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ORIGINAL PAPER

The Relationship Between Adverse Childhood Experiences and Utilization of Different HIV Testing Strategies Among Young Men Who Have Sex with Men in Texas

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Abstract

Adverse childhood experiences (ACEs) are a well-documented HIV-risk factor, but less is known about the relationship between ACEs and different HIV testing strategies. This study used data from an LGBTQ + community health assessment, that was part of a multi-staged community-based participatory research project in San Antonio, Texas. Overall, 464 young men who have sex with men (YMSM; < 36-years-old) completed an online, cross-sectional survey that included questions about ACEs and HIV testing behavior. An association between increased ACEs exposure and the odds of clinic-based testing and HIVST HIV significantly decreased relative to never testing for HIV. Additionally, greater ACEs exposure was significantly associated with increased odds of reporting community-based testing (AOR = 1.09, 95% CI = 1.00, 1.20) and significantly reduced odds of HIV self-testing (AOR = 0.72, 95% CI = 0.63, 0.82) compared to clinic-based testing. Cumulative ACEs exposure is important in understanding HIV testing behaviors in YMSM and should be considered when developing HIV testing programs.

Keywords YMSM · HIV testing · Adverse Childhood Experiences (ACEs) · Early childhood adversity · HIV self-testing

Introduction

Men who have sex with men (MSM) carry a disproportionate burden of HIV and this trend is especially evident in the Southern United States [1]. For example, recent molecular clusters of rapid HIV transmission among young MSM (YMSM; 18–35 years old) throughout Texas highlight missed opportunities for prevention and screening, resulting in late HIV diagnosis and delays in care [2] producing worse outcomes, such as increase risk for opportunistic infections and death within following 12 months post diagnosis, and higher healthcare costs compared to those who initiate care sooner [3]. Nearly 1 in 5 MSM in Texas receive a late HIV diagnosis [4, 5]. Improving access to timely and routine HIV

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testing in Texas will increase status awareness, reduce late diagnoses, and link YMSM into status neutral care (i.e., prevention and treatment) resulting in fewer new HIV cases in this priority population.

Broadly, HIV testing can be conceptualized as three strategies: clinic-based testing, community-based testing, and HIV self-testing (HIVST) [6]. Clinic-based testing involves strategies that require YMSM to visit a facility for testing, such as a sexual health clinic, AIDS service organization, or a primary care clinic. Community-based testing includes strategies that take HIV testing to YMSM and can include options such as venue-based testing (e.g., gay bars, Pride events), mobile units, or testing in other non-traditional settings such as bath houses or college campuses. HIV self-testing is relatively new method that until recently often requires YMSM to visit a pharmacy in order to obtain an HIV self-testing kit. Research clearly demonstrates that a number of factors influences decisions regarding HIV testing, as well as where individuals choose to get tested for HIV. Factors that influence these decisions include stigma, fear, and knowledge of where to get tested as well as others [7, 8]. One factor that has received less attention regarding health screening behaviors generally and more specifically HIV testing is exposure to adverse childhood experiences (ACEs).

Conceptualized broadly as abuse, neglect, and household challenges (e.g., witnessing domestic violence, substance use in the home, family member with a severe mental health condition), ACEs include ongoing stressful or traumatic events before the age of 18 [9]. Exposure to ACEs contribute to developmental trajectories [10] that increase risk for poor psychological functioning, [11] leading to increased risk behavior, [12] ultimately affecting health in adulthood. Research has clearly documented that as ACEs exposure increases, so does poor health [13–15]. In particular individuals with exposure to 4 or more ACEs carry a greater burden of disease compared to those with less exposure, and exposure to 6 or more ACEs reduces life expectancy by as much as 20 years. [16, 17] Moreover, populations carrying a greater burden of HIV, such as YMSM, on average are exposed to more ACEs [18]. In addition, individuals with greater ACEs exposure also have greater HIV risk profiles [19, 20]. The body of research on the topic shows that sexual minority (e.g., lesbian, gay, bisexual, queer) adults, including MSM [15] have greater overall ACEs exposure, [21, 22] are more likely to report specific ACEs compared to heterosexuals, [18, 23, 24] and report frequent exposure to ACEs [25], all of which are linked to increased HIV risk behavior. [26–28].

While much is known about the deleterious effects of ACEs exposure on psychological [29, 30], behavioral [31], and physiological [32, 33], health outcomes in adulthood, there is considerably less research examining the impact of ACEs exposure on health screening behaviors, such as HIV testing. There are several ways in which ACEs exposure might influences decisions around HIV testing. First, according to social cognitive theory, [34] YMSM with ACEs exposure may not have had role models who valued or promoted preventative health behaviors and had limited access to resources that would support development of habits related to health screening behaviors. Second, related to the impact of stigma on HIV testing, recent research suggests that adults with greater ACEs exposure were more likely to report exposure to daily and lifetime discrimination compared to those with less ACEs exposure [35]. Third, exposure to ACEs have a direct impact on early literacy levels [36] and may impact health literacy over the life course, affecting decisions to engage in health promoting behaviors [37], which could lead to underutilization of preventative health screenings.

