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Structural Equation Modeling of Stigma and HIV Prevention Clinical Services Among Transgender and Gender Diverse Adults: The Mediating Role of Substance Use and HIV Sexual Risk

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Abstract

Background: Transgender and gender diverse (TGD) adults experience high levels of stigma which contributes to elevated substance use and HIV sexual risk behaviors. Despite higher burdens of substance use and HIV, TGD individuals may be less likely to engage in healthcare to avoid further discrimination.

Setting: This analysis included 529 TGD adults in Massachusetts and Rhode Island who were HIV-negative or had an unknown HIV serostatus and were purposively sampled between March and August 2019.

Methods: We used structural equation modeling to test whether substance use, HIV sexual risk behaviors (i.e., condom use, sex work, multiple partners), and receiving gender-affirming hormone therapy mediate any observed association between TGD-related stigma and utilization of HIV prevention clinical services (i.e., HIV prevention programs, PrEP use, HIV testing).

Results: Substance use and HIV sexual risk mediated the relationship between TGD-related stigma and utilization of HIV prevention clinical services ($\beta=0.08$; 95% CI=0.01, 0.17; $p=0.03$ and $\beta=0.26$; 95% CI=0.14, 0.37; $p<0.001$). Having a hormone therapy prescription was not a mediator between TGD-related stigma and HIV prevention clinical services.

Conclusions: Future interventions that aim to improve HIV prevention clinical services among TGD adults should consider the impact of TGD-related stigma on participants' substance use and sexual risk behaviors. These efforts require that healthcare organizations and community organizations make a deliberate investment in the reach and success of interventions and programs.

Keywords

human immunodeficiency virus; HIV prevention; HIV sexual risk behaviors; stigma; substance use; transgender and gender diverse adults

1. Introduction

Transgender and gender diverse (TGD) people experience stigma in a variety of settings.¹ Transgender and gender diverse (TGD) refers to individuals with gender identities or expressions that depart from the gender socially and culturally attributed to one's sex assigned at birth.² Stigma across one's lifetime can contribute to health risks, such as engaging in hazardous or harmful substance use, HIV sexual risk behaviors, and HIV acquisition.³⁻⁶ Hence, TGD individuals are not "ipso facto 'risky' populations" per se but are susceptible to unique risks resulting from the challenges they encounter.⁷

Social and structural factors, often rooted in oppression and injustice, lead to syndemic clustering of substance use and HIV,⁸ including among TGD populations.⁹⁻¹² Syndemics describes the synergistic effect of social factors that exacerbate enmeshed health risks, leading to subsequent adverse interactions that reinforce a disproportionate burden among minoritized populations.^{8,13} Considering the syndemic risk that TGD individuals face in the wake of substance use and HIV, and its interplay with discrimination and HIV prevention strategies, further inquiry is warranted.¹⁴

A survey of approximately 28,000 TGD adults, found that 29% reported past month substance use, compared to just 10% of the general U.S. adult population.¹⁵ Other studies with TGD populations have also found a higher prevalence of binge drinking in TGD adults compared to cisgender samples.^{7,15-18} TGD individuals may use substances to cope with discrimination and interpersonal stressors.^{6,19-23} Similarly, national data indicate that HIV infection prevalence estimates among TGD individuals range from 9.1% based on laboratory-confirmed tests to 16.1% based on self-reported data compared to 0.3% of the general population with laboratory-confirmed tests.^{9,15,24} Stigma and discrimination have also been linked to increased HIV sexual risk behaviors among TGD populations, such as sex work and condomless sex. For example, faced with employment discrimination, some TGD people may engage in transactional sex work for financial survival,²⁵⁻²⁷ which can increase their risk for HIV.^{28,29} Research also finds that some TGD people affirm their gender through sex and may succumb to their partner's pressure to not use condoms in an effort to maintain their relationship.³⁰

Despite higher burdens of substance use and HIV and the need for many TGD people to access gender-affirming hormones,³¹ TGD individuals may avoid healthcare for fear of discrimination.^{22,23,32} Further, some providers may be ill-equipped to care for people with SUD or those who engage in transactional sex, which can lead to unmet treatment needs for some TGD populations.^{22,32,33} However, factors that may signal a more supportive healthcare environment to TGD patients, such as receiving gender-affirming hormone therapy from a medical provider, may facilitate access to needed services such as HIV-related services.^{34,35} Although some evidence posits that TGD-related stigma may be a barrier to receiving HIV care^{12,36-39} and gender-affirming hormone therapy may facilitate HIV care engagement,⁴⁰ no prior studies, to our knowledge, have simultaneously considered how substance use, gender-affirming care, and stigma related to HIV prevention service utilization among TGD adults.

