

**Structural Determinants of Health Among Transgender Populations: Policing, Sex Work,
and HIV**

DISSERTATION

Presented to the School of Public Health
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January 2024

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Dedication

I dedicate this dissertation to my wife, Georgia, and my brother, Alex. Without your love and support, I would not have been able to complete this degree and dissertation.

Acknowledgements

I would like to thank my dissertation chair, faculty advisor, and mentor, Dr. Nolan Kline, for all his guidance throughout my academic journey. Additionally, I would like to thank my dissertation committee members, Dr. Griner, Dr. Rossheim, and Dr. Yockey for their diligent work during this process. Finally, I would like to thank my family for all their support.

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Abstract

Transgender (*trans*) populations experience disproportionately high rates of HIV infection compared to cisgender populations. Additionally, due to overlapping layers of discrimination in education, housing, healthcare, and employment, trans populations are more likely to engage in a criminalized form of work, such as sex work. Policing has been identified as a potential structural determinant of HIV infection among individuals engaging in sex work. Trans populations, including those engaging in sex work, are more likely to interact with police and experience some form of police violence. This dissertation investigated policing as a potential structural determinant of HIV status and HIV testing among trans individuals who engage in sex work. Unadjusted and adjusted logistic regression analyses were utilized to identify associations between HIV status/HIV testing and police interactions. Mediation analyses were utilized to investigate police interactions as a potential mediating variable between HIV status/HIV testing and trans individuals who have engaged in street-based sex work. Statistically significant associations were identified between police interactions and HIV status in unadjusted (OR: 2.564, 95% CI: 1.166, 5.641, p-value = 0.019) and adjusted (aOR: 12.055, 95% CI: 3.076, 47.232, p-value <0.001) logistic regression models. Additionally, police interactions were not identified as a statistically significant mediating variable between HIV status/HIV testing and trans individuals engaging in street-based sex work. These findings suggest policing may act as a contributing factor towards HIV infection among trans individuals engaged in sex work, but further research is needed to elucidate this interaction. HIV infection prevention interventions need to include an intersectional lens that incorporates trans identities and address the structural issues that trans populations experience including discrimination in housing, employment, and healthcare.

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Chapter 1: Introduction

Globally, transgender (trans) and gender non-conforming populations experience significant discrimination and stigma that contributes to both mental and physical health outcome disparities compared to cisgender (cis) populations (Bockting, Miner, Swinburne Romine, Hamilton, & Coleman, 2013; Marshall et al., 2019; Seelman, Young, Tesene, Alvarez-Hernandez, & Kattari, 2017). Trans refers to an individual that has a gender identity that is different to their sex assigned at birth and cis refers to an individual that has a gender identity that is the same as their sex assigned at birth. Trans populations are often stigmatized due to their gender identity expression, resulting in elevated rates of depression, anxiety, poor sexual health, and overall physical health (Marshall et al., 2019). For this dissertation, the term *trans* will serve as an umbrella term including gender non-conforming identities. Stigma and discrimination exacerbate poor health outcomes and health disparities through the ostracization of a particular community (Stangl et al., 2019). Further, stigma and social exclusion act as barriers to healthcare and plays a meaningful role in increasing health disparities between trans and cis populations (de Villiers et al., 2020; Socías et al., 2014; Stangl et al., 2019; Wilson, Chen, Arayasirikul, Raymond, & McFarland, 2016).

Trans health inequality stemming from social exclusion is directly related to social and political factors, such as governmental legislation focused on trans people. In the United States (U.S.), 23 states have passed expressly anti-trans legislation in 2023 alone (Trans Legislation Tracker, 2023). Such legislation includes bills related to bathroom usage, athletic participation, and healthcare that force trans individuals to act incongruent with their gender identity. With such legislation, many states in the U.S. have created a political environment that institutionalizes stigma and discrimination towards trans populations.

The systemic discrimination against transgender populations in the United States has had geopolitical repercussions (National Public Radio, 2023). The increase in trans-exclusionary policies and harsh environment for trans populations in the U.S. has resulted in Canada enacting a travel advisory ban to the U.S. for Canadian trans individuals (National Public Radio, 2023). Compared to 2022, U.S. state legislatures have introduced nearly three times as many bills focused on restricting access to gender affirming care for transgender individuals (Funakoshi, 2023). The U.S. falls behind other countries in recognizing and protecting transgender populations. For example, 20 other countries have passed some form of legislation protecting transgender rights (Ansari, 2017). In 2012, Argentina unanimously passed legislation that made gender affirming surgery a right covered by public and private healthcare plans (Ansari, 2017). Denmark has passed legislation that allows trans individuals above the age of 18 to change their gender identity on their identification documents without approval or consultation of a medical professional (Ansari, 2017). However, globally, trans populations experience elevated rates of violence and discrimination and many other countries continue to lag in granting transgender individuals basic human rights (Ansari, 2017). Moreover, the pervasive discrimination and legislative barriers faced by transgender individuals in the U.S. not only undermine their civil rights but also contribute significantly to their disproportionately adverse health outcomes, including higher rates of mental health issues and limited access to essential healthcare services, compared to cisgender populations (Gonzales & Henning-Smith, 2017; Gonzales, Tran, & Bennett, 2022). The increasing number of anti-trans legislations further marginalizes transgender individuals and results in exacerbating the previously discussed public health challenges but also significantly contributes to their vulnerability within the criminal justice system, where trans

individuals face heightened risks of discrimination, unjust treatment, and abuse (James, 2016; National Center for Transgender Equality, n.d.).

1.1 Transgender Populations and the Criminal Justice System

Discrimination faced by trans populations in the U.S. extends beyond geopolitics and permeates various aspects of their lives, with significant implications for their interactions with the criminal legal system. Incarceration for trans individuals is particularly dangerous. Trans individuals are up to ten times as likely to be sexually assaulted by fellow inmates and 5 times as likely to be sexually assaulted by prison staff (National Center for Transgender Equality, n.d.-b). The path to incarceration begins with policing where trans populations face high rates of discrimination and harassment (James, 2016).

Trans populations experience high rates of discrimination in the U.S. from law enforcement officers (James, 2016; National Center for Transgender Equality, 2021). Policing, particularly police brutality, has been highlighted by the American Public Health Association (APHA) as a prioritized public health issue in the U.S. (American Public Health Association, 2018). Over-policing and police violence disproportionately impact communities of color and marginalized communities (Sirry Alang, McAlpine, & McClain, 2021; S. Alang, McAlpine, McCreedy, & Hardeman, 2017; American Public Health Association, 2018; Geller, Fagan, Tyler, & Link, 2014; James, 2016). In addition to policy-level and individual-level discrimination, trans populations experience discrimination and harassment from law enforcement at elevated rates compared to cis populations (DeVylder et al., 2017; James, 2016). Experiencing violence from police is a risk factor for mistrust in other institutions (e.g. healthcare) (S. Alang, McAlpine, & Hardeman, 2020), poor mental health (Das, Singh, Kulkarni, & Bruckner, 2021; Geller et al., 2014), and poor physical health (DeVylder, Anglin, Bowleg, Fedina, & Link, 2022). Trans

populations bear a disproportionate burden of police violence in the U.S and as a result are over-represented in the carceral system (Stammen, 2022), which comes with its own list of impacts on health outcomes including negative impacts of physical and mental health (Wildeman & Wang, 2017).

1.2 Transgender Populations and Employment Discrimination

Trans populations face high risk of discrimination in employment as a result of their gender identity expression (James, 2016; National Center for Transgender Equality, 2021). This employment-based discrimination results in trans populations being more likely to engage in a form of work that is criminalized such as sex work to earn money (Nadal, Davidoff, & Fujii-Doe, 2014). Many forms of sex work are criminalized in the U.S. and street-based sex work is criminalized writ large (Weitzer, 2020). Individuals who engage in street-based sex work are at high risk of experiencing violence, police harassment, and poor sexual health (James, 2016). Further, individuals who engage in a criminalized form of work will likely encounter law enforcement more often, and individuals engaging in sex work are more likely to experience police violence or discrimination (Footer, Silberzahn, Tormohlen, & Sherman, 2016; James, 2016; McBride et al., 2020). Due to sex work being criminalized, individuals who engage in sex work are unlikely to trust police and acts of violence may go unreported (James, 2016; McBride et al., 2020). Current research has focused on the impact of policing on individuals who engage in sex work, but less research has investigated the role of policing on gender minorities in informal lines of work such as trans populations that engage in sex work, particularly in the U.S. For effective interventions, current research emphasizes the need for comprehensive policies and programs that not only protect transgender individuals from employment discrimination but also provide them with supportive resources for secure, non-criminalized forms of employment (Medina, 2021). This includes legal reforms, such as extending the Biden-Harris administration

Executive Order 13988 to prohibit discrimination against gender identities in employment, housing, healthcare, education and credit (Medina, 2021). Further, workplace policies geared towards eliminating violence against trans populations are needed to address societal stigma and discrimination in the workplace (Medina, 2021). Additionally, the discrimination faced by transgender individuals in employment settings extends beyond their gender identity; it is often compounded by a lack of awareness and understanding of transgender issues among employers and colleagues, as well as systemic biases in hiring practices and workplace cultures that fail to accommodate or respect gender diversity (Medina, 2021).

1.3 HIV and Transgender Populations Engaging in Sex Work: Policing as a Structural Determinant of Health

1.3.1 *Human Immunodeficiency Virus (HIV)*

HIV is a virus that attacks the immune system and makes an individual more susceptible to becoming sick. The virus attacks specific cells in an individual's immune system, CD4 cells, that are important for fighting off diseases (HIVcare.org, 2023). HIV is transmitted through bodily fluids including blood, semen, vaginal fluids, anal mucus, and breast milk (HIV.gov, 2023). Common transmission methods include vaginal or anal sex and sharing of needles or syringes (HIV.gov, 2023). Common prevention methods for HIV transmission include condom-use when engaging in sexual activity (HIVcare.org, 2023). Currently, there is not a cure for HIV but there are effective treatments that can manage the disease and allow individuals to live healthy lives and reduce transmission to their partners (Centers for Disease Control and Prevention, 2022a).

In 2021, approximately 1.2 million people in the U.S. were HIV positive (Centers for Disease Control and Prevention, 2023). Significant disparities exist across racial and sexual orientation for those who are HIV positive. Of those who are HIV positive, Black/African

American and Hispanic/Latino populations account for a disproportionate percentage of cases of HIV (Centers for Disease Control and Prevention, 2023). Further, men who have sex with men are most impacted by HIV and account for higher rates of new HIV infection (Centers for Disease Control and Prevention, 2023). Significant stigma surrounding HIV exists and negatively impacts outreach and treatment. Moreover, stigma relating to an HIV diagnosis can have deleterious effects on an individual's mental health and emotional health (Centers for Disease Control and Prevention, 2021). Individuals who have HIV might absorb the stigma they encounter in connection with the virus, leading to a detrimental self-perception (Centers for Disease Control and Prevention, 2021). Negative self-perception is when an individual internalizes stigma and discrimination, in this instance related to HIV status, and can lead to feelings of isolation, despair, and shame (Centers for Disease Control and Prevention, 2021).

1.3.2 HIV among Transgender Populations Engaging in Sex Work

Trans populations experience elevated rates of Human Immunodeficiency Virus (HIV) prevalence and incidence compared to cis populations (Centers for Disease Control and Prevention, 2022c; James, 2016). This disparity is compounded for trans individuals that engage in sex work where HIV prevalence and incidence is elevated (Centers for Disease Control and Prevention, 2022b; James, 2016). Transgender populations that engage in sex work are particularly vulnerable to HIV infection and this relationship is shaped by structural determinants of health including interacting with the criminal legal system (e.g. law enforcement) (Footer et al., 2016; Operario, Soma, & Underhill, 2008; Poteat et al., 2015; Reisner et al., 2009). Because sex work is a criminalized form of work, the work environment is largely shaped by increased number of law enforcement interactions including both day-to-day interactions (e.g. asking to see identification) and violent interactions (e.g. police brutality). As such, policing has been

identified as a structural determinant of HIV among populations that engage in sex work (Footer et al., 2016).

Policing and policy further shape the HIV environment in which individuals that engage in sex work practice their profession as common HIV prevention methods such as condom use can be used as evidence of arrest for prostitution (Wurth, Schleifer, McLemore, Todrys, & Amon, 2013). In other words, carrying condoms is sufficient evidence for arresting an individual for prostitution. As a result, individuals engaging in sex work may not carry or utilize a primary HIV transmission prevention method for fear of being arrested (Centers for Disease Control and Prevention, 2022c; Wurth et al., 2013). Trans populations engaging in sex work may be less inclined to properly negotiate safe sex practices with clients or vet clients for safe interactions because of the heightened rate of police interactions as a trans individual engaging in sex work (Footer et al., 2019; James, 2016). Trans populations that engage in sex work experience elevated rates of physical and sexual violence from police compared to cis populations (James, 2016; Stenersen, Thomas, & McKee, 2022a, 2022b). Violence is a known risk factor for HIV infection (Centers for Disease Control and Prevention, 2014). Because of the combined issues of heightened HIV risk, police interactions, and police violence, police act as a structural determinant of HIV health among transgender populations that engage in sex work. In this dissertation, I will investigate the relationship between police interactions and HIV among transgender populations that engage in sex work through a social-ecological model framework.

1.4 Background

To comprehensively understand the health disparities faced by transgender populations, especially those involved in sex work, it is essential to adopt a theoretical perspective that deeply analyzes how complex social and political forces contribute to health-related vulnerabilities. This

necessity brings into focus the concept of structural vulnerability, a framework that scrutinizes how various social, economic, and political factors systematically create disadvantages, thereby escalating individuals' susceptibility to health risks and disparities (Quesada, Hart, & Bourgois, 2011). While structural vulnerability provides a robust lens for understanding these disparities, its application in health sciences is not widespread and often lacks the granularity needed for practical application. To address this gap and retain the complexity of the issues at hand, the Social Ecological Model (SEM) offers a valuable operationalization. The SEM, which has been instrumental in studying health outcomes such as HIV and violence (Bar al, Logie, Grosso, Wirtz, & Beyrer, 2013; Bronfenbrenner, 1979; McMahon et al., 2020), considers health issues through four interrelated factors: intrapersonal, interpersonal, community, and policy (Centers for Disease Control and Prevention, 2022). By integrating structural vulnerability with the Social Ecological Model (SEM), a more effective analysis and understanding of the multifaceted structural relationships influencing HIV status among transgender populations engaged in sex work can be achieved, with a particular emphasis on their interactions with police forces.

1.5 Intrapersonal and Interpersonal Factors: HIV and Transgender Health

Intrapersonal and interpersonal factors are the most common aspects researched relating to HIV status among transgender populations (Poteat, Malik, Scheim, & Elliott, 2017). These factors include mental health (Price-Feeney, Green, & Dorison, 2020), sexual health (Van Gerwen et al., 2020), substance use (Connolly et al., 2021), violence (UCLA School of Law Williams Institute, 2021), and negative interactions with others such as healthcare providers or law enforcement officers (Casey et al., 2019). Trans populations experience elevated rates of each of these intrapersonal and interpersonal factors, each of which is considered as a risk factor for HIV. Using the social ecological model to understand how these different risk factors overlap clarifies the interrelatedness of each risk factor and how they can exacerbate HIV transmission

among a particularly vulnerable population. For example, trans individuals who experience discrimination in healthcare settings are more likely to delay or avoid health care (Casey et al., 2019). These experiences of discrimination also impact the mental health of an individual which also influences risk taking behavior such as substance use (Wilson et al., 2016). Each of these factors can influence the other to create a compounding effect that negatively impacts HIV health. As such, it is crucial to address HIV health among trans populations engaging in sex work through a guiding framework that considers the complex nature involved in HIV care such as the social ecological model. SEM will be utilized to facilitate a layered understanding of how individual behaviors, interpersonal dynamics, community contexts, and policy frameworks collectively influence the experiences and HIV risks faced by transgender individuals engaged in sex work. This model aids in comprehensively dissecting the multifaceted aspects that underpin the vulnerability of this group to HIV, providing a foundation for more targeted and effective interventions.