Two studies have reported on the relationship between ACEs and HIV testing [15, 33] with mixed results. Bertolino and colleagues [20] have shown there is no relationship between any ACEs exposure versus no ACEs exposure and HIV testing and that divorce or parental separation increased odds of receiving an HIV test with the past 12 months in a national sample of MSM. However, Kidman and Kohler's [38] work with young heterosexual people in Malawi suggests that cumulative ACEs exposure is associated with HIV testing, with each additional ACEs exposure increasing odds of HIV testing. Taken together it remains unclear if cumulative ACEs exposure affects HIV testing behavior in YMSM. Moreover, it is unclear how ACEs exposure might impact the use of different HIV testing strategies (e.g., clinic-based, community-based, or HIVST). The purpose of this study was twofold. First, we assessed the odds of each testing strategy (clinic, community, HIVST) compared to never testing for HIV in relation to cumulative ACEs exposure among YMSM who reported sex in the past year and hypothesized that YMSM with greater ACEs exposure would have lower odds of reporting each testing modality compared to never testing for HIV. While this may conflict with past work on the topic [15, 33], other research on ACEs and our understanding of the impact of social environments on health behavior [29–32] suggests otherwise. Second, to explore if ACEs was associated with likelihood of using of different testing modalities among those who reporting an HIV test, we assessed the odds of community-based testing and HIVST compared to clinic-based testing among YMSM reporting sex in the past year in relation to cumulative ACEs exposure.

Methods

Recruitment and Data Collection

Data from this paper come from a larger, multistage project called Strengthening Colors of Pride (SCoP) focused on understanding childhood adversity, resilience, and health in sexual and gender minority people living in South Texas, primarily in living in Bexar County. [23–25, 39, 40] SCoP is grounded in the principles of community-based participatory research (CBPR) [41, 42] incorporating input from a community advisory board (CAB) regarding all aspects of the study. We used a multimodal recruitment strategy that included distribution of palm cards containing brief study information, inclusion criteria, and a link to an online survey, as well as a QR code. Palm cards were distributed at LGBTQ + specific community events during the summer of 2019. Email addresses and consent to be contacted at a later date about completing the online survey were also collected during the annual San Antonio Pride Festival and an email blast was sent out from The Pride Center San Antonio which serves LGBTQ + individuals living in Bexar County and surrounding counties. Recruitment was also done via social media (e.g., Facebook, Twitter, Instagram) and other websites (e.g., The Pride Center San Antonio, CAB member organizations websites), as well as through the social and professional networks of the SCoP CAB. All study procedures were approved by Trinity University Institutional Review Board.

This paper reports on data collected using an online survey. Participants who visited the study website were provided with additional information about SCoP. Respondents who clicked on the link to the survey were taken to study information sheet (n = 2821). After reading the study information sheet, respondents provided consent to participate and were taken to the online survey (n = 2798. 99.9%). Of those consenting 187 (6.7%) did not start the survey and 459 (17.6%) did not meet inclusion criteria for the study. While individuals under 18 were included in the original data collection (n = 166, 7.7%), they are excluded in this analysis because the ACEs they report may be ongoing and would be considered recent rather than past adverse experiences. In total, 464 (23.5%) of respondents met eligibility for inclusion in this analysis: assigned male at birth, identified as cisgender men, were between the ages of 18—35 years old, reported sex with men or men and women during the past year, where HIV negative, and responded to all relevant questions. The survey took, on average, 30-min to complete and participants were provided a $10 electronic Amazon Gift Card for their time.

Measures

Adverse Childhood Experiences (ACEs)

A standard ten item measure was used to assess ACEs [9]. Individual ACEs categories include 3 items for childhood abuse (emotional, physical, sexual), 2 items for childhood neglect (emotional and physical), and 5 items for household challenges (domestic violence, substance use in the home, mental health issue in the home, divorce or separation, and family member family member incarceration). Responses options ranged from 0 (never)–5 (Always). Each item was recoded (0 = no exposure, 1 = exposure). A summed score ranging from 0–10 was calculated.

HIV Screening

Participants were asked three questions regarding HIV testing, "Have you ever received an HIV test?" (*Yes = 1, No = 0, and Unsure = 2*). This variable was recoded so that 1 = yes and no/unsure = 0. Second, respondents indicating they had received an HIV tested were asked "Where did you receive this HIV test?" Response options included, 1 = doctor/primary care provider, 2 = AIDS service organization or other community-bases organization/non-profit clinic, 3 = a mobile testing unit, 4 = a community event/space (e.g., PRIDE, a bar), 5 = at-home self-testing kit, 6 = college campus, 7 = unsure, 8 = prefer not to answer). Individuals reporting unsure or prefer not to answer were excluded from this specific analysis. Response options were recoded so that, 1 = clinic-based testing (i.e., doctor/primary care provide and AIDS service organization), 2 = community-based testing (i.e., mobile testing unit, a community event/space, college campus), 3 = HIVST. A final variable was created so that 0 = never tested for HIV, 1 = clinic-based testing, 2 = community-based testing, and 3 = HIVST. Third, those reporting a past HIV test were asked, "When was your most recent HIV test?" Response options included, 1 = during the past 30-days, 2 = more than 30 days ago, but less than 3 months ago, 3 = at least 3 months ago, but less than 6 months ago, 4 = 6 months to 1 year ago, 5 = more than a year ago. The composite variable described above includes those who have never tested for HIV and those who have used clinic-based, community-based, or HIVST during the past year.