This study aims to explore the relationship between substance use, HIV sexual risk behaviors, gender-affirming hormone therapy, stigma, and the utilization of HIV prevention services among TGD adults. We hypothesized that: [1] HIV sexual risk behaviors would mediate the relationship between TGD-related stigma and the use of HIV prevention clinical services; [2] that substance use would mediate the association between TGD-related stigma and HIV sexual risk behaviors; and [3] having a gender-affirming hormone therapy prescription would mediate the relationship between TGD-related stigma and HIV prevention clinical services (see figure, Supplemental Digital Content 1). Understanding the relationships between stigma and HIV sexual risk behaviors has policy and clinical implications for reducing disparities in healthcare utilization for TGD individuals.

2. Methods

2.1. Study Sample

The analytic sample was derived from a non-probability, convenience sample of TGD adults who completed a cross-sectional digital health and needs assessment between March and August 2019 (N=600). Individuals from TGD community-based organizations and academic institutions developed a data collection plan, including creating culturally sensitive screening criteria and pilot testing survey questions. Sampling occurred in-person at LGBTQ+ community settings and online via social networking websites. Individuals were eligible to participate if they identified as TGD, resided in Massachusetts or Rhode Island for at least three months within the prior year, were able to read English or Spanish, and were at least 18 years of age. For this analysis, the sample was restricted to participants who did not report living with HIV and reported receiving routine healthcare within the prior three years (n=529). Additional details about the parent survey can be found elsewhere.⁴¹ This study was approved by the Institutional Review Boards of [redacted for review].

2.2. Measures

2.2.1. Demographics—*Age* was measured in years. Since younger TGD adults (relative to those over 30) may experience unique health disparities^{16,42} and be less likely to engage in HIV preventive health services,^{43,44} age was re-coded as *young adult* (yes, 18-29 years-old vs. no, 30 years and above). *Race/ethnicity* was coded as White (non-Hispanic) vs. Black, Indigenous, or Person of Color (BIPOC, inclusive of Asian/Pacific Islander, Black, Hispanic/Latino, another race, and multiple races/ethnicities). Assigned birth sex (female, male) was cross-tabulated with gender identity (i.e., woman/trans woman, man/trans man, non-binary/genderqueer) to create the following gender categories: trans feminine, trans masculine, and non-binary.⁴⁵

2.2.2. TGD Everyday Discrimination Score—*TGD-related stigma* was assessed via modified version of the Everyday Discrimination Scale⁴⁶ adapted for TGD populations.^{4,6,22,47,48} The scale captured the frequency (range: 0=never to 4=very often) of lifetime discrimination via 11-items such as: “People have acted as if they are afraid of you” and “You have been called names or insulted.” To create an indicator of TGD-related discrimination, summary scores were recoded as zero if respondents did not attribute their discrimination experiences to some aspect of their TGD-related identity or expression (i.e., gender identity, gender expression, masculine or feminine appearance, or sex). The final score ranged from 0–44, had a mean of 19.56 (*SD*=9.59), and an alpha of .94, similar to previous research with TGD adults from Massachusetts.⁴⁷

2.2.3. Substance Use and Hazardous Drinking—*Substance use* was assessed with measures used in previous research with TGD populations.²² Specifically, respondents were asked to indicate whether they had intentionally used 10 different types of drugs “to get high” in the past 12 months (yes =1 vs. no=0): cocaine (powder), crack cocaine, club drugs (ecstasy, GHB, ketamine), heroin, methamphetamine, poppers, hallucinogens (e.g., LSD, mushrooms), benzodiazepines (e.g., Valium, Ativan, Xanax), painkillers (e.g., Oxycontin, Vicodin, Percocet), other drugs. Using a measure from the Alcohol Use

Disorders Identification Test (AUDIT-C),⁴⁹ hazardous drinking was defined as having 5 drinks during one occasion (yes=1 vs. no=0). The drug use and hazardous drinking variables were then summed to create a continuous score of past 12-month substance use ranging from 0 to 11. Substance use was operationalized as a continuous variable to account for both frequency of use and number of substances used, enabling us to capture individuals with considerable use patterns (e.g., high polysubstance use).⁶

2.2.4. HIV Sexual Risk Behaviors—The outcome variable, *HIV sexual risk behavior*, was created as a latent variable consisting of three indicators based on heightened HIV vulnerability in TGD populations:⁵⁰⁻⁵² *condomless sex*, *multiple partners*, and *sex work*. *Condomless sex* was constructed based on respondents reporting sometimes or never using condoms in the past 6 months when engaging in receptive or insertive “front-hole”/vaginal or anal sex with a “flesh penis” versus those who always used condoms or did not report engaging in these sexual behaviors. The term “flesh penis” was used to distinguish between a prosthetic device since the former carries more risk for HIV transmission. The rationale for this terminology and an acknowledgment that this may not be the term people use were provided in the survey and was approved by an advisory board of TGD community members. Respondents with 2 or more partners in the last 6 months were coded as yes, *multiple partners*; those with 0-1 partners were coded as no. Lifetime history of *sex work* was assessed by asking respondents if they had “ever traded sexual activity or favors for food, money, a place to sleep, drugs, or other material goods?” (yes/no).