1.6 Community Factors: HIV and Transgender Health

While a considerable amount of research has focused on intrapersonal and interpersonal factors associated with HIV, far less research has investigated the impact of community and political aspects associated with HIV. Community level factors refer to how an individual interacts with different systems or organizations including the health system or criminal legal system. Policy level factors include the legislation that shapes the context within which an individual lives, also referred to as the political determinants of health (Dawes, 2020). Each of these broader socio-political factors can greatly influence the life course of an individual and will be the primary focus of this dissertation.

Community level factors that impact HIV status among trans populations include interactions with health settings, discriminatory health insurance practices, employment and housing discrimination, and negative interactions within the criminal legal system (Hana, Butler, Young, Zamora, & Lam, 2021; James, 2016; National Center for Transgender Equality, 2021, n.d.-a). The health system is a significant source of discrimination and stigma for trans communities where 33% of trans individuals have reported experiencing some form of discrimination or misgendering from healthcare providers (James, 2016). Further, until 2019, identifying as trans was considered a mental health issue under the medical standard of care (SOC) resulting in institutionalized discrimination against trans populations and further stigmatization for this population (Coleman et al., 2022; World Health Organization, 2022). These factors culminate in trans populations being more likely to avoid or delay necessary care for fear of further discrimination or stigmatization (Casey et al., 2019). Such institutionalized discrimination extends to health insurance practices where many gender-affirming medical practices are denied coverage by insurance companies (James, 2016). For example, 25% of trans populations reported being denied coverage for gender-affirming care (James, 2016). These forms of institutionalized discrimination in the healthcare field negatively impact the ability for trans populations to access healthcare and create a deleterious environment for HIV care.

Trans populations are more likely to engage in sex work as a form of work due to discrimination in the formal economy and discrimination in housing (Nadal et al., 2014; National Center for Transgender Equality, 2021, n.d.-a). Trans populations have little legal protection against discrimination in the workplace. For example, 30% of trans individuals have experienced some form of workplace harassment or discrimination (James, 2016). Further, trans individuals are more likely to be discriminated against during the hiring process resulting in it being

increasingly difficult to find employment in the formal economy (James, 2016; National Center for Transgender Equality, 2021). This discrimination extends to housing where trans populations experience elevated rates of homelessness compared to cis populations (James, 2016; National Center for Transgender Equality, n.d.-a). These forms of community-level discrimination create an environment where trans individuals are more likely to engage in sex work as a way to earn a living. Engaging in a criminalized form of work and experiencing discrimination in employment and housing place transgender individuals at an elevated risk for HIV transmission compared to cisgender populations. Additionally, transgender individuals also experience elevated rates of police interactions. Each of these issues places transgender populations at higher risk of HIV infection due to overlapping sources of discrimination, harassment, and structural vulnerability.

The criminal legal system, particularly policing, can shape the overall work environment that individuals engaging in sex work operate (Footer et al., 2016). Trans populations are more likely to interact with police, experience various forms of discrimination, and experience physical or sexual violence from law enforcement officers compared to cis-gender populations (Gruskin, Ferguson, Alfven, Rugg, & Peersman, 2013; Gruskin, Pierce, & Ferguson, 2014; James, 2016; Muldoon et al., 2017; Platt et al., 2013; Shannon et al., 2015). These disparities are exacerbated for trans populations engaging in sex work, a criminalized form of work (James, 2016). Previous research has identified policing as a structural determinant of HIV among populations that engage in sex work because of the ability for law enforcement to create a hazardous environment for this criminalized form of work (Footer et al., 2016). Specifically, police can use carrying condoms as sufficient evidence for arrest for prostitution resulting in trans populations engaging in sex work to avoid carrying a common preventive for STI or HIV transmission (Centers for Disease Control and Prevention, 2022c; Wurth et al., 2013). Further,

violence, both interpersonal and violence from police is associated with HIV transmission (Centers for Disease Control and Prevention, 2014; Footer et al., 2016). Most research investigating the role of policing in HIV status has focused on cis populations (Footer et al., 2016). In this dissertation, I will investigate the structural role of policing on HIV status among trans populations that engage in street-based sex work. This dissertation will close the gap in literature regarding the role of policing in HIV status among a vulnerable population at higher risk for HIV: trans individuals that engage in sex work.

1.7 Policy Factors: HIV and Transgender Health

There is a paucity of research relating to the influence of policy on HIV transmission among trans populations that engage in sex work. Since 2017 there has been a sharp increase in legislation introduced and passed at the state-level of government in the United States relating to trans populations (Kline et al., 2023). The affirming or exclusionary nature of these policies varies by state where the Southern region of the US has largely passed exclusionary policies (Kline et al., 2023). Of the available research, associations between mental and physical health outcomes and protective trans policies have been identified (Goldenberg, Reisner, Harper, Gamarel, & Stephenson, 2020; Goldenberg, S, G, K, & Stephenson, 2020). Specifically, in states with policies that are protective of trans identities as opposed to exclusionary, trans populations experience improved mental and physical health outcomes (Goldenberg, Reisner, et al., 2020; Goldenberg, S, et al., 2020). Because of the multiple overlapping factors and confounders associated with policy and health outcomes, it is difficult to directly attribute legislation to improved or worsened health among populations. However, with the increase in exclusionary policies geared towards trans populations and the sharp increase in introduced legislation related to trans populations (Kline et al., 2023), additional research is necessary to gauge the impact of this legislation on trans health.

There are critical gaps in literature relating to structural determinants of HIV health among trans populations including at the community and political levels. Identifying structural forms of oppression that increase the risk landscape for HIV transmission among transgender populations that engage in sex work is necessary to adopt appropriate interventions and policies to mitigate the elevated rates of HIV among this population. While HIV and violence have been hallmarks of research among trans populations, much of this research has focused on intrapersonal and interpersonal factors associated with HIV. In this dissertation, I will address this gap in literature by investigating the structural role of policing on HIV status among trans populations that engage in sex work. Future research is required to identify other structural determinants of HIV among this population, particularly related to policy.

This study addresses current literature gaps related to the structural role of policing in HIV status among trans populations engaging in sex work through secondary data analysis of the 2015 United States Transgender Survey (USTS). Three statistical analysis methods will be utilized to investigate the role of policing in HIV status among trans populations engaging in sex work:

- 1) Multiple logistic regression to examine potential associations between HIV testing/status and police interactions among trans individuals engaging in street-based sex work.
- 2) Mediation analysis to explore the direct and indirect effects of sex work and police interactions on HIV testing/status among trans populations.
- 3) Structural equation modeling to identify the different causal pathways to HIV status among trans populations engaging in sex work.

These statistical models will examine potential associations between policing and HIV status and potential causal pathways between HIV status, policing, and engaging in sex work.

For study 1, multiple logistic regression to identify associations between policing and HIV status, I hypothesized that increased interactions with police would be associated with increased odds of a positive HIV status and increased odds of HIV testing. This hypothesis is based on previous literature identifying that law enforcement act as a structural determinant of HIV among individuals who engage in sex work (Footer, Silberzahn, Tormohlen, & Sherman, 2016). This is because law enforcement is both a source of violence among trans populations in addition to being able to arrest an individual for prostitution for carrying common HIV prevention items such as condoms. For study 2, mediation analysis, I hypothesized that police interactions will be a mediating factor associated with increased likelihood for positive HIV status and increased likelihood for HIV testing among trans populations engaging in sex work. Individuals engaging in sex work are at elevated risk for HIV infection in addition to interacting with police. Law enforcement have been identified as a potential structural component for HIV transmission and associated with increased testing among those engaging in sex work (Footer et al., 2016). Put together, police may mediate the relationship between sex work and HIV testing/status. For study 3, structural equation modeling, I utilized the social ecological model to theorize potential causal pathways for HIV status among transgender populations with policing and engaging in sex work playing acutely important roles. However, due to data limitations including small sample sizes for the necessary variables, structural equation models did not converge. As a result, additional outcomes were added to Aim 1 and Aim 2 to include HIV testing. This allowed for a nuanced investigation into the structural role policing may play in regard to the HIV landscape among trans populations engaged in sex work.

In this dissertation, I identify an association between police interactions and HIV status through logistic regression analysis. Mediation analysis was utilized to further investigate the

causal relationship between policing and HIV testing/status (Holland, 1986). This dissertation explores policing as a structural determinant of HIV among trans populations that engage in sex work. As such, future research is needed to identify potential modifiable mechanisms at the policy level, law enforcement organization level, and community level to decrease the vulnerability to HIV among trans populations engaging in sex work. At the policy level, these modifiable mechanisms may include decriminalizing/legalizing sex work to create a safer legislative environment for trans populations engaging in sex work, protecting trans populations from discrimination in employment and housing at the federal policy level, and passing additional protective legislation geared towards trans populations in both the health system and the criminal legal system. Among law enforcement organizations, cultural competency trainings geared towards trans populations may improve interpersonal interactions with trans individuals and improve respect and trust between these communities. Ultimately, the development and implementation of interventions specifically tailored to prevent and treat HIV within transgender populations are imperative to enhance the overall health outcomes of this demographic.

In this dissertation, I explore policing as a structural determinant of HIV health among an acutely vulnerable population, transgender individuals who engage in sex work. The studies presented in this dissertation address the gaps in literature regarding the role policing plays in HIV status and testing and call for future research into the political determinants of health for trans populations.

Chapter 2: Background

This chapter reviews the literature on trans population health particularly relating to health disparities, engaging in sex work, policing, and HIV using the social ecological model as a guiding framework to understand the overlapping structures that result in health disparities among this population. Structural vulnerability is a theoretical lens that will be utilized and operationalized through the social ecological model to understand the broader social, political, and economic structures that intersect and influence health outcomes. Through this evaluation of the current literature, I discuss the role of intrapersonal, interpersonal, community, and political factors on HIV status among trans populations that engage in sex work. I specifically show how existing scholarship largely focuses intrapersonal and interpersonal factors to explain various health outcomes among trans populations including HIV status. In doing so, much of the broader socio-political context that creates and underlies the environment in which trans populations live has yet to be substantively studied.

One social and political factor that demands research attention is policing. Recent scholarship has identified policing as a pressing public health issue that disproportionately impacts minoritized and/or vulnerable communities including trans populations and populations that engage in sex work (American Public Health Association, 2018; Footer, Silberzahn, Tormohlen, & Sherman, 2016). In populations that engage in sex work, different policing tactics have been associated with increased risk of HIV infection, but little research has investigated the potential causes for this association, particularly among trans populations engaging in sex work (Footer et al., 2016). Researchers have posited that policing is a structural determinant of HIV status in populations that engage in sex work and further exploration of this relationship is needed (Footer et al., 2016). Trans populations, particularly trans women, are at much higher risk of engaging in sex work due to various forms of oppression and are therefore more likely to

encounter police (James, 2016). Little research has investigated the role of policing as a structural determinant for HIV infection in trans populations that engage in sex work. This dissertation begins to close the literature gap by investigating the role of policing in HIV infection among a large sample of trans individuals.

2.1 Theoretical Frameworks

2.1.1 *Individual-Level Theory*

The Health Belief Model (HBM) is a theory that frames health behavior decision making through an individual's perceived benefits and barriers to a potential outcome (Boston University School of Public Health, 2019a). The HBM frames individual health decisions through a desire to want to be healthy or avoid illness and that a specific action can prevent illness or increase healthiness (Boston University School of Public Health, 2019a). The HBM includes six constructs that are utilized to frame an individual's readiness to act on a particular health behavior: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy (Boston University School of Public Health, 2019a). The HBM has been used to understand preventive behaviors for HIV and HIV risk among transgender populations (O. T. Van Gerwen, Austin, Camino, Odom, & Muzny, 2022). The HBM is a useful theory to understand how an individual perceives themselves amidst a particular health landscape, but the HBM has significant limitations. The HBM does not account for broader social, economic, or political factors that influence the health landscape for different populations. For example, transgender populations are a marginalized population that experiences significant discrimination socially, economically, and politically. These broader social factors can significantly impact health-seeking behavior. Further, among a marginalized population that is engaging in a criminalized form of work, the HBM does not capture the intersecting barriers for the HIV health environment. Due to these limitations, the HBM alone is not a sufficient

theoretical perspective for understand the HIV risk environment among trans populations engaging in sex work.

The social cognitive theory (SCT) is a theoretical perspective that extends beyond the HBM to include how an individual interacts with others and the environment can impact health behaviors. Constructs of the SCT include reciprocal determinism, behavioral capability, observational learning, reinforcements, expectations, and self-efficacy (Boston University School of Public Health, 2019b). The SCT has been utilized to create interventions for health behaviors related to HIV risk and transmission (O'Leary, 2001; Safren et al., 2010). The SCT is used to understand health behaviors through an individual's subjective experience and personal history and that individual's interactions with an environment (Boston University School of Public Health, 2019b). Health behaviors are subsequent outcomes as a result of passed learned behaviors and current external stimuli. While this theory expands on the HBM to include how an environment impacts health behaviors, the SCT has significant limitations. For transgender populations engaging in sex work, the SCT does not adequately capture the social and structural factors impacting the HIV risk environment for this population. Further, SCT does not adequately incorporate factors such as intersectionality or cultural sensitivity/humility. Trans populations engaging in sex work often experience overlapping forms of discrimination, stigma, or oppression and the SCT does not substantially include these broader factors. Additionally, the SCT is largely individual-focused, relying on an individual to change their environment and health behaviors. The individual-focused behavior change is a limitation due to the political, economic, and social factors constrain trans populations engaging in sex work from reducing their HIV risk environment. As a result, the SCT is exceptional in understanding an individual's

interactions with the risk environment but does not adequately include broader structural factors influencing HIV transmission.

The Minority Stress Theory has been utilized to understand how social stigmas related to sexual and gender minorities negatively impacts health outcomes (Frost & Meyer, 2023). The Minority Stress Theory is a framework that identifies social stressors such as homophobia or transphobia as unique and hostile stressors that influence health outcomes (Frost & Meyer, 2023). This theory extends beyond the HBM and SCT to include broader social stressor impact on individual health and has been utilized to understand HIV, sex work, and mental health (She, Mo, Ma, Liu, & Lau, 2021; She et al., 2022). The Minority Stress Theory is an important theory in understanding how marginalized and minoritized identities are impacted by social stressors but fails to incorporate broader economic and political factors that influence the health landscape of a population. Minoritized identities will be used in this dissertation to refer to populations that have been historically marginalized in the U.S. as a result of social and political institutions (Harper, 2012). This marginalization is not necessarily due to being a numerical minority, but rather due to systemic and structural power imbalances in society. Minoritized identities can be based on race, ethnicity, gender, sexual orientation, religion, disability, socioeconomic status, or other characteristics that have been used to oppress or exclude groups from full participation in society. The term emphasizes the active process of being marginalized by dominant cultural norms and power structures, rather than simply being a smaller part of the population. As such, this dissertation will utilize a framework that is inclusive of the broader structures impacting minoritized identities, structural vulnerability, to understand the overlapping forms of discrimination towards trans populations at the social, economic, and political levels.