Demographic Characteristics

Participants were asked to select their age from a drop-down menu ranging from 18–100-years-old. Individuals were asked to indicate their sexual orientation: response options included gay, bisexual, pansexual, same-gender loving, asexual, queer, heterosexual, and heteroflexible. Orientation

was recoded to compare mono-sexual orientation (i.e., gay or same-gender loving, heterosexual) to not mono-sexual orientation (i.e., bisexual, pansexual, heterosexual and queer). Respondents were asked to self-identify their race (i.e., African American/Black, Asian Pacific Islander, Native American/Alaskan Native, White) and whether they identified as Hispanic/Latino/Latina/Latinx (Hispanic/Latinx). Respondents were given the option of selecting multiple racial identities. Race/ethnicity was coded with three levels (1 = White, not Hispanic/Latinx, 2 = Hispanic/Latinx any race, 3 = person of color, not Hispanic/Latinx). Participants were asked to report the highest level of education attainment. Responses were recoded so that 0 = less than a 4-year college degree and 1 = at least a 4-year degree. Participants were asked to select from 8 annual income categories ranging from 0 = $0—$10,000/year to more than $100,000/year. Responses were recoded so that 0 = less than $50,000/year and 1 = at least $50,000/year. This cut point was determined on the basis of annual median income of Bexar County. Participants were asked who they have sex within the past year (1 = men only, 2 = women only, 3 = both men and women). Individuals reporting not having sex or having sex with only women in the past year were excluded from this analysis. We also asked participants to report what Texas County they currently lived in and recoded this variable to reflect if they lived in a Health Resources and Services Administration (HRSA) designated rural county (1 = yes) or not (0 = no).

Data Analysis

Two sets of analyses were conducted. The first set of analyses included those reporting they had not previously tested for HIV. The second set of analyses were completed only on those reporting an HIV test during the past year. Chi-square test and analysis of variance (ANOVA) were used to examine bivariate relationships between ACEs and most recent HIV testing strategy. Next, multinomial logistic regression adjusted for demographic factors (see Table 1) was used to assess odds of each of the HIV testing strategies (i.e., clinic-based, community-based, and HIVST) compared to never testing for HIV. Then multinomial logistic regression adjusted for demographic factors was used to determine the odds of engaging in community-based testing or HIVST compared to clinic-based testing. Demographic factors were selected if they had a p-value of 0.1 or less or if they had been shown to impact HIV testing in previous research. In cases where variables were significantly related to each other using a chi-square test for independence, only one variable was included [43]. In addition, variables with more than two levels that had low or no cases were collapsed in order to meet requirements to run a multinomial logistic regression. Multinomial logistic regression requires "large cell sizes." Standard practice is less than 20% of cells be "small samples." Small cell sizes within an individual variable increase the number of total cells with no data with each level of every independent variable in a contingency table. This affects model stability and in some cases the analysis will not run if too many cells in the contingency table are 0 [43]. In order to accommodate for small cells sizes, it is recommended to collapse categories where possible [43]. Data were analyzed using SPSS version 27. [44].

Results

The average age of the sample was 27.9 (*standard deviation (SD)* = 3.6) years old. Overall, just under three quarters of the sample identified as gay (n = 343, 73.9%) and 4 in 5 reported sex with men only during the past year (n = 3 80.6%). Three quarters (n = 358, 75.1%) of respondents were White, non-Hispanic/Latinx. The vast majority (n = 419, 90.3%) made less than $50,000/year and three-quarters had less than a 4-year university degree (n = 67.1%). Using a Chi-Square Test, differences were noted across HIV testing categories for sexual orientation, gender of past year sexual partners, as well as race and ethnicity. Table 1 provides information on demographics and differences by HIV testing category.

The average number of ACEs reported was 4.25 (*SD* = 4.11) and nearly half (48.3%) reported exposure to 4 or more ACEs (see Table 2), and 41.4% (n = 192) reported 6 or more ACEs. Among the total sample, more than half reported emotional abuse (n = 247, 53.2%) and neglect (n = 243, 52.4%). Significant differences were noted regarding average ACEs exposure and HIV testing modality ($F(3,460) = 12.87$, $p < 0.001$) with respondents who had never tested for HIV reporting the greatest ACEs exposure (*mean (M)* = 5.62, *SD* = 4.19), followed by community-based testing (*M* = 4.18, *SD* = 3.98), clinic-based testing (*M* = 3.79, SD = 3.94), and HIVST *(M = 1.50, SD = 2.90).* More than half of participants who reported never receiving an HIV test also indicated exposure to each individual ACE item with the exception of parents divorcing/separating (n = 54, 35.5%) and having a family member in prison (n = 66, 43.4%) before the age of 18. Significant differences were noted for each ACE category across HIV testing groups, except for parental divorce/separation. Table 3 including participants reporting having never received an HIV test.