2.2.5. HIV Prevention Clinical Services—The outcome variable, engagement in *HIV prevention clinical services*, was created as a latent variable using three separate dichotomous variables that represent evidence-based HIV clinical services commonly used among TGD populations.⁵³⁻⁵⁷ *HIV prevention programs or services* was assessed by asking participants (yes/no) if they had “accessed any HIV prevention programs or services (for example, risk reduction counseling, demonstrations on how to use condoms, programs for couples or groups focused on reducing HIV risk by changing behaviors)” in the past 12 months. *HIV testing* captured whether respondents had tested for HIV in the past year (yes/no). Pre-Exposure Prophylaxis (*PrEP*) use was coded as yes/no in response to a question assessing whether respondents had ever taken PrEP.

2.3. Data analysis

Descriptive analyses were performed in Stata/SE version 17.⁵⁸ Univariate descriptive statistics were used to produce means, standard deviations (SD), proportions, and frequencies. Bivariate correlations were measured using the Pearson product-moment correlation coefficient. The cut-off of significance was alpha=0.05. In the total sample, 29 respondents were missing one or more responses. Missing values for the continuous TGD-related stigma score were inputted based on the mean (M=19.56); all other items were binary and inputted based on the model. The latent variables, HIV sexual risk behaviors, and HIV prevention clinical services, each met the minimum requirement of at least 3 indicators.⁵⁹

AMOS 27⁶⁰ was used to test each hypothesis using Structural equation modeling (SEM).^{61,62} The following model fit indices were examined: comparative fit index (CFI) and adjusted goodness of fit (AGFI: 0.90-0.95 = good; 0.95 = excellent), normed fit index (NFI) and goodness of fit (GFI: close to 0.90 = good; 0.95 = excellent), root mean squared error of approximation (RMSEA: 0.05-0.08 = excellent), standardized root mean square residual (SRMR: 0.08 = excellent).^{59,61,63,64} R^2 was used to assess the reliability of model fit. Since the nested model without the HIV sexual risk behaviors latent variable was nested within the complete model, the Bayesian Information Criterion (BIC) and chi-square difference test ($p < 0.05$) were compared to determine the best fit.⁵⁹ Final estimates were derived from the parsimonious model with HIV sexual risk behaviors.

We tested the hypothesized structural equation model (see figure, Supplemental Digital Content 1). We then tested the model with a direct path between TGD-related stigma and HIV prevention clinical services. Additionally, we shifted the path from substance use to HIV sexual risk behaviors to HIV prevention clinical services to more directly test the hypothesis that TGD-related stigma is negatively associated with HIV prevention clinical services indirectly through substance use. Following Weston & Gore,⁵⁹ we compared the nested mediation model (i.e., original hypothesized model) with the full mediation model that had direct paths between TGD-related stigma and substance use to HIV prevention clinical services. We then identified the best fitting model.

Bootstrapping with maximum likelihood estimation was applied to test the parameter estimation and indirect effects for the final model. In total, 5,000 random samples were generated with a 95% standardized confidence interval.⁶⁵ Bootstrap bias-correction was used to adjust the skewness and bias of estimates.⁶⁶ In these analyses, mediation was determined to be significant if the 95% bias-corrected and accelerated confidence intervals for the indirect effect do not include 0.^{66,67}

3. Results

The sample (N=529) demographic characteristics are shown in Table 1. The mean age was 31.36 years (SD=11.3; range 18-73 years). The majority of the sample was white (82.23%) white, followed by another race (8.5%) and Hispanic/Latinx/Latine (3.59%). Out of all gender identity categories, 42.16% (n=223) respondents were non-binary, gender variant, genderfluid, genderqueer, gender nonconforming, or another gender identity. Slightly over half of the sample were low-income. The mean score for TGD-related stigma was 19.56 (SD=9.59; range 0-44). In the past 12 months, 43.67% of the sample had used at least one substance while slightly over one-third reported hazardous drinking and condomless sex in the past 6 months. Two-thirds of the sample were currently receiving gender-affirming hormones from a medical provider; only three respondents did not have a prescription and reported receiving hormones from friends, online, or a non-licensed provider. Approximately half of the sample received an HIV test in the past year.