2.1.2 Frameworks: Structural Vulnerability and Social Ecological Model

Structural vulnerability is a theoretical framework that identifies broader social structures, economic, and political systems as having significant influence on health disparities and health outcomes among marginalized populations. Structural vulnerability has been utilized to understand the influence of structural violence and stigmatization on the health of migrant Latino communities in the U.S. (Quesada, Hart, & Bourgois, 2011). In this research, structural vulnerability was utilized to understand the weaponization of citizenship, economic influence, and policy all have undue influence on the health outcomes of Latino populations. Structural vulnerability is a theoretical framework that applies to marginalized populations to understand the intersecting influence of social, economic, and political systems on health outcomes. This dissertation will utilize structural vulnerability to understand the multiple overlapping levels of influence on the health of trans populations that engage in sex work. Structural vulnerability will be operationalize in context with the social ecological model.

The Social Ecological Model is a framework used to guide the understanding of multiple levels of influence on a particular health outcome including intrapersonal, interpersonal, community, and political factors. Developed in the 1970s by Bronfenbrenner (1979), the Social Ecological Model (SEM) has been used to study numerous fields in health research including HIV (Baral, Logie, Grosso, Wirtz, & Beyrer, 2013), sex work (Ma, Chan, & Loke, 2017), and violence (McMahon et al., 2020). The SEM framework addresses the complex environment that inform health behaviors including that there are multiple overlapping factors and systems that can influence individual health behaviors or outcomes. As such, to fully understand the context influencing a health behavior, the SEM framework is an excellent guide to investigate the multiple levels of influence on HIV status for transgender populations.

The original social ecological framework developed by Bronfenbrenner included the microsystem, mesosystem, exosystem, and macrosystem levels to describe the overlapping factors that can influence potential health behaviors (Bronfenbrenner, 1979). Bronfenbrenner and other health researchers have updated the framework terminology as the individual, relationship, community, and societal factors. For the purpose of this dissertation, I will review the current literature through a similar model utilizing intrapersonal, interpersonal, community, and political factors to understand HIV among trans populations engaging in sex work. Intrapersonal factors refer to individual level influences such as biological factors, substance use, and personal history. Interpersonal factors are relationship factors such as interactions with family members, health providers, and law enforcement. Community level factors refer to an individual's relationship with community level programs including work, housing, school, and neighborhoods. Political factors are macro level issues that shape the context with which the individual lives such as norms, policy, or cultural beliefs.

Health research often utilizes intrapersonal and interpersonal exposures to explain different health behaviors while overlooking the broader community and political level factors that can influence an individual's behavior. In this chapter, I discuss existing literature relating to trans health, HIV, and policing using the SEM framework. I show that much of the current literature has primarily investigated HIV in trans populations engaging in sex work through intrapersonal and interpersonal factors while community and societal level factors are much less emphasized. As such, there are clear gaps in the current research on the role structural factors play in influencing HIV status in trans populations engaging in sex work.

2.2 Individual-Level Factors

2.2.1 *Health Disparities: Mental health, substance use, and sexual health*

Existing literature on trans health disparities has largely focused on individual-level factors that influence individual-level health behaviors or outcomes including mental health, substance use, and sexual health. This literature has been foundational in identifying the many forms of health disparities that trans populations experience in comparison to cis populations. Current research has identified that trans populations are more likely to experience mental health issues, use illicit substances, and have worse sexual health outcomes compared to cis populations. This section will discuss the multiple factors associated with health disparities at the individual level for trans populations regarding mental health, substance use, and sexual health.

Mental Health

Transgender youth and adults have significantly worse mental health outcomes compared to their cis-gender counterparts. Specifically, transgender youth are more likely to experience depression and anxiety (Parodi et al., 2022; Price-Feeney, Green, & Dorison, 2020), attempt suicide (Price-Feeney et al., 2020), and have symptoms of post-traumatic stress disorder (Parodi et al., 2022). These issues continue into adulthood where transgender adult populations experience elevated rates of mental health issues relating to anxiety, depression, suicide ideation/attempts, and PTSD in comparison to their cis-gender counterparts (Feldman, Lohur, Herman, Poteat, & Meyer, 2021; James, 2016; Valentine & Shepherd, 2018).

In a survey of LGBTQ youth aged 13-24 produced by the Trevor Project, trans and non-binary youth reported high rates of experiencing symptoms of anxiety (71-79%) and depression (60-69%) (The Trevor Project, 2022). In comparison, US youth aged 3-17 years old, reported a prevalence of 9.4% of any anxiety disorder a prevalence of 4.4% of experiencing depression

(Centers for Disease Control and Prevention, 2023a). In an online, national survey of LGBTQ youth aged 13-24 years old, transgender males were at 2.11 times the odds of depressive mood and 2.13 times the odds of contemplating suicide compared to cis-gender LGBTQ youth (Price-Feeney et al., 2020). Additionally, trans males in this study population were at significantly higher odds (OR = 1.45) of attempting suicide in the past 12 months compared to cis-gendered LGBTQ participants. Similarly, transgender females in this study had elevated odds of depressive mood (OR = 1.82) and contemplating suicide (OR = 1.44) compared to cis-gender LGBTQ youth. With these stark differences in mental health outcomes among transgender youth, there is ample need for further research into possible solutions for addressing this pressing public health concern.

Issues related to mental health continue for the transgender population from the adolescent and youth period into adulthood. Significant mental health disparities persist for trans adults. In a systematic review investigating the impact of social stressors on the mental health among trans and non-binary populations, Valentine and Shpherd (2018) found that trans and non-binary populations experienced elevated rates of most measured mental health outcomes, including depression, anxiety, suicide, and PTSD. Mental health disparities between trans populations and the general US populations are further evidenced by the 2015 US Transgender Survey (USTS) where 39% of respondents who identified as trans or non-binary reported experiencing psychological distress compared to 5% of the general US population (James, 2016). Additionally, in a survey of trans and cisgender populations, Feldman et al. (2021) found that trans populations experienced more days of poor mental health compared to their cis-gender counterparts.

It is critical to note that a large portion of the current literature studying trans populations is in relation to mental health outcomes. To clarify, trans populations are not pre-disposed to experiencing mental health or other health related outcomes but rather these adverse health outcomes are largely impacted by experiences throughout the life-course such as discrimination, experiences of violence, and harassment. As such, it must be made abundantly clear that in order to address health disparities between trans populations and the general US population, serious consideration must be given to addressing systemic issues that create oppressive and damaging environments.

Obtaining mental health care in the United States can be difficult as the leading provider of mental health services in many states are jails (Nye, 2019). Mental health care in the United States can also be costly, even with insurance, leading to a potential deterrent to accessing important and necessary care (Costa, 2023; Safer et al., 2016). Trans populations are at higher risk of depression, anxiety, and PTSD, all of which can benefit from mental health care. However, trans populations have reported significant barriers to obtaining needed mental health care. According to the Trevor Project, nearly 3 in 5 trans youth who wanted mental health care were unable to receive it in the previous year. In a majority rural-based sample of 241 transgender and gender diverse individuals in the Northeast US, 49% were not currently utilizing gender-affirming mental health care (Reisner et al., 2021). Finding appropriate mental health care services can be difficult to navigate and find providers trained to treat trans populations (Costa, 2023; Reisner et al., 2021). In some cases, trans patients have had to pay for mental health services only to have to teach the provider how to appropriately care for trans individuals (Costa, 2023). Other barriers to utilizing mental health care by trans populations include financial costs, transportation issues, and stigmatization (Costa, 2023; Reisner et al., 2021).

While the ability to access mental health care is largely related to societal, community, or relationship factors, it is important to note in the mental health section that the necessary care for this issue is increasingly difficult for trans populations to utilize. Therefore, expanding the existing literature beyond how trans populations are impacted by mental health issues towards what are the greater social and political influences instigating these disparities is necessary.

Substance Use

Illicit substance use including injection drug use is a known risk factor for HIV (National Institute on Drug Abuse, 2020). Like LGBTQ+ populations, trans population may be at elevated risk of substance use (National Institute on Drug Abuse, 2020), but more research is needed to clarify this risk among trans populations. The current state of research into substance use and trans populations provides inconclusive evidence on the prevalence and likelihood for trans populations to engage in illicit drug or cigarette use. For example, a systematic review of 41 studies investigating trans populations and substance use found that trans populations were often much more likely to engage in cigarette use or illicit drug use activities compared to cis populations (Connolly & Gilchrist, 2020).

Among gender diverse populations, rates of substance use can differ resulting in disparate impacts on health for populations within the trans community. For example, among a cohort of gender diverse youth and young adults in Chicago, researchers found that transgender women experienced the worst health outcomes compared to transgender men and other gender diverse populations. Particularly relating to currently using cigarettes and use of illicit drugs, there was a significantly higher proportion of transgender women engaging in substance use activities (Newcomb et al., 2020). As such, it is evident that trans populations are at higher risk of engaging in illicit substance use activities. Further, substance use is associated with HIV

transmission as the use of substances can alter individual judgment and lead to unprotected sexual activity including engaging in sex without a condom (Centers for Disease Control and Prevention, 2021c). However, what is not known are the underlying factors associated with illicit substance use or the structural issues that lead to a higher prevalence of substance use in trans populations compared to cis populations. Overall, additional research is needed to further explore the relationship between substance use in gender diverse populations through a structural or political determinants of health lens to clarify the causes behind elevated rates of substance use in trans populations. These macro-level lenses will expand the research into trans populations and help to encompass the greater socio-political context in which trans populations exist and how these different forms of influence can have deleterious impacts on health behaviors.

Sexual Health

Sexually transmitted infections/HIV

Trans populations experience a high burden of sexually transmitted infections. The disparities in HIV prevalence among transgender populations, particularly in racially minoritized groups, can be attributed to a complex interplay of factors including social stigma, discrimination in healthcare settings, limited access to gender-affirming healthcare, higher rates of engagement in risky behaviors due to socio-economic marginalization, and a lack of targeted HIV prevention and education programs (Centers for Disease Control and Prevention, 2021; Olivia T. Van Gerwen et al., 2020). A systematic review of trans populations globally found that prevalence of STIs can vary widely and are particularly burdensome for transgender women (Van Gerwen et al., 2020). For example, rates of syphilis, gonorrhea, and chlamydia in trans women ranged from 1.4% to 50.4%. Trans men had much lower rates of syphilis, gonorrhea, and chlamydia ranging from 0% to 11.1% globally (Van Gerwen et al., 2020). Prevalence of HIV infection is of

particular concern for trans populations, where trans women are estimated to have a prevalence of 14%. Further disparities exist among trans populations where racially minoritized populations are at elevated risk of HIV infection compared to white trans populations. Black (19%-44%), Hispanic (4.4%-26%), and Indigenous (4.6%) trans women have the highest prevalence of HIV infection among trans populations (Centers for Disease Control and Prevention, 2021e; James, 2016). As such, additional research is needed to explore the relationship between minoritized trans populations and STI and HIV infection to identify potential interventions and prevention measures geared towards this population.

Transgender health and HIV

Compared to the general US population, trans populations have a higher prevalence of being previously tested for HIV while also having a higher prevalence of HIV infection (James, 2016). For example, 55% of the respondents to the USTS indicated they had ever been tested for HIV compared to 34% of the general US population (James, 2016). Through the structural vulnerability framework, higher rates of HIV testing among trans populations are a reasonable outcome as this population faces multiple intersecting factors that increase the risk environment for HIV transmission. Due to these intersecting factors placing trans populations at higher risk for HIV transmission, trans populations may be more aware of HIV risk, in addition to having a higher proportion of the population that has tested for HIV. These intersecting factors are described further in this chapter. Further, HIV infection was higher among trans populations (1.4%) compared to the US population (0.3%) (James, 2016). Potential reasons for the higher prevalence of HIV among trans populations include associations with substance use, informal economy work such as sex work, and discrimination. Each of these issues are impacted by greater political, social, and interpersonal dynamics that create structures that actively and

passively impact the likelihood for HIV infection among trans populations (Nadal, Davidoff, & Fujii-Doe, 2014).

Trans populations are at elevated risk for HIV infection. In the US, trans populations account for less than 1% of the total population but represent 2% of all new HIV infections (Centers for Disease Control and Prevention, 2023b). Until 2020, there was little data collected federally to accurately estimate HIV infection among transgender population (Centers for Disease Control and Prevention, 2022d). In 2020, the CDC launched a revised HIV surveillance survey with updated questions relating to sex and gender identity. This has allowed for better estimates of the prevalence of HIV among sexual and gender minorities in the US (Centers for Disease Control and Prevention, 2021b, 2022d). Additionally, the CDC conducted a literature review of studies conducted in the US on the prevalence of HIV among transgender populations and identified significant disparities in HIV prevalence compared to the US general population. The total US population has a 0.5% HIV positive prevalence rate. In comparison, the prevalence of HIV infection among trans populations is estimated at 9.2% (Centers for Disease Control and Prevention, 2022d). HIV infection disparities between trans and cis gender populations are significant public health issues.

Among trans populations, significant disparities exist between trans women and trans men in HIV infection. The prevalence of HIV is significantly higher among trans women compared to trans men. The CDC estimates trans women to have a prevalence of 14.1% for HIV infection whereas trans men have a prevalence rate of 3.2% (Centers for Disease Control and Prevention, 2022d). The HIV status disparity between trans men and women is further substantiated by the 2015 USTS where trans women reported the highest rate of HIV infection (3.4%) among the respondents (James, 2016). Trans men reported an HIV positive prevalence

rate of 0.3% (James, 2016). Further, the rate of new diagnoses significantly impacts trans women more than trans men. In 2021, during the CDC's HIV Surveillance study, trans women accounted for 89% of all new HIV diagnoses among the trans population (Centers for Disease Control and Prevention, 2021a). Trans women bear the brunt of the HIV epidemic and are at higher risk of HIV infection.

HIV prevalence among trans populations differs significantly by race and ethnicity, particularly among trans women. Black trans populations experience starkly higher rates of HIV infection compared to other racial and ethnic groups. In an HIV surveillance study conducted by the CDC, Black trans women had a prevalence rate of 62% for HIV infection and Hispanic/Latina trans women had a rate of 35% (Centers for Disease Control and Prevention, 2021d, 2022d). In comparison, White trans women had a prevalence rate for HIV infection of 17% (Centers for Disease Control and Prevention, 2021d). Further, Black trans women have significantly higher incidence rates of HIV infection where 46% of new infections of HIV among trans women occurred in Black trans women (Centers for Disease Control and Prevention, 2022d). Elevated rates of HIV among Black trans women can best be described through an intersectional lens where this population is faced with multiple forms of intersecting discrimination and oppression (Crenshaw, 1989). Black trans women are experiencing discrimination for being trans, Black, and a woman, all of which combine, overlap, or intersect to result in higher rates of HIV infection among this population. Little research has investigated this issue through an intersectional lens to identify the multiple sources of harm this population experiences that results in elevated rates of HIV infection. This dissertation seeks to identify potential structural causes associated with HIV that can begin to close the gap on why particular trans populations experience worse outcomes regarding HIV.