Among those indicating a HIV test during the past year (n = 312), average ACEs exposure was 2.76 SD = 3.56). The most commonly reported ACEs among those reporting a previous HIV test were emotional abuse (n = 150, 48.1%) and neglect (n = 139, 44.6%). A significant difference was noted between testing strategies in relation to total ACEs exposure ($F(2, 311) = 6.21$, $p = 0.002$) and in relation to individual ACEs categories, except for parental divorce/

Table 1 Participant demographics stratified by most recent HIV testing location (n = 464)

	Total sample (n = 464)	Never tested (n = 152)	Clinic-based (n = 227)	Community-based (n = 49)	HIVST (n = 36)		
	n (%)	n (%)	n (%)	n (%)	n (%)	X^2	p
Age (*M, SD*)	27.9 (3.6)	27.6 (3.1)	28.1 (3.9)	27.94 (3.6)	28.4 (3.2)	0.84*	0.473
Sexual orientation						13.18	0.004
Monosexual		129 (84.9)	149 (65.6)	41 (83.7)	24 (66.7)		
Gay	343 (73.9)						
Non-monosexual		23 (15.1)	78 (34.4)	8 (16.3)	12 (33.3)		
Bisexual	115 (24.8)						
Pansexual	2 (0.4)						
Queer	4 (0.9)						
Past year sexual partners						37.00	< 0.001
Men only	374 (80.6)	143 (94.1)	158 (69.6)	43 (87.8)	30 (83.3)		
Men and women	90 (19.4)	9 (5.9)	69 (30.4)	6 (12.2)	6 (16.7)		
Race/ethnicity						18.59	0.005
White, not Latinx	349 (75.2)	129 (84.9)	165 (72.7)	29 (59.2)	26 (72.2)		
Latinx, any race	53 (11.2)	11 (7.2)	29 (12.8)	10 (20.4)	2 (5.6)		
PoC, not Latinx	63 (13.6)	12 (7.9)	33 (14.5)	10 (20.4)	8 (22.2)		
Educational attainment						2.93	0.402
less than a 4 year degree	311 (67.0)	98 (64.5)	158 (69.6)	29 (59.2)	26 (72.2)		
At least a 4 year degree	153 (33.0)	54 (35.3)	69 (30.4)	20 (40.8)	10 (27.8)		
Annual income						6.74	0.081
Less than $50,000/year	419 (90.3)	142 (93.4)	197 (86.8)	47 (95.9)	33 (91.7)		
$50,000 or more	45 (9.7)	10 (6.6)	30 (13.2)	2 (4.1)	3 (8.3)		
HRSA-designated rural county						4.50	0.21
Yes	37 (8.0)	14 (9.2)	21 (9.3)	1 (2.0)	1 (2.8)		
No	427 (92.0)	138 (90.8)	206 (90.7)	48 (98.0)	35 (97.2)		

*X*2 chi-square statistic

*F statistic

separation. Table 4 provides results on ACE exposure and testing category among participants reporting HIV testing.

In an unadjusted multinomial logistic regression model, individuals reporting greater ACEs exposure were less likely to report each HIV testing modality compared to never testing (see Table 5). After controlling for demographic characteristics the relationship held for clinic-based testing *(AOR = 0.84, 95% CI [0.79, 0.89], < 0.001)* and HIVST *(AOR = 0.72, 95% CI [0.63, 0.82], p < 0.001).* A second set of multinomial logistic regressions were run, restricting the sample to only those reporting an HIV test in the past year. Compared to clinic-based testing, individuals with greater ACEs exposure had significantly lower odds of reporting HIVST *(AOR = 0.85 [CI = 0.74, 0.97], p = 0.013),* controlling for participant demographics. In addition, participants with greater ACEs exposure had significantly greater odds of reporting community-based HIV testing compared to clinic-based testing *(AOR = 1.09, [CI = 1.00, 1.20], p = 0.041)* after adjusting for demographic factors. Table 5 provides information on the odds of testing modality in relation to total ACEs exposure.