Bivariate correlations between TGD-related stigma, HIV sexual risk behaviors, substance use, gender-affirming hormone prescription, and HIV prevention clinical services are shown

in Table 2. Most correlation coefficients were positively and significantly associated. TGD-related stigma was associated with all variables except condomless sex and hormone use.

Unstandardized and standardized results from the SEM and fit statistics are displayed in Tables 3a and 3b. The full model demonstrated adequate fit: $X^2 (df=20) 80.21, p<0.001$; NFI=0.85; CFI=0.88; RMSEA=0.07; 95% CI [0.06, 0.09]; SRMR=0.05; GFI = 0.97; AGFI=0.93. The chi-square statistic was significant, which is somewhat expected given that chi-square analyses are sensitive to large sample sizes.⁶⁸ The full model accounted for 6.5% of the variance in HIV sexual risk behaviors and 21.8% of the variance in HIV prevention clinical services.

The nested model yielded similar results as the full model with regard to model fit: $X^2 (df=28)=87.8, p<0.001$; NFI=0.83; CFI=0.87; RMSEA=0.06; 95% CI [0.04,0.07]; SRMR=0.05; GFI=0.96; AGFI=0.94. In the nested model, 7.7% of the variance in HIV sexual risk behaviors and 21.8% of the variance in HIV prevention clinical services were accounted for. There was a significant difference between the two models: $X^2 (df=8) 7.59, p<0.001$. Given similar fit indices, the full model was used for further analysis.

Figure 1 shows the final full model measuring the direct association between TGD-related stigma and HIV prevention clinical services and indirect effects of substance use, HIV sexual risk behaviors, and hormone use. TGD-related stigma was not directly associated with engagement with HIV prevention clinical services. As hypothesized, TGD-related stigma positively predicted substance use ($\beta=0.12, SE=0.01, p<0.01$) and HIV sexual risk behaviors ($\beta=0.26, SE=0.01, p<0.001$). Counter to the hypothesis; substance use was positively associated with engagement with HIV prevention clinical services, which only included HIV prevention services or programs and PrEP use ($\beta=0.13, SE=0.01, p<0.01$). Similarly, HIV sexual risk behaviors were also positively associated with engagement with HIV prevention clinical services ($\beta=0.42, SE=0.07, p<0.001$). Significant associations were found with PrEP use and HIV prevention programs or services within the HIV prevention clinical services and did not include HIV testing. Substance use and HIV sexual risk mediated the relationship between TGD-related stigma and HIV prevention clinical services. Results based on 5,000 bootstrapped samples indicated that the indirect effect was significant (substance use = 0.08, 95% CI=0.05, 0.17; $p=0.03$; HIV sexual risk behaviors = 0.26, 95% CI=0.14, 0.37; $p<0.001$). Hormone use did not mediate the relationship between TGD-related stigma and HIV prevention clinical services.

4. Discussion

We tested a model depicting the relationship between TGD-related stigma and HIV prevention clinical services in a multi-state sample of TGD adults. Our results were consistent with our hypothesis that stigma specific to TGD individuals leads to increased substance use (count score of hazardous drinking and the use of up to 10 drugs to get high) and HIV sexual risk behaviors (condomless sex, multiple partners, or sex work) and corroborate prior research.^{5,19-22,52} Counter to our hypothesis, TGD-related stigma was positively associated with the use of HIV prevention clinical services indirectly through substance use and HIV sexual risk behaviors. TGD-related stigma in itself does not lead to

improved access to HIV prevention services. Rather, our model suggests that discrimination increases the risk for both substance use and HIV sexual risk behaviors which, in turn, leads to engagement in HIV prevention services. These results may also indicate that respondents may be aware of their risk behavior and have access to HIV prevention services, which enable them to appropriately engage in these services. Findings from this study lend insight to the importance of addressing stigma within interventions seeking to engage TGD individuals in integrated HIV prevention efforts.

