Sexual Assault and Co-occurrence of Mental Health Outcomes among Female, Male, and
Transgender–Gender Nonbinary U.S. College Students

Nicholas J. Parr, MS, MPH^{a, b}

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^a Department of Counseling Psychology and Human Services, University of Oregon. 5251 University of Oregon, Eugene, OR, 97403, United States of America. ORCID: 0000-0003-2067-9500.

^b Prevention Science Institute, University of Oregon, 6217 University of Oregon, Eugene, OR, 97403, United States of America

Author Note

Correspondence concerning this manuscript should be addressed to Nicholas J. Parr, Department of Counseling Psychology and Human Services, 5251 University of Oregon, Eugene, OR, 97403. Contact: nparr2@uoregon.edu. Telephone: (301) 221-6306. Fax: (541) 346-6778.

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Abbreviations: sexual assault (SA); transgender–gender nonbinary (TNB); latent class analysis (LCA); inverse-propensity weights (IPW).

Abstract

Purpose. To examine the co-occurrence of mental health (depression, anxiety, non-suicidal self-injury, suicide ideation) and substance use outcomes among female, male, and transgender–gender nonbinary (TNB) college students exposed to sexual assault (SA).

Methods. Data were drawn from a 2018 U.S. national survey of college student wellbeing ($N = 50,438$). Inverse propensity-weighted three-step latent class analysis was used to examine co-occurrence of outcomes while adjusting for 31 potential confounders of the relation between SA exposure and outcomes.

Results. Four latent classes were identified for female and male participants, and two for TNB participants, reflecting a range from low to high outcome risk. Exposure to SA was associated with significantly and substantially increased odds (ORs: 2.03–3.64) of membership to the highest-risk outcome class compared to the lowest risk class.

Conclusions. Exposure to SA in the college setting is associated with substantially increased risk of co-occurrence of depression, anxiety, non-suicidal self-injury, and suicide ideation regardless of gender identity.

Keywords: sexual assault; mental health; depression; non-suicidal self-injury; suicide; college; latent class analysis; transgender; gender nonbinary.

Implications and Contribution

This study advances understanding of co-occurring risks associated with sexual assault exposure among U.S. college students, and provides insight into the prevalence and impact of sexual assault among young adults identifying as cisgender female and male as well as transgender and gender nonbinary.

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Sexual assault (SA) among college and university (“college”) students constitutes an issue of major public concern, with up to 34% of female, 31% of male, and 20% of transgender college students experiencing some form of SA since entering college [1,2]. Outcomes associated with SA among college students include depression and anxiety, substance use, and suicidality [3–5]. Prior studies assessing the relation of SA with mental and behavioral health outcomes have typically done so while regression-adjusting for a set of potential confounders (e.g., age, race/ethnicity, education level, or fraternity/sorority membership). In these cases, the number of confounders is often limited and interactions among confounders as well as higher-order terms (e.g., quadratic or cubic) are rarely examined. It is also likely that such models do not control for all sources of confounding given the numerous possible etiological pathways of mental and behavioral health outcomes such as depression and substance use; moreover, regression adjustment does not allow for examining the degree to which systematic differences between exposure groups have been eliminated [6]. Additionally, most models in the existing literature test bivariate relations between SA exposure and a single outcome variable, an approach that provides limited insight into patterns of co-occurrence of mental and behavioral outcomes among SA victims in the college setting. Finally, most prior studies of the impact of SA have focused on cisgender female-identifying college students; notably fewer studies have assessed psychosocial outcomes of SA among cisgender male or transgender students, and in those that have, inference is limited by sampling strategies which produce comparatively small subsamples of cisgender male and non-cisgender (transgender or gender nonbinary) participants [7,8].

The current study attempts to address these limitations by using data derived from a large, U.S. national survey study of college student health and wellbeing ($N = 50,438$), and by implementing inverse propensity-weighted three-step latent class analysis to examine co-occurrence of mental health and substance use outcomes while adjusting for potential confounders of the relation between sexual assault exposure and outcomes among female, male, and transgender–gender nonbinary (TNB) participant subgroups.

Methods

Data were drawn from the 2017-2018 Healthy Minds Study, an annual survey administered to college and university students throughout the U.S. [9]. 34,007 participants identified as cisgender female, 14,908 as cisgender male, and 1,523 as TNB. Mean age in each subgroup was 23.1 ($SD = 6.3$), 23.8 (6.6), and 21.5 (5.0), respectively. Across subgroups, 66.2–77.5% of participants identified as White. Most participants (90.2–94.5%) maintained a full-time enrollment status and were enrolled in bachelor’s degree programs (60.7–82.7%). This study was exempted from institutional review board oversight as a secondary analysis of deidentified data; data were collected with informed consent from all participants during the original survey administration.

