of penetration and injury experienced, the use of drugs or alcohol prior to the assault, weapon use during the assault, and whether the assault occurred within intimate partner violence. The initial aim of the current study was to see whether receiving psychiatric medication in the emergency department on the same day of the SAMFE is associated with suicidal behavior in the year after the SAMFE using a binary logistic regression (Aim 1). An additional exploratory aim was to identify latent classes of SA survivors (Aim 2). This aim was extended to also explore the association between identified latent classes of survivors and subsequent diagnoses related to suicide, which include suicidal ideation, suicide attempt, and self-inflicted harm and poisoning (e.g., overdose) (Aim 3).

Research Questions

After SA, some survivors present to the emergency department within several days to receive a SAMFE in order to treat any injuries, administer sexually transmitted infection post-exposure prophylaxis, and collect forensic evidence. In addition, psychiatric medication is often prescribed at the emergency department on the same day of the SAMFE if the presenting patient is in severe acute distress or has a history of self-harm or substance use (Freedman, 2020). Furthermore, assault severity, measured by characteristics of the SA, may predict subsequent overdoses, suicidal behavior, and substance use disorders in these survivors (Figure 1). Therefore, this study will examine the following questions:

1. Does the administration of psychiatric prescription medication in the emergency department on the same day as a SAMFE predict suicide-related diagnoses using a logistic regression?
2. Are there latent classes of SA types who receive a SAMFE?
3. Do latent class assault types predict subsequent suicidal behavior one year after the SAMFE and/or overdoses?

Figure 1. A conceptual framework of the factors associated with poisoning and suicide-related diagnoses after SA.



Chapter II: Literature Review

Sexual violence has a substantial impact on not only the mental health of the survivor but also on society due to economic burden. Though sexual violence encompasses numerous acts, the current study will focus exclusively on SA in the form of rape, including completed forced penetration, attempted forced penetration, and completed alcohol- or drug-facilitated penetration (Smith et al., 2018). SA became a prominent area of research in the 1980s and continues to grow beyond its initial roots as an area to develop psychometrics for to educating health care providers on trauma-informed care. Although the proliferation of trauma-informed care and understanding assault's impact is important, there is a lack of understanding of potential differential mental health needs of individuals receiving a SAMFE to understand and prevent suicidal ideation and behavior after the SAMFE.

Discontinuity of care is an issue that has plagued our health care system for decades and extends into the clinical management of SA survivors. However, unlike the prototypical patient, patients that have experienced SA are experiencing an uncoordinated multidisciplinary response from a lack of organization between the legal, medical, and mental health systems. The role confusion and nonsynchronous, if not antagonistic, relationships between these systems have previously led to survivors "falling through the cracks" (Greeson & Campbell, 2013). In an attempt to coordinate these efforts, SA response teams (SARTs) were developed as a community-level effort to aid in collaboration using a victim-centered approach (Greeson & Campbell, 2013). Though SARTs are now widespread through the United States and recommended by the Department of Justice, there is little consistency with their implementation due to a lack of standardization (Department of Justice (DOJ), 2013). For example, the DOJ requires that SARTs maintain membership from police, rape victim advocate, SA forensic

examiner, and prosecutors; however, Greeson and Campbell found that only 75% of SARTs have active membership from these groups, while others maintain a litany of collaborations with organizations including domestic violence agencies and sex offender treatment (DOJ, 2013; 2015). Further, researchers found that improving offender accountability and prevention were not prioritized by the response teams and that the frequency of collaborative activities were inconsistent, especially the relationships between rape victim advocates and police (Greeson & Campbell, 2015). This inconsistent and oft uncoordinated effort can lead to survivors feeling revictimized by the medical and legal systems, which can often be exacerbated by long wait times in the emergency room and negative treatment by medical personnel (Maier, 2012). Indeed, patients often report negative experiences with medical personnel, such as being subject to rape stereotypes and obvious inexperience in dealing with survivors, as hindering their recovery (Ranjbar & Speer, 2013).

Historically, much of the SA literature has focused on the psychological impact of victimization. For example, a review by Dworkin and colleagues found that SA is associated with increased risk for psychopathology, with significantly stronger associations for post-traumatic stress and suicidality (2017). Furthermore, SA survivors are also more likely to report having an affective disorder, i.e., depression, anxiety, and bipolar affective disorder, and 3% report being diagnosed with schizophrenia long-term after an assault (Creighton & Jones, 2012). These diagnoses may also leave survivors at greater risk for being revictimized due to the association of vulnerability and mental illness with SA victimization. Revictimization has its own impacts, often exacerbations of findings related to a single SA experience. Independent of diagnosed psychiatric illness, revictimized survivors are more likely to experience self-blame, feeling stigmatized, and a higher risk of drinking and prescription opioid abuse (Ullman, 2016;

Ullman et al., 2014; Ullman & Peter-Hagene, 2016; Walsh et al., 2014). The association between psychopathology and suicidality is also well-established in the literature. Indeed, a study on trauma and suicide found that experiencing assault of any kind resulted in suicidal ideation and suicide attempt in 50.7% and 28.7% of participants, respectively (LeBouthillier et al., 2015). Furthermore, the acute stress associated with experiencing SA is positively associated with suicidal ideation as well as opioid misuse (Gilmore et al., 2018). However, it is unclear if psychopathology as identified in medical records, which is accessible to SANEs during a SAMFE, is associated with suicidal ideation and behavior within the year following the SAMFE. If there are identifiable factors within the SAMFE visit that predict suicidal ideation and behavior within a medical record, it would be possible to develop suicide prevention efforts during or soon after the SAMFE.