Earlier work has demonstrated that protective policies are associated with increased access to gender-affirming, transition-related health services.⁶⁹ In our study, protective policies in Northeastern states may have contributed to higher use of HIV prevention clinical services. In recent years, legal protections and rights for TGD people have been heavily debated in several states, with an alarming amount of anti-TGD legislation imposing restrictions on health care access, especially among TGD youth.⁷⁰ Similar research with TGD participants from other states should consider how oppressive policy landscapes likely contribute to care access and risk behaviors,^{69,70} including higher non-prescribed hormone use in states with stigmatizing policies.⁷¹

Despite prior studies with TGD samples demonstrating that substance use is linked to greater health needs,^{72,73} individuals who use substances might also be more aware of their related health needs and therefore may seek HIV prevention services. Prior work has also demonstrated that TGD-related discrimination is associated with higher substance use treatment⁶ signaling increased engagement in healthcare potentially due to other factors despite stigma. In addition, HIV sexual risk behaviors may lead to engagement with HIV prevention strategies potentially due to TGD individuals being aware of their own HIV susceptibility and the perception of risk reducing health services. For example, although some gaps in PrEP awareness and HIV risk perception persist, recent studies indicate TGD individuals may be increasingly aware of risk for HIV and PrEP, in part due to recent public health efforts to increase awareness or promote favorable attitudes towards particular prevention services.⁷⁴⁻⁷⁶ Moreover, research with trans feminine individuals and cisgender men who have sex with men (MSM) found a relationship between elevated HIV risk perception and accepting a PrEP prescription.⁷⁷ In our study, potential heightened awareness or elevated perception of HIV risk may be contributing to increased PrEP use and engagement in HIV clinical prevention services. Further research is needed to investigate HIV risk perception and engagement in HIV prevention services for TGD people.

Our results are consistent with studies that show that TGD individuals may still obtain PrEP prescriptions or participate in HIV prevention programs despite substantial interpersonal and structural barriers. For example, one study demonstrated that 80% of a sample of Black and Latina trans feminine individuals visited a health care provider in the past year despite the majority lacking health care coverage.⁷⁸ In our sample, over 96% had some insurance coverage which likely further facilitated PrEP prescriptions.⁷⁹ TGD individuals who are insured might be engaged in some level of care which therefore might facilitate linkages to other prevention services, including PrEP and programming efforts around reducing HIV risk.

4.1. Clinical and Policy Implications

These findings demonstrate a need for clinicians and policymakers to factor in TGD-related stigma with strategies for HIV prevention programming and support. The two significant HIV prevention clinical services in our model, PrEP prescriptions and HIV prevention programs or services, such as risk reduction counseling, typically require some level of interaction with a health care worker or provider. As such, these findings suggest that HIV sexual risk reduction interventions should consider the syndemic interplay between substance use, HIV sexual risk behaviors, and the lasting sequelae of TGD-related stigma. Despite the pervasive discrimination experienced by TGD people in this study, our findings indicate that TGD individuals are resilient, and can successfully access and receive HIV prevention services regardless of the potential for mistreatment in care settings. Additionally, this research was conducted in Massachusetts and Rhode Island which have protective policies for TGD people along with an abundance of health and social services. Nonetheless, although some TGD individuals are still able to receive the HIV prevention services they need, it is imperative that programs and clinicians address and mitigate multilevel sources of stigma to further increase the uptake of HIV prevention services among at-risk TGD populations.^{20,28,80-82}

PrEP prescribing clinicians should make an active, conscious effort to build their knowledge and awareness of gender-affirming patient care practices and be prepared to continually address potential patient concerns around TGD-related stigma. Ensuring that trained social workers or peer support is available during consults may be effective in helping patients navigate the emotional distress of anticipated stigma in care settings, such as being viewed as morally fallible, and preventing health care avoidance.^{83,84} Additionally, integrating PrEP care with other services, such as substance use treatment, may facilitate even greater PrEP uptake.⁵⁷ Also on a structural level, clinics should consistently implement and enforce non-discrimination policies that explicitly protect the dignity of TGD patients.

In response to multi-level stigma associated with both HIV and TGD status, several interventions have been developed to deliver a community-centered approach to HIV risk reduction.^{54,81,82,85-87} Interventions have included risk reduction trainings and workshops, discussions about relationships and couples, demonstrations on using sexual supplies (e.g., condoms, lubricant), and health education on behavioral risk factors for HIV.^{54,81,82,85-87} Recognizing the need for HIV risk reduction programs to adopt an integrated HIV and substance use approach,¹² some HIV prevention interventions with TGD people have included components that address harmful or hazardous substance use, such as how to navigate substance use during sex⁸⁶ and offer referral to treatment for individuals with indication.⁵⁴

4.2. Limitations

Although this study uses robust statistical modeling with a large sample of TGD adults, several limitations remain. These data are from a non-probability sample. However, the use of purposive convenience sampling allows researchers to access participants that are hard to reach and who are not necessarily represented in representative, population-level data.⁸⁸ Relatedly, we cannot infer causality or temporality given the cross-sectional nature of this

study design. Similar to other SEM analyses using cross-sectional data, the directionality of relationships should be interpreted prudently since we have no way of knowing which lifetime experiences occurred first (e.g., lifetime discrimination experiences or engaging in sex work). Longitudinal research is needed and is currently underway by members of our team to further explore how substance use and HIV sexual risk behaviors are related to engagement with HIV prevention clinical services over time.⁸⁹

