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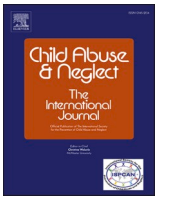

Associations between early child adversity and lifetime suicide attempts among gender diverse individuals: A moderated mediation

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ABSTRACT

Background: This study examines the effect of adverse childhood experiences (ACEs) on lifetime suicide attempts (LSA) across five gender subgroups (i.e., transgender men, transgender women, transgender non-binary, cisgender men and cisgender women).
Objective: To examine (1) the prevalence of LSA across gender identity subgroups; (2) whether the association between ACEs and LSA is moderated by gender identity subgroup; (3) depressive symptoms, alcohol use disorder, social support, and social well-being as mechanisms linking ACEs with LSA; and (4) the moderating role of gender identity on the four putative mediators.
Participants and settings: We used nationally representative data from a population-based survey of $N = 1368$ transgender and cisgender individuals collected between 2016 and 2019.
Methods: Structural equation modeling was used to explore the indirect effect of depressive symptoms on the relation between ACEs and LSA, and the moderating impact of gender identity.
Results: LSA was significantly more prevalent among transgender respondents (cisgender man = 5 %; cisgender woman = 9 %; transgender man = 42 %; transgender woman = 33 %; transgender non-binary = 37 %; $p < 0.001$). Individuals with more ACEs had a greater risk of engaging in LSA regardless of gender identity; however, moderation results showed that the impact of each additional ACE on LSA was stronger for individuals with transgender identities: the likelihood of engaging in LSA was statistically similar for transgender men with no ACEs and cisgender men with all 8 ACEs. Indirect effects of ACEs on LSA via depressive symptoms were also observed, and the mediating effect was moderated by gender identity.
Conclusions: By examining the mechanisms linking childhood adversity to LSA, this study demonstrates that not all ACEs impact gender minority subgroups equally.

1. Introduction

Deemed a public health crisis, suicide is a leading cause of death in the United States. The prevalence of suicide increased by 16 % from 2011 to 2021 (Saunders & Panchal, 2023). Whereas individuals of any gender can be at risk for suicide, suicidality disproportionately impacts those whose gender is different than their sex assigned at birth (i.e., transgender individuals) (Jackman, Caceres,

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Kreuze, & Bockting, 2021). Previous studies in the United States have estimated that between 14.8 and 41 % of transgender adults attempt suicide during their lifetime compared to 1.1–4.6 % of the general population (Barboza, Dominguez, & Chace, 2016; James et al., 2016; Haas, Rodgers & Herman, 2014; Clements-Nolle, Marx, & Katz, 2006; Goldblum et al., 2012; Marshall et al., 2016; Xavier, Bobbin, Singer, & Budd, 2005). Further, studies show that among the transgender population, the prevalence of lifetime suicide attempts (LSA) is highest in adolescence and young adulthood (Austin, Craig, D'Souza, & McInroy, 2022). Despite research indicating that LGBTQ+ (Lesbian, Gay, Bisexual, Transgender, Queer and all other sexual/gender identities) individuals are at increased risk for both adverse childhood experiences (ACEs) and suicidal behavior, there has been relatively little research exploring the association between these constructs by gender identity subgroups. Evidence-based interventions are critical for designing effective, gender specific, prevention strategies and programs (Lee & Park, 2023). However, "researchers have yet to fully explore the combined impact that these prevention strategies can have on suicide and ACE prevalence (Ports, Merrick, et al., 2017, p.4)."

1.1. Adverse childhood experiences and LSA

ACEs are defined as stressful or traumatic experiences during childhood including witnessing domestic violence, child abuse and neglect, living in a household with someone who misused drugs or alcohol, was incarcerated, and/or had a mental health problem (Felitti et al., 1998; Felitti, Anda, Nordenberg, & Williamson, 1998). Two decades of research on ACEs highlight childhood adversity as a common occurrence and focuses attention on how multiple exposures effect a variety of negative health outcomes. Consistent with the literature on polyvictimization, researchers using the cumulative risk (CR) score have found a dose-response relationship between the number of ACEs and a broad range of physical and mental health problems. Demarcating the ACEs CR scale at 'four or more' has been repeatedly shown to be the cutoff by which the risk of poor mental and physical health markedly increases (Felitti, Anda, Nordenberg, Williamson, 1998; Liu et al., 2021; Radcliff, Crouch, & Strompolis, 2018; Sun et al., 2017; Testa, Jackson, Boccio, Ganson, & Nagata, 2022). Given the cumulative nature of ACEs, an additive risk score is also commonly used to capture the impact of multiple ACEs on behavioral health outcomes (Lund, Toombs, Radford, Boles, et al., 2020; Barboza, 2018; Menard, Bandeen-Roche, & Chilcoat, 2004). However, only recently has research begun to focus on the connection between ACEs and suicidality (Lee & Park, 2023) and/or sought to identify the combined impact of risk and protective factors that may exacerbate the relationship between them (Ports, Merrick, et al., 2017). Studies have shown, however, that depression (Abbott & Slack, 2021; Barboza, 2018; Chapman et al., 2004), substance misuse (Barboza, 2018; Dube, Anda, Felitti, Edwards, & Croft, 2002; Testa et al., 2022) suicidal ideation and suicidal behaviors (Blosnich, Henderson, Coulter, Goldbach, & Meyer, 2020; Boullier & Blair, 2018; Felitti, Anda, Nordenberg, Williamson, 1998; Fujiwara, 2022; Fuller-Thomson, Baird, Dhrodia, & Brennenstuhl, 2016; Vig, Paluszek, & Asmundson, 2020) are specific risk factors of ACEs CR risk that last well into adulthood.

1.2. Gender identity as moderator of the ACEs-LSA connection

Research has established that transgender youth experience more adversity in childhood relative to both the general population (Barboza-Salerno & Remillard, 2023; Craig et al., 2020) and the heterosexual population (Schnarrs et al., 2019). One study of sexual and gender minorities reported that LGBTQ+ individuals experience 3.14 ACEs before age 18 out of a total of 10, on average, measured using the original ACEs scale (Craig et al., 2020). A different study examining associations between ACEs and delinquent behavior in a sample of 1245 foster youth found that sexual minority youth endorsed 3.26 ACEs out of 16 possible, on average, from the Lifetime Experiences Questionnaire (Barboza-Salerno & Remillard, 2023). Whereas most studies do not disaggregate the LGBTQ+ population due to sample size constraints, one study of 131 transmasculine individuals enrolled in a clinical trial found that over 90 % of the sample reported at least one ACE, and that 45 % reported four or more ACEs (Suarez, Peitzmeier, Potter, Samandur, & Reisner, 2021).

Studies from around the world have found that ACEs increase the risk of both depression and suicidality among gender minorities (Cook, Valera, Calebs, & Wilson, 2017; Hart et al., 2018; McGraw et al., 2022; Rafael et al., 2021). Nevertheless, although the link between exposure to traumatic childhood events and suicidal behaviors is well-documented (Brodsky & Stanley, 2008; Fuller-Thomson et al., 2016; Janiri et al., 2018), little is known about the relationship between ACEs and LSA among specific gender subgroups. One study found that transgender men who reported four or more ACEs had higher odds for experiencing a range of mental health problems including depression, suicidality, post-traumatic stress disorder, and intimate partner violence compared to those who experienced three or fewer ACEs (Suarez et al., 2021). Specific ACEs associated with lifetime suicide attempts among gender minority adults include childhood physical abuse, neglect, (Austin et al., 2022; Schnarrs et al., 2019) and exposure to domestic violence (Fuller-Thomson et al., 2016; Schnarrs et al., 2019) and family rejection (Mosley-Johnson et al., 2019).