Using a person-centered approach, it is not uncommon for latent class analyses and other forms of structural equation modeling to analyze the complex nature of SA. However, existing literature on the long-term outcomes of violence mostly focuses on childhood instances of physical and sexual abuse, though many of these associations mirror the adult literature. For example, in a latent class analysis examining patterns of witnessed or experienced childhood violence and physically and sexually violent experiences in adulthood, participants who experienced high levels of non-sexual intimate partner violence were at significantly greater odds of depression and PTSD (Cavanaugh et al., 2012). Childhood sexual trauma has also been previously linked to moderate psychological distress and PTSD/borderline personality disorder (BPD) comorbidity (French et al., 2014; Frost et al., 2020). Similarly, in adult populations, SA perpetrated by intimate partners is often a predictor of PTSD and carries a greater risk of more extensive and severe bodily injury (Ullman et al., 2006; Zilkens et al., 2017). This increased

likelihood of physical injury, as well as perceived threat to life and the presence and use of a weapon during the assault, is also an established predictor of other forms of psychological distress post-assault (Weaver & Clum, 1995). Penetration type used during the assault is an additional important facet of SA severity. Indeed, experiencing anal penetration during an assault is associated with increased anxiety, depression, PTSD symptomatology, and dysfunctional sexual behavior over vaginal penetration alone (Pinsky et al., 2017). Non-genital injury, including abrasions and bruises, are often more common and more severe in SA involving forced anal penetration compared to those only involving vaginal penetration (Bowyer & Dalton, 1997). Further contributing to more severe assaults, both acute alcohol intoxication and chronic substance use prior to SA are associated with more extensive PTSD symptomatology as well as a greater risk of injury to the survivor (Gong et al., 2019; Jaffe et al., 2017; Testa et al., 2004). The existing literature has used person-centered analyses to examine differences in the characteristics of penetrative v. non-penetrative sexual violence, but no study to date has specifically examined subsequent suicidal behavior and substance use in relation to experiences during a SA in adult women.

Though the volumes of research on the psychological impact of rape is generally consistent, the vast majority of the literature focuses on specialized populations. For example, almost all of the studies correlating suicidality and SA use adolescent populations rather than adult populations. Although SA is equally distressing to adolescents and adults, adolescent survivors are more likely to delay receiving medical care, to sustain anogenital injury during the assault, and to be assaulted by a family member (Jones et al., 2003; Torazzi et al., 2021). The presence of more severe injury and delaying medical evaluation due to stigma or fear of disclosure may contribute to prevalence of suicidality and psychopathology differently than in a

sample of nonclinical adult women. In addition to an emphasis on the adolescent population, a large number of studies of SA survivors and suicidality are measured within specialized setting such as in the military context or on college campuses. Although both populations show an increased risk for suicidal ideation and attempts when revictimized, these populations often have different predictors of suicidality. For example, Bryan and colleagues found that the risk of suicide attempt increased among female military personnel with a history of battering and physical abuse, but not with a history of sexual abuse or rape (2013). Both military and undergraduate populations may also experience additional stigma and difficulties disclosing and reporting due to campus or military base politics, further altering the risk of suicidality from the general adult population (Deitz et al., 2015; Kennedy & Prock, 2018; Schreiber & McEnany, 2015). These differences highlight the need for further research engaging a sample of SA survivors not related to an institutional setting or specialized populations such as children and adolescents.

In an effort to fill these gaps, the current study examined suicide-related diagnoses in adult women SA survivors presenting for a SAMFE in order to elucidate the associations between suicidality and administration of psychiatric prescriptions during the examination before elucidating classes of assault severity, and examining these class's associations with subsequent overdose, substance use disorders, and suicidal behavior.

Chapter III: Review of Statistical Methods

Logistic Regression

Used to fit data under experimental and observational conditions, binary logistic regression models the association between a dichotomous dependent, or outcome, variable (Y) and categorical or continuous predictor variables (X_i) (Pregibon, 1981). The mathematical concept underlying logistic regression is the *logit*, the natural logarithm of the odds ratio of the probability (π) of the occurrence of the dependent variable (Y) to the probability of Y not occurring ($1-\pi$) (Peng et al., 2002). From this concept, the simplest form of the logistic model predicts the relationship between the outcome variable and a single predictor variable in the form

$$logit(Y) = \ln(odds) = \ln\frac{\pi}{1-\pi} = \alpha + \beta X,$$

where α is the y-intercept and β is the slope. This can be expanded to include multiple predictor variables in the form of

$$logit(Y) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n.$$

β_i are interpreted as regression coefficients, which determine the strength and directionality of the relationship between the outcome and predictor variables. For example, a positive regression coefficient indicates that larger X values are associated with larger logits of Y. Therefore, a sufficiently large β implies a linear relationship between X and the logit of Y, where the odds ratio is equal to the natural logarithm base raised to the regression coefficient (e^{β}). To use logistic regression, basic regression assumptions must be met. These assumptions include independence of errors, whereby no responses are duplicated, the existence of a linear relationship between the logit for any continuous predictors, no highly influential points, and the absence of multicollinearity among predictors (Stoltzfus, 2011).

Latent Class Analysis

Belonging to a larger family of latent variable statistical methods called finite mixture models, latent class analysis (LCA) is an exploratory statistical approach used to identify unobserved groups, or latent classes, in a population based on identified observed variables (Nylund-Gibson & Choi, 2018). Similar to factor analysis and k-means clustering, LCA relies on selected indicator variables to create these groups. However, LCA is unique in its approach as a "person-centered" analysis, aiming to flexibly classify individuals while allowing for evaluation of how adequately the proposed LCA model fits the given data (Nylund-Gibson & Choi, 2018). The underlying assumption of LCA is that membership in these latent classes explains patterns of the indicator variables included in the model (Weller et al., 2020). Therefore, the determination of the number of classes to retain in specifying a LCA model is a critical step.