Discussion

Similar to past work [18, 21, 23, 24], a substantial proportion of our sample reported at least 1 ACE (n = 292, 62.9%), and nearly half (n = 224, 48.3%) indicated exposure to 4 or more ACEs putting them at increased risk for myriad of poor health outcomes, including HIV. Also, in line with past work

Table 2 Cumulative ACEs exposure and HIV testing modality (n = 464)

Cumulative ACEs Exposure	Total Sample (n = 464) n (%)	Never Tested (n = 152) n (%)	Clinic-Based Testing (n = 227) n (%)	Community-Based Testing (n = 49) n (%)	HIVST (n = 36) n (%)
0	172 (37.1)	41 (27.0)	95 (41.9)	14 (28.6)	22 (61.1)
1	26 (5.6)	3 (2.0)	11 (4.8)	6 (12.2)	6 (16.7)
2	22 (4.7)	7 (4.6)	10 (4.4)	3 (6.1)	2 (5.6)
3	20 (4.3)	7 (4.6)	9 (4.0)	4 (8.2)	0. (0.0)
4	13 (2.8)	1 (0.7)	8 (3.5)	2 (4.1)	2 (5.6)
5	19 (4.1)	9 (5.9)	9 (4.0)	1 (2.0)	0 (0.0)
6	12 (2.6)	5 (3.3)	6 (2.6)	1 (2.0)	0 (0.0)
7	6 (1.3)	1 (0.7)	3 (1.3)	1 (2.0)	1 (2.8)
8	55 (11.9)	16 (10.5)	35 (15.4)	4 (8.2)	0 (0.0)
9	48 (10.3)	18 (11.8)	22 (9.7)	7 (14.3)	1 (2.8)
10	71 (15.3)	44 (28.9)	19 (8.4)	6 (12.2)	2 (5.6)

For the total sample, using a chi-square linear trend test we found a significant result $X^2(1) = 28.90$, $p < .001$ suggesting a linear trend regarding cumulative ACEs exposure and most recent testing modality

[20], the current study indicates that some ACEs are more common among YMSM based on testing modality, and that some ACEs are more prevalent among YMSM who have never tested for HIV, such as sexual abuse, as well as emotional and physical neglect. These results are consistent with previous work [20, 21, 23, 24, 30, 45] documenting alarmingly high rates of ACEs among sexual minority populations indicating that ACEs are a persistent public health issue among sexual minority men, including MSM and MSMW.

Previous research [20, 38] is mixed regarding the relationship between ACEs exposure and HIV testing. Specifically, work by Bertolino and colleagues showed no link between any ACEs exposure compared to no ACEs exposure and HIV testing among a national sample of MSM, while Kidman and Kohler's findings suggest that cumulative ACEs exposure increases HIV testing among young heterosexual people in Malawi. Our data show that YMSM reporting more ACEs have significantly lower odds of reporting clinic-based testing, community-based testing, and HIVST compared to never receiving an HIV test. This suggests that cumulative ACEs exposure is important for understanding health screening behavior, in particular HIV screening behaviors, rather than if ACEs exposure occurred or did not occur as in Bertolino and colleagues' work [20], and that identifying which HIV testing strategy was used is important in understanding this relationship as well. This is also somewhat consistent with Kidman and Kholer's [33] findings and supports a cumulative approach to assessing ACEs rather than no exposure versus any exposure. However, in contrast to Kidman and Kholer [38], our findings suggest that increased ACEs exposure decreases odds of HIV testing rather than increases odds of HIV testing. In both studies, lifetime history of HIV testing was treated as binary outcome, whereas the current study was focused on the HIV strategy used by participants' during their most recent HIV test suggesting that ACEs exposure may not affect whether an individual with ACEs exposure gets tested, but rather the setting where they seek out testing.

A major contribution of this study is that among YMSM who have received an HIV test in the past year, those with greater ACEs exposure had increased odds of reporting community-based testing and lower odds of HIVST compared to clinic-based testing, after controlling for demographics. Taken together, we extend past work by documenting a relationship between cumulative ACEs exposure and HIV testing strategy. In line with this finding, programs engaging in HIV testing in the community should incorporate trauma-informed practices that support regular HIV testing in YMSM. A review the literature suggests there are currently few interventions that address both trauma and HIV prevention and testing needs of men who have sex with men [45]. In fact, in their review Sales and colleagues [45], identified 8 trauma-informed interventions addressing HIV prevention and care, and only one focused on men who have sex with men and women. More recent work on trauma-informed HIV care has focused on the needs of women primarily targeting intimate partner violence, and focused on addressing trauma among those living with HIV. However, we can gain insights from strategies addressing trauma for those living with HIV and apply these strategies to YMSM at-risk for HIV to encourage HIV testing [46]. In their review, Goldhammer and colleagues [47], identify 5 categories of interventions to address traumatic stress in individuals living with HIV, such as expressive writing, coping skills interventions, and trauma-informed care approaches.