1.3. Potential mediators of the ACEs-LSA association

Exposure to ACEs results in changes to brain structure and function and alters stress-responsive neurobiological systems which predisposes individuals to LSA (Dorri, Stone, Salcido Jr, Russell, & Schnarrs, 2023). However, not all individuals exposed to ACEs engage in LSA suggesting the existence of possible mediating effects (Rytilä-Manninen, Haravouri, et al., 2018). Studies have shown that exposure to ACEs is associated with higher levels of depression (Cook et al., 2017), and alcohol use (Ding, Liu, & Liu, 2023), on the one hand, and lower levels of perceived social support (Rytilä-Manninen, Haravouri, et al., 2018; Ding et al., 2023), and social well-being (Mosley-Johnson, Garacci, Wagner, Mendez et al., 2019), on the other, thereby increasing LSA risk. Gender minorities who lack social support and have low levels of social well-being have a greater risk of poor mental health outcomes including suicidality (Barboza et al., 2016; Warren, Smalley, & Barefoot, 2016). Deterioration in social support and well-being increases the likelihood of

experiencing additional risk factors such as gender-based victimization and discrimination among individuals with more ACEs (Austin et al., 2022; Leone, 2023). For example, one study of 350 transgender persons found that the relative risk of LSA was greater among individuals who experienced physical victimization based on gender-identity, had low levels of social support, and were housing insecure (Barboza et al., 2016). Similarly, ACEs exposure is associated with higher levels of depressive symptoms and alcohol use, which in turn contributes to the persistence of psychological distress over time, including LSA (Liu, Nestor, Eckstrand, & Cole, 2023).

Stress proliferation theory has been used to explain why ACEs tends to predispose individuals to LSA risk. Specifically, stress proliferation theory suggests that multiple adverse experiences in childhood influence how stressors are experienced in the future and sets the stage for experiencing reinforcing cycles of psychological distress into adulthood (Liu et al., 2023). Given past research, it is likely that transgender individuals with more ACEs have higher levels of depressive symptoms, more alcohol use, lower levels of social support and less social well-being which, in turn, heightens the risk of LSA. However, no previous study to date has examined potential mediators of the association between ACEs cumulative burden and LSA, or whether the link between ACEs and LSA differs across specific gender identity subgroups (i.e., transgender man, woman, non-binary, cisgender man, cisgender woman). This gap in the extant research literature is especially pronounced given that 1) depressive symptoms, alcohol use and social support have consistently been shown to influence the association between ACEs and LSA in the general population; 2) that traditional gender categories (i.e., cisgender man v. woman) contextualize the suicidal process (Fuller-Thomson et al., 2016); and 3) that the suicide rate is considerably higher among transgender persons (Virupaksha, Muralidhar, & Ramakrishna, 2016).

1.4. Study objectives

Given the review of research presented above, in this paper we consider the following hypotheses: (1) transgender individuals have higher prevalence of LSA; (2) transgender individuals with more ACEs are more likely to engage in LSA (i.e., direct effect); (2) ACEs is indirectly linked to LSA via four potential mediators (depressive symptoms, alcohol use disorder, social support, and social well-being) (i.e., mediation); and (4) the indirect effect of ACEs on LSA via the potential mediators will be greater for transgender subgroups compared to cisgender subgroups (i.e., moderated mediation). By focusing on the moderating role of subgroup identification on the ACEs – LSA connection, we avoid masking potentially significant differences in LSA prevalence across specific gender identity subgroups (Diemer, Hughto, Gordon, Guss et al., 2018) and consider the psychosocial experiences of cisgender and gender minority groups separately (Warren et al., 2016). To address the identified gaps in extant research, the current study uses a large, population-based sample of transgender and cisgender adults to address the following questions: (1) What is the prevalence of LSA across gender identity subgroups? (2) Is there a relationship between ACEs and LSA and if so, does gender identity moderate the relationship? and (3) Do depressive symptoms, alcohol use disorder, perceived social support, and/or social well-being mediate the relationship between ACEs and LSA?; and (4) Does gender identity moderate the mediating effect of those relations?

2. Methods

2.1. Study design and sampling

The current study examined data from a national probability sample of cisgender and transgender individuals in the United States collected between 2016 and 2018 (Meyer, 2020). Participants were recruited and screened by Gallup, Inc. using random digit dialing (RDD) of both landlines and cellphones followed by a survey mailed to participants' home addresses. A two-step process was used to recruit participants for the study. The purpose of step one was to determine whether one's current gender identity (e.g., man, woman, transgender) is different than their gender identity at birth. During step two, individuals who identified as a gender minority were invited to complete the survey. Eligibility criteria included being at least 17 years of age, having completed a sixth-grade education, and being able to complete the interview in English. Participants who were not classified as transgender were invited to take a similar survey, the *Cisgender* survey, that had the same eligibility requirements for age, education, and speaking English. Participants responded to each survey by self-administering the study questionnaire either online via a link provided in an email or on paper via a mailed questionnaire returned in a pre-stamped preaddressed envelope. A $25 gift certificate was sent with the invitation to participate in the survey. In total, 432,251 and 4020 transgender and cisgender participants, respectively, were screened for inclusion in the study. Among those who were screened, 668 (71.9 % of those eligible) and 2548 (72.3 %) agreed to participate in the study. The response rate was 28.7 % and 33.6 % for the trans and cisgender surveys, respectively, leaving a final combined sample size of 1436 ($N = 274$ transgender and $N = 1162$ cisgender individuals). Both studies were reviewed and approved by a university Institutional Review Board (IRB). For more about the survey design and methodology see *LGBTQ People in the US: Select Findings from the Generations and TransPop Studies* (Meyer, 2020).

2.2. Outcome variable

Suicidal ideation and behavior. Suicidal behavior was measured using a modified version of the Study to Assess Risk and Resilience in Service Members (STARRS) Instrument (Ursano et al., 2014). Respondents were first asked about lifetime suicide ideation ("Did you ever in your life have thoughts of killing yourself?"), and subsequently suicide attempts ("Did you ever make a suicide attempt; that is, purposefully hurt yourself with at least some intention to die?"). Suicide ideation is a necessary precursor to suicidal behavior; hence, only respondents who reported lifetime suicidal ideation were assessed.

2.3. Independent variable

Adverse child experiences. A scale on ACEs (CDC-BRFSS, 2010) was used to measure negative experiences before age 18. Scale items included household mental illness (i.e., living with someone who was depressed, mentally ill, or suicidal); household intimate partner violence (i.e., parents or adults in the home slap, hit, kick, punch, or beat each other up on more than one occasion); being emotionally abused on more than one occasion; being physically abused on more than one occasion; being sexually abused once; parental divorce or separation; household substance use and living with an incarcerated household member. A score (0–8) indicating the number of adverse childhood experiences respondents reported during childhood was created by summing the items. Respondents indicating "don't know" or "refused" on any single scale item were recorded as missing. (Cronbach's = 0.77).[1]

2.4. Moderator variable

Gender identity as either a cisgender man or woman or a transgender man, woman or non-binary individual served as the moderator variable. Gender identity was determined using the two-step process described above.

2.5. Potential mediator variables

Depressive symptoms. Mental disability was assessed using the Kessler-6, which is a 6-item scale in the National Comorbidity Survey (Kessler et al., 2003). Scale items asked respondents how often, in the past 30 days, they had felt 1) nervous, 2) hopeless, 3) restless or fidgety, 4) so depressed that nothing could cheer you up, 5) that everything was an effort, and 6) worthless. Responses were recorded on a 5-point scale (ranging from "*all of the time*" to "*none of the time*.") All items were first reverse-coded so that "*none of the time*" had a value of 1 and "*all of the time*" had a value of 5. Any scale items not answered by respondents were recorded as missing. Subsequently, the scale was created as the sum of all variables within the scale (Cronbach's = 0.89).

Alcohol use. Alcohol use was assessed using the Alcohol Use Disorder Identification Test (AUDIT- C), a 3-item scale created to identify persons with problematic drinking behaviors, or who have current alcohol use disorders (Bush et al., 1998), including those alcohol use disorders identified in the fifth revision of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (Dawson et al., 2012). The scale items and responses include: 1) How often do you have a drink containing alcohol? (0 = "*never*" to 4 = "*4 or more times a week*"); 2) How many standard drinks containing alcohol do you have on a typical day? (0 = "*none*" to 4 = "*10 or more*"), and 3) How often do you have six or more drinks on one occasion? (0 = "*never*" to 4 = "*daily or almost daily*"). The final scale was created as the sum of all variables (Cronbach's = 0.67).

Perceived social support. The Multidimensional Scale of Perceived Social Support (Zimet et al., 1988) asks respondents to rate their levels of agreement with 12 items such as 1) there is a special person who is around when I am in need, and 2) my family really tries to help me. Responses were recorded on a 7-point Likert scale ranging from "*very strongly disagree*" to "*very strongly agree.*" The middle point of this scale was "*neither agree nor disagree.*" The scale was created as a mean score of each of the scale items. The scale ranged from 1 to 7 with lower values indicative of less perceived social support and higher values indicative of more perceived social support (Cronbach's = 0.93). All scale items are reproduced in Appendix I.