Class enumeration involves fitting several models with differing numbers of latent classes, while calculating goodness-of-fit measures for each model. Typically, the process begins by estimating a 1-class LCA model to serve as a baseline for comparison of subsequent models before increasing the number of classes by one until convergence issues are encountered, typically indicated from warnings given by the software package (Nylund-Gibson & Choi, 2018). One commonly used category of fit indices are information criteria, where lower values of these indices indicate superior fit. The Bayesian Information Criterion (BIC) and the Akaike Information Criterion (AIC) are the most commonly used in LCA model selection. Due to its consistency and ability to penalize the number of indicator variables, where a model containing more indicators may identify classes easier, the BIC is often utilized as a goodness-of-fit measure in a simple fixed, finite model (Vrieze, 2012).

Likelihood-related tests are another common type of fit measures used in selecting an optimal LCA model. These measures range from simple comparison of log-likelihoods between models of differing classes to the Vyong-Lo-Mendell-Rubin adjusted likelihood ratio test, which provides *p*-values to assess whether the addition of a class to a LCA has a significantly improved model fit compared to a model with less latent classes. Similarly to the BIC, a smaller log-likelihood indicates a more optimal LCA model fit (Nylund-Gibson & Choi, 2018).

It is important to acknowledge that despite fit indices, one can never know the true number of latent classes that exist. Commonly, fit indices do not universally agree and may not all indicate the same solution, so considering both model fit indices and substantive interpretation is vital to appropriate model selection (Nylund-Gibson & Choi, 2018). An additional guideline that can be used to examine the heterogeneity of latent classes within a model is entropy. While not used as a means for selecting a final optimal model, entropy indicates how accurately the model defines each class. Ideally, entropy values will be close to 1, where above 0.6 is acceptable, though there is no agreed-upon cutoff criterion (Weller et al., 2020). Further, while sample size is usually not a concern in the use of LCA unless the number of indicators outnumber the sample, it is suggested that classes contain more than 5% of the sample, though this may be conceded if the rarity of the class is conceptually appropriate (Weller et al., 2020).

Although LCA is a powerful, flexible statistical tool, limitations exist. The assignment of each individual to a latent class is based on probability given the pattern of values they have on the indicator variables. Therefore, LCA is considered an unsupervised learning technique, as neither true class membership nor the exact number of individuals within each class are known (Vermunt & Magidson, 2002; Weller et al., 2020).

Prediction of Distal Outcomes

While identifying latent classes may be the main interest with using LCA, the relationship between the identified latent classes and an external variable may be of interest. These external variables may take the form of covariates or a distal outcome to identify not only typologies of individuals within a given sample or population but also possible consequences of class membership (Kamata et al., 2018). Researchers can use the range of descriptive and inferential statistics to measure the associations between class membership and a distal outcome. However, there are several specific approaches to estimate the effect of class membership on this variable.

The traditionally used approach to modeling a distal outcome is the *classify-analyze* approach (Clogg, 1995). In this two-stage process, LCA is conducted and used to assign each individual to a latent class by the highest posterior probability. In the second step, these mutually exclusive classes are then used as a grouping variable to compare on an external variable. While the implementation of this method is straightforward, this approach could result in misclassified individuals and misidentification of the number of latent classes based on the LCA posterior probabilities, contributing bias to the estimated effects of class membership (Kamata et al., 2018; Lanza et al., 2013).

The preferred alternative is a one-stage approach, where the LCA model and external variables are estimated concurrently (Kamata et al., 2018). The inclusion of these variables to the LCA model may reduce standard errors and improve entropy (Clark & Muthén, 2009). However, including external variables into the original LCA model could affect the overall fit if the relationships between indicators and latent classes are not sufficiently strong (Kamata et al., 2018). While issues with the *classify-analyze* approach have been documented, we utilize this

approach due to the small sample size as well as the overall rarity of severe SA in the population employed in this study (Dziak et al., 2016; Vermunt, 2010). Further, there is some evidence that, while the one-stage approach may result in more conservative estimates of latent classes and effects on distal outcomes, both approaches may result in similarly characterized groups (Nielsen et al., 2017).

Chapter IV: Methods

Sample

This study utilized a retrospective cohort design using clinical chart data from SA survivors receiving at least one SAMFE within 120 hours of SA. This secondary data was previously collected from a medical university in the Southeastern United States between July 2014 to May 2019. Of the original sample (n=939), 239 women had documented inpatient or outpatient hospital or clinic visits one year after the SAMFE at the same hospital system and were, therefore, retained in the sample.

Measures and Outcomes

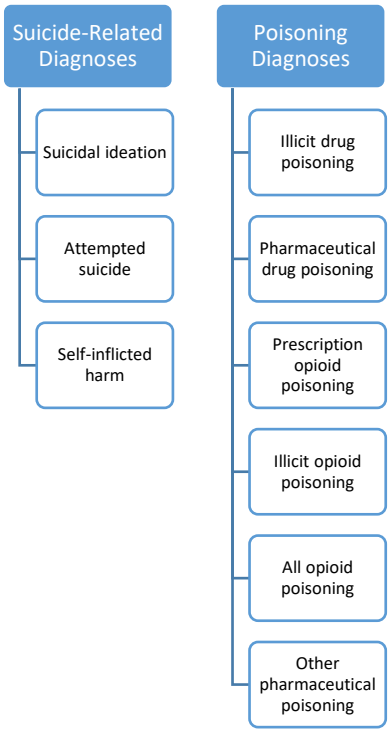
Demographic information such as age, race, ethnicity, marital status, and military status was collected directly from survivors' medical records. Further, SA characteristics, including type of penetration, presence of injury, the use of a weapon, whether the SA was perpetrated by an intimate partner, and use of alcohol or drugs by the survivor or perpetrator, collected from the SA Nurse Examiner (SANE) was used to generally characterize the sample of victims.

Records of medications prescribed in the emergency department on the same day as the initial SAMFE, including prescription pain, over-the-counter pain, antibiotics, and psychiatric medications, were obtained from medical records. In addition, data on mental health services and diagnoses of mental health disorders, including suicide-related and poisoning, will be obtained from the medical record.