The Substance Abuse and Mental Health Services Administration (SAMHSA) describe 6 guiding principles of trauma-informed care that include: safety, trustworthiness

Table 3 Exposure to ACEs stratified by never testing and HIV testing location among the total sample (n = 464)

	Total Sample (n = 464)	Never Tested for HIV (n = 152)	Clinic-Based (n = 227)	Community-Based (n = 49)	HIVST (n = 36)		
	n (%)	n (%)	n (%)	n (%)	n (%)	X^2	p
Total ACEs (M, SD)	4.25 (4.11)	5.62 (4.19)	3.79 (3.94)	4.18 (3.98)	1.50 (2.90)	12.87*	< 0.001
Individiaul ACEs Category							
Emotional abuse						25.69	< 0.001
No	217 (46.8)	55 (36.2)	114 (50.2)	19 (38.8)	29 (80.6)		
Yes	247 (53.2)	97 (63.8)	113 (49.8)	30 (61.2)	7 (19.4)		
Physial abuse						27.13	< 0.001
No	241 (51.9)	58 (38.2)	126 (55.5)	27 (55.1)	30 (83.3)		
Yes	223 (48.1)	94 (61.8)	101 (44.5)	22 (44.9)	6 (16.7)		
Sexual abuse						34.77	< 0.001
No	271 (58.4)	66 (43.4)	140 (61.7)	31 (63.3)	34 (94.4)		
Yes	193 (41.6)	86 (56.6)	87 (38.3)	18 (36.7)	2 (5.6)		
Emotional neglect						35.70	< 0.001
No	221 (47.6)	48 (31.6)	123 (54.2)	21 (42.9)	29 (80.6)		
Yes	243 (52.4)	104 (68.4)	104 (45.8)	28 (57.1)	7 (19.4)		
Physical neglect						26.15	< 0.001
No	270 (58.2)	67 (44.1)	143 (63.0)	29 (59.2)	31 (86.1)		
Yes	194 (41.8)	85 (55.9)	84 (37.0)	20 (40.8)	5 (13.9)		
Domestic violence						29.70	< 0.001
No	262 (56.5)	64 (42.1)	136 (59.9)	30 (61.2)	32 (88.9)		
Yes	202 (43.5)	88 (57.9)	91 (40.1)	19 (38.8)	4 (11.1)		
Substance use in the home						20.55	< 0.001
No	240 (51.7)	60 (39.5)	127 (55.9)	25 (51.0)	28 (77.8)		
Yes	224 (48.3)	92 (60.5)	100 (44.1)	24 (49.0)	8 (22.2)		
Mental health issue in the home						25.02	< 0.001
No	254 (54.7)	64 (42.1)	131 (57.7)	28 (57.1)	31 (86.1)		
Yes	210 (45.3)	88 (57.9)	96 (42.3)	21 (42.9)	5 (13.9)		
Divorce or seperation						7.51	0.057
No	336 (72.4)	98 (64.5)	172 (75.8)	37 (75.5)	29 (80.6)		
Yes	128 (27.6)	54 (35.5)	55 (24.2)	12 (24.5)	7 (19.4)		
Family member incarceration						52.73	< 0.001
No	355 (76.5)	86 (56.6)	198 (87.2)	38 (77.6)	33 (91.7)		
Yes	109 (23.5)	66 (43.4)	29 (12.8)	11 (22.4)	3 (8.3)		

ACE Adverse Childhood Experiences, *HIVST* HIV self-testing, X^2 chi-square statistic

*F statistic

and transparency, peer support, collaboration and mutuality, empowerment, voice and choice, and cultural, historical, and gender issues [48]. A handful of interventions for YMSM and HIV prevention align with a number of these principles. In particular, the Mpowerment Project intervention is focused on improving HIV testing by empowering YMSM and leveraging peer support to influence sexual health decision-making, including HIV testing. Given this intervention is often implemented in community settings and leveraging peer networks, it might be an ideal intervention for reaching YMSM with higher ACEs exposure. Infusing interventions like Mpowerment [49] with strategies that have been shown to be effective in addressing trauma in people living with HIV, such as expressive writing [46] or other arts-based strategies [50], as well as with coping skills interventions could serve as potential avenue for reaching YMSM to address ACEs exposure and HIV testing [46]. Moreover, arts-based strategies have been used in other HIV-related interventions to address issues such as HIV stigma and are often delivered in a group format [51, 52], which could be easily translated to peer-based HIV-testing and prevention interventions akin to Mpowerment. In addition, screening for

Table 4 ACEs exposure stratified by most recent HIV testing location among those reporting ever being tested for HIV (n = 312)