Among trans men, Black trans men are particularly at risk for HIV infection. Black trans populations are up to 5 times more likely to be HIV positive than other races or ethnicities (James, 2016). According to the 2015 USTS, Black trans people had the highest prevalence of HIV infection (6.2%) followed by Indigenous (2.0%), and Latino/a (1.6%) trans populations (James, 2016). In contrast, Asian and White populations had a prevalence of 0.5 and 0.4% respectively (James, 2016). Intersecting minoritized identities also plays a role in the prevalence of HIV among trans populations. Black trans women are significantly more likely to be HIV positive, where 19% of the Black trans women in the 2015 USTS indicated they were HIV positive (James, 2016). This is in contrast to the overall rate of HIV infection among trans women (1.4%), and other minoritized identities including Latina (4.4%) and Indigenous (4.6%) trans women (James, 2016). Further research is needed to identify interventions for preventing and managing HIV among trans populations. Current literature suggests that interventions for cis populations regarding HIV are neither culturally competent in relation to trans populations nor impactful at reaching trans populations, much less at reaching trans populations that engage in sex work (Centers for Disease Control and Prevention, 2022b).

2.3 Relationship-Level Factors

Relationship level factors are related to how an interaction between individuals impacts health outcomes or health behaviors. Relationship factors include experiencing discrimination from strangers to interacting with healthcare providers or law enforcement. These relationship factors can significantly impact health seeking behavior as those who experience discrimination in a certain field (e.g. healthcare or criminal justice) are going to be less inclined to trust the officials in that field. Further, experiencing different forms of discrimination in one system (law enforcement) may negatively impact an individual's relationship with another system (healthcare). For example, individuals who have experienced police violence report elevated

rates of mistrust for the medical field (S. Alang, McAlpine, & Hardeman, 2020). Mistrust of the medical field can lead to delayed or avoided care which can result in worse health outcomes (LaVeist, Isaac, & Williams, 2009; Powell et al., 2019). People living with HIV often encounter discrimination solely because of their HIV status (Centers for Disease Control and Prevention, 2022c), and when this HIV-related stigma is combined with discrimination from healthcare professionals or law enforcement officers, it can exacerbate the stigma and potentially result in delaying necessary medical care.

Discrimination/Stigma/Social Isolation

Trans populations experience high rates of discrimination, stigma, and social isolation related to their gender identity. In a national sample of LGBTQ adults in the US, 38% of transgender participants reported that they had personally been subjected to slurs and 28% of respondents reported having experienced microaggressions related to their gender identity (Casey et al., 2019). Trans participants in this study also reported discrimination in the healthcare field (10%) and healthcare avoidance due to anticipated discrimination (22%) (Casey et al., 2019). Similar results were found in the USTS where 31% of trans men and 22% of trans women reported healthcare avoidance due to anticipated discrimination (James, 2016). Experiences of discrimination can be isolating and result in mental health issues for transgender individuals. For example, Wilson, Chen, Arayasirikul, Raymond, and McFarland (2016) found that trans youth that experienced discrimination were at significantly higher odds of PTSD, depression, and stress related to suicidal thoughts. The impact of discrimination alone can have lasting negative effects on the mental health of trans individuals.

When seeking medical services, trans populations report high rates of experiencing some form of discrimination including stigmatization, misgendering, or lack of experience or

education on transgender medical care (Costa, 2023; Feldman et al., 2021; James, 2016). For example, 33% of transgender populations report ever experiencing some form of discrimination in the last year in the medical field (James, 2016). Discrimination from medical professionals can be harmful to trans health as it is associated with avoidance of care or discontinuation of care (Kcomt, Gorey, Barrett, & McCabe, 2020). As such, 23% of trans populations have previously reported delaying care due to fear of discrimination from providers (James, 2016). As described throughout this chapter, trans populations are at higher risk for numerous physical and mental health issues that necessitate experienced medical care. Reducing the occurrences of interacting with the medical profession can potentially have deleterious effects on trans health.

Violence

Transgender populations experience elevated rates of both sexual and physical violence (James, 2016; UCLA School of Law Williams Institute, 2021). Compared to cis-gender populations, trans populations are four times as likely to experience violent victimization (UCLA School of Law Williams Institute, 2021). For example, trans population violence victimization rate was 86.2 per 1000 individuals compared to 27.1 per 1000 violent victimization rate for cis-gender populations. Further, trans populations are more likely to experience sexual abuse or sexual violence than cis-gendered populations (Connolly et al., 2021; James, 2016; Newcomb et al., 2020; Peitzmeier et al., 2020). Trans populations may experience elevated rates of violence victimization as a result of transphobia, a form of discrimination that is directly tied to how an individual expresses their gender identity.

Among trans populations, trans women experience higher rates of sexual and gender-identify based violence victimization (James, 2016; Newcomb et al., 2020). Further, trans women have reported much higher rates of child sexual abuse compared to trans men or non-

binary men (Newcomb et al., 2020). Previous research has found that trans populations are 2.5 times as likely to experience sexual interpersonal violence compared to cis populations (Peitzmeier et al., 2020). Violence is associated with numerous adverse health outcomes including HIV infection (Dawson & Kates, 2019). Often violence and HIV infection are referred to as a syndemic, or a situation in which two or more diseases interact and exacerbate the other, resulting in higher likelihood for both when seen together (Godley & Adimora, 2020). Experiences of violence, both physical abuse and sexual abuse are considered risk factors for engaging in unprotected sex (Centers for Disease Control and Prevention, 2014; Homma, Wang, Saewyc, & Kishor, 2012). Further, forced sexual encounters and sexual abuse can be inflection points for HIV transmission (Centers for Disease Control and Prevention, 2014). This relationship between HIV and violence among trans populations has been studied less in comparison to cis populations, but it can be theorized that a similar relationship exists. Further research is required to elucidate the relationship between violence and HIV among trans populations, particularly trans populations engaging in sex work, a form of work that is at elevated risk for HIV transmission. This study seeks to close this gap in literature by exploring the relationship between police interactions and HIV to understand different factors that can inform HIV status.

Transgender health and policing

Previous research has identified policing behaviors as harmful to minoritized communities, including transgender populations (American Public Health Association, 2018). Policing behaviors include police brutality and over-policing of minoritized or marginalized communities. Denoted as racialized policing, police brutality and over-policing towards Black individuals and communities in the United States has shaped much of the modern criminal legal

system (Tonry, 2010). This form of violent policing extends to marginalized communities, including trans populations who are more likely to interact with police and experience police violence at higher rates than cis populations (Stenersen, Thomas, & McKee, 2022). Numerous adverse health outcomes are associated with exposure to police brutality and incarceration including mental and physical health issues (Haile, Rowell-Cunsolo, Hyacinthe, & Alang, 2023). These harmful police practices are largely legally protected in the United States where 98.1% of fatal police violence has not resulted in a criminal conviction (Sinyangwe, Monck, Hammond, & Emerson, 2022). It is critical to investigate the role policing has on different health outcomes, including HIV, as law enforcement can seriously impact the life course of an individual, whether that is through arrest, or a potential intervention point.

Trans individuals interact more frequently with police and experience elevated rates of harmful interactions with police compared to cis populations. Trans individuals interact with police more frequently as a result of community and societal level factors. Discrimination in employment, healthcare, and housing results in trans populations being at higher risk for engaging in criminalized activity in order to survive including engaging in sex work. Individuals who engage in criminalized activity, particularly street-based sex work are likely to be exposed to police interactions as street-based sex work is illegal in the US. According to the USTS, 40% of respondents reported interacting with police in any way (James, 2016). Of this population, over half reported that at some point they were not treated with respect from police (James, 2016). Further, trans populations experience high rates of police misconduct including emotional, physical, and sexual violence (DeVylder, Anglin, Bowleg, Fedina, & Link, 2022; James, 2016). Trans populations report high rates of police misconduct, where of those that have interacted with police in the last year, 49% reported being misgendered by police, 20% reported

being verbally harassed, 19% reported being asked about gender transition, and 11% reported that officers believed them to be sex workers (James, 2016). Trans populations report elevated rates of police violence including 4% reporting being physically assaulted by police, 3% reported being sexually assaulted by police, and 1% reported being forced to engage in sexual activity to avoid arrest (James, 2016). These rates from the USTS are further evidenced by the much of the available research into trans populations and policing. For example, in a review of gendered violence against trans populations, 37.5% of the reviewed studies mentioned police interactions as a source of different forms of violence (Silva et al., 2022). Additionally, in two additional surveys conducted by DeVlyder and Alang that included transgender and non-binary populations, over half of the trans respondents reported experiencing some form of police brutality including physical and sexual violence (S. Alang et al., 2021; DeVlyder et al., 2022).

Due, in part, to racialized policing in the US, minoritized racial and ethnic trans groups experience heightened levels of negative police encounters (James, 2016). The USTS found higher prevalence of not being treated with respect, experiencing one or more types of mistreatment from law enforcement, physical attack, and assumptions of being a sex worker among all non-White racial and ethnic groups compared to the White racial group (James, 2016). Additional disparities exist between trans populations in relation to gender identity where trans men experience higher rates of police misconduct in comparison to trans women (James, 2016).

Police brutality, violence, and harassment can have enduring harms for the impacted communities. Police brutality results in greater mistrust of the criminal legal system. For example, among the USTS study sample, nearly 3 in 5 individuals were not comfortable reaching out to the police for help if they needed it (James, 2016). Further, these forms of state violence can have ripple effects that create further mistrust within other systems such as healthcare

(Socías et al., 2014). As has been previously discussed in this chapter, the healthcare system is built to serve heteronormative populations and can itself be a source of harm. However, these issues can have compounding impacts that result in worse overall health and safety outcomes for vulnerable populations. Globally, research has identified an association between exposure to police violence and healthcare avoidance (Gyamerah et al., 2021). Further, other forms of harassment from police officers can lead to decreased healthcare seeking behavior, such as being questioned about their gender identity (Gyamerah et al., 2021 ; Socías et al., 2014). Consequently, trans populations that engage in sex work are at higher risk of interacting with law enforcement and suffering negative consequences as a result of these interactions.

Interactions with law enforcement for individuals engaging in sex work is associated with numerous adverse outcomes including increased client-based violence (Sirry Alang, McAlpine, & McClain, 2021; DeVlyder et al., 2017; Geller, Fagan, Tyler, & Link, 2014). Previous research has identified associations between interacting with police and experiencing violence from clients for women engaging in sex work. Specifically, researchers found that for each additional interaction with police, women engaging in sex work were at 1.3 times the odds for experiencing client-based violence (Footer et al., 2019). Further, experiencing negative police encounters similarly is associated with increased client-based violence for individuals engaging in sex work. The full relationship between law enforcement and violence for those engaging in sex work has yet to be explored, but current data suggests that interacting with law enforcement can be associated with harsh outcomes for those engaging in sex work.

2.4 Community-Level Factors

Community level-factors are critical in understanding trans populations relationship with the medical field and how this impacts health outcomes for trans populations. Insurance, medical

education, and the standardization of transgender care each relate to how and why trans populations are less likely to utilize medical care when necessary. This section examines the different forms of discrimination trans populations experience in health services and why that is important for HIV status among trans populations engaging in sex work. Starting with exclusionary insurance policies and then describing clinical settings themselves, I show community-level factors related to labor and medical settings contribute to trans individuals' poor health. I then describe how trans exclusion is embedded in basic principles of social organization, including employment and housing, all of which contribute to sources of harm for trans people.

Insurance Coverage

In the United States, health services are largely tied to health insurance as a way to finance care. Insurance is most often tied to employment through employment-based insurance, but a large portion of the population is also covered under public insurance plans such as Medicaid and Medicare. Trans populations experience higher uninsured rates than the general US population where 14% of surveyed trans populations were uninsured in 2015 compared to 11% of the general US population (James, 2016). The elevated levels of employment discrimination faced by transgender individuals (James, 2016; National Center for Transgender Equality, 2021), which often result in job instability or unemployment, contribute to higher uninsured rates within this group, as they are less likely to have access to insurance coverage (James, 2016; Koma, 2020). Lack of insurance is compounded by geographic location and race/ethnicity. Trans populations in the US South had much higher rates of uninsurance (20%) compared to other regions of the US (9-13%) (James, 2016). Further, Black (20%), Indigenous (18%), and Hispanic (17%) trans populations experienced high rates of uninsurance (James,

2016). Similar trends of elevated rates of uninsurance in minoritized populations are seen across the US general population as well (Artiga, Hill, & Damico, 2022). Lack of insurance can be a significant barrier to accessing necessary medical care, leading to delayed care (Institute of Medicine Committee on Health Insurance & Its, 2009; Majerol, 2015).

Outside of having access to insurance, those with insurance have difficulty obtaining trans-affirming medical care approved by their insurance company. For example, 25% of trans populations surveyed in the USTS reported being denied insurance coverage for gender-affirming care such as gender transition care or transition-related care (James, 2016). In other studies investigating structural barriers to healthcare access among trans populations, denial of coverage was a common theme (Costa, 2023). In another study exploring healthcare use and access of transgender and cis-gender individuals, researchers found that despite equal rates of insurance coverage for both populations, transgender populations were much more likely to delay or avoid care due to cost concerns (Feldman et al., 2021). Not only do trans populations experience elevated rates of uninsurance compared to the general US population, those with insurance also must face the difficult task of navigating a medical system that is not built to support their needs.

Medical Settings

Structural factors associated with the medical field create deleterious environments for trans populations. These structural issues include a lack of standardization of medical care for trans individuals, trans medical care not being taught in institutions that train providers, and lack of protection from discrimination (Hana, Butler, Young, Zamora, & Lam, 2021). Until 2019, the global standard for diagnostic health, the International Classification of Diseases (ICD) 10th edition diagnosed those who identified as trans as a mental health issue to be diagnosed by a

physician and referred to a mental health specialist for treatment (Hana et al., 2021). In 2019, the ICD-11 was published and ratified by the World Health Association as the current standard for diagnostic health (World Health Organization, 2022). In this volume, the ICD-11 reclassified trans identities as gender incongruence and removed this diagnosis from the mental health chapter (Hana et al., 2021). In 2023, the World Professional Association for Transgender Health commissioned a new Standards of Care (SOC) protocol specifically geared towards transgender medical care (Coleman et al., 2022). This SOC provides the best practices for treating transgender patients based on current available research and evidence. However, many states in the US have passed laws that actively restrict advised medical care for trans populations including banning gender-affirming care for trans youth populations (Davis Jr., 2023; Human Rights Campaign, 2023).

In recent years, the field of medicine worldwide has been increasingly recognizing the importance of providing care that aligns with the gender identities of trans individuals. However, there remains a gap in the training of healthcare providers, leaving them inadequately prepared to treat trans patients. Medical students are often not taught about transgender care in both undergraduate and post-graduate education (Hana et al., 2021). Previous research identified that most training on trans health in the medical school context was conducted in an isolated training rather than being integrated throughout the medical curriculum (Hana et al., 2021; MacCormick & George, 2020; Moll et al., 2014). This means that students were only taught about transgender care during a single lesson. Most research on these interventions included short follow-ups, so the understanding of the retention of transgender care information by students participating in these isolated interventions is limited (Hana et al., 2021; MacCormick & George, 2020; Moll et al., 2014).