Measures

Sexual assault was measured using an item assessing the occurrence of past-year unwanted sexual experiences. Outcome variables were defined as follows: depression (above cutoff score of 10 on the Patient Health Questionnaire-9), anxiety (above cutoff score of 10 on the Generalized Anxiety Disorder-7 scale), non-suicidal self-injury (NSSI; endorsement of any form of NSSI [e.g., cutting or burning] in the prior year), suicide ideation (endorsement of the item, “In the past year, did you ever seriously think about attempting suicide”), and substance

use (past 30-day use of cocaine, heroin, methamphetamines, or ecstasy, as well as non-methamphetamine stimulants [e.g., Adderall] or opioid pain relievers without a prescription or more than prescribed). All outcome variables were binary.

Analytic Approach

Latent class analysis (LCA) was used to examine the co-occurrence of outcomes by estimating multivariate classes of all outcomes from response data. SA exposure status was incorporated as a predictor of participant membership to outcome classes using a three-step estimation approach to prevent the covariate from problematically influencing the formation of the classes. Estimation of separate models for female, male, and TNB participants was planned a priori. To control for the influence of potential confounders of the relation between SA exposure and outcome classes, a method proposed by Butera et al. [10] for incorporating inverse propensity weights (IPWs) into LCA was implemented. In this procedure, IPWs are calculated from propensity scores and specified as weights in the LCA model. Compared with regression adjustment, this approach has the benefits of allowing for the inclusion of numerous potential confounders and for the formal evaluation of the degree to which included confounders address systematic differences between groups (through inspection of balance diagnostics). Propensity scores were estimated using generalized boosted regression, which employs a regression tree algorithm to allow for interactions among, and higher-order forms of, included confounders [10]. Thirty-one potential confounders were used to estimate propensity scores, including variables related to participant race/ethnicity, academic level, socioeconomic status, involvement in activities (e.g., fraternities/sororities) and military service, religious affiliation, and mental health history (e.g., prior diagnoses of depression, anxiety, or substance use disorder). Prior to LCA model estimation, IPWs were multiplied by survey weights available in the data to account for

the complex survey design utilized for data collection. Propensity scores were estimated using the *twang* package for R (version 3.6.0), and LCA with IPWs was carried out in *Mplus* (version 8.3).

Results

Sexual assault was reported by 13.2% of female, 3.7% of male, and 18% of TNB participants. Following PS estimation, absolute standardized mean differences between SA exposure groups on all included confounders was less than 0.2, indicative of balance on confounders across exposure groups [10]. LCA model fit information (Table 1) indicated that models with four outcome classes were best fitting for female and male participants, and with two classes for TNB participants. In all subgroups, a low-risk class was identified in which participants had low probabilities of endorsing each outcome, as was a high-risk class which reflected moderate to high probabilities of co-occurring depression, anxiety, NSSI, and suicide ideation (Table 2). In female and male subgroups, intermediate risk classes were also identified, and in all subgroups and classes, there was low probability of endorsing substance use. Finally, participants exposed to SA were significantly more likely to belong to higher-risk outcome classes than to low-risk classes, compared with participants who were not exposed to SA. Sexual assault exposure among female participants was associated with a 2.9-fold increase in odds of membership to the highest risk class, 95% CI [2.49, 3.30]; a 3.6-fold increase in odds of membership to the highest risk class among male participants, 95% CI [2.46, 5.39]; and 2.0-fold increase in odds of membership to the highest risk class for TNB participants, 95% CI [1.28, 3.23]. In female and male subgroups, SA exposure was similarly associated with greater odds of membership to intermediate-risk classes compared to low-risk classes (see Table 2).

Discussion

Sexual assault is a prevalent public health concern, in particular in the college setting, and impacts young adult mental and behavioral health and social wellbeing. Building on prior studies that have examined bivariate associations between SA exposure and depression, anxiety, NSSI, suicidality, and substance use, the current study examined the co-occurrence of these outcomes among SA-exposed and non-exposed college students in a large, gender-diverse U.S. national sample, while accounting for numerous potential confounders. Findings indicate that, with the exception of substance use (exclusive of alcohol or marijuana), college students exposed to SA have substantially higher risk of co-occurrence of depression, anxiety, NSSI, and suicide ideation. Importantly, however, a key limitation of this study is the use of cross-sectional data; as a result, conclusions about the causal nature of this relation should be made with caution.