	Total Sample (n = 312)	Clinic-Based (n = 227)	Community-Based (n = 49)	HIVST (n = 36)		
	n (%)	n (%)	n (%)	n (%)	X^2	p
Total ACEs (M, SD)	4.52 (4.11)	3.79 (3.94)	4.18 (3.98)	1.50 (2.90)	6.21*	0.002
Individiaul ACEs category						
Emotional abuse					15.48	< 0.001
No	162 (51.9)	114 (50.2)	19 (38.8)	29 (80.6)		
Yes	150 (48.1)	113 (49.8)	30 (61.2)	7 (19.4)		
Physial abuse					10.22	0.006
No	183 (58.7)	126 (55.5)	27 (55.1)	30 (83.3)		
Yes	129 (41.3)	101 (44.5)	22 (44.9)	6 (16.7)		
Sexual abuse					14.96	< 0.001
No	205 (65.7)	140 (61.7)	31 (63.3)	34 (94.4)		
Yes	107 (34.3)	87 (38.3)	18 (36.7)	2 (5.6)		
Emotional neglect					12.48	0.002
No	173 (55.4)	123 (54.2)	21 (42.9)	29 (80.6)		
Yes	139 (44.6)	104 (45.8)	28 (57.1)	7 (19.4)		
Physical neglect					8.19	0.017
No	203 (65.1)	143 (63.0)	29 (59.2)	31 (86.1)		
Yes	109 (34.9)	84 (37.0)	20 (40.8)	5 (13.9)		
Domestic violence					11.38	0.003
No	198 (63.5)	136 (59.9)	30 (61.2)	32 (88.9)		
Yes	114 (36.5)	91 (40.1)	19 (38.8)	4 (11.1)		
Substance use in the home					7.13	0.028
No	180 (57.7)	127 (55.9)	25 (51.0)	28 (77.8)		
Yes	132 (42.3)	100 (44.1)	24 (49.0)	8 (22.2)		
Mental health issue in the home					10.87	0.004
No	190 (60.9)	131 (57.7)	28 (57.1)	31 (86.1)		
Yes	122 (39.1)	96 (42.3)	21 (42.9)	5 (13.9)		
Divorce or seperation					0.41	0.814
No	238 (76.3)	172 (75.8)	37 (75.5)	29 (80.6)		
Yes	74 (23.7)	55 (24.2)	12 (24.5)	7 (19.4)		
Family member incarceration					4.19	0.123
No	269 (86.2)	198 (87.2)	38 (77.6)	33 (91.7)		
Yes	43 (13.8)	29 (12.8)	11 (22.4)	3 (8.3)		

ACE Adverse Childhood Experiences, *HIVST* HIV self-testing, *X*2 chi-square statistic

*F statistic

exposure to ACEs in YMSM should be occurring across HIV testing settings, generally, and in community-based testing contexts, specifically, where we documented higher rates of ACEs exposure. YMSM who screen positive for ACEs exposure should be referred to trauma-informed peer-based HIV prevention programs. However, such a process would also require additional training for HIV outreach workers and HIV testing counselors in the provision of trauma-informed care, including management of vicarious trauma (change resulting from empathetic engagement with trauma survivors), for example debriefing meetings with staff and creating space to discuss interactions with YMSM who disclose ACEs exposure to understand how these discussions may be affecting their own mental health [53]. More research is need to understand why YMSM with greater ACEs exposure tended to use community-based testing compared to other strategies, how those future insights can be applied to clinic-based testing and HIVST utilization, and how to best deliver trauma-informed care in community-based settings, potentially leveraging peer-based strategies.

One might expect that YMSM with greater ACEs exposure would have had greater odds of using HIVST given that this strategy allows YMSM to test for HIV in the privacy of their own home, addressing barriers to clinic-based testing

Table 5 Multinomial regression, ACEs exposure and HIV testing modality (n = 464)

	Unadjusted				Adjusted			
	OR	SE	95%CI	p	AOR	SE	95%CI	p
Never tested for HIV (ref)	–	–	–	–	–	–	–	–
Clinic-based testing	0.90	0.03	0.85, 0.94	< .001	0.84	0.03	0.79, 0.89	< 0.001
Community based testing	0.92	0.04	0.85, 0.99	< .001	0.92	0.04	0.85, 1.01	0.072
HIVST	0.74	0.06	0.66, 0.84	< .001	0.72	0.07	0.63, 0.82	< 0.001
	Unadjusted				Adjusted			
	OR	SE	95%CI	p	AOR	SE	95%CI	p
Clinic-based testing (ref)	–	–	–	–	–	–	–	–
Community based testing	1.03	0.04	0.95. 1.11	0.526	1.09	0.05	1.00, 1.20	0.041
HIVST	0.82	0.06	0.73, 0.93	0.002	0.85	0.07	0.75, 0.97	0.013

OR Odds ratio, *SE* Standard error, *CI* Confidence interval, *CI* Confidence interval, *HIVST* HIV self-testing, *AOR* Adjusted odds ratio