Outside of the medical field, trans populations experience numerous forms of discrimination that can lead to engaging in criminalized activities to earn a living wage. For example, trans populations experience multiple forms of discrimination with little legal recourse including in housing, employment, and healthcare (James, 2016; National Center for Transgender Equality, 2021, n.d.; Rodriguez, Agardh, & Asamoah, 2018). As such, trans populations are at higher likelihood for being homeless, engaging in a form of work that is criminalized, and avoiding healthcare (James, 2016; Kcomt et al., 2020). For example, 16% of trans respondents in the USTS reported having been fired as a result of their gender identity and 30% reported some form of mistreatment in the workplace related to their gender identity or expression (James, 2016). Trans populations also experience other forms of violence and harassment in the workplace at higher rates than cis-gender populations. For example, 15% of USTS respondents indicated they had experienced some form of physical or sexual harassment in the workplace (James, 2016). As a result of these different forms of harassment, a large majority of trans populations report taking measures to avoid harassment and discrimination by masking their true gender identity in the workplace (James, 2016).

Employment and Housing

For trans populations with employment in the formal economy, harassment and violence are all too common, however, for those trans individuals that engage in the informal economy, violence and harassment are extraordinarily elevated (James, 2016). Trans populations face numerous barriers to being employed in the formal economy, amongst these barriers, discrimination looms the largest (National Center for Transgender Equality, 2021). Because sex work, particularly street-based sex work, is criminalized across the US, trans populations that engage in sex work are at high risk of interacting with the police, experiencing negative police

contact, experiencing violence (from clients and police), and increasing the risk of HIV or STI infection (Sirry Alang et al., 2021; DeVylder et al., 2017; Geller et al., 2014).

2.5 Policy-Level Factors

Societal factors include norms and policies that inform the overall environment where an individual lives and can have significant influence over health outcomes and behaviors. In trans populations that engage in sex work, geographical location and state policy drive the greater societal context for HIV prevention, treatment, and infection. HIV prevalence rates vary significantly by geography in the US due to differing levels of investment in public health programs and stigma/discrimination (Centers for Disease Control and Prevention, 2019). Further, trans-related policies that have been introduced and passed at the state level of government in the US have sharply increased since 2017 (Kline et al., 2023). These policies have varied from being trans-exclusive to trans-affirming and the density of such legislation differs based on geographic region (Kline et al., 2023).

Trans policies introduced and passed in beginning in 2017 include legislation related to bathrooms, athletics, healthcare, religion, and education (Trans Legislation Tracker, 2023). Much of the legislation introduced and passed has been trans-exclusionary such as bills that ban gender-affirming care. These bills go so far as to charge providers with a felony for providing care recommended by international medical associations (Coleman et al., 2022). Additional exclusionary legislation includes forcing trans individuals to use a bathroom that is not concordant with their gender identity and for trans individuals to participate in athletic teams that are not concordant with their gender identity (Trans Legislation Tracker, 2023).

There is a paucity of research investigating the influence the policy landscape has on HIV infection, prevention, and treatment that necessitates further investigation. Unfortunately, it can

be difficult to directly attribute the cause of health disparities to policy as there are so many overlapping factors that influence a health outcome. However, it is critical to understand how the environment that surrounds a health outcome to appropriately intervene. Future research is needed to identify the relationship between policy and trans health in the US.

Geographic areas in the US have different rates of HIV infection among trans populations, with the Southern region of the US accounting for a larger percentage of the prevalence and incidence of HIV infection. According to the CDC, 4 in 10 new cases of HIV in 2019 occurred in the South for trans populations (Centers for Disease Control and Prevention, 2022a). The Southern region of the US has a deep-rooted history of social and racial marginalization that has negatively impacted the health of the most vulnerable populations, including trans individuals (Centers for Disease Control and Prevention, 2019). Connected to this history of marginalization, the US South continually underfunds social programs including programs for improving public health such as expansion of Medicaid (Centers for Disease Control and Prevention, 2019). As such, the access to adequate HIV care is lower in this area of the US and prevention interventions for HIV are more stigmatized. The stigmatization of HIV in the South may play a contributing role to the elevated rates of HIV infection among the trans populations. Further research into the association between geographic region, HIV status, and trans identity is needed.

In concordance with the elevated rates of HIV infection in the US South, the policy landscape in this region is particularly exclusive of trans identities. Between 2017 and 2021, the legislation introduced and passed in states in the US South was largely exclusive of trans identities. A recent study by (Kline et al., 2023) found that the US South introduced and passed a higher density of trans exclusionary bills compared to trans-affirming bills. Little research is

available identifying the association between the political determinants of health for trans populations in the US South and different health outcomes, including HIV. Of the literature that does exist investigating health behaviors and outcomes in trans populations as a result of different policy contexts in the US, researchers have found that protective policies of trans identities were associated with increased medical care including the use of therapy/counseling and gender-affirming care (Goldenberg, Reisner, Harper, Gamarel, & Stephenson, 2020; Goldenberg, S, G, K, & Stephenson, 2020). Additionally, researchers have identified an association between trans protective policies and improved mental health, decreased alcohol use, and shortened the time since last health check-up (Du Bois, Yoder, Guy, Manser, & Ramos, 2018). This area of research can be difficult to create meaningful associations and appropriate assumptions as so many things can contribute to health outcomes among a population, particularly minoritized populations to be able to indicate the political environment is directly contributing to health outcomes. However, this area of research needs further development.

To further understand the greater social, economic, and political determinants of health involved in HIV infection and treatment among transgender populations, we must discuss the systemic issues in HIV care and prevention. To start, stigma, discrimination, and isolation play significant roles in the treatment of HIV (Centers for Disease Control and Prevention, 2022b; de Villiers et al., 2020; Radusky et al., 2020; Roller, Sedlak, & Draucker, 2015). While the stigma around an HIV positive diagnosis has lessened over the decades, individuals who are HIV positive continue to experience stigma and discrimination. Stigma and discrimination are known to negatively impact healthcare seeking behavior along with healthcare access, as has been discussed previously in this chapter. Even among healthcare professionals, stigma, discrimination, and lack of medical knowledge towards trans populations negatively impacts

their care (Hana et al., 2021). The result of these multifaceted sources of stigma and discrimination are that trans populations are less likely to be exposed to prevention interventions, healthcare providers, and HIV treatment, all of which can contribute to HIV infection.

For trans populations that engage in sex work, the policy context and how it informs daily interactions with different systems (e.g. medical system, criminal legal system) is necessary to understand to identify potential associations with HIV status. The policy context, where sex work is criminalized creates an environment where individuals engaging in sex work are more vulnerable and at risk for exploitation, violence, and other adverse physical and sexual health outcomes (Gruskin, Ferguson, Alfven, Rugg, & Peersman, 2013; Gruskin, Pierce, & Ferguson, 2014; Muldoon et al., 2017; Platt et al., 2013; Shannon & Csete, 2010). Further, sex work criminalization increases the likelihood for interacting with police and interacting with the police while working a job in the informal economy can lead to negative interactions such as physical and sexual violence, or harassment (James, 2016). Additionally, the nature of sex work criminalization lends itself towards avoiding police, both while engaging in a criminalized form of work, but also when in need of law enforcement assistance. As such, those engaging in sex work are less likely to report client-based violence potentially in fear of being arrested for engaging in criminalized activity (James, 2016; UCLA School of Law Williams Institute, 2021). Additionally, for trans women engaging in sex work, circumstantial evidence can and has been used for arrest for prostitution (James, 2016). In many areas of the US, carrying condoms can be used as evidence for prostitution (Wurth, Schleifer, McLemore, Todrys, & Amon, 2013). Therefore, one of the most common prevention methods for decreasing the transmission of STIs or HIV is criminalized and further puts those engaging in sex work at higher risk of adverse sexual health outcomes. Potential explanations for why interacting with law enforcement is

associated with adverse physical and sexual health outcomes for individuals engaging in sex work is multifaceted and necessitates further research.

Because of the environment created by policy and law enforcement actions, those engaging in sex work are at increased risk for HIV infection (Footer et al., 2016). For example, population engaging in sex work are up to 13 times more likely to be HIV positive than those who do not engage in sex work (International Association of Providers of AIDS care, 2021). Compared to cis-gender populations, trans populations engaging in sex work are at higher risk of being HIV positive (Reisner et al., 2009). HIV status among those engaging in sex work has been associated with police interaction including arrest, negative encounters, and police violence (Footer et al., 2016). The current state of research requires further investigation of these associations, and some have postulated that policing is a structural determinant of HIV transmission in those engaging in sex work (Footer et al., 2016). In order to further explore the structural impact of policing on transgender populations engaging in sex work, this dissertation examines HIV infection among trans populations through three studies: 1) regression analyses on the association between HIV status and police interactions among those engaging in sex work, 2) mediation analysis identifying pathways between HIV status, policing, and engaging in sex work among trans populations, 3) structural equation modeling to define potential causal pathways for HIV infection among trans populations. Each of these studies will seek to identify the role policing plays in HIV infection among trans populations that are particularly vulnerable for adverse sexual health outcomes.

2.6 Conclusion

In this chapter, I have summarized the existing literature relating to trans health disparities, paying particular attention to HIV and the impact of policing and violence through a

social ecological model framework. Much of the extant literature has focused on individual and relationship-level factors relating to trans health. Trans populations experience significant disparities relating to mental health, substance use, sexual health, and discrimination. These issues are influenced by the broader community and societal level factors such as medical systems, criminal legal systems, geography, and the policy landscape. These community and societal level factors have significantly less research attributed to them in comparison to the individual and relationship level factors. As a result, research into HIV status among trans populations necessitates further research to investigate the influence larger systems and structures have on the health of trans populations.

Further, trans populations that engage in sex work are at elevated risk of experiencing violence and police brutality. Police interactions, particularly negative police interactions, have been associated with HIV infection among populations that engage in sex work. Researchers have posited that law enforcement acts as a structural determinant of HIV status among populations engaging in sex work. This is because police can use condoms as evidence of prostitution leading to those engaging in sex work avoiding carrying or using the most common preventive measure for HIV. Further, trans populations that engage in sex work experience elevated rates of harassment and violence from law enforcement, both of which can potentially lead to increased risk-taking behavior to avoid future interactions with police. However, little research has investigated the role policing plays as a structural determinant of HIV in trans populations that engage in sex work. In this dissertation, I seek to close this gap by identifying potential mechanisms in which police interactions shape HIV status among trans populations that engage in sex work.

Chapter 3: Methods

The previous two chapters have identified health disparities among trans populations. Many of these issues are impacted by structural factors including employment, housing, discrimination, and policy (Goldenberg, S, G, K, & Stephenson, 2020; S. E. James, Herman, J. L., Rankin, S., Keisling, M., Mottet, L., & Anafi, M., 2016; National Center for Transgender Equality, 2021, n.d.). Structural vulnerability is a theoretical lens that provides an explanation for how power systems and social structures can influence health disparities (Quesada, Hart, & Bourgois, 2011). Structural vulnerability identifies that broader political, social, and economic systems contribute to health disparities, vulnerabilities, and inequities (Quesada et al., 2011). This theoretical perspective highlights how different individual characteristics including race, gender, and other social determinants of health intersect to shape an individual's and communities' relationship with broader social structures to create a heightened level of vulnerability and disadvantage (Quesada et al., 2011). Structural vulnerability is a theoretical framework that has been utilized in public health and sociology to describe the ways in which structural factors such as policing, policy, discrimination, and other systems impact health of individuals (Bourgois, Holmes, Sue, & Quesada, 2017; Holmes, 2011; Quesada et al., 2011). This theoretical framework is the most aligned with understanding the role of policing on HIV in a marginalized community, as it acknowledges the impacts of broader power structures on health behaviors and outcomes. Operationalizing a structural vulnerability framework can be difficult because there are numerous intersecting and confounding factors that can lead to a particular outcome (e.g., HIV status). However, recognizing that larger structural forces are at play is important when investigating health outcomes, particularly among a marginalized population engaging in a criminalized form of work. The three chosen methods for this dissertation will build upon each other to better our understanding of the role of policing on HIV status, testing,

and testing awareness among trans populations who engage in sex work. As such, structural vulnerability will be operationalized through the following three methods: logistic regression analysis, mediation analysis, and structural equation modeling.

3.1 Method Justification

There are numerous potential methods to investigate the role of structural factors, including policing, on HIV status among trans populations that engage in sex work. Because there is a paucity of research investigating the role of policing on trans populations engaging in sex work, qualitative methods are useful to provide insight into an understudied topic and population. Qualitative methods are often used to explore an understudied topic; however, these methods are not ideal for this dissertation due to time and monetary constraints. Future research ought to utilize qualitative methods including focus groups, individual in-depth interviews, and/or open-ended survey questions with trans individuals and law enforcement groups to gain a greater understanding of the role of policing on trans populations engaging in sex work. Additionally, primary data collection for quantitative data analysis are a suitable method for investigating the role of policing on HIV status among trans populations engaging in sex work. However, similar constraints exist for primary quantitative data collection that exist for qualitative data collection. Further, the 2015 USTS has successfully collected a large sample of trans individuals covering numerous topics including policing, health, healthcare, employment, and experiences of discrimination (S. E. James, Herman, J. L., Rankin, S., Keisling, M., Mottet, L., & Anafi, M., 2016). The 2015 USTS is an underutilized dataset and has significant potential to elucidate associations between policing and trans health. As such, secondary data analysis is ideal for studying this topic because there is readily available data that has been underutilized, a large sample size, and avoids the major constraints of primary data collection.

For the secondary data analysis utilized in this dissertation, logistic regression, mediation analysis, and structural equation modeling provide insight into the relationship between policing and HIV status and testing among trans populations that engage in sex work. Each of these forms of statistical analysis are used to explore the role of policing on HIV status among trans populations who engage in sex work through different means. Logistic regression analysis was utilized to understand potential associations between policing and HIV status among individuals who engage in sex work. This analysis lays the foundation for examining the potential association between police interactions (structural concept) and HIV status (individual health outcome) among individuals engaging in sex work (criminalized form of work that is impacted by the structural concept).

This study further explores the relationship between sex work, policing, and HIV status using mediation analysis, which examines the potential direct and indirect effects of policing on HIV status and sex work. Previous research has identified individuals engaging in sex work as having a higher prevalence of HIV infection compared to the general US population (S. E. James, Herman, J. L., Rankin, S., Keisling, M., Mottet, L., & Anafi, M., 2016). What is not known is how policing may mediate HIV status and testing among individuals engaging in sex work. The mediation analysis operationalized the structural vulnerability theory through incorporating a structural factor that has been posited as a strong influence for increased HIV status among populations that engage in sex work (Footer, Silberzahn, Tormohlen, & Sherman, 2016). Policing may act as mediating factor because it shapes the interactions individuals engaging in sex work have with their potential clientele. For example, carrying condoms, a common HIV prevention method, can be used as adequate justification for arrest for prostitution (Wurth, Schleifer, McLemore, Todrys, & Amon, 2013). This results in individuals engaging in

sex work having additional constraints placed upon them by a structural factor in policing that inhibits their ability to manage potential high risk HIV transmission activities. As such, I explored the mediating effect of policing on HIV status among trans populations.