The mental health diagnoses based on International Classification Disease-9 (ICD-9) and ICD-10 categories are depicted in Figure 2. In the current study, individuals were considered positive for a suicide-related diagnosis if they had received a diagnosis of suicidal ideation, self-

inflicted harm, or attempted suicide in the year following the assault, while one was considered positive for a poisoning diagnosis if they received a diagnosis of poisoning caused by illicit drugs, illicit or pharmaceutical opioids, or other pharmaceuticals in the year post-assault.

Figure 2. ICD-9/10 Categories of Suicide-Related and Poisoning Diagnoses.



Analytic Plan

Demographic data were analyzed by computing frequencies using IBM SPSS Version 28 and presented as percentages of the sample with those characteristics. Similarly, SA characteristics will be presented as percentages of the sample containing those characteristics. Originally count data, all SA characteristics, distal outcomes, and mental health diagnoses were dichotomized prior to regression, latent class analyses, and the exploration of association with

distal outcomes such that the presence of these variables was coded as “2” while their absence was coded as “1.”

Logistic Regression

The associations between each independent variable (administration of psychiatric prescriptions during the examination, age, whether the assault was perpetrated by an intimate partner, and whether drugs or alcohol were used prior to the assault) and the dependent variable (suicide-related diagnoses) were analyzed by calculating a logistic regression with SPSS, with $p<0.05$ representing a significant finding. Individuals missing data on one or more of these variables were removed listwise from the analysis.

Latent Class Analysis

To identify profiles of SA survivors, we estimated models for six variables of interest related to factors that have established influence on the severity of the assault such as injuries sustained, force used during the assault, and relationship to the perpetrator, and compared the models to identify the best fit. Specifically, these variables, or indicators, of interest included the presence of genital injury, which was computed as experiencing vaginal and/or anal injury, anal penetration during the assault, presence of non-genital injury, weapon use during the assault, the use of drugs or alcohol prior to the assault, and whether the assault was perpetrated by an intimate partner. All variables of interest were treated as dichotomous categorical variables and, as such, were treated as factors by R with levels “1” for not present and “2” for present.

For each LCA indicator used during model estimation, the proportion of missing data ranged from 12.1% of the non-genital injury variable to 36.4% of all anal penetration data.

Because the characteristics of the assault were taken by SANE nurses during the SAMFE, there are many missing data points. Missingness may be missing at random (MAR) in this case, as responsiveness may be related to how busy the emergency department was at the time of the exam or if the SANE nurse asked the questions. The employed R package "poLCA" used listwise deletion to remove individuals with incomplete data on the indicators. This resulted in the removal of 42% of individuals, and a smaller sample size for the LCA and subsequent analyses (n=137). While the missing data on the LCA indicators is not related to overdoses post-SAMFE, those missing anal penetration were more likely to have a suicide-related diagnosis (t=2.943, p=0.004).

Given the minimal literature on assault identification, there is no theoretically expected number of classes. Therefore, an initial run of 1-4 classes was analyzed with six variables of interest. Model fit was determined by the Bayes Information Criterion (BIC) as well as the log-likelihood. Furthermore, an entropy above 0.8 was sought (Weller et al., 2020). All LCA analyses were completed using R and its associated poLCA package (Linzer & Lewis, 2011).

Prediction of Distal Outcomes

After identifying the optimal model, each case was assigned to a specific class based on their posterior class membership probabilities. Based on established associations in the literature, we defined suicide-related diagnoses and poisoning diagnoses as distal outcomes often related to SA severity. Therefore, we explored the association between class membership and the distal outcomes of suicide-related and poisoning diagnoses. The distal outcomes were summarized by class before proceeding with hypothesis testing using pairwise z-tests with adjustments for multiple pairwise comparisons as needed to assess for significant differences.

Chapter V: Results

Sample Characteristics

Table 1 provides demographic characteristics of the sample. Survivors ranged in age from 18 to 64 years old, with a mean age of 30.72 years of age (SD=11.30). While non-Hispanic White women made up the majority of the sample (70.3%, *n*=168), women identifying as African American (25.9%, *n*=62), Hispanic/Latinx (2.5%, *n*=6), Asian (0.4%, *n*=1), and Other (2.5%, *n*=6) were also represented to a smaller degree. According to their medical records, 72% of survivors were single (*n*=172), 10.5% were married (*n*=25), 12.6% were legally separated or divorced (*n*=30), and 2.9% (*n*=7) were widowed. During the study period, most survivors only received one SAMFE (91.2%, *n*=218). However, the remaining 7.9% of the sample (*n*=19) received two exams and a smaller proportion received three SAMFEs (0.8%, *n*=2).

The majority of the sample reported experiencing vaginal penetration during their assault (91.2%, *n*=145) and around one-third of survivors experiencing vaginal injury (32.8%, *n*=67). Conversely, anal penetration and injury were much less common in the sample with 18.4% (*n*=28) and 6.9% (*n*=14) experiencing these, respectively. SA perpetrated by an intimate partner (13.7%, *n*=28) and weapon use during the assault (10.6%, *n*=22) were also relatively less common among survivors who disclosed these occurrences. Table 2 displays assault experience information.

Table 1. Demographics of the sample.

Demographic Characteristic	n (%)
Race	
White	170 (71.1)
Black	62 (25.9)
Asian	1 (0.4%)
Other	6 (2.5%)
Ethnicity	
Hispanic/Latinx	6 (2.5%)
Non-Hispanic/Latinx	232 (97.5)
Marital Status	
Single	172 (72.0)
Married/In a Relationship	27 (11.3)
Separated	9 (3.8)
Divorced	21 (8.8)
Widowed	7 (2.9)
Number of Visits	
One	218 (91.2)
Multiple	21 (8.8)
Were psychiatric medications prescribed during visit?	
Yes	18 (7.5)
No	221 (92.5)
Positive for suicide-related diagnosis?	
Yes	36 (15.1)
No	203 (84.9)
Poisoning-related diagnosis?	
Yes	9 (3.8)
No	230 (96.2)

Table 2. SA experiences.