such stigma. However, prior to the COVID-19 pandemic when these data were collected, HIVST kits were primarily distributed via a facilities-based (e.g., pharmacies) strategy [54]. This facilities-based distribution of HIVST is likely to encounter similar barriers to clinic-based HIV testing, such as stigma, that may be felt or anticipated more in settings where sexual health/HIV care are not as common, such as pharmacies. [6, 54] Coupled with recent research that shows ACEs exposure, increases perceived interpersonal discrimination [35], YMSM with ACEs exposure may perceive greater discrimination or stigma in these settings thereby decreasing uptake of HIVST kits. In other words, YMSM with greater ACEs exposure may be less willing to access HIVST kits in settings where they perceive greater potential stigma. Future research should investigate the relationship between ACEs exposure and HIV testing as mediated by perceived stigma. In addition, HIVST is a relatively new testing modality that may be less known among YMSM in general, but ACEs exposure may also be related to lower health literacy, [37] meaning lower awareness of novel HIV testing and prevention strategies among YMSM with greater ACEs exposure However, additional research is need to understand how ACEs exposure might affect sexual health literacy and impact HIV testing, specifically newer strategies like HIVST. Despite a small proportion of YMSM reporting use of HIVST in our study, this strategy shows real promise for increasing HIV testing in key populations. [55–57] Given that our data show that community-based testing was more utilized by individuals who reported greater ACE exposure, leveraging community spaces or social networks (i.e., peer-to-peer delivery of HIVST kits) may help to improve uptake of HIVST in YMSM, specifically those with significant ACEs exposure. Some preliminary evidence suggests that social network distribution of HIVST kits is feasible and efficacious. [58] Using social networks for distributing HIVST kits resolves some health literacy issues associated with ACEs exposure by providing information and education on HIVST specifically, and reduces stigma associated with accessing HIVST kits in facilities that might be perceived as more stigmatizing or discriminatory by YMSM with ACEs exposure.

This study is not without limitations. First, these data are from a cross-sectional community health assessment done in South Texas and findings should be interpreted as such. While these findings are generalizable beyond the study population, YMSM living in the Southern United States, more specifically South Texas experience unique and profound barriers to HIV testing due to increase stigma stemming from regional and cultural norms regarding sexuality, sexual behavior, and HIV [59, 60]. Second, the question "where did you receive your most recent HIV test?" was presented with a limited number of response options and some YMSM may have received an HIV test in a setting that was not included, such a pharmacy chain or independent lab. This may have led to YMSM skipping this question as there was not a response option reflecting their most recent testing experience. Third, missing from this analysis is exposure to other forms of childhood adversity, specifically sexual and gender minority specific ACEs that often occur outside the home, such as seeing or hearing about LGBTQ + people being physically harmed or hearing a religious leader say homophobic, biphobic, or transphobic things. The recent development of the sexual and gender minority adverse childhood experiences (SGM-ACEs) scale assesses exposure to heterosexism prior to adulthood and has been associated with increased reports of diagnosis with anxiety, depression, and post-traumatic stress disorder in sexual and gender minority adults [60]. Future research in other areas should consider how exposure to SGM-ACEs [60] in combination with family-based ACEs [9] influences HIV testing and prevention. Similarly, there are variables that might affect the relationship between ACEs exposure

HIV testing modality, such as degree of "outness," perception of stigma and discrimination or substance use, and these potential intervening variables should be explored in future research. Finally, despite the racial and ethnic diversity of the larger sample (44.9% white, non-Hispanic/Latinx) [61] , this subsample of YMSM was majority non-Hispanic White and not representative of the racial and ethnic make-up of the area from where the data were collected. This study also had a number of strengths that included the use of CBPR and diverse recruitment strategy that make these findings more relevant to the population and increase generalizability.

Conclusions

This study extends past work by assessing ACEs impact on HIV testing and by demonstrating that level of ACE exposure is associated with HIV testing strategies, providing an initial first step towards understanding how YMSM exposed to ACEs access HIV testing services. Our findings support the need for a deeper understanding of the role ACEs exposure plays in HIV testing and suggest that individuals with the greatest levels of ACEs exposure are most likely to use community-based testing strategies or to have never been tested. As such, testing programs that leverage community-based or social network strategies may be suited for reaching YMSM with ACEs exposure. Future research is needed to increase HIV testing rates among ACEs exposed YMSM, especially among those with the greatest ACEs exposure. Specifically, more research is needed to better understand why level of ACEs exposure is associated with HIV testing strategies, as well as the ramifications for different types of ACEs exposure on utilization of different HIV testing strategies. There are several plausible explanations that exist for the influences of ACEs exposure on HIV testing and HIV testing strategy that need to be more fully investigated in future studies.

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Author Contribution PWS: Made substantial contributions to the conception and design of the study; and the acquisition, analysis, and interpretation of data for this manuscript; drafted and revised the manuscript; approved the final version to be published; agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. MB: Made substantial contributions to data analysis and interpretation of data, revised the manuscript for critically important intellectual content; approved the final version to be published; agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. ALS and RS: Made substantial contributions to the conception and design of the study and the acquisition of data for this manuscript; revised it critically for important intellectual content; approved the final version to be published; agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. JD and TG: Made substantial contributions to interpretation of data, revised the manuscript for critically important intellectual content; approved the final version to be published; agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Data Availability Data are not publically available

Code Availability N/A

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Ethical Approval
Ethics approval was provided by Trinity University. We certify that the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Consent to Participate Participants were provide an online study information sheet and asked "Do you provide you consent to participate in this research study" with response options Yes or No. Individuals selecting yes were taken to the online survey. Those selecting No were taken to the study webpage.

Consent for Publication Data report are all aggregate no individual data or images are presented. The study information sheet indicates that aggregate data may be published in academic publications, presentations, or published in other reports.

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