Although the race and ethnicity of the sample are analogous to the racial/ethnic composition of Massachusetts (82% White) and Rhode Island (83% White), our findings are likely not generalizable to racially and ethnically diverse groups or other geographic regions. Finally, over 96% of respondents in our sample had health insurance coverage, which can facilitate higher engagement in healthcare. TGD individuals who are engaged in some level of care might be more apt to use HIV prevention services. Testing our models with other TGD samples, including those who are more racially and ethnically diverse, geographically diverse, and/or have lower levels of health insurance coverage, is warranted.

4.3. Conclusion

This study underscores the need for clinical HIV prevention interventions that account for the interconnected, synergistic relationships among TGD-related stigma, substance use, and HIV sexual risk behaviors. These efforts require that healthcare organizations and community organizations make a deliberate investment in the reach and success of interventions and programs. Finally, unveiling additional factors that tie substance use and HIV sexual risk behaviors to stigma and HIV prevention efforts is necessary to inform the development of strategies to decrease HIV acquisition among at-risk TGD populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Conflicts of interest and Source of Funding:

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Data Availability Statement:

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

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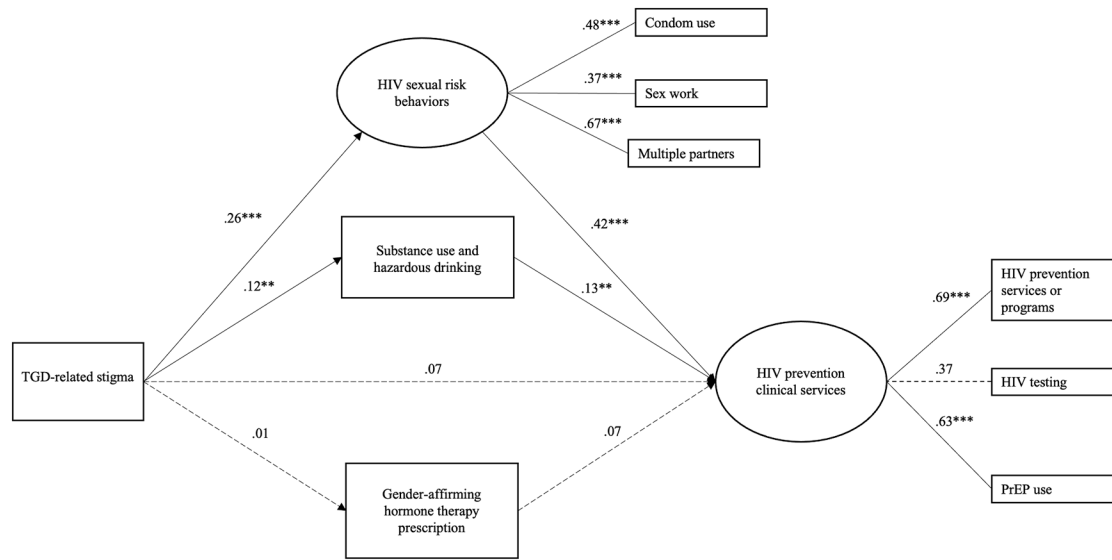


Figure 1. Structural Equation Model of TGD-related Discrimination, HIV Sexual Risk Behaviors, Substance Use, Gender-affirming Hormone Therapy Prescriptions, and HIV Prevention Clinical Strategies

Note. Standard regression weights are presented. Rectangles: observed variables; ovals: latent variables. * $p < .05$, ** $p < .01$, *** $p < .001$. Dotted line represents non-significant paths. Model fit indices: $\chi^2 (df=20)=80.21, p < 0.001$; NFI=0.85; CFI=0.88; RMSEA=0.07; 95% CI [0.06,0.09]; SRMR=0.05; GFI=0.97; AGFI=0.93.

Table 1.