Social well-being. The Social Well-Being scale consists of 15 items used to assess the respondents' appraisal of their circumstances and functioning in society (Keyes, 1998). In this scale, the respondents were asked to rate their levels of agreement with several items that include, for example, 1) I don't feel I belong to anything I'd call a community 2) My community is a source of comfort, and 3) I have something valuable to give to the world. Each were rated on a 7-point Likert scale ranging from "*strongly disagree*" to "*strongly agree*". To create a scale variable, 8 of the 15 items were reverse-coded then the scale was created as a mean score of each of the items within the scale. The scale ranged from 1 to 7 with lower values indicative of less social well-being and higher values indicative of greater social well-being (Cronbach's = 0.81). All scale items are reproduced in Appendix I.

2.6. Control variables

Demographic covariates consisted of age (continuous; years), sexual orientation, race/ethnicity (non-Latine White, non-Latine-Black, Latine, Other Race), income (continuous; dollars), education (continuous; years), sex at birth (female v. male; dichotomous), and poverty status. Poverty status consisted of four categories (<100 % of the federal poverty line (FPL); 100–199 % FPL, 200–299 % FPL and 300 % + FPL). Respondents were categorized as either living in poverty (below 100 % FPL) based on their reported household income and the reported number of people living on that household income in consideration of the U.S. Census Bureau's poverty thresholds for the year in which the survey was taken (i.e., 2016–17).

2.7. Statistical analysis

We first estimated the weighted distributions of sociodemographic and contextual characteristics by history of suicidal behavior among respondents with suicide ideation and used *t*-tests and chi-square tests of independence to explore group differences. We

[1] For each scale item we report Cronbach's alpha as a measure of the internal consistency as found in the original scale.

compared the average number of ACEs across gender identity by history of suicidal behavior. We used *ggstatsplot* (Patil, 2018; Wickham, Pedersen, Takahashi, Wilke, & Woo, 2018) in R (RStudio Team, 2022) to create visualizations using details from the statistical analysis testing group differences using a variable based dot plot. The variable based dot plot compares mean ACEs by gender identity by combining the graphical information with tests of statistical significance using the Bayes Factor. The Bayes Factor provides a ratio of the likelihood of obtaining the data provided by the alternative and null hypotheses.

Because the dependent variable was dichotomous, we conducted multivariate logistic regression moderated mediation analysis using the PROCESS macro available in SPSS (Hayes, 2009, 2017). We used PROCESS model 1 to test for moderation only and PROCESS model 8 to test for moderated mediation. Four logistic regression analyses were conducted: (1) Model 1, our unadjusted model, included gender identity only; (2) Model 2 incorporated demographic characteristics and ACEs CR; (3) Model 3 added an interaction term between ACEs and gender identity to test the hypothesis that gender moderates the relationship between ACEs CR and LSA (PROCESS model 1); and (4) Model 4 added four potential mediators separately to Model 3 to test for indirect effects and moderated mediation (PROCESS model 8). Specifically, the moderated mediation tested the conditional indirect effect of two risk (depressive symptoms, alcohol use disorder) and two protective (social support, social well-being) factors on the relationship between ACEs and LSA, and includes an interaction term between gender identity and ACEs. The theoretical and statistical diagram corresponding to the hypothesized relationships are shown in Fig. 1A and B.

In all models, we considered transgender men as the referent for gender identity instead of another category (e.g., cisgender men) because 1) transgender men had the highest prevalence of LSA; and 2) to avoid using the socially dominant group as the reference category (Johfre & Freese, 2021). In any event, because we use post-estimation to calculate the predicted probability of LSA for all gender identities, the selection for the referent group is not important. An index of moderated mediation was used to test the significance of the moderated mediation (i.e., the difference of the indirect effects across levels of gender identity) using 10,000 bias corrected 95 % confidence intervals (Hayes, 2017). An effect was deemed significant if zero was not included within the confidence interval. To better illustrate the impact of gender identity across ACEs CR, we predicted the probability of LSA across gender identity and ACEs CR using the model coefficients while holding all other variables constant at their means (i.e., poverty status, education, income, race, sexual identity, sex at birth, and age). We were additionally interested in exploring differences in LSA across all levels of race/ethnicity in addition to gender and ACEs CR. We used post-estimation to calculate the probability of LSA across gender and racial identity (Lenth, 2020). We compared the fit of each model using the likelihood ratio test and examined the sensitivity and specificity of the best fitting model. Variance Inflation Factors (VIFs) and tolerance measures were examined for multicollinearity.

3. Results

All 1368 respondents with valid data on the measures were included in our final model. The prevalence of suicidal ideation was significantly lower for cisgender men (5 %) and women (9 %) compared to transgender men (42 %), transgender women (44 %) and transgender non-binary persons (37 %) ($p < 0.001$) (see Table 1). Individuals who attempted suicide were younger, received less formal education and had lower income levels. Compared to White respondents, respondents of color were significantly more likely to engage in LSA. The prevalence of LSA was more than four times higher among respondents who identified as lesbian, gay, or bisexual compared to heterosexual and who reported living <100 % below the FPL v. 300 % + below the FPL. The mean ACEs CR score differed significantly for respondents who attempted suicide compared to those who did not. Table 2 shows the correlations between putative mediator variables used in the models for transgender (upper diagonal) and cisgender (lower diagonal) individuals. The strongest negative correlations are observed for social well-being and depressive symptoms (transgender: $r = -0.43$, $p < 0.001$; cisgender: $r = -0.47$, $p < 0.001$) whereas strong positive correlations are observed for ACEs CR and depressive symptoms (transgender: $r = 0.42$, $p < 0.001$; cisgender: $r = 0.34$, $p < 0.001$).

All individuals who reported LSA had an ACEs CR score greater than four, on average (see Fig. 1). The test statistics supporting the

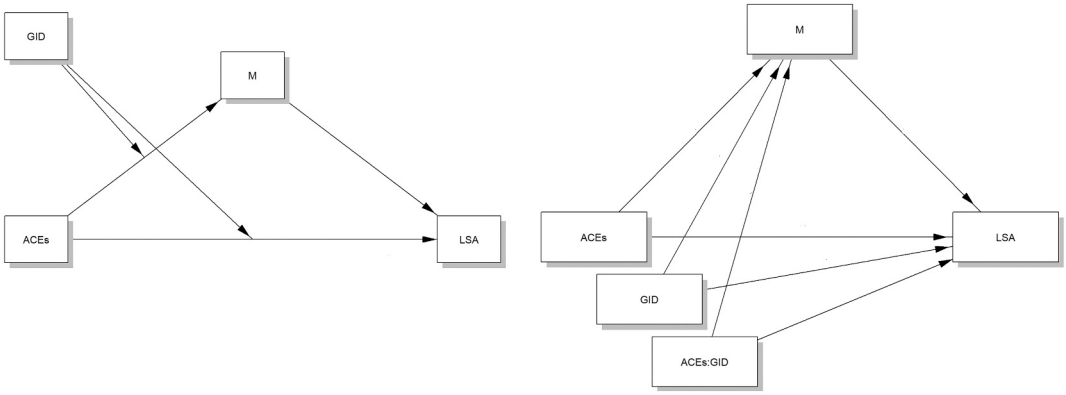

Fig. 1. (A) Theoretical model of the hypothesized relationships based on PROCESS model 8 between GID = gender identity, adverse childhood experiences = ACEs, *M* = putative mediators (i.e., depressive symptoms, alcohol use disorder, perceived social support and social well-being) and lifetime suicide attempts = LSA; (B) statistical model of the same relationships.

Table 1
Descriptive statistics by suicide attempt.