SA Characteristic	n (%)
Anal penetration	
Yes	28 (18.4)
No	124 (81.6)
Missing	87 (36.4)
Genital injury	
Yes	76 (31.8)
No	128 (53.6)
Missing	35 (14.6)
Non-genital injury	
Yes	110 (46.0)
No	100 (41.8)
Missing	29 (12.1)
Alcohol or drug use prior to SA	
Yes	124 (51.9)
No	81 (33.9)
Missing	34 (14.2)
SA perpetrated by intimate partner	
Yes	28 (11.7)
No	176 (73.6)
Missing	35 (14.6)
Weapon use during SA	
Yes	22 (9.2)
No	185 (77.4)
Missing	32 (13.4)

Results of the Logistic Regression

Overall, 15.1% of the sample received a suicide-related diagnoses during the year after receiving a SAMFE (*n*=36). A logistic regression was performed to ascertain the effects of age, psychiatric medication prescriptions, alcohol and/or drug use prior to the assault, and whether the assault was perpetrated by an intimate partner on whether the patient receives a suicide-related diagnosis in the year following their assault. The results of this analysis are displayed in Table 3. While the overall model is not statistically significant, $\chi^2(4)=7.77$, $p=0.101$, receiving a prescription for psychiatric medications at the emergency department on the same day of the

SAMFE was significantly associated with suicidal behavior. Indeed, survivors receiving these prescriptions were 5.41 times more likely to receive a suicide-related diagnosis in the year following their assault (95% CI: 1.60, 18.25, p=0.007). Overall, 7.5% of the sample were prescribed psychiatric medications during their SAMFE (n=18). While the additional predictors were not significantly associated with suicidality, SA perpetrated by an intimate partner increased the odds of a suicide-related diagnosis by almost 40%.

Table 3. Logistic Regression Results for receiving suicide-related diagnosis

Variable	**B**	**S.E.**	**df**	**Sig.**	**OR (95% C.I.)**
Age	.003	.019	1	.874	1.003 (.967, 1.040)
Psychiatric prescriptions	1.688	.621	1	.007	5.408 (1.602, 18.249)
SA perpetrated by intimate partner	.335	.645	1	.604	1.398 (.395, 4.948)
Drug or alcohol use	.020	.454	1	.965	1.020 (.419, 2.483)
Constant	-2.008	.695	1	.004	.134

Identification of Latent Classes of SA Survivors

Table 4. Model fit and diagnostic criteria

	Model Fit Criteria					Diagnostic Criteria	
Models	**LL**	**BIC**	**AIC**	**Chi-square**	**df**	**Entropy**	**Smallest class size, n (%)**
1-Class	-395.88	821.27	803.75	175.14	57	0.695	137 (100)
2-Class	-377.13	818.22	780.26	55.20	50	0.662	11 (8)
3-Class	-369.87	838.13	779.73	41.73	43	0.648	11 (8)
4-Class	-364.36	861.57	782.73	22.85	36	0.639	9 (6.6)

N=137; LL=log-likelihood, BIC=Bayes information criterion, AIC=Akaike information criterion

The results of the LCA supported Aim 2, suggesting that classes of SA survivors exist. Table 4 presents results for models with classes 1 through 4. As shown, the BIC suggested a two-class model over the fitted one-, three-, and four-class models. Because BIC is typically considered the most reliable indicator of model fit, a two-class model was chosen. However, it should be considered that the other fit criteria did not indicate a two-class model, though inconsistent findings across fit indices are common in LCA analyses (Nylund-Gibson & Choi, 2018). In addition, the entropy was found to be slightly lower than the one-class model, although all models were above the minimum entropy (i.e., above 0.6). Furthermore, it is vital to note that the literature indicates a low likelihood of the existence of a single class of SA survivors, as both perpetrators and survivors may exhibit a wide range of characteristics and behaviors before and during an assault (Greathouse et al., 2016).

Table 5. Class membership percentages experiencing selected SA characteristics

Indicators	**Class 1**	**Class 2**
Genital injury	27.4	93.8
Anal penetration	7.2	75
Non-genital injury	43.5	81
Weapon use	7.6	31.3
Drug or alcohol use	12.1	6.8
SA perpetrated by an intimate partner	51.1	62.5

Table 6. Class memberships probabilities of experiencing selected SA characteristics

Indicators	**Class 1**	**Class 2**
Genital injury	.0	.9992
Anal penetration	.1349	.9091
Non-genital injury	.4603	.8182
Weapon use	.1032	.2727
Drug or alcohol use	.5635	.5456
SA perpetrated by an intimate partner	.1270	.0909

Table 7. Covariance matrix

Indicators	**1**	**2**	**3**	**4**	**5**	**6**
1. Genital injury	0.49920	0.38679	0.17881	0.08468	-0.00894	-0.01804
2. Anal penetration	0.38679	0.29969	0.13854	0.06561	-0.00693	-0.01397
3. Non-genital injury	0.17881	0.13854	0.06405	0.03033	-0.00320	-0.00646
4. Weapon use	0.08468	0.06561	0.03033	0.01437	-0.00152	-0.00306
5. Drug or alcohol use	-0.00894	-0.00693	-0.00320	-0.00152	0.00016	0.00032
6. SA perpetrated by an intimate partner	-0.01804	-0.01397	-0.00646	-0.00306	0.00032	0.00065

Figure 3 depicts a graphic representation of the two-class model of this sample of SA survivors as well as the probability of class membership relating to the six indicators of interest. The vast majority of the sample belonged to Class 1 (92%). Individuals assigned to this class were less likely to have experienced anal penetration, non-genital injury, and weapon use. Furthermore, genital injury was significantly less common in this group, whereas the risk of an intimate partner perpetrating SA was somewhat greater. In contrast, while Class 2 makes up a considerably smaller portion of the sample (8%), it has a substantially greater risk of genital and non-genital injury, anal penetration, and weapon usage than Class 1. Interestingly, both classes had similar probabilities of drug and/or alcohol use prior to their SA and somewhat similar probabilities of their assault being perpetrated by an intimate partner .