Structural equation modeling was the final method used to operationalize the structural vulnerability theoretical framework. Structural equation modeling is used to build diagrammatic webs that show causal pathways between predictor variables and outcomes of interest. These diagrammatic webs are created using previous literature and grounded in theory. Unfortunately in this dissertation analysis, the structural equation models were unable to converge due to data limitations. As a result, the methods for structural equation modeling included in this section, but no results will be presented. Structural equation modeling was used to build potential causal pathways between sex work, policing, and HIV. The structural vulnerability model was organized through the constructs of the social ecological model framework. Due to small sample size relating to policing and sex work, the structural equation models were unable to converge. As such, future research will be needed to provide a thorough investigation of potential causal pathways for HIV status including the primary structural factor of note (policing).

This dissertation addresses gaps in literature regarding the structural impact of policing on HIV status among trans populations that engage in sex work through three statistical methods.

- 1) Multiple logistic regression to examine potential associations between HIV status/HIV testing and police interactions among trans individuals engaging in street-based sex work.
- 2) Mediation analysis to explore the direct and indirect effects of sex work and police interactions on HIV status among trans populations.
- 3) Structural equation modeling to identify the different causal pathways to HIV status among trans populations engaging in sex work.

In this dissertation, I conducted a secondary data analysis of a large sample of transgender adults in the United States and US territories to fill the gap in the existing literature regarding the structural impact policing has on HIV status among trans populations engaging in sex work. Filling this gap in the existing literature is crucial because understanding the structural impact of policing on HIV status among transgender individuals engaged in sex work is essential for developing targeted interventions and policies to improve public health outcomes and reduce health disparities within this vulnerable population.

3.2 Data

Data came from the 2015 U.S. Transgender Survey (USTS). This survey was created through collaboration with researchers and advocates for transgender people and sought to examine the experiences of transgender population in the US. Many questions from the survey were derived from previously validated, national surveys conducted in the US such as the American Community, National Survey on Drug Use and Health (NSDUH), and the CDC's Behavioral Risk Factor Surveillance System (BRFSS) among others. The survey was administered electronically and could be taken by survey participants via any web-enabled device. The survey was pilot tested among 100 participants that met the survey criteria: 1) 18 years or older, 2) transgender, 3) willing to provide feedback for improvement of the survey, 4) available to take the survey during the specified time period, and 5) agreed to not share the survey questions with others. The pilot study was used to improve and refine the final survey material, of which, researchers created a survey with 324 possible questions divided into 32 categories. The categories included sections related to experiences with healthcare, education, housing, employment, and law enforcement. Participants were offered the incentive of being entered into a three cash prize drawings: one prize for \$500 USD and two prizes for \$250 USD. Of the 27,715 completed surveys, 17,643 individuals entered into the cash prize drawings. The

survey was offered to participants in both English and Spanish. English and Spanish responses were included in data analysis. The pilot study and the administration of the final survey were approved by the University of California, Los Angeles North General Institutional Review Board. Further documentation about the US Transgender Survey can be found in the USTS methodology report (S. E. H. James, J.; Keisling, M.; Mottet, L.; Anafi, M., 2017).

3.3 Study Sample

The population of interest was defined by the following inclusion criteria for the USTS: 1) identified as transgender, trans, genderqueer, non-binary, or other identities on the transgender spectrum, such as crossdresser; 2) 18 years old or older; 3) currently lived in a US state or territory or on a US military base. The final study sample (N=27,715) for the USTS included responses from all 50 US states and US territories Puerto Rico and Guam. The survey was not nationally representative, but measures to minimize bias from online survey administration were undertaken. Weights provided by USTS were used in all studies for race/ethnicity, age, and education.

3.4 Study 1: Logistic Regression

Logistic regression analysis was used to examine the associations between HIV status/HIV testing and police interactions among trans individuals that engage in sex work. This analysis explored associations between the structural factor of policing and the identified health outcome of HIV status/testing among trans populations engaging in sex work. This analysis provided the foundation for understanding potential influences of policing on HIV status among a population engaging in a criminalized activity.

3.4.1 Study Sample

The study sample for study 1 was restricted to respondents to the USTS that answered ‘Yes’ to ever having engaged in sex work in their lifetime and indicated that they had ever engaged in street-based sex work. The final data included n=471 participants.

3.4.2 Measures

Dependent Variables

HIV Status

The primary outcome variable was HIV status. HIV status was measured in the USTS as a categorical variable as 1=HIV positive, 2=HIV negative, and 3=Don’t know/not tested.

Because the outcome of interest is HIV status, don’t know/not tested category was removed from the analysis. Missing data for HIV status was minimal for the entire dataset (n=61, 0.22%). For the subset of the data that focused on individuals who had ever engaged in sex work, 0.27% of the data was missing. The outcome variable was recoded as a dichotomous variable (0=HIV positive, 1=HIV negative). The data subset for study 1 included 11.27% (n=46) HIV positive individuals and 88.73% (n=362) HIV negative individuals. Full case analysis will be utilized due to minimal missing data.

HIV Testing

HIV testing was utilized as an outcome variable in analysis to identify potential associations between police interactions and HIV testing. HIV testing was measured in the USTS through a question, “Have you ever been tested for HIV?” The HIV testing variable was recorded as a dichotomous variable, 1=Yes, previously tested, 0=No previous test. Missing data for the HIV testing variable was minimal (n=1, 0.21%). The data subset for this analysis included 10.19% (n=48) individuals who had not been tested for HIV and 89.60% (n=422) of individuals

who have been tested for HIV. Full case analysis will be utilized due to the minimal missing data.

Independent Variables

Police interaction

Police interaction was measured in the USTS through a question asking if the survey participant ever interacted with the police while doing sex work or when police thought you were doing sex work. These questions were asked to participants who indicated they had engaged in sex work in the past year. The interaction with police was captured through two variables depending on the answer selected: 1) interacted with police while they were doing sex work or 2) interacted with police while the officer thought they were doing sex work. Both variables were dichotomous where 0=did not interact with police and 1=interacted with police (while engaging in sex work OR while the police thought they were engaging in sex work). Missing data for the entire dataset for both police interaction variables was 0.6%. For the data subset including only those who had ever engaged in sex work, the missing data was 0.1% of the data. Due to the low percentage of missing data, no imputation methods were required. Police interaction variables were combined and recoded into a single variable measuring any police interaction. The final variable was coded as 0=never interacted with police, 1=interacted with police while engaging in sex work and/or while the police thought they were engaging in sex work. Never interacting with police was used as the reference category. Of those who indicated they had engaged in sex work in the previous year, 40.64% (n=191) indicated they had interacted with police and 76.86% (n=362) indicated they had not interacted with police.

Race/Ethnicity

Race and ethnicity were captured in the USTS using the American Community Survey measures including Alaska Native, American Indian, Asian/Asian American, Native Hawaiian/Pacific Islander, Biracial/Multiracial, Black/African American, Latino/a/Hispanic, White/European American, Middle Eastern/North African. Participants were asked to select the single race/ethnicity that they most identified with, recognizing that this singular race/ethnicity may not account for their full racial/ethnic identity. For analyses, USTS recoded responses to a categorical variable with four options: Other/Multiracial (18.90%, n=89), Black/African American alone (11.89%, n=56), Latino/a/Hispanic alone (9.13%, n=43), and White/Middle Eastern/North African (60.08%, n=283). The reference category for analyses was White/Middle Eastern/North African.

Gender

Gender was a categorical variable with five options: crossdresser (2.34%, 11), trans woman (61.15%, n=288), trans man (17.83%, n=84), non-binary or genderqueer assigned female at birth (AFAB) (10.40, n=49), and non-binary or genderqueer assigned male at birth (AMAB) (8.28%, n=39). Crossdresser was used as the reference category.

Education

Education was a categorical variable with four options: less than a high school degree (8.28%, n=39), high school degree or equivalent (18.26%, n=86), some college (49.26%, n=232), bachelor's degree or more (24.20%, n=114). The reference category for the education variable during analyses was bachelor's degree or more.

Substance Use

Substance use was a variable used to capture the use of illicit drugs other than cannabis. Participants were asked if they had ever used illegal or illicit drugs such as cocaine, crack, heroin, meth, LSD, or inhalants such as poppers or whippits in a single question. A follow-up question was asked to identify the recency of such illicit drug use. The currently using illegal or illicit drug use variable excluding cannabis was used in the analysis. Cannabis use was assessed in a separate question. Cannabis use is not a potential transmission source for HIV as opposed to injection drugs, so cannabis use was not utilized in this analysis as a covariate. Illegal or illicit substance use excluding marijuana was included in analyses as certain illicit drug activities can increase the likelihood of HIV transmission (HIVcare.org, 2023). Substance use was captured through a dichotomous variable indicating whether the survey participant was used illicit drugs in the past 30 days (0=no, 1=yes). Of the data subset population, 23.46% (n=107) indicated they were currently using illicit drugs and 76.54% (n=349) were not currently using illicit drugs. The reference category for all analyses was 0=no.

Age

Age was a continuous variable that captured participants current age through the questions “what is your current age?” Responses for this variable ranged from 18-67 years old with a mean of 31.23 years old.

Experienced homelessness

Individuals who are experiencing homelessness are at higher risk of HIV infection (Arum et al., 2021). The USTS captures experiences of homelessness by asking participants to identify if they have ever experienced homelessness. This variable was coded as 0=never having experienced homelessness and 1=ever experienced homelessness. Of the included individuals for

this analysis, 78.85% (n=369) ever experienced homelessness and 21.15% (n=99) have never experienced homelessness. The reference category for this variable was 0=never having experienced homelessness.

3.4.3 Statistical Analysis Study 1:

Descriptive statistics were produced for all variables included in the final analyses with 95% confidence intervals. Bivariate statistics were run including Rao Scott Chi-Square tests of independence for categorical variables and t-tests for continuous variables. Sample weights created for the 2015 US Transgender Survey were used to appropriately weight for age, race/ethnicity, and education for all analyses. Logistic regression analyses were run using HIV status as the outcome variable and police interactions as the primary predictor. Covariates included demographic variables such as age, race/ethnicity and education status. Additional covariates were included to account for potential reasons for positive HIV status including substance use and lifetime experience of homelessness. Gender identity was not included in the statistical analysis due to insufficient sample size across gender identity categories.

Sensitivity analyses included additional regression analyses that investigated the interaction effects between race and police interaction variables. Research on intersectionality and policing has consistently shown communities of color are policed at higher rates compared to white communities in addition to communities of color being at higher risk of experiencing police violence in comparison to white communities. Experiences of police violence are associated with higher risk for HIV infection. Interaction effects with other variables of interest such as gender identity were not included due to sample size limitations.

3.5 Study 2: Mediation analysis.

Mediation analysis assesses the extent to which the relationship between an independent variable and an outcome variable is influenced by an intermediary variable known as a mediator.

Mediation analysis was originally pioneered by Wright (1921) and later expanded upon by Baron and Kenny (1986) to assess the effect size of continuous variables in a mediation framework. A mediator serves as an intermediate factor that aids in elucidating the connection between the independent variable and the outcome referred to as the indirect effect. This analysis quantifies both the direct and indirect effects of the independent variable on the outcome of interest (Baron & Kenny, 1986).

The Baron and Kenny (1986) approach to mediation analysis is built on multiple linear regression analyses on continuous mediator and outcome variables. Because of this assumption, the Baron and Kenny approach is not widely applicable to different variable types, particularly issues arise when utilizing dichotomous variables as mediator or outcome variables (Valeri & Vanderweele, 2013; VanderWeele, 2016). As such, to appropriately analyze the direct and indirect effects of sex work and policing on HIV status, an updated approach to mediation analysis must be utilized. Additionally, the Baron and Kenny (1986) approach does not incorporate potential exposure, mediator interactions and confounding. In a study investigating the impact of police interactions on individuals who engage in sex work, there may be confounding among these variables as those who are engaging in a criminalized form of work are at elevated risk of interacting with the police. As a result, confounding must be addressed in the mediation analysis to adequately describe the relationship between sex work, policing, and HIV status (Valeri & Vanderweele, 2013).

This dissertation will use the counterfactual approach to mediation analysis (Valeri & Vanderweele, 2013; VanderWeele, 2016). The counterfactual approach is robust in its ability to include dichotomous mediator and outcome variables. Additionally, the counterfactual approach incorporates potential exposure, mediator confounding. Finally, the counterfactual approach

allows for the total effect size identified to be broken down into indirect and direct effects in order to measure the effect size that flows through the mediator variable (Valeri & Vanderweele, 2013; VanderWeele, 2016). Direct and indirect effects for the Baron and Kenny approach and counterfactual approach are explained in further detail below.

The Baron and Kenny (1986) approach to understanding direct and indirect effects offers a useful introduction to understanding the direct and indirect effects for mediation analysis. The direct effect represents the pathway between the independent variable and the outcome variable, and it is examined by regressing the outcome variable on the independent variable. Conversely, the indirect effect is evaluated by regressing the mediator variable on the independent variable and subsequently regressing the outcome variable on the mediator variable. The Beta coefficients from these two regressions are multiplied to identify the indirect effect of the independent variable on the outcome variable that flows through the mediator variable. This approach necessitates using a continuous mediator variable and continuous outcome variable in order to appropriately identify the indirect effects. The presence of a mediator is expected to attenuate the direct effect of the independent variable on the outcome when the outcome variable is regressed on both the independent and mediator variable. A reduction in the direct effect signifies that the mediator variable exerts a non-negligible influence on the causal pathway connecting the independent variable and the outcome variable (Baron & Kenny, 1986).

The counterfactual approach addresses issues with including dichotomous variables for the mediator or outcome variables (Valeri & Vanderweele, 2013; VanderWeele, 2016). Additionally, utilizing the counterfactual approach allows for the total effect to be decomposed into the controlled direct effect, the natural direct effect, and the natural indirect effect (Valeri & Vanderweele, 2013). The controlled direct effect identifies the amount the outcome would

change depending on different levels of the exposure variable, holding the mediating variable constant. The natural direct effect identifies the amount the outcome variable would change depending on different levels of the exposure variable while the mediating variable is kept at the level recorded for that observation. The natural indirect effect identifies the amount the outcome variable would change while holding the exposure variable constant and the mediator variable is measured at both levels. Three effect sizes (controlled direct effect, natural direct effect, natural indirect effect) compose the total effect. The total effect identifies the amount the outcome would change based on changes in the exposure variable (Valeri & Vanderweele, 2013).

The counterfactual approach includes four assumptions (Valeri & Vanderweele, 2013; VanderWeele, 2016). The first assumption is that there is no unmeasured confounding between the exposure-outcome relationship. The second assumption is that there is no unmeasured confounding between the mediator-outcome relationship. The third assumption is that there is no unmeasured confounding between the exposure-mediator relationship. The fourth assumption is that there is no mediator-outcome confounder that is impacted by the exposure variable. In order to meet these assumptions, all confounding variables between the variables must be accounted for in the analysis. Additionally, to mitigate potential exposure-mediator confounding, an interaction variable is included.

In summary, mediation analysis elucidates the intricate relationships between exposure and outcome variables by incorporating one or more additional variables within the causal pathway.