	No LSA ($N = 1103$)			LSA ($N = 291$)			Statistics	
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	*p*	Cohen's D
Contextual Variables								
Social Well-Being	4.78 (0.87)	1.6	6.87	4.34 (0.96)	2.2	6.4	<0.001	0.47
Depressive Symptoms	4.48 (4.53)	0	22	10.28 (5.82)	0	24	<0.001	−1.11
Alcohol Use Disorder	2.25 (2.09)	0	12	2.21 (2.10)	0	11	0.811	0.02
Social Support	5.45 (1.34)	1	7	4.85 (1.39)	1	7	<0.001	0.44
ACEs	2.06 (1.94)	0	8	4.18 (2.06)	0	8	<0.001	−1.06
Demographics								
Age (years)	54.83 (16.2)	18	72	41.5 (17.1)	18	72	<0.001	0.80
Income (dollars)	7.62	0	13	4.92	0	13	<0.001	0.36
Education (years)	4.44 (1.36)	1	6	3.95	1	6	<0.001	0.74
Gender Identity								
Cisgender Man	95 %	–	–	5 %	–	–		–
Cisgender Woman	91 %	–	–	9 %	–	–		–
Transgender Man	58 %	–	–	42 %	–	–	<0.001	–
Transgender Woman	68 %	–	–	33 %	–	–		–
Transgender Non-Binary	63 %	–	–	37 %	–	–		–
Race/Ethnicity								
Non-Latine White	89 %	–	–	11 %	–	–		–
Non-Latine Black	78 %	–	–	22 %	–	–	<0.001	–
Latine	80 %	–	–	20 %	–	–		–
Other Race	79 %	–	–	21 %	–	–		–
Sexual Identity								
Heterosexual	93 %	–	–	7 %	–	–	<0.001	–
LGB	66 %	–	–	34 %	–	–		–
Sex at birth								
Female	85 %	–	–	15 %	–	–	0.02	–
Male	89 %	–	–	11 %	–	–		–
Poverty Status								
<100 % FPL	69			31				
100–199 % FPL	81			19			<0.001	
200–299 % FPL	86			14				
300 % + FPL	93			7				

Note. LSA = lifetime suicide attempt; LGB = lesbian, gay or bisexual. *p*-value represents differences between individuals with and without a history of LSA. Cohen's D is the standardized effect size for measuring the difference between two group means included in *t*-tests of mean differences. Means for categorical variables are represented by percentages and group differences tested with the chi-square test of independence. FPL = Federal Poverty Line; ACEs = Adverse Childhood Experiences; Other Race = non-Latine respondents who identified as a race that was not either Black or White.

Table 2
Correlation, means and standard deviations of scales used as mediator variables for Transgender and Cisgender adults

		Social Well-Being		Depressive Symptoms		Social Support		ACEs		Alcohol Use Disorder	
Social Well-Being	Pearson's r	–		−0.43	***	0.35	***	−0.14		−0.03	
	p-value	–		<0.001		<0.001		0.022		0.564	
	N	–		274		274		274		274	
Depressive Symptoms	Pearson's r	−0.47	***	–		−0.24	***	0.42	***	0.19	**
	p-value	<0.001		–		<0.001		<0.001		0.001	
	N	1162		–		274		274		274	
Social Support	Pearson's r	0.32	***	−0.26	***	–		−0.19	**	−0.09	
	p-value	<0.001		<0.001		–		0.001		0.138	
	N	1162		1162		–		274		274	
ACEs	Pearson's r	−0.19	***	0.34	***	−0.23	***	–		0.07	
	p-value	<0.001		<0.001		<0.001		–		0.262	
	N	1162		1162		1162		–		274	
Alcohol Use Disorder	Pearson's r	0.08	**	−0.02		0.06	*	−0.01		–	
	p-value	0.004		0.533		0.043		0.766		–	
	N	1162		1162		1162		1162		–	
Transgender		4.46 (0.952)		9.26 (5.85)		4.99 (1.33)		3.21 (2.09)		2.14 (2.04)	
Cisgender		4.77 (0.868)		4.25 (4.38)		5.48 (1.34)		2.11 (2.01)		2.28 (2.12)	

Correlations are presented for transgender (upper diagonal) and cisgender (lower diagonal) separately. The bottom two rows show means (standard deviations) for each scale across gender identity. ACEs = Adverse Childhood Experiences.

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

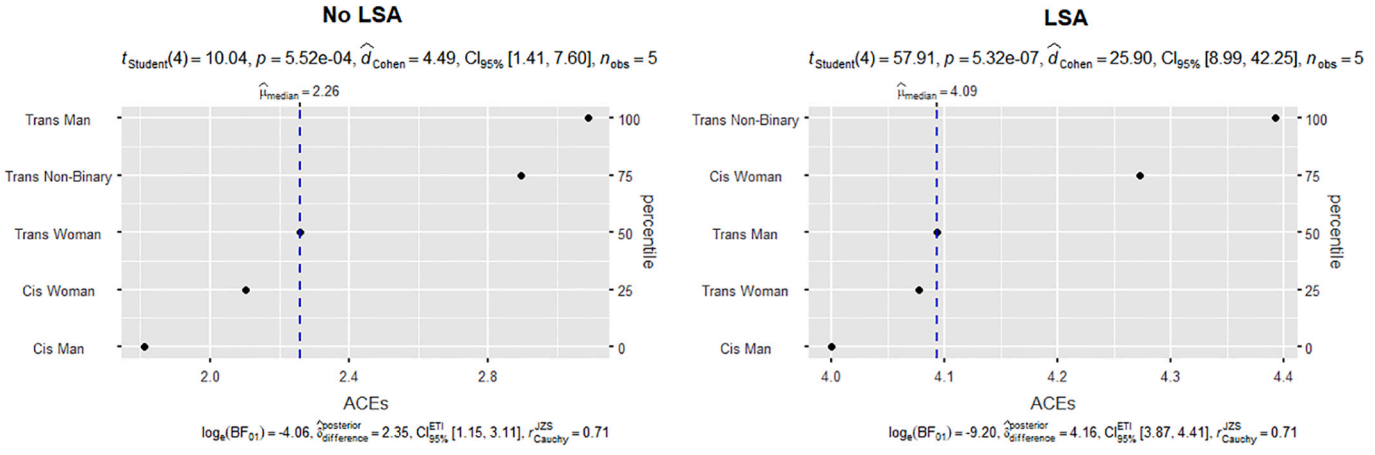

Fig. 2. Variable Based Dot Plot of Gender Identity by Suicidal Behavior and Mean ACEs CR. *Note.* The plot contains both the visual and numerical summaries of ACEs CR mean differences by gender identity and LSA. The dots represent the mean ACE CR score for each gender identity category. The plot demonstrates statistically significant differences in ACEs CR across gender identity with and without LSA. Mean ACEs CR risk ranges between 1.8 and 3 without LSA and 4–4.4 with LSA.

graphics demonstrate very strong evidence that 1) transgender men and transgender non-binary respondents with no reported history of LSA have significantly more ACEs compared to respondents with other gender identities $log_e(BF_{10}) = 4.06$; and 2) transgender non-binary and cisgender women with a history of LSA have significantly more ACEs compared to respondents with other gender identities $log_e(BF_{10}) = 9.20$. In the present case, the Bayes Factor revealed that the data were 57.97 and 9896.12 times more probable under the alternative hypothesis for no LSA and with LSA, respectively, compared to the null hypothesis (see Fig. 2).

Unadjusted and Adjusted Logistic Regression Models. Details of the unadjusted and adjusted logistic regression model results are presented in Table 3, showing the log-odds ratio, odds ratio (OR), 95 % confidence interval and the VIF for each variable. In the unadjusted model (which includes gender identity subgroup only), findings indicated that the odds of suicidal behavior are significantly lower for cisgender men ($OR = 0.07$, 95 % CI = [0.04, 0.12], $p < 0.001$) and cisgender women ($OR = 0.15$, 95 % CI = [0.09, 0.19], $p < 0.001$) compared to transgender men. In Model 2, which adjusted for sociodemographic characteristics, the odds of suicidal behavior continued to be significantly lower for cisgender men ($OR = 0.25$, 95 % CI = [0.06, 0.66], $p < 0.01$) and cisgender women ($OR = 0.47$, 95 % CI = [0.23, 0.87], $p < 0.01$) compared to transgender men. Hence, the magnitude of the effect is reduced but remained statistically significant. Both age ($OR = 0.98$, 95 % CI = [0.97, 0.99], $p < 0.001$) and poverty status (200–299 % FPL v. < 100 % FPL: $OR = 0.50$, 95 % CI = [0.27, 0.86], $p < 0.01$; 300 % + FPL v. < 100 % FPL: $OR = 0.38$, 95 % CI = [0.20, 0.62], $p < 0.001$) significantly predicted LSA. The likelihood of engaging in LSA is more than two times greater among individuals who identify as Lesbian, Gay or Bisexual (LGB) compared to heterosexual ($OR = 2.04$, 95 % CI = [1.28, 3.50], $p < 0.001$). The coefficient coding the effect of ACEs CR was statistically significant ($OR = 1.47$, 95 % CI = [1.35, 1.64], $p < 0.001$). Every one-unit increase in the ACE CR score increased the odds of suicidal behavior by 47.7 % even after controlling for sociodemographic factors (calculated as $|\exp.(0.39)-1| \; x \; 100$).