Figure 3. Depiction of class membership probabilities by LCA indicators.

AP=anal penetration, GI=genital injury, NGI=non-genital injury, WU=weapon use, DA=drug or alcohol use, IPV=perpetration by an intimate partner

Class Membership Relation to Suicidal Behavior and Overdoses

A two-proportion z-test was conducted to see if SA class membership was associated with receiving a suicide-related or poisoned diagnosis after the assault. Because suicide and SA have a well-established relationship in the literature, it is unlikely that experiencing SA, regardless of severity, results in a significantly lower risk of suicidal behavior or overdoses. Therefore, a one-tailed probability was examined.

Table 8 shows the proportion of survivors who received a suicide-related diagnosis or poisoning diagnosis separated by Class 1 and Class 2. SA survivors with predicted membership in Class 2 had a statistically significantly higher proportion of overdoses (.125) compared to those in Class 1 (.031) ($z=1.90$, SEM=.084, $p=0.029$ one-tailed). A calculation of Cohen's h was found to be $h=0.37$, indicating a small to moderate effect size. Class 2 SA survivors also had a larger proportion (.250) of total suicidal behavior compared to Class 1 (.143). However, this relationship was non-significant ($z=1.15$, SEM=.111, $p=.125$ one-tailed).

Table 8. Number and proportion of SA survivors with suicide-related and poisoning diagnoses by predicted class membership

	Suicide-Related Diagnoses	**Poisoning Diagnoses**
Class 1, n (%)	7 (43.8)	2 (12.5)
Class 2, n (%)	106 (47.5)	7 (3.1)

Table 9. Chi-square relationships between distal outcomes and LCA indicators

	Suicide-Related Diagnoses		**Poisoning Diagnoses**	
Indicators	X^2	df	X^2	df
Anal penetration	1.235	1	1.111	1
Genital injury	0.176	1	0.837	1
Non-genital injury	0.203	1	0.364	1
Weapon use	3.931	1	10.476*	1
Drug or alcohol use prior to SA	0.456	1	0.445	1
SA perpetrated by intimate partner	0.135	1	1.448	1

*$p<0.05$

A Chi-square analysis was conducted to understand whether specific indicators facilitated the associations between class membership and diagnoses in the following year. Table 9 shows the relationships between LCA indicators and distal outcomes of interest. Weapon use during the assault and poisoning diagnoses in the year after the assault have a significant relationship. Though the interpretation of this is limited due to the small sample size, the use of a weapon during an assault may be driving poisoning diagnoses following the assault. All associations between suicide-related diagnoses and SA characteristics were nonsignificant, consistent with similar proportions of suicidal behavior in both classes.

Chapter VI: Discussion and Conclusions

Discussion of Research Questions

In the current study, we aimed to examine the relationship between factors related to receiving a SAMFE after an assault and suicide-related diagnosis. Further, we also sought to identify distinct typologies of SA survivors who receive a SAMFE and to examine whether those identified classes predict subsequent suicidal behavior and/or overdoses one year after the exam. From a logistic regression, we identified receiving a prescription for a psychiatric medication as a significant predictor of suicide-related diagnoses in the year following a SAMFE. Indeed, SA survivors receiving these prescriptions were more than five times more likely to have suicidal behavior compared to women who received SAMFE but no prescription.

An LCA identified two distinct latent classes, which differed on assault severity. Approximately 7% of survivors assigned to Class 1 experienced anal penetration or weapon use during their assault and were less likely to experience genital and non-genital injury compared to Class 2. Comprising 92% of the sample, individuals assigned to Class 1 were more likely to report their assault as being perpetrated by an intimate partner.

The remaining 8% of the sample was assigned to the second group, defined by experiencing more extreme violence during their assault. In comparison with Class 1, the vast majority of the survivors assigned to the second identified latent class experienced genital injury (93.8%), anal penetration (75%), or non-genital injury (81%).

A two-proportion z-test identified that class membership was associated with experiencing an overdose. Indeed, the survivors with membership in Class 2 had a significantly higher proportion of poisoning diagnoses in the year following their SAMFE. While Class 2

survivors also had a larger proportion of suicide-related diagnoses in the sample, it was not significantly higher compared to those assigned to Class 1.

Though Class 2 made up a significantly smaller portion of the sample, it calls a pattern of the effects of violence to attention. Given the women in Class 2 experience more violent assaults that include weapon use and both genital and non-genital injury, it is not unexpected that the common effects of SA, such as PTSD and substance abuse, may be exacerbated by experiencing a more violent assault. Understanding the psychologic complexities involved, the relationship between these violent assaults and overdoses in the following year may suggest using substances as a coping mechanism. For example, a 2014 study found that PTSD symptoms among SA survivors predicted substance use and misuse in the six months following the assault, indicative of self-medicating (Walsh et al., 2014).