3.5.1 Study population

The study population for study 2 was the survey population for the USTS. For the mediation analysis investigating HIV status, the population was restricted to those who were not

missing data for HIV status, police interaction, and sex work variables (n=14,025). For the mediation analysis investigating HIV testing, the population was restricted to those who were not missing data for HIV testing, police interaction, and sex work variables (n=27,664)

Primary outcome measures:

HIV Status

The primary outcome variable was HIV status. HIV status was measured in the USTS as a categorical variable as 1=HIV positive, 2=HIV negative and 3=Don't know/not tested. Missing data for HIV status was minimal for the entire dataset (n=61, 0.22%). For this study, Because the outcome of interest is HIV status, the third category of don't know/not tested was removed from analysis. HIV status was recoded as a dichotomous variable (1=HIV positive (1.28%, n=179), 0=HIV negative (98.72%, n=13,846)).

HIV Testing

HIV testing was utilized in a second mediation analysis as an outcome variable. HIV testing was measured in the USTS through a question, "Have you ever been tested for HIV?" The HIV testing variable was recorded as a dichotomous variable (1=Yes, previously tested (54.45%, n=14,234), 0=No previous test (48.55%, n=13,430)).

Mediator variables:

Police interaction

Police interaction was a dichotomous variable that measured past year interaction with the police. This variable was measured as 0=no police interaction in the past year (55.14%, n=7,734) and 1=police interaction in the past year (44.86%, n=6,291).

Street-Based Sex Work

Street-based sex work was measured by asking survey participants if they have ever engaged in sex work for money. For those who indicated they had engaged in sex work for money were asked an additional question to indicate what type of sex work they had done. The street-based sex work variable was recoded for the USTS survey population as 0=did not engage in street-based sex work (97.10%, n=13,640) and 1=did engage in street-based sex work (2.90%, n=408).

3.5.2 Statistical analysis:

Police interaction and street-based sex work variables were fit into a mediation model to identify the direct and indirect effect of these items on HIV status among transgender populations. Mediation analysis is a special case of regression analyses to identify the relationship between the independent variable (sex work) and the outcome variable (HIV status) through an intermediate mediator variable (police interaction). I employed the counterfactual approach to mediation analysis to investigate the interplay between police interaction, street-based sex work, and HIV status within transgender populations. This approach allows the estimation of the causal mediation effects and assesses the counterfactual outcomes under different levels of the mediator variable. The counterfactual approach decomposes the total effect of the treatment variable on the outcome variable into the natural direct effect, the natural indirect effect, and the controlled direct effect.

Total Effect

The total effect refers to the total effect size of the treatment variable on the outcome variable without considering a mediator variable (VanderWeele, 2011). The total effect of street-based sex work on HIV status was assessed through logistic regression analysis. The total effect

was identified by regressing HIV status on sex work, without considering the mediator (police interaction). This provides the total effect of sex work on HIV status.

Natural Direct Effect, Natural Indirect Effect, Controlled Direct Effect

The natural direct effect refers to the direct effect of the treatment on the outcome where the mediator variable is not changed from its natural level (VanderWeele, 2011). The natural indirect effect refers to the effect size of the treatment on the outcome variable when the mediator variable varies (VanderWeele, 2011). In other words, the treatment and outcome variable remain constant and the mediator variable changes. The controlled direct effect is the effect size of the treatment variable on the outcome variable when the mediator is held constant (VanderWeele, 2011). Logistic regression analysis was conducted to identify the natural direct effect and natural indirect effects of sex work on HIV status, including the mediating variable police interaction. The natural direct effect was identified by regressing HIV status on sex work while controlling for police interaction. Additionally, the natural indirect effect was identified by multiplying the coefficients obtained from separate regressions of police interaction on sex work and HIV status on police interaction.

The mediation effects were assessed by comparing the total effect with the sum of the natural direct effect and the natural indirect effect. A significant reduction in the total effect after considering the mediator suggests evidence for mediation.

All analyses were conducted using Stata version 15.1. I will measure the direct and indirect effect of sex work on HIV status with a mediator of police interactions. In the mediation analyses, a bootstrap sampling approach was employed, conducting 500 resamples to estimate the indirect effects and their corresponding confidence intervals. Covariates for the study will

include race, education, substance use, experiences of homelessness, and age. The direct effect is the effect sex work has on HIV status. The indirect effect explains how much the police interaction mediator explains the sex work effect on HIV status.

Weighting

The decision not to weight the mediation analysis on the impact of sex work and policing on HIV status/testing was informed by several key considerations. Firstly, the survey in question did not employ a complex survey design (James, 2017), which often necessitates weighting due to stratification, clustering, or multi-stage sampling processes. Given the straightforward nature of the sampling method used, the introduction of weights was not inherently required (Bollen, Biemer, Karr, Tueller, & Berzofsky, 2016). Moreover, the availability and quality of data played a crucial role in this decision. The analyses utilized a limited dataset focused on trans populations that had engaged in street-based sex work, and in such cases, the benefits of weighting must be carefully weighed against the potential loss in statistical efficiency and power. Bollen et al. (2016) emphasizes that unnecessarily weighting data can lead to lower efficiency and reduced statistical power, which was a significant concern in the analysis. Importantly, preliminary analyses comparing weighted and unweighted logistic regression models showed minimal differences statistical significance in the odds ratios. This indicated that weighting did not substantially alter the findings, further supporting the decision to proceed without weighting. As such, weights were not utilized in the mediation analyses.

3.6 Study 3: Structural equation modeling

Structural equation modeling is utilized to build potential causal pathways towards HIV status among transgender populations. The potential causal pathways are based on structural vulnerability theory and operationalized through the use of the social ecological model. This

allows for broader structures that can impact health to be included into the structural equation model, such as policing, discrimination, and violence. The structural equation model method will further define how policing interacts with other risk factors to influence HIV status among transgender populations. The study sample for this aim includes the full survey population from the 2015 USTS.

3.6.1 Conceptual framework:

This research is guided by the theory of structural vulnerability. Structural vulnerability identifies that broader social, economic, and political systems have a significant impact on health outcomes and health disparities, particularly among marginalized populations. The theory posits that there are multiple overlapping factors that interact at a structural level to create an untenable health environment for marginalized populations. As such, structural vulnerability theory is an ideal theoretical framework to use for this dissertation as the population of interest is under direct political attack across the U.S. and experiences multiple forms of discrimination as described in the previous two chapters. Further, this dissertation explores the role of policing on HIV status for transgender populations that are engaging in a criminalized form of work, sex work. This adds an additional layer to the concept of structural vulnerability among this population as those engaging in a criminalized form of work have fewer legal protections. The theoretical framework of structural vulnerability will be operationalized through the social ecological model that identifies multiple overlapping levels of influence that contribute to a health outcome. The social ecological model, which posits that individual health outcomes are influenced by multiple levels of factors, including intrapersonal, interpersonal, and community-level determinants. In this study, we examine these factors in relation to HIV status among transgender individuals.

3.6.2 Variables

Intrapersonal Variables:

Mental Health

The USTS utilized the Kessler-6 (K6) scale to assess the mental health of survey participants. The K6 scale is a widely recognized tool for evaluating serious psychological distress and comprises six questions aimed at gauging the mental well-being of respondents. These questions inquire about the frequency of experiences such as feeling nervous, restless or fidgety, hopeless, worthless, or that everything was an effort in the past 30 days. Respondents provide their answers using a Likert scale, ranging from "none of the time" to "all of the time," with each response assigned a numerical value (0 for "none of the time" to 4 for "all of the time"). These values are then summed to calculate the total Psychological Distress measure, where a score of 13 or higher indicates the presence of serious psychological distress. The variable used in the is a continuous variable with scores ranging from 0 to 24. The K6 score mean was 10.65.

Substance Use

Substance use was a variable used to capture the use of illicit drugs other than marijuana. This variable was included in analyses as certain illicit drug activities can increase the likelihood of HIV positive status. Substance use was captured through a dichotomous variable indicating whether the survey participant was currently using illicit drugs (0=no (10.44%, n=1,446), 1=yes (89.56%, n=12,401)). The reference category for all analyses was 0=no.

Experience of Homelessness

Individuals who are homeless are at higher risk of HIV infection. The USTS captures experiences of homelessness by asking participants to identify if they have ever experienced homelessness. This variable was coded as 0=never having experienced homelessness (63.28%,

n=8,879) and 1=ever experienced homelessness (36.72%, n=5,152). The reference category for this variable was 0=never having experienced homelessness

Age

Age was a continuous variable that captured participants current age through the questions “what is your current age?” Responses for this variable ranged from 18-67 years old with a mean of 31.23 years old.

Education

Education was a categorical variable with four options: less than a high school degree (1.63%, n=229), high school degree or equivalent (7.96%, n=1,118), some college (41.25%, n=5,795), bachelor’s degree or more (49.16%, n=6,906). The reference category for the education variable during analyses was bachelor’s degree or more.

Interpersonal Variables:

Violence

The USTS utilized the Physical Violence Scale from the National Intimate Partner and Sexual Violence Survey (NISVS). This is a tool used to assess and measure physical violence in the context of intimate partner relationships. It is designed to gather data on various forms of physical violence, including acts of aggression, harm, or force inflicted by one partner upon another within an intimate relationship. These questions were recoded to a dichotomous variable to indicate if survey participants ever experienced some form of intimate partner violence. The recode indicated that 0=no experience of intimate partner violence and 1=yes experienced intimate partner violence. The 2015 USTS included 12 questions related to different forms of

intimate partner violence including being threatened, slapped, pushed, hit, kicked, slammed, or choked. Previous research investigating intimate partner violence has similarly dichotomized experiences of intimate partner violence into a single variable for analysis (Leight & Wilson, 2021).

Discrimination in the workplace

The USTS measured discrimination in the workplace through multiple questions asking participants to identify if they experienced some form of workplace discrimination including if their boss gave them a negative job review, removed them from customer contact, asked them to present in the wrong gender, forced them to resign, or forced them to switch departments/positions. These experiences were recoded to a scalar variable ranging from 0 to 9. Each form of discrimination experienced by the individual was summed to create the new discrimination variable. The 2015 USTS asked about nine potential forms of workplace discrimination.

Community Variables:

Police Interactions

Police interaction was measured through a question that asked survey participants, “In the past year, did you interact with the police or other law enforcement officers?” Answer options included 0=no (55.14%, n=7,734) and 1=yes (44.86%, n=6,291). This police interaction variable was asked to all survey participants.

Additional Variable:

Engagement in Street-Based Sex Work

Street-based sex work was measured by asking survey participants if they have ever engaged in sex work for money. For those who indicated they had engaged in sex work for money were asked an additional question to indicate what type of sex work they had done. The street-based sex work variable was recoded for the USTS survey population as 0=did not engage in street-based sex work (97.10%, n=13,640) and 1=did engage in street-based sex work (2.90%, n=408).

3.6.3 Statistical Analysis

Structural Equation Modeling (SEM)

Structural Equation Modeling (SEM) was employed to assess the potential causal pathways between intrapersonal, interpersonal, community, and engagement in street-based sex work variables and their impact on HIV status among transgender individuals. SEM allows for the simultaneous estimation of relationships among multiple latent and observed variables. SEM builds a diagrammatic web of regression analyses to estimate potential causal pathways to a designated outcome. The potential causal pathways are based on the theory. For this analysis, structural vulnerability theory will be operationalized utilizing the social ecological model. Constructs from the social ecological model are used to assess direct and indirect potential causal pathways to HIV status among transgender populations.

Model Specification

The SEM model was constructed with latent variables representing the intrapersonal construct, the interpersonal construct, and the community construct, with observed variables as indicators for each latent construct. The engagement in street-based sex work variable and HIV status were included as observed variables. The model incorporated hypothesized direct and indirect paths based on the social ecological framework. The social ecological framework is used

to operationalize the theory of structural vulnerability. Structural vulnerability identifies broader social, economic, and political systems as important factors in determining health outcomes and health disparities among marginalized populations. Multiple potential models will be created based on previous research on HIV status among transgender populations and populations that engage in sex work. Previous research has identified important factors associated with HIV infection and these factors will be organized utilizing the social ecological model constructs. Different potential causal pathways will be created and analyzed. The best fitting model based on model fit assessment (see next section) will be determined as the most appropriate potential model pathway for this analysis. Due to relatively low percentage of missing data for the included variables, complete case analysis methods were used (Schafer, 1999).

Model Fit Assessment

To evaluate the goodness-of-fit of our SEM model, several fit indices were used:

- Comparative Fit Index (CFI): A measure of incremental fit, with values close to 1 indicating a good fit.
- Root Mean Square Error of Approximation (RMSEA): A measure of the fit of the model to the population covariance matrix.
- Standardized Root Mean Square Residual (SRMR): A measure of the standardized discrepancy between the observed and estimated covariance matrices.

Model Modification

If the model fit assessment indices indicate an imperfect causal model, potential model modifications will be included. A modification index is provided by Stata to identify potential variable to include/exclude or to correlate specific variables together (MacCallum, 1992). The

limitation behind modification indices produced by Stata is that these items are devoid of theory (MacCallum, 1992). This means that the options provided by the software may or may not have theoretical justification for inclusion in the model. For these instances, modification indices that are provided will be utilized only if there is a basis for inclusion/exclusion or correlation with another variable based on previous research and the theories that underpin this analysis.

3.7 Conclusion

This dissertation examines the structural role of policing on HIV status among transgender individuals who engage in sex work through three methods: logistic regression, mediation analysis, and structural equation modeling. Previous research has identified policing as a potential contributor to hazardous environments for people engaging in sex work that increases the risk for HIV infection (Footer, Silberzahn, Tormohlen, & Sherman, 2016). As such, in this dissertation, I conducted secondary data analysis on a large dataset to identify potential associations between HIV status and police interactions. This research fills an important gap in the literature surrounding transgender populations and the structural role of law enforcement on HIV status. Filling this gap is crucial as it will build on previous evidence for policy changes that affirm transgender identities and reduce police violence against marginalized populations. Additionally, this research is necessary to identify potential interventions geared towards transgender population to reduce HIV infection that incorporate a structural lens. The use of a structural lens when identifying interventions for HIV transmission among a marginalized population is necessary because of the numerous intersecting forms of oppression that impact the health risk environment.

Chapter 4: Results

4.1 Aim 1

4.1.1 Descriptive Statistics

The sample for Aim 1 (n=408) was weighted by age, education, and race to make estimates more representative of the U.S. transgender population. Weighted and unweighted descriptive statistics are presented in Table 1. The Aim 1 study sample only included individuals who indicated they had ever engaged in street-based sex work and had non-missing data regarding HIV status. Among this sample, 11.27% (n=46) were HIV positive and 88.73% (n=362) were HIV negative. Among individuals who had engaged in street-based sex work, 40.64% (n=191) indicated they had interacted with police while they were engaging in sex work or while the police thought they were engaging in sex work. For race/ethnicity distribution of the sample, 60.08% (n=283) were White, 18.90% (n=89) were other/multiracial, 11.89% (n=56) were Black/African American, and 9.13% (n=43) were Latino/a/Hispanic. The educational attainment of the sample was as follows: 8.28% (n=39) had not completed high school, 18.26% (n=86) held a high school degree or equivalent, 49.26% (n=232) had attended some college, and 24.20% (n=114) possessed a bachelor's degree or higher. For substance use, 23.46% (n=107) of the population subsample indicated that they past 30-day illicit substances use other than cannabis. Additionally, 78.85% (n=369) of the population subsample indicated they had ever experienced homelessness. Weighted percentages with 95% confidence intervals are presented in Table 1.