Moderation model. Next, we examine whether the effect of ACEs on LSA is conditioned by gender identity using PROCESS model 1. Results showed that gender identity moderated the effect of ACEs CR on LSA. Specifically, the odds of each additional ACE on LSA in greater for transgender men compared to cisgender men ($OR = 1.39$, 95 % CI = [1.02, 1.90], $p < 0.01$) and cisgender women ($OR = 1.32$, 95 % CI = 1.01, 1.74, $p < 0.01$). Fig. 3 shows the predicted probability of LSA by gender identity over the range of ACEs (0–8). The predicted probability of LSA is highest for transgender men and women with zero ACEs; however, as shown by the figure, each additional ACE increases the predicted probability of suicidal behavior regardless of gender identity. Excluding transgender men, the predicted probability of LSA is <0.10 for individuals with no ACEs. For transgender men with no ACEs, the predicted probability of LSA is 0.24, which is approximately the same for a cisgender man who has experienced all 8 ACEs (0.26; the dotted line helps visualize the result). Moreover, the association between ACEs and LSA is linear for transgender men. But, as shown by the figure, the substantial difference in slopes across gender identity suggests that the impact of ACEs on LSA is greater for some gender identities (i.e., transgender women and transgender non-binary) compared to others (i.e., cisgender men and cisgender women).

Fig. 4 presents a tree map of the post-estimation of the predicted probabilities for the model coefficients associated with race and

Table 3
Adjusted and Unadjusted Logistic Regression Models of LSA on Key Variables*

	Unadjusted model			Gender Identity, Demographics + ACEs CR			
Variable	log odds	OR	95 % CI (OR)	log odds	OR	95 % CI (OR)	VIF
Intercept	−0.32	0.73	0.46, 1.15	−1.14	0.32	0.85, 4.26	
Gender Identity							
Cisgender Man v. Transgender Man	−2.70***	0.07	0.04, 0.12	−1.39**	0.25	0.06, 0.66	
Cisgender Woman v. Transgender man	−1.91***	0.15	0.09, 0.19	−0.76**	0.47	0.23, 0.87	2.01
Transgender woman v. Transgender man	−0.36	0.70	0.38, 1.26	0.06	1.06	0.26, 2.75	
Trans Non-Binary v. Transgender man	−0.24	0.79	0.41, 1.52	−0.41	0.66	0.30, 1.40	
Race/Ethnicity							
Non-Latine Black v. Non-Latine White	–	–	–	0.16	1.17	0.63, 2.45	
Latine v. Non-Latine White	–	–	–	0.09	1.10	0.60, 1.15	1.13
Non-Latine Other v. Non-Latine White	–	–	–	0.30	1.35	0.83, 1.46	
Income (dollars)	–	–	–	−0.03	0.97	0.89, 1.01	1.89
Age (years)	–	–	–	−0.02***	0.98	0.97, 0.99	1.60
Education	–	–	–	0.01	1.01	0.83, 1.09	1.11
Poverty Status							
100–199 % FPL v. < 100 % FPL	–	–	–	−0.15	0.86	0.44, 1.26	
200–299 % FPL v. < 100 % FPL	–	–	–	−0.70**	0.50	0.27, 0.86	1.91
300 % + FPL v. < 100 % FPL	–	–	–	−0.98***	0.38	0.20, 0.62	
Sex at birth							
Male v. Female	–	–	–	0.06	1.06	0.41, 3.16	1.12
Sexual Identity							
LGB v. Hetero	–	–	–	0.71***	2.04	1.28, 3.50	2.04
ACEs CR				0.39***	1.47	1.35, 1.64	1.14

Note. Estimates represent the log odds of LSA vs. no LSA. OR = odds ratio. OR was calculated from the log odds estimate as *exp*(log odds). CI = confidence interval. The 95 % CI is provided for the odds ratio. VIF = Variance Inflation Factor. VIF score reported for adjusted model.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

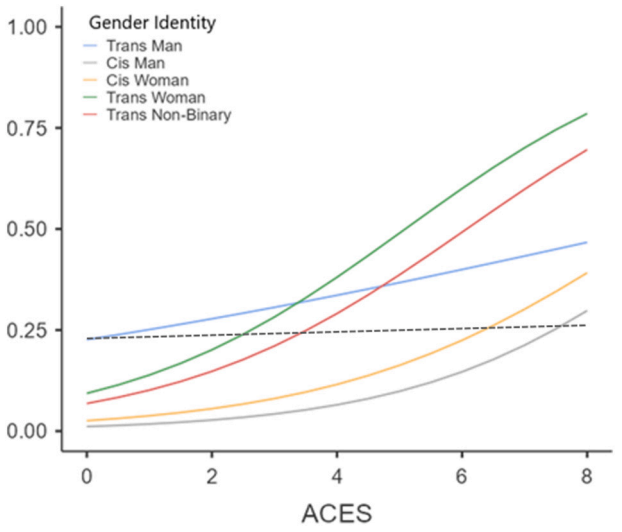

Fig. 3. Predicted probability of suicide attempt by ACEs CR across gender identity.
Notes. Predicted probabilities were generated from moderation model of ACEs CR and gender identity controlling for age, race, sexual identity, sex at birth, income, poverty level and education. Dotted line shows similarity between 0 ACEs and 8 ACEs. Trans = transgender.

gender identity subgroup holding other variables constant at their means (the size of the boxes illustrate relative effects). As shown by the figure, the predicted probability of LSA among Black transgender men is equal to 0.518 whereas the predicted probability for Black cisgender men is substantially (0.077). Table 4 shows the estimated marginal means (i.e., probabilities) of LSA across levels of gender identity, race/ethnicity, and ACEs (mean and +/− 1 standard deviation (SD)). The results show that the predicted probability of LSA for respondents who have an ACEs CR score equal to 1 SD above the mean is highest among Black and 'other' race transgender women (0.58 and 0.45; bolded in the table). White cisgender men with a similar ACE score, on the other hand, had the lowest probability of lifetime suicide attempt (0.08). To further illustrate disparities across race and gender, consider that changing a Black transgender women's ACEs CR score from 1 SD above the mean to 1 SD below the mean will reduce the probability of LSA by 0.40, a >3-fold decrease in risk, and the largest decrease observed in the table (a 0.40 difference in the probability; bold-italicized in the table) across all groups.

Moderated mediation. We conducted four separate moderated mediation models using putative mediators pertaining to depressive symptoms, alcohol use disorder, perceived social support and social well-being. Results showed significant effects for the model including depressive symptoms only. In the separate moderated mediation model that include depressive symptoms, there was a significant indirect effect of ACEs through depressive symptoms on the likelihood of LSA. The test of the highest order unconditional interaction was statistically significant indicating that gender identity subgroup moderates the relationship between ACEs and depressive symptoms ($F_{4,1351} = 2.69 . p = 0.030$).Inclusion of depressive symptoms accounted for 34.3 % of the total effect of ACEs on LSA. In the moderated mediation model, the effect seen in earlier models of race, income, sex at birth, age and education were no longer significant. However, ACEs ($b = 0.329$, $z = 7.04$, $p < 0.001$, Lower Level Confidence Interval (LLCI) = 0.238, Upper Level Confidence Interval (ULCI) = 0.421), sexual identity ($b = 1.08$, $z = 4.99$, $p < 0.001$, LLCI = 0.656, ULCI = 1.50) and poverty ($b = -0.323$, $z = -3.11$, $p = 0.002$, LLCI = −0.526, ULCI = −0.120) remain significant. In addition, depressive symptoms are associated with LSA ($b = 0.085$, $z = 4.26$, $p < 0.001$, LLCI = 0.046, ULCI = 0.124). The conditional indirect effects of ACEs on depressive symptoms across gender identity is shown in Fig. 5. The figure shows that the impact of ACEs on depressive symptoms is steepest for transgender men and women, and therefore the impact of each additional ACEs on depressive symptoms is greater.