Study Limitations

While the current study takes important strides in the identification of classes of SA severity and their implications, some limitations should be acknowledged. This data was obtained from only one medical center and inclusion required an additional visit during the year after the SAMFE. Thus, follow-up data was only available for visits to that specific medical center or a hospital-affiliated outpatient clinic. Data about suicide-related and poisoning diagnoses post-assault were only available for those interested in follow-up at the medical center. Therefore, we did not have data from individuals who received a SAMFE but were uninterested in follow-up. Further, the majority of those who experience SA do not present for a SAMFE within the designated time frame after the assault (120 hours), which may limit the generalizability of results to the general population, as these individuals may be less likely to

engage in follow-up care (Gilmore et al., 2021). Furthermore, there is a possibility of overestimating the incidence of suicidal behavior and overdoses following an assault as those most at risk may have opted to attend these follow-up meetings, while those with stronger coping mechanisms may have been less inclined to go.

Second, this study only included women who completed a SAMFE. Men who received a SAMFE were excluded from these analyses due to the limited number of men who completed a SAMFE, rendering it impossible to examine gender differences in SA severity. Future studies should aim to examine whether latent classes of SA severity differ among men, and whether similar trends of suicidal behavior and overdoses can be found.

Lastly, missing data presents a limitation to the current study. Twelve percent (non-genital injury) to 36.4% (anal penetration) of data was missing for each LCA indicator. Listwise deletion occurred via the R package, "poLCA," resulting in decreased observations entered into the LCA and subsequent hypothesis analysis. Further, missing data about the occurrence of anal penetration during the assault was significantly associated with suicide-related diagnoses, while other missing indicators were not associated with any distal outcomes. While this could indicate that data is MAR due to some predictability of this association, the true cause of missing data cannot be ascertained. With anal penetration being associated with increased assault severity, there is a possibility that survivors were less willing to disclose the occurrence of anal penetration or unable to due to more severe injuries sustained. This could indicate that data could be considered Missing Not at Random (MNAR). Regardless of the missing data classification, non-response bias remains a possibility. Therefore, it is possible that those who experienced anal penetration during an assault are underrepresented in our analysis.

Implications of Findings, Recommendations, & Future Directions

Given the devastating mental health effects of SA, finding effective secondary prevention efforts and treatment for survivors is critical. The findings of the current findings study support an intervention administered within the SAMFE framework. The SAMFE offers a distinct opportunity to screen survivors and offer an intervention by medical providers, victim advocates, or other professionals. However, no psychological care is typically provided during the course of a SAMFE (DOJ, 2013).

This study identified receiving a psychiatric medication as predicting suicide-related diagnoses in the year following the SAMFE. This signals a point during the initial exam in which a behavioral intervention can be administered. For example, completing suicide safety planning with SA survivors receiving a psychiatric prescription could be a valuable addition to the SAMFE. Additionally, secondary prevention efforts including teaching skills that may reduce the likelihood of suicide including emotion regulation or distress tolerance may be warranted. Further, with assault severity's associations with suicidal behavior in the year after receiving a SAMFE, similar procedures could be employed to administer a suicide intervention for those who experience anal penetration, extensive genital and/or non-genital injury, or report weapon use during their assault.

Presently, most procedures for SANEs dictate performing a physical examination, forensic evidence collection, photography, and administration of pregnancy and sexually transmitted infection prophylaxis, with mental state examination of mental state comprising a smaller portion of the exam (Cybulska, 2013; DOJ, 2013). While mental state examinations may provide information on the acute cognitive state and identify those with a history of self-harm, these exams may not identify all individuals who may later exhibit suicidal behavior or

experience an overdose. In addition, referral for counseling or psychiatric services may present a financial or time constraint in receiving necessary care (Cybulska, 2013).

To facilitate the psychological care of SA survivors, it may be advantageous to integrate brief interventions and mental health first aid training into the administration of the SAMFE. The most typically utilized approach to identifying those at-risk in the emergency department is the use of self-report screeners due to the ease of administration in the high acuity setting (Asarnow et al., 2017). However, there has been increased recognition of the possibility of integrating therapeutic assessments into these screeners by adapting them to include behavioral tasks that may assess mental state, employ the development of a suicide safety plan, and/or indicate persons from whom to seek support (Babeva et al., 2016). The addition of these components may improve continuity of care during follow-up and may mitigate suicide and overdose risk in the short-term. Few of these advancements in suicide risk detection have been transferred into post-assault psychological care, but those few interventions have shown clinical success. For example, one study found that survivors who watched a video intervention explaining the SAMFE procedures and how to mitigate long-term trauma with standard care were less likely to exhibit psychological distress and use substances in the six weeks following the assault (Decker & Naugle, 2009). Thus, the inclusion of psychological assessments and brief interventions may reduce some of the psychological distress experienced by SA survivors. To combat struggles with time constraints, discomfort with providing trauma-informed care, and shortages of psychiatric and mental health professionals, telemedicine may be an advantageous approach to mitigate suicide and overdose risk among survivors of SA (Bruce et al., 2018; Ku et al., 2021). Current research highlights the growth of technology-based health interventions as a feasible approach that may be appropriate to mitigate the complex psychological trauma associated with

SA (Gilmore et al., 2017). Further, utilizing telemedicine to increase access to follow-up care may provide a less time intensive and inexpensive alternative for survivors at a high risk for suicide (Gilmore et al., 2017; Ward-Ciesielski et al., 2018).

Conclusions

The current study suggests that among women who received a SAMFE, those who received psychiatric prescription medication during their visit were more likely to exhibit suicidal behavior in the year following the exam. Further, two classes of SA survivors were characterized, such that a small percentage of the women included experienced more severe assaults that were more likely to include anal penetration, genital and non-genital injury, and weapon use, and comprised a larger proportion of overdoses in the sample. This presents distinguishing factors that may act as signals for further psychological care and treatment during and after a SAMFE.