Descriptive Statistics of Transgender and Gender Diverse (TGD) Adults in Massachusetts and Rhode Island Engaged in Routine Care and HIV-uninfected or Serostatus Unknown (N=529)

DEMOGRAPHICS	Mean	SD
Age (Range: 18-73 Years)	31.36	11.3
Young Adult	%	n
No (30-73)	44.61	236
Yes (18-29)	55.39	293
Race/Ethnicity		
White (non-Hispanic)	82.23	435
Person of Color	17.39	92
Asian/Pacific Islander (non-Hispanic)	2.45	13
Black (non-Hispanic)	2.83	15
Hispanic/Latinx/Latine	3.59	19
Another race (non-Hispanic)	8.50	45
Prefer not to answer	0.38	2
Gender Identity		
Trans feminine	25.14	133
Woman	9.07	48
Trans Woman or Male-to-Female	16.07	85
Trans masculine	32.70	173
Man	9.64	51
Trans Man or Female-to-Male	23.06	122
Non-binary ^a	42.16	223
Health Insurance		
Private	43.66	231
Public	30.62	162
Other	22.11	117
None	2.67	14
Prefer not to answer	0.94	5
Educational Attainment		
High School or Less	13.42	71
Some college (1-3 years)	29.68	157
College graduate (4-year college degree or higher)	56.71	300
Prefer not to answer	0.19	1
Low Income		
No	46.50	246
Yes	51.04	270
Don't know or Prefer not to answer	2.46	13
DISCRIMINATION (LIFETIME)		
TGD Everyday Discrimination Score ^b	Mean	SD

Range: 0-44	19.56	9.59
HIV SEXUAL RISK BEHAVIORS		
	%	n
Condomless Sex (Past 6 months)		
No	64.08	339
Yes	35.92	190
Sex Work (Lifetime)		
No	80.91	428
Yes	19.09	101
Multiple Partners (Past 6 months)		
No	74.86	396
Yes	25.14	133
SUBSTANCE USE		
	Mean	SD
Drug Use and Hazardous Drinking (Past 12 months)^c		
Range: 0-11	0.77	1.36
	%	n
No (0)	56.33	298
Yes (1)	43.67	231
Hazardous Drinking Only (Past 6 months)		
	%	n
No	65.78	348
Yes	34.22	181
GENDER-AFFIRMING MEDICAL CARE		
Gender-affirming Hormone Therapy Prescription (Current)		
No	33.65	178
Want it	9.26	49
Not sure if I want it	14.36	76
Don't want it	6.62	35
Unknown	2.84	15
Unregulated use	0.57	3
Yes	66.35	351
Any medical gender-affirming intervention (Lifetime)^d		
No	28.54	151
Yes	71.46	378
HIV PREVENTION CLINICAL SERVICES		
Prevention Programs/Services (Past 12 months)		
No	90.93	481
Yes	9.07	48
HIV Testing (Past 12 months)		
No	51.23	271
Yes	48.77	258
PrEP Use (Lifetime)		
No	94.14	498
Yes	5.86	31

Note. Engaged in routine care entails receiving a check-up in the past 3 years.

^aNon-binary included individuals who identified as non- binary, gender variant, genderfluid, genderqueer, gender nonconforming.

^bTGD everyday discrimination score is a continuous score from the Everyday Discrimination Scale (EDS) attributable to gender identity, gender expression, masculine or feminine appearance, or sex.

^cSubstance Use is a continuous variable of use to get high (yes/no) of 10 substances/classes of substances: cocaine (powder), crack cocaine, club drugs (ecstasy, GHB, ketamine), heroin, methamphetamine (meth, tina, crystal, speed), poppers (amyl nitrate, butyl nitrate), hallucinogens (LSD, mushrooms, etc.), benzodiazepines (Valium, Ativan, Xanax, etc), painkillers (Oxycontin, Vicodin, Percocet, etc.), other drug (please specify) in the past 12 months, and hazardous drinking (≥ 5 drinks in one occasion) in the past 6 months.

^dResults are in response to the question, "Have you accessed any transgender-related medical interventions to affirm your gender (e.g., hormones, surgeries)?"

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Table 2. Bivariate Correlations and Univariate Statistics for TGD-related Discrimination, HIV Sexual Risk Behaviors, Substance Use, Gender-affirming Hormone Therapy Prescriptions, and HIV Prevention Clinical Strategies (n=529)

Variables	1	2	3	4	5	6	7	8	9
1. TGD Everyday Discrimination Score ^a	1.00	0.06	0.28***	0.15***	0.13**	0.01	0.11**	0.16***	0.09*
<i>HIV Sexual Risk Behaviors</i>									
2. Condomless Sex ^b		1.00	0.12**	0.36***	0.05	-0.01	0.18***	0.12**	0.08
3. Sex Work ^b			1.00	0.26***	0.20***	-0.03	0.11**	0.15***	0.12**
4. Multiple Partners ^b				1.00	0.28***	0.13***	0.24***	0.38***	0.15***
5. Substance Use ^c					1.00	-0.04	0.11**	0.15***	0.04
6. Gender-affirming Hormone Therapy Prescription						1.00	0.01	0.11**	0.10**
<i>HIV Prevention Clinical Services</i>									
7. Prevention Programs/Services							1.00	0.21***	0.45***
8. HIV Testing								1.00	0.23***
9. PrEP Use									1.00
Mean or %	19.56	35.92	19.09	25.14	0.77	66.35	9.07	48.77	5.86
SD or n	9.59	190	101	133	1.37	351	48	258	31
Range	0-44	--	--	--	0-11	--	--	--	--