In this case, the conditional indirect effect of ACEs on LSA through depressive symptoms conditioned by gender identity quantifies the amount by which two individuals with different gender identities but the same ACE score is estimated to differ on LSA indirectly through depressive symptoms effect on suicide. The confidence interval for the index of moderated mediation did not include zero suggesting that gender identity moderates the mediation effect, justifying further investigation of the conditional indirect effects (ACEs ➔ Depressive Symptoms ➔ LSA). Table 5 shows the 95 % bootstrap confidence intervals for the conditional indirect effects of gender identity (i.e., moderated by gender identity) on the relationship between ACEs and LSA via depressive symptoms. The following indirect effects do not include zero: cisgender women (Effect = 0.046, 95 % bootCI = 0.022, 0.076), transgender men (Effect = 0.080, 95 % bootCI = 0.033, 0.144), transgender women (Effect = 0.106, 95 % bootCI = 0.048, 0.180) and cisgender men (Effect = 0.046, 95 % bootCI = 0.022, 0.078). Pairwise contrasts between conditional indirect effects of depressive symptoms across gender identity further revealed significant differences between transgender women and transgender non-binary (Contrast = 0.081, 95 % bootCI = 0.019, 0.161), cisgender women (Effect = 0.060, 95 % bootCI = 0.014, 0.122) and cisgender men (Effect = −0.060, 95 % bootCI = −0.122, −0.013). Because no significant indirect effects were found for the other putative mediators the results are omitted.

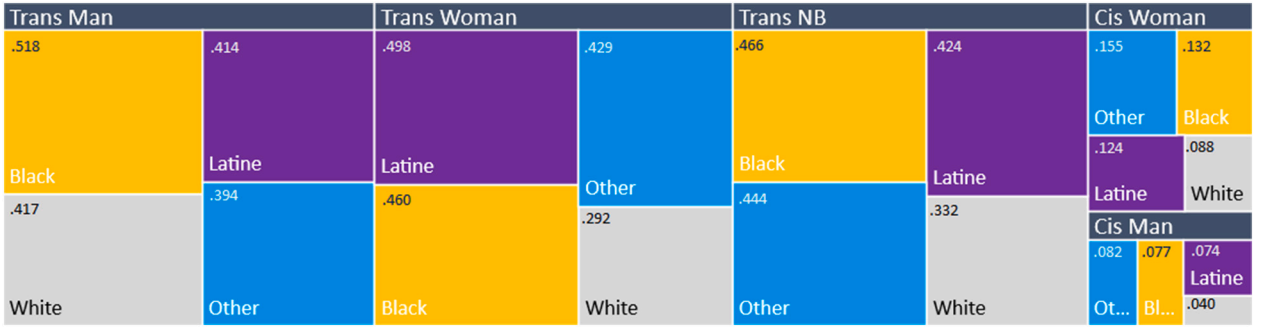

Fig. 4. Predicted probability of suicide attempt by gender and race/ethnicity. NB = Non-Binary.

Table 4
Estimated Marginal Means representing predicted probability of LSA for interactions between ACEs CR, Race/Ethnicity and Gender

						95 % Confidence Interval	
Gender Identity	Race/Ethnicity	ACEs		Pr(LSA)	SE	Lower	Upper
Transgender man	Non-Latine White	0.25	−	0.23	0.09	0.10	0.44
		2.33	μ	0.27	0.07	0.16	0.42
		4.41	+	0.33	0.07	0.21	0.48
	Non-Latine Black	0.25	−	0.31	0.13	0.12	0.59
		2.33	μ	0.37	0.11	0.19	0.59
		4.41	+	0.43	0.11	0.24	0.64
	Latine	0.25	−	0.25	0.11	0.10	0.52
		2.33	μ	0.30	0.10	0.15	0.52
		4.41	+	0.36	0.11	0.18	0.58
	Other Race	0.25	−	0.24	0.10	0.10	0.48
		2.33	μ	0.29	0.08	0.16	0.47
		4.41	+	0.34	0.09	0.19	0.54
Cisgender Man	Non-Latine White	0.25	−	0.01	0.01	0.01	0.03
		2.33	μ	0.03	0.01	0.02	0.05
		4.41	+	0.08	0.02	0.05	0.12
	Non-Latine Black	0.25	−	0.02	0.01	0.01	0.05
		2.33	μ	0.04	0.02	0.02	0.10
		4.41	+	0.10	0.04	0.05	0.21
	Latine	0.25	−	0.01	0.01	0.01	0.04
		2.33	μ	0.04	0.01	0.02	0.08
		4.41	+	0.09	0.03	0.04	0.18
	Other Race	0.25	−	0.02	0.01	0.01	0.04
		2.33	μ	0.04	0.02	0.02	0.09
		4.41	+	0.10	0.03	0.06	0.19
Cisgender Woman	Non-Latine White	0.25	−	0.03	0.01	0.02	0.05
		2.33	μ	0.06	0.01	0.04	0.09
		4.41	+	0.13	0.02	0.10	0.17
	Non-Latine Black	0.25	−	0.05	0.02	0.02	0.10
		2.33	μ	0.10	0.03	0.05	0.19
		4.41	+	0.20	0.06	0.11	0.34
	Latine	0.25	−	0.03	0.01	0.01	0.08
		2.33	μ	0.07	0.03	0.04	0.15
		4.41	+	0.16	0.05	0.08	0.28
	Other Race	0.25	−	0.04	0.01	0.02	0.08
		2.33	μ	0.08	0.03	0.04	0.15
		4.41	+	0.17	0.04	0.10	0.28
Transgender Woman	Non-Latine White	0.25	−	0.09	0.04	0.04	0.19
		2.33	μ	0.20	0.04	0.13	0.30
		4.41	+	0.39	0.07	0.27	0.53
	Non-Latine Black	0.25	−	***0.18***	0.08	0.07	0.39
		2.33	μ	0.36	0.10	0.19	0.57
		4.41	+	***0.58***	0.11	0.36	0.77
	Latine	0.25	−	0.13	0.06	0.05	0.32
		2.33	μ	0.28	0.09	0.14	0.47
		4.41	+	0.49	0.11	0.29	0.69
	Other Race	0.25	−	0.12	0.05	0.05	0.26
		2.33	μ	0.25	0.07	0.14	0.41
		4.41	+	**0.45**	0.09	0.28	0.64
Transgender Non-Binary	Non-Latine White	0.25	−	0.07	0.04	0.02	0.20
		2.33	μ	0.15	0.05	0.07	0.28
		4.41	+	0.30	0.07	0.18	0.44
	Non-Latine Black	0.25	−	0.08	0.06	0.02	0.28
		2.33	μ	0.18	0.08	0.07	0.38
		4.41	+	0.35	0.10	0.18	0.57
	Latine	0.25	−	0.09	0.06	0.02	0.30
		2.33	μ	0.20	0.08	0.08	0.41
		4.41	+	0.38	0.11	0.19	0.61
	Other Race	0.25	−	0.11	0.07	0.03	0.34
		2.33	μ	0.23	0.09	0.10	0.45
		4.41	+	0.42	0.11	0.24	0.64

Note. - mean - 1SD, $^{\mu}$ mean, $^{+}$ mean + 1SD; SD = standard deviation; ACEs = Adverse Childhood Experiences; SE = standard error; Pr = Probability; LSA = Lifetime Suicide Attempt. Other Race = non-Latine respondents who identified as a race that was not either Black or White.

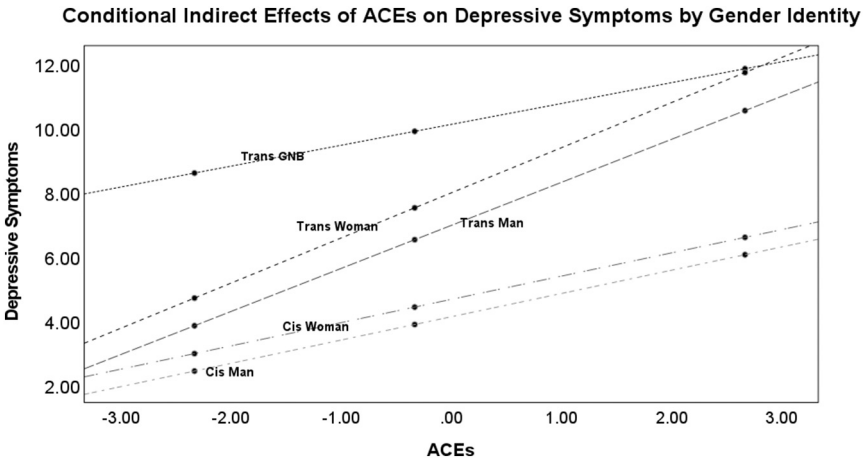

Fig. 5. Conditional indirect effects of ACEs on Depressive symptoms by gender identity (moderator) from moderated mediation of ACEs on LSA through depressive symptoms. *Note.* ACEs was mean centered (mean = 0). The dots represent 1 standard deviation above and below the mean. Trans = transgender. GNB = gender non binary.