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Appendix

Appendix A. Syntax for Logistic Regression using SPSS

```
LOGISTIC REGRESSION VARIABLES Any_Suicidality_dxs_post
  /METHOD=ENTER AGEATVISIT_SANE_v1 Any_PsychMeds_SANE_v1 DV_SANE_v1
ETOH_or_drugs_SANE_v1
   /PRINT=GOODFIT CI(95)
   /CRITERIA=PIN(.05) POUT(.10) ITERATE(20) CUT(.5).
```

Appendix B. Syntax for Latent Class Analysis using R

Data management

```
samfe <- read.csv(file='C:/Users/Alyssa/Dropbox (GSU
Dropbox)/MPH/n256data_samfe_simplified.csv', header=TRUE, na.strings =
c("9999"))
head(samfe)
samfe$DV_SANE_v1[samfe$DV_SANE_v1 == 1] <- 2
samfe$DV_SANE_v1[samfe$DV_SANE_v1 < 1] <- 1
samfe$DV_SANE_v1

samfe$vagpen_SANE_v1[samfe$vagpen_SANE_v1 ==1] <- 2
samfe$vagpen_SANE_v1[samfe$vagpen_SANE_v1 < 1] <- 1

samfe$vaginj_SANE_v1[samfe$vaginj_SANE_v1 == 1] <- 2
samfe$vaginj_SANE_v1[samfe$vaginj_SANE_v1 < 1] <- 1

samfe$analpen_SANE_v1 [samfe$analpen_SANE_v1 == 1] <- 2
samfe$analpen_SANE_v1 [samfe$analpen_SANE_v1 < 1] <- 1

samfe$analinj_SANE_v1 [samfe$analinj_SANE_v1 = = 1] <- 2
samfe$analinj_SANE_v1 [samfe$analinj_SANE_v1 < 1] <- 1

samfe$nongenitalinj_SANE_v1[samfe$nongenitalinj_SANE_v1 == 1] <- 2
samfe$nongenitalinj_SANE_v1[samfe$nongenitalinj_SANE_v1 < 1] <- 1

samfe$weaponuse_SANE_v1[samfe$weaponuse_SANE_v1 == 1] <- 2
samfe$weaponuse_SANE_v1[samfe$weaponuse_SANE_v1 < 1] <- 1

samfe$ETOH_or_drugs_SANE_v1[samfe$ETOH_or_drugs_SANE_v1 == 1] <- 2
samfe$ETOH_or_drugs_SANE_v1[samfe$ETOH_or_drugs_SANE_v1 < 1] <- 1
```

Creating Dataset with Only Females

```
samfe_fem <- filter(samfe, GENDER==1)

#Combining vag+anal injury into "genital injury"
samfe_fem$geninj<-samfe_fem$vaginj_SANE_v1>1
samfe_fem$geninj<-samfe_fem$analinj_SANE_v1>1

samfe_fem$geninj[samfe_fem$geninj == TRUE] <- 2
samfe_fem$geninj[samfe_fem$geninj == FALSE] <- 1
samfe_fem$geninj
```

LCA Specification

```
library(poLCA)
library(scatterplot3d)
library(MASS)
library(dplyr)
library(ggplot2)

f2<-cbind(geninj, analpen_SANE_v1, nongenitalinj_SANE_v1, weaponuse_SANE_v1,
ETOH_or_drugs_SANE_v1, DV_SANE_v1) ~ 1
M0<-poLCA(f2, samfe_fem, nclass=1, maxiter = 2000, graphs = FALSE, na.rm =
TRUE)
M1<-poLCA(f2, samfe_fem, nclass=2, maxiter = 2000, graphs = FALSE, na.rm =
FALSE, coeff.V)
M2<-poLCA(f2, samfe_fem, nclass=3, maxiter = 2000, graphs = FALSE, na.rm
=TRUE )
M3<-poLCA(f2, samfe_fem, nclass=4, maxiter = 2000, graphs = FALSE, na.rm =
TRUE)

poLCA.entropy(M0)/log(prod(sapply(M0$probs,ncol)))
poLCA.entropy(M1)/log(prod(sapply(M1$probs,ncol)))
poLCA.entropy(M2)/log(prod(sapply(M2$probs,ncol)))
poLCA.entropy(M3)/log(prod(sapply(M3$probs,ncol)))

M1$predclass
samfe_fem$predclass <- M1$predclass

library(foreign)
write.foreign(samfe_fem, "C:/Users/Alyssa/Dropbox (GSU Dropbox)/MPH/Master's
Thesis - Alyssa/Code/samfe_fem_export.txt","C:/Users/Alyssa/Dropbox (GSU
Dropbox)/MPH/Master's Thesis - Alyssa/Code/samfe_fem_export.sav",
              package="SPSS")
```

Appendix C. Syntax for two-proportions test using SPSS

```
PROPORTIONS
  /INDEPENDENTSAMPLES Any_Poisoning_dxs_post Any_Suicidality_dxs_post BY predclass
SELECT=LEVEL(1
    ,2 ) CITYPES=AGRESTI_CAFFO NEWCOMBE  TESTTYPES=WALDPROPORTIONS
  /INDEPENDENTSAMPLES Any_Poisoning_dxs_post Any_Suicidality_dxs_post BY predclass
SELECT=LEVEL(1
    ,2 ) CITYPES=AGRESTI_CAFFO NEWCOMBE WALDCC  TESTTYPES=WALDH0
WALDH0CC
  /SUCCESS VALUE=LAST
  /CRITERIA CILEVEL=95
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE.H0
  /SUCCESS VALUE=LAST
  /CRITERIA CILEVEL=95
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE.

CROSSTABS
  /TABLES=Any_Suicidality_dxs_post Any_Poisoning_dxs_post BY predclass
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ PHI CMH(1)
  /CELLS=COUNT PROP
  /COUNT ROUND CELL.

*association between missingness and outcomes.
CROSSTABS
  /TABLES=Any_Suicidality_dxs_post Any_Poisoning_dxs_post BY vagpen vaginj analpen
analinj
    nongenitalinj weapon drugalc dv
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ CMH(1)
  /CELLS=COUNT
  /COUNT ROUND CELL.
```