Note. TGD: Transgender and gender diverse

^aTGD everyday discrimination score is a continuous score from the Everyday Discrimination Scale (EDS) attributable to gender identity, gender expression, masculine or feminine appearance, or sex. Mean and SD are presented.

^bCondomless sex, sex work, multiple partners, gender-affirming hormone use, prevention programs/services, HIV test, and PrEP use are binary variables with the n and percentage of participants who responded "yes" presented.

^cSubstance Use is a continuous variable of use to get high (yes/no) of 10 substances/classes of substances [cocaine (powder), crack cocaine, club drugs (ecstasy, GHB, ketamine), heroin, methamphetamine (meth, tina, crystal, speed), poppers (amyl nitrate, butyl nitrate), hallucinogens (LSD, mushrooms, etc.), benzodiazepines (Valium, Ativan, Xanax, etc.), painkillers (Oxycontin, Vicodin, Percocet, etc.), other drug (please specify) in the past 12 months, and hazardous drinking (>5 drinks in one occasion) in the past 6 months. Mean and SD are presented.

Person's r is reported for all variables.

* p<0.05

** p<0.01

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Table 3a.

Measurement Model and Estimates of Substance Use, HIV Sexual Risk Behaviors, Gender-affirming Hormone Therapy Prescriptions, and HIV Prevention Clinical Services

Variables	Unstandardized		Standardized		
	<i>B</i>	<i>SE</i>	β	<i>SE</i>	
Substance Use	0.02**	0.01	0.12**	0.01	
<i>HIV Sexual Risk Behaviors</i>	0.01***	0.01	0.26***	0.01	
Condomless Sex	1.00	--	0.48***	0.05	
Sex Work	0.64***	0.18	0.37***	0.18	
Multiple Partners	1.26***	0.25	0.67***	0.25	
Gender-affirming Hormone Prescription	0.01	0.02	0.01	0.03	
<i>HIV Prevention Clinical Services</i> ^a	0.01	0.01	0.07	0.01	
Prevention Programs/Services	1.00	--	0.69***	0.09	
HIV Test	0.94	0.70	0.37	0.70	
PrEP Use	0.75***	0.14	0.63***	0.14	
Indirect Effects	<i>B</i>	<i>CI</i>	<i>B</i>	<i>CI</i>	
Substance Use	0.01*	(0.01,0.03)	0.08*	(0.05, 0.17)	
HIV Sexual Risk Behaviors	0.27***	(0.14, 0.41)	0.26***	(0.14, 0.37)	
Model fit: $X^2 = 80.21$ (<i>df</i> = 20), <i>p</i> < .001	RMSEA (CI)	NFI	CFI	SRMR	GFI
	0.07 (0.06, 0.09)	0.85	0.88	0.05	0.97

Note. *B* and β : beta; *SE*: standard error; *CI*: Confidence Interval; X^2 : Chi-Square, *df*: degrees of freedom; RMSEA: root mean square error of approximation; *CI*: 95% confidence interval; *NFI*: non-normed fit index; *CFI*: comparative fit index; *SRMR*: standardized root mean square residual; *GFI*: goodness of fit; *AGFI*: adjusted goodness of fit.

^aHIV Prevention Strategies includes association with TGD-related discrimination; TGD: transgender and gender diverse

*
p<0.05

**
p<0.01

p<0.001

Table 3b.

Model Estimates of Transgender-related Stigma, Substance Use, HIV Sexual Risk Behaviors, and Gender-affirming Therapy Hormone Prescriptions

Variables	Unstandardized		Standardized	
	<i>B</i>	<i>SE</i>	β	<i>SE</i>
TGD-related stigma	0.01	0.01	0.07	0.06
Substance Use	0.02 **	0.01	0.13 **	0.01
HIV Sexual Risk Behaviors	0.36 ***	0.07	0.42 ***	0.07
Gender-affirming Hormone Prescription	0.03	0.02	0.07	0.06

Note. *B* and β : beta; *SE*: standard error. Model fit statistics from Table IIIa apply. TGD: transgender and gender diverse

*
p<0.05

**
p<0.01

p<0.001