Table 5
Moderated mediation model with gender identity as moderator and depressive symptoms and LSA as outcome variables

Conditional Indirect Effects (ACEs ➔ Dep ➔ LSA)			
	Effect	SEBoot	95 % bootCI
Trans GNB	0.025	0.024	−0.019, 0.078
Cisgender Woman	**0.046**	**0.013**	**0.022, 0.076**
Transgender Man	**0.080**	**0.028**	**0.033, 0.144**
Transgender Woman	**0.106**	**0.034**	**0.048, 0.180**
Cisgender Man	**0.046**	**0.014**	**0.022, 0.077**
Pairwise contrasts between conditional indirect effects of depressive symptoms across gender identity (ACEs ➔ Dep ➔ LSA)			
Cisgender Woman v. Transgender Non-Binary	0.021	0.025	−0.026, 0. 073
Transgender Man v. Transgender Non-Binary	0.055	0.034	−0.006, 0.127
Transgender Woman v. Transgender Non-Binary	**0.081**	**0.037**	**0.019, 0.161**
Cisgender Man v. Transgender Non-Binary	0.022	0.025	−0.028, 0.074
Transgender Man v. Cisgender Woman	0.034	0.024	−0.008, 0.088
Transgender Woman v. Cisgender Woman	**0.060**	**0.027**	**0.014, 0.122**
Cisgender Man v. Cisgender Woman	0.000	0.012	−0.023, 0.023
Transgender Woman v. Transgender Man	0.026	0.031	−0.031, 0.094
Cisgender Man v. Transgender Man	−0.034	0.025	−0.090, 0.010
Cisgender Man v. Transgender Woman	**−0.060**	**0.028**	**−0.122, −0.013**

Note: Effects in bold indicate that the respective 95 % CIBoot does not include zero and are thus considered statistically significant. Effects are unstandardized coefficients. 95 % percentile bootstrap confidence interval (bootCI) (N = 10,000); SEBoot, percentile bootstrap standard error. Results controlled for race, sexual identity, sex at birth, poverty, income level, education and age. ACEs was mean centered prior to the analysis. A heteroscedasticity consistent standard error and covariance matrix estimator was used. GNB = Gender Non-Binary; LSA = Lifetime Suicide Attempts; ACEs = Adverse Childhood Experiences.

4. Discussion

To our knowledge, this is the first study to explore the role of gender identity subgroup on the direct and indirect associations between ACEs and LSA via well-known mechanisms such as depressive symptoms, alcohol use and social supports/well-being controlling for sexual identity, income, age, education, race, poverty status and sex assigned at birth. Consistent with past research, in this study we found that LSA risk is greater among gender minorities, that gender minorities experience more ACEs compared to cisgender individuals, and that ACEs are strongly associated with the LSA (Barboza et al., 2016; Dorri et al., 2023; Fuller-Thomson et al., 2016; Goldblum et al., 2012; Schnarrs et al., 2019). We add to the existing literature by highlighting two additional findings: 1) the effect of ACEs on LSA is substantially greater for transgender men, women and non-binary persons compared to cisgender men and women; and 2) gender identity subgroup moderates the indirect effect of depressive symptoms on the ACEs-LSA association. We elaborate further on the significance of our results below.

Our first research question was to examine the prevalence of LSA across gender identity subgroups. Consistent with previous studies, the prevalence of LSA for transgender men, women and non-binary adults was 8.4, 6.6 and 7.4 times higher than the

prevalence for cisgender men and 4.7, 3.7 and 4.1 times higher than the prevalence for cisgender women (Haas, Rodgers & Herman, 2014; Barboza et al., 2016). As expected, our results showed that experiencing cumulative adversity in early childhood is associated with increased risk of both depressive symptoms and LSA, thereby confirming the longstanding relationship between ACEs and poor long-term behavioral health outcomes found in previous research (Austin et al., 2022; Blosnich et al., 2020; Boullier & Blair, 2018; Felitti, Anda, Nordenberg, Williamson, 1998; Fujiwara, 2022; Fuller-Thomson et al., 2016; Vig et al., 2020).

Regarding our second research question, we examined the moderating role of gender identity on the ACEs-LSA association and note very large disparities across subgroups indicative of highly gendered profiles of LSA risk. Our analysis shows that all individuals with more ACEs have a greater risk of engaging in LSA and that, regardless of gender identity, individuals who experience more ACEs have more depressive symptoms. Nevertheless, the cumulative burden of each additional ACE on LSA is stronger for gender minorities compared to similarly situated cisgender individuals. For example, post-estimation showed that the risk of LSA is statistically similar for a cisgender man who has experienced all 8 ACEs and a transgender man who has experienced none. As well, the differential impact of each additional ACE on LSA conditioned by gender identity subgroup increases as the number of ACEs increases but not necessarily in a linear way. While this non-linearity is inconsistent with other studies examining the association between ACEs and suicide attempts (Blosnich et al., 2021) it is a finding that has received support in recent studies (Mersky & Lee, 2019). For example, a study examining how ACEs correlated with exam performance in undergraduate students found that ACEs were related to resilience but in a non-linear fashion: i.e., zero and high ACEs groups had comparable levels of resilience (York et al., 2023). As with this study, the finding that zero and high ACEs groups have comparable LSA risk is not surprising considering the greater internal and external (societal) pressures to conform faced by transgender persons that are not similarly experienced by cisgender groups. The non-linearity effect observed in the present study suggests the possibility of threshold effects, whereby for some transgender groups, LSA risk is greater following exposure to fewer ACEs including ACEs that are below threshold levels seen in cisgender groups (Mersky & Lee, 2019). While we cannot sort out all these relationships here, there is a clear need for future research to continue to explore how differential patterns of ACEs, and specific constellations of ACEs, lead to unique pathways to poor mental health across transgender and cisgender populations.

Given the large variations in both LSA risk and ACEs across gender identity observed in this study, a better understanding of the underlying mechanisms that link ACEs to LSA risk, along with any protective effects afforded by one's gender identity, are critical. Prior research has established that ACEs are indirectly linked to suicidal thoughts and behaviors through depressive symptoms (Laghaei, Mehrabizadeh Honarmand, Jobson, Abdollahpour Ranjbar, & Habibi Asgarabad, 2023; Park & Bae, 2020; Zhai et al., 2023). Our analysis extends this work by offering evidence that cisgender identity buffers the impact of childhood adversity on the risk of LSA via depressive symptoms. As such, our third and fourth research questions were examined using moderated mediation to test the indirect effects of multiple putative mediators independently and the moderating effect of gender simultaneously. The moderated mediation analysis revealed two additional findings. First, that the association between ACEs and LSA was mediated by depressive symptoms (i.e., feeling worthless and hopeless) which is consistent with other studies (Lee & Park, 2023). The significant conditional indirect pathways from ACEs exposure to LSA through depressive symptoms by gender identity confirms the cumulative nature of adversity that may be salient features of early childhood contexts experienced by vulnerable groups. We found evidence that adopting a "traditional" gender identity buffers the impact of cumulative ACEs burden: individuals who have experienced more ACEs but who identify as cisgender have fewer depressive symptoms compared to those who adopt a transgender identity. It is worth re-emphasizing that, in the present study, the average number of ACEs experienced by individuals engaging in LSA was above the critical ACEs threshold of four and further that mean ACEs CR differed significantly across gender minority status. Second, we found that the impact of depressive symptoms on the ACEs-LSA relationship does not work the same way across gender. The conditional indirect effects of ACEs on LSA demonstrated that depressive symptoms exert a relatively larger effect for transgender women and men and identified differences between transgender women, on the one hand, and transgender non-binary, transgender men, and cisgender men on the other. Taken together, the results of the moderated mediation are consistent with the claim that heightened depressive symptoms resulting from ACEs increase LSA risk, but the risk is significantly higher for transgender women compared to cisgender women and men, and transgender nonbinary individuals.