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Table 1

Latent Class Model Fit Information

	Number of classes	BIC	LRT <i>p</i> -value
Female	1	155986.0	—
	2	137391.6	.000
	3	136499.4	.000
	4	136228.8	.000
	5	136280.7	.214
	6	136341.8	—
Male	1	61426.6	—
	2	54280.3	.000
	3	53998.6	.000
	4	53879.0	.000
	5	53934.4	.685
	6	53990.0	—
TNB	1	8845.1	—
	2	8120.7	.000
	3	8139.4	.178
	4	8163.1	—
	5	8205.9	—
	6	8249.0	—

Note. Boldface Bayesian information criterion (BIC) value is the lowest value for each subgroup; lower BIC values suggest a model is more likely to be the true model among models estimated. Corrected Vuong-Lo-Mendell-Rubin likelihood ratio test (LRT) *p*-values less than .05 indicate a model fits significantly better than a model with one fewer class; *p*-values greater than .05 suggest a model does not fit significantly better than a model with one fewer class (i.e., the prior model is better fitting). TNB = transgender–gender nonbinary.

Table 2

Latent Classes of Depression, Anxiety, Non-suicidal Self-injury, Suicide Ideation, and Substance Use among Female, Male, and Transgender–Gender Nonbinary Participants (N = 50,438): United States, 2017–2018

	Female (n = 34,007)				Male (n = 14,908)				Transgender–Gender Nonbinary (n = 1,523)	
	Low Risk	Moderate Depression, NSSI	Depression, Anxiety	Depression, Anxiety, NSSI, Moderate Ideation	Low risk	Moderate Depression, NSSI	Depression, Moderate Anxiety	Depression, Anxiety, NSSI, Moderate ideation	Low Risk	Depression, Anxiety, NSSI, Moderate Ideation
Depression										
1 (no)	0.929	0.459	0.249	0.060	1.000	0.961	0.000	0.012	0.792	0.045
2 (yes)	0.071	0.541	0.751	0.940	0.000	0.039	1.000	0.988	0.208	0.955
Anxiety										
1 (no)	0.950	1.000	0.170	0.032	0.950	0.861	0.487	0.257	0.875	0.209
2 (yes)	0.050	0.000	0.830	0.968	0.050	0.139	0.513	0.743	0.125	0.791
Self-injury										
1 (no)	0.930	0.391	0.761	0.252	0.973	0.481	0.839	0.190	0.659	0.224
2 (yes)	0.070	0.609	0.239	0.748	0.027	0.519	0.161	0.810	0.341	0.776
Ideation										
1 (no)	0.986	0.580	0.930	0.352	0.990	0.788	0.869	0.412	0.859	0.468
2 (yes)	0.014	0.420	0.070	0.648	0.010	0.212	0.131	0.588	0.141	0.532
Substance use										
1 (no)	0.981	0.921	0.966	0.917	0.967	0.908	0.944	0.844	0.933	0.930
2 (yes)	0.019	0.079	0.034	0.083	0.033	0.092	0.056	0.156	0.067	0.070
n ^a	21,372	2,025	8,098	2,512	9,583	1,374	2,827	1,125	536	987
(%)	(62.8)	(6.0)	(23.8)	(7.4)	(64.3)	(9.2)	(19.0)	(7.5)	(35.2)	(64.8)
OR		2.854	1.346	2.865		3.938	1.753	3.640		2.031
[95% CI]	REF	[2.37, 3.44]	[1.16, 1.57]	[2.49, 3.30]	REF	[2.49, 6.39]	[1.19, 2.59]	[2.46, 5.39]	REF	[1.28, 3.23]

Note. Substance use includes use of cocaine, heroin, methamphetamines, or ecstasy, as well as non-methamphetamine stimulants (e.g., Adderall) or opioid pain relievers without a prescription or more than prescribed. Item response probabilities in boldface are those greater than .50. Confidence intervals (CI) in boldface indicate statistical significance at $\alpha = .05$. NSSI = non-suicidal self-injury. OR = odds ratio for class membership by sexual assault exposure status. REF = reference class. ^a Class counts and proportions derived from posterior probabilities of class membership.