Overall, our findings speak to the deleterious impact that adverse childhood experiences have on both depressive symptoms and LSA among those with non-cisgender identities. To provide context, we note that the number of ACEs (4.18 v. 2.06) and depressive symptoms (10.28 v. 4.48) experienced by individuals who engage in LSA is at least twice as high compared to those who do not engage in LSA. Further, transgender individuals experience one additional ACE, on average, compared to cisgender individuals and the bivariate association between ACEs and depressive symptoms is stronger for transgender persons. These findings are consistent with studies showing that gender minority individuals who experience childhood stress show greater adverse mental health outcomes compared to those who do not face similar levels of adversity (Barboza et al., 2016; Dickinson & Adams, 2014). But these results beg the question of *why* ACEs might be more common in the transgender population in the first place? Studies of individuals who detransition have attributed their initial gender dysphoria to a reaction of either childhood adversity or family challenges (Lemma & Savulescu, 2023; Littman, 2021; Littman, O'Malley, Kerschner, & Bailey, 2023; Sanders, du Plessis, Mullens, et al., 2023). If true, the implication is that ACEs affects gender identity in some individuals. Other studies have attributed the higher rates of emotional abuse, physical neglect, and emotional neglect among transgender persons to gender nonconformity and social stigma as possible explanations for experiencing higher ACEs compared to cisgender groups (Schnarrs et al., 2019). Others still have noted that because transgender persons commonly experience stigma and non-acceptance as well as rejection and marginalization from peers, family and society (Zhang, Mishra, Liang, & Wekerle, 2023) they are more likely to experience higher levels of adversity including gender-based violence and bullying by peers (Meyer, 2003; Biedermann et al., 2021). In all situations, maladaptive coping in childhood may exacerbate the impact of ACEs on suicidality particularly among those with intersecting oppression (Liu et al., 2023; Zhang et al.,

2023).

The results of this study revealed very large differences in suicidal behavior across intersectional race and gender identities that were considerably minimized after accounting for early child adversity. The vast difference in the number of ACEs across levels of intersectionality provides further evidence that increased risks for LSA may be due to shared underlying experiences of adversity common in this population. LGBTQ+ and Black youth are disproportionately harmed by potentially traumatic childhood experiences including experiences with gender- and racial discrimination which exacerbate poor mental health outcomes (Bernard et al., 2021). Related to Black transgender populations specifically, the research indicates that increased violence, trauma and abuse—including fatalities towards this population in a number of studies (Kawano et al., 2022; LaMartine, 2020; Sherman et al., 2022; Tobin-Tyler, 2023; Waldron, 2021). Coupled with the results demonstrating non-linearity of ACEs in predicting suicidality, it is critical that future research scrutinize the ACEs framework both conceptually and methodologically, so it is consistent with a culturally informed approach that acknowledges the unique lived experiences of vulnerable groups (Barboza, 2018; Bernard et al., 2021; McLennan, MacMillan, & Afifi, 2020).

Finally, contrary to our expectations, we did not find that family support, social well-being or alcohol use disorder mediated the ACEs-LSA association, nor did we find evidence that gender identity moderates these mediation effects. These results are not consistent with studies showing that perceived social support, alcohol misuse, and social well-being all tend to reduce mental health problems following childhood adversity and further that the mechanisms differ across the gender binary (i.e., cisgender men and women) (Chen, Hua, Huang, Zhou, & Wang, 2021; Fritz, 2021). One reason for the differences across studies may be the use of convenience sampling or to the way that gender identity is operationalized. We note, however, that in this study, our results only showed that these factors are not the mechanisms by which ACEs exerts an effect on LSA. This does not rule out their potential role as moderators which was not examined in this study. Future studies should continue to explore how perceived social support, alcohol misuse, and social well-being may exacerbate or buffer the impact of ACEs on the likelihood of LSA across gender identity subgroups using, for example, PROCESS models 3, 11 or 12 (data not shown).

4.1. Strengths and limitations

Previous research has been limited by non-representative samples, small sample sizes of transgender individuals and/or the lack of focus on early childhood adversity. Therefore, the strengths of this study pertain to the use of a nationally representative sample of transgender individuals, inclusion of different gender identities, integrating validated scales and use of the original ACEs measure (Biedermann et al., 2021). Nevertheless, there are important limitations to consider in future studies. First, we focus on suicidal behaviors rather than suicidal ideation and/or non-suicidal self-injurious behaviors which may be manifestations of different risk factors. It is common practice to analyze LSA among those with suicide ideation only, since suicide ideation is a precursor to LSA (Choi, Lee, Yoon & Kim, 2017; Ding et al., 2023), however the fact that our estimates are conditional on participants with suicide ideation may be an additional limitation. Even though differences in LSA across gender identity noted in bivariate analyses were robust to multivariate analyses, the relatively smaller number of transgender individuals in the study coupled with the 5 % of excluded cases may have resulted in biased estimates if the missingness was not random. Our study is also limited by reliance on self-report which may have also biased the findings. Most importantly, the dose-response and threshold approaches demarcating four or more ACEs have been questioned in recent literature (Anda, Porter, & Brown, 2020; Asmundson & Afifi, 2019; Putnam, Amaya-Jackson, Putnam, & Briggs, 2020). For example, the ACEs CR score implies an additive dose-response relationship where each ACE has equal weight, and largely ignores how different ACEs cluster together and/or how individuals experience unique constellations of risk (Barboza, 2018; Jacobs, Agho, Stevens, & Raphael, 2012). Moreover, the ACEs CR scale has been criticized as not being culturally inclusive because it omits experiences of adversity highly relevant to minoritized groups such as racial discrimination and child welfare involvement (Barboza-Salerno & Remillard, 2023; Freeny et al., 2021; Merritt, 2021). Therefore, it is quite possible that our measure of ACEs CR omits important items that are both disproportionately experienced among gender minorities and likely to be associated with LSA. As well, we are unable to describe how individuals in this study qualitatively experienced the range of ACEs that were measured. Considering our results, future studies would benefit from a greater focus on the role that intersectionality has in increasing the risk of suicidal thoughts and behaviors among transgender men and women of color. Taken together, the limitations of our study underscore the need for future work to continue to examine the moderating role of gender identity on the indirect effects of experiences that are unique to gender minorities such as experiences with gender-based discrimination, gender non-conformity, victimization, and treatment by professionals, religiosity/spirituality, and/or being rejected and/or ostracized by family or friends.

5. Conclusion

In conclusion, we found that cumulative ACEs burden increases the risk of LSA, that depressive symptoms is a key mechanism linking ACEs to LSA risk, and further that gender identity exacerbates the role of cumulative ACEs exposure on both depressive symptoms and LSA risk. This means that transgender men, transgender women and transgender non-binary individuals who experience early child adversity have a greater likelihood of engaging in LSA compared to their similarly situated cisgender counterparts. Further, Black transgender men and women with an above average number of ACEs had a higher risk of engaging in LSA. Resultantly, health-related policy and practice aimed at minimizing suicide risk must consider that the complex interplay between ACEs and mental health does not work similarly across diverse populations. In order to create holistic and integrated systems of care, intervention strategies must focus on the role that intersectionality plays in increasing the risk of LSA particularly for individuals who have experienced adversity in early childhood.

CRediT authorship contribution statement

Gia E. Barboza-Salerno: Writing – review & editing, Writing – original draft, Visualization, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Jacquelyn C.A. Meshelemiah:** Writing – review & editing, Writing – original draft.

Data availability

Data will be made available on request.

Appendix I

Multidimensional Scale of Perceived Social Support

1. There is a special person who is around when I am in need.
2. There is a special person with whom I can share my joys and sorrows.
3. My family really tries to help me.
4. I get the emotional help and support I need from my family.
5. I have a special person who is a real source of comfort to me.
6. My friends really try to help me.
7. I can count on my friends when things go wrong.
8. I can talk about my problems with my family.
9. I have friends with whom I can share my joys and sorrows.
10. There is a special person in my life who cares about my feelings.
11. My family is willing to help me make decisions.
12. I can talk about my problems with my friends.

Social Well-Being Scale

1. I don't feel I belong to anything I'd call a community.
2. I feel close to other people in my community.
3. My community is a source of comfort.
4. People who do a favor expect nothing in return.
5. People do not care about other people's problems.
6. I believe that people are kind.
7. I have something valuable to give to the world.
8. My daily activities do not produce anything worthwhile for my community.
9. I have nothing important to contribute to society.
10. The world is becoming a better place for everyone.
11. Society has stopped making progress.
12. Society isn't improving for people like me.
13. The world is too complex for me.
14. I cannot make sense of what's going on in the world.
15. I find it easy to predict what will happen next in society.

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