Table 1: Descriptive Statistics from 2015 U.S. Transgender Survey for Individuals Who Engaged in Street-Based Sex Work, 2015.

				Weighted 95% CI Lower Bound	Weighted 95% CI Upper Bound
HIV Status	Freq.	Percent	Weighted Percent		
Negative	362	88.73%	67.27	51.5	79.91
Positive	46	11.27%	32.73	20.09	48.5
HIV Testing					
No	48	10.19%	9.00%	4.84	16.14
Yes	422	89.60%	91.00%	83.86	95.16
Police Interaction¹					
No	279	59.36%	42.99	32.69	53.93
Yes	191	40.64%	57.01	46.07	67.31
Race/Ethnicity					
Other/Multiracial	89	18.90%	11.51	7.061	18.21
Black/African American	56	11.89%	34.1	23.02	47.23
Latino/a/Hispanic Alone	43	9.13%	21.99	13.14	34.42
White	283	60.08%	32.41	24.45	41.52
Education					
Less than high school	39	8.28%	38.03	25.97	51.76
High school grad or equivalent	86	18.26%	28.78	20.8	51.76
Some college	232	49.26%	22.11	16.65	28.76
Bachelor's degree or higher	114	24.20%	11.08	7.3	16.47
Past 30-Day Substance Use					
No	349	76.54%	84.32	77.28	89.48
Yes	107	23.46%	15.68	10.52	22.72
Lifetime Experience of Homelessness					
No	99	21.15%	23.58	16.26	32.88
Yes	369	78.85%	76.42	67.12	83.74

¹Police interaction while engaging in sex work or while police thought they were engaging in sex work

4.1.2 Bivariate Statistics

Rao-Scott Chi-Squared Tests of Independence were conducted to identify significant differences between HIV status groups by predictor and covariate groups. Analyses identified statistically significant differences between HIV status and police interaction ($\chi^2(1, 408) = 17.45$, $p < 0.0001$). Additionally, a statistically significant difference was identified between HIV status and race/ethnicity ($\chi^2(3, 408) = 85.56$, $p < 0.0001$). No statistically significant differences were identified between HIV status and education level, substance use, or experiences of homelessness. Results for adjusted and unadjusted bivariate statistics are available in Table 2.

Rao-Scott Chi-Squared Tests of Independence were conducted to identify significant differences between HIV testing groups by predictor and covariate groups. Unweighted analyses identified statistically significant differences between HIV testing groups and police interaction ($\chi^2(1, 469) = 4.001$, $p = 0.045$). Additionally, statistically significant differences were identified between HIV testing groups and educational attainment ($\chi^2(3, 470) = 8.7616$, $p = 0.033$), and lifetime experience of homelessness ($\chi^2(1, 468) = 8.568$, $p = 0.003$). No statistically significant differences were identified between HIV status race/ethnicity and substance use. Results for adjusted and unadjusted bivariate statistics are available in Table 2.

Table 2: Bivariate Statistics Using Data from the 2015 U.S. Transgender Survey of Individuals who Engaged in Street-Based Sex Work by HIV Status.

Variable	HIV Negative	HIV Positive	p-value	HIV Negative	HIV Positive	
	n (%)	n (%)		Weighted % (CI)	Weighted % (CI)	
Police Interaction¹						
No	226 62.60%	14 30.43%	<0.0001	58.1 (47.35, 68.14)	15.32 (5.95, 34.1)	0.0001

	135	32		41.9	84.68	
Yes	37.40%	69.57%		(31.86, 52.65)	(65.9, 94.05)	
Race/Ethnicity						
	71	8		11.66	4.09	
Other/Multiracial	19.61%	17.39%		(6.99, 18.81)	(1.48, 10.77)	
	24	24		21.2	66.22	
Black/African American	6.63%	52.17%		(12.15, 34.36)	(34.64, 87.88)	
	35	3		23.77	24.07	
Latino/a/Hispanic Alone	9.67%	6.52%		(15.01, 35.51)	(5.96, 61.33)	
	232	11		43.37	5.63	
White	64.09%	23.91%	<0.0001	(33.53, 53.75)	(1.93, 15.33)	0.0039
Education						
	23	5		30.28	56.21	
Less than high school	6.35%	10.87%		(19.26, 44.16)	(28.94, 80.18)	
	64	8		32.68	16.04	
High school grad or equivalent	17.68%	17.39%		(23.7, 43.14)	(5.26, 39.66)	
	180	27		24.16	22.04	
Some college	49.72%	58.70%		(18.29, 31.19)	(10.06, 41.68)	
	95	6		12.88	5.71	
Bachelor's degree or higher	26.24%	13.04%	0.192	(8.57, 18.92)	(1.38, 20.77)	0.1486
Past 30-Day Substance Use						
	275	34		81.23	91.28	
No	77.90%	77.27%		(71.77, 88.05)	(78.71, 96.74)	
	78	10		18.77	8.72	
Yes	22.10%	22.73%	0.924	(11.95, 28.23)	(3.26, 21.29)	0.1292
Lifetime Experience of Homelessness						
	67	11		24.87	13.35	
No	18.56%	24.44%	0.345	(16.42, 35.8)	(5.08, 30.74)	0.1969

HIV Testing Bivariate Statistics						
Variable	No Previous HIV Test	Previous HIV Test		No Previous HIV Test	Previous HIV Test	
	n	n	p-value	Weighted %	Weighted %	
	(%)	(%)		(CI)	(CI)	
Police Interaction¹						
No	35 72.92%	244 57.96%	0.045	39.25 (17.30, 66.61)	43.46 (32.41, 55.20)	0.7804
Yes	13 27.08%	177 42.04%		60.75 (33.39, 82.70)	56.54 (44.80, 67.59)	
Race/Ethnicity						
Other/Multiracial	8 16.67%	81 19.19%	0.614	37.79 (13.29, 70.67)	8.93 (5.50, 14.19)	0.0059
Black/African American	4 8.33%	51 12.09%		18.68 (4.95, 50.30)	35.48 (23.61, 49.45)	
Latino/a/Hispanic Alone	3 6.25%	40 9.48%		1.88 (0.40, 8.31)	24.02 (14.36, 37.35)	
White	33 68.75%	250 59.24%		41.65 (17.61, 70.45)	31.56 (23.38, 41.06)	
Education						
Less than high school	9 18.75%	30 7.11%	0.033	42.65 (16.90, 73.11)	37.65 (24.80, 52.52)	0.5162
High school grad or equivalent	10 20.83%	76 18.01%		32.79 (11.87, 63.87)	28.44 (20.13, 38.53)	
Some college	18 37.50%	213 50.47%		7.53 (3.19, 16.75)	23.39 (17.33, 30.78)	
Bachelor's degree or higher	11 22.92%	103 24.41%		17.03 (4.19, 49.09)	10.52 (6.84, 15.82)	

Past 30-Day Substance Use						
No	33	316	0.418	87.62	83.99	0.6120
	71.74%	77.07%		(71.17, 95.31)	(76.30, 89.53)	
Yes	13	94		12.38	16.01	
	28.26%	22.93%		(4.69, 28.83)	(10.47, 23.70)	
Lifetime Experience of Homelessness						
No	18	81	0.003	51.13	20.82	0.0306
	37.50%	19.29%		(23.41, 78.17)	(13.87, 30.03)	
Yes	30	339		48.87	79.18	
	62.50%	80.71%		(21.83, 76.59)	(69.97, 86.13)	
Yes	294	34	75.13	86.65		
	81.44%	75.56%	(64.2, 83.58)	(69.26, 94.92)		

¹Police interaction while engaging in sex work or while police thought they were engaging in sex work.

4.1.3 Logistic Regression
HIV Status, Unadjusted:

In the unadjusted logistic regression model for HIV status as the outcome, statistically significant associations were identified between the outcome variable and police interaction, race/ethnicity, and education. In the context of interacting with police while engaging in sex work, individuals who had interacted with police while engaging in sex work had statistically significantly higher odds (OR: 2.564, 95% CI: 1.166, 5.641, p-value = 0.019) of being HIV positive compared to those who did not interact with police while engaging in sex work. Notably, Black/African American individuals had statistically significantly higher odds (OR: 18.590, 95% CI: 7.339, 47.088, p-value < 0.001) of HIV positive status compared to White individuals. Associations with other race/ethnicity categories were not statistically significant at the p<0.05 level. Compared to those with a Bachelor’s degree or higher, all other education

categories were statistically significantly associated with higher odds of HIV positive status: less than a high school education (OR: 5.139, 95% CI: 1.074, 24.589, p-value = 0.04), high school degree or equivalent (OR: 5.511, 95% CI: 1.378, 22.036, p-value = 0.016) and some college/Associate's degree (OR: 3.954, 95% CI: 1.278, 12.231, p-value = 0.017). A statistically significant association was not identified for substance use, age, or experiences of homelessness and HIV status at the $p < 0.05$ level (Table 3).

HIV Status, Adjusted

In the adjusted logistic regression model for HIV status as the outcome variable, statistically significant associations were identified between HIV status and police interaction, race/ethnicity, education, and age. Individuals who had interacted with police while engaging in sex work (aOR: 12.055, 95% CI: 3.076, 47.232, p-value < 0.001) had higher odds of being HIV positive compared to those who did not interact with police while engaging in sex work. For race, Black/African American individuals (aOR: 42.349, 95% CI: 6.383, 280.957, p-value < 0.001) had higher odds of being HIV positive compared to White individuals. No statistically significant association was identified among other race/ethnicity categories and HIV status. Compared to individuals with a Bachelor's degree or higher, all education categories had higher odds of being HIV positive: less than a high school degree (aOR: 240.883, 95% CI: 3.677, 15,781.668, p-value = 0.010); high school degree or equivalent (aOR: 117.837, 95% CI: 1.588, 8,743.044, p-value = 0.030); some college (aOR: 64.385, 95% CI: 1.316, 3,150.826, p-value = 0.036). For age, each one-year increase in age (aOR: 1.088, 95% CI: 1.021, 1.159, p-value = 0.009) was associated with higher odds of being HIV positive. A statistically significant association was not identified for the substance use and experienced homelessness covariates and HIV status (Table 3).

Table 3: Unadjusted and Adjusted Logistic Regression Results Investigating the Impact of Police Interactions on HIV Status among Transgender Individuals who Engaged in Street-Based Sex Work

	Unadjusted logistic regression analysis on HIV status to identify associations with police interactions and other covariates among transgender populations that engage in sex work.					Adjusted logistic regression analysis on HIV status to identify associations with police interactions and other covariates among transgender populations that engage in sex work.				
	HIV Status (n=395)					HIV Status (n=1,107)				
VARIABLES	OR	Standard Error	95% CI Low	95% CI High	p-value	aOR	Standard Error	95% CI Low	95% CI High	p-value
Police Interaction¹										
No	(REF)					(REF)				
Yes	2.564**	-1.031	1.166	5.641	0.019	12.055***	-8.4	3.076	47.242	<0.001
Race										
White	(REF)					(REF)				
Other/Multiracial	2.580*	-1.309	0.955	6.974	0.062	1.484	-1.524	0.198	11.103	0.701
Black/African American	18.590***	-8.815	7.339	47.088	<0.001	42.349***	-40.884	6.383	280.957	<0.001
Latino/a/Hispanic Alone	0.856	-0.702	0.172	4.269	0.85	2.708	-2.552	0.427	17.174	0.29
Education										
Bachelor or Higher	(REF)					(REF)				
Less than High School	5.139**	-4.104	1.074	24.589	0.04	240.883**	-513.989	3.677	15,781.67	0.01
High School or Equivalent	5.511**	-3.897	1.378	22.036	0.016	117.837**	-258.917	1.588	8,743.04	0.03
Some College/Associates	3.954**	-2.278	1.278	12.231	0.017	64.385**	-127.799	1.316	3,150.83	0.036
Past 30-Day Substance Use										
No	(REF)					(REF)				
Yes	1.148	-0.514	0.478	2.759	0.758	1.694	-1.129	0.459	6.255	0.429
Age										
Age	1.030*	-0.016	0.999	1.062	0.056	1.088***	-0.035	1.021	1.159	0.009

Lifetime Experience of Homelessness										
No	(REF)					(REF)				
Yes	0.629	-0.284	0.26	1.523	0.304	0.381	-0.277	0.092	1.584	0.184
Constant	0.004***	-0.004	0.000	0.031	<0.001	0.000***	0.000	0.000	0.005	<0.001

*** p<0.01, ** p<0.05, * p<0.1

¹Police interaction while engaging in sex work or while police thought they were engaging in sex work.

HIV Testing, Unadjusted

In the unadjusted logistic regression model with HIV testing as the outcome, statistically significant associations were identified between the outcome variable and education and experiences of homelessness. Inclusion criteria for these analyses included individuals who had indicated they had previously engaged in street-based sex work and had non-missing data related to HIV testing. Compared to individuals with a Bachelor's degree or higher, those with less than a high school degree had statistically significantly lower odds (OR: 0.275, 95% CI: 0.093, 0.811, p-value = 0.019) of having tested for HIV. Those with a high school education were not statistically significantly associated with HIV testing. Additionally, individuals who had previously experienced homelessness had statistically significantly higher odds (OR: 2.977, 95% CI: 1.489, 5.955, p-value = 0.002) of having tested for HIV compared to those who had not previously experienced homelessness. There was no statistically significant association between HIV testing and police interaction, race/ethnicity categories, substance use, and age (Table 4).

HIV Testing, Adjusted

In the adjusted logistic regression model with HIV testing as the outcome, statistically significant associations were identified between the outcome variable and race/ethnicity. Compared to White individuals, Latino/a/Hispanic individuals had statistically significantly higher odds (aOR: 16.902, 95% CI: 1.982, 144.127, p-value = 0.01) of testing for HIV. There were no statistically significant associations between HIV testing and Black/African American individuals or Other/Multiracial individuals. No other covariates were statistically significantly associated with HIV testing.

Table 4: Unadjusted and Adjusted Logistic Regression Results Investigating the Impact of Police Interactions on HIV Testing among Transgender Individuals who Engaged in Street-Based Sex Work

	Unadjusted logistic regression analysis on HIV testing to identify associations with police interactions and other covariates among transgender populations that engage in sex work.					Adjusted logistic regression analysis on HIV testing to identify associations with police interactions and other covariates among transgender populations that engage in sex work.				
	HIV Testing (n=454)					HIV Testing (n=27,698)				
VARIABLES	OR	Standard Error	95%CI Low	95% CI High	p-value	aOR	Standard Error	95% CI Low	95% CI High	p-value
Police Interaction¹										
No	(REF)					(REF)				
Yes	1.641	-0.602	0.8	3.367	0.177	0.574	-0.401	0.146	2.256	0.426
Race										
White	(REF)					(REF)				
Other/Multiracial	1.36	-0.627	0.551	3.355	0.505	0.557	-0.39	0.142	2.193	0.403
Black/African American	1.779	-1.06	0.553	5.72	0.334	2.594	-1.975	0.583	11.533	0.21
Latino/a/Hispanic Alone	2.159	-1.466	0.571	8.167	0.257	16.902***	-18.482	1.982	144.127	0.01
Education										
Bachelor or Higher	(REF)					(REF)				
Less than High School	0.275**	-0.152	0.093	0.811	0.019	0.83	-0.678	0.167	4.116	0.819
High School or Equivalent	1.151	-0.576	0.432	3.069	0.779	1.339	-1.328	0.192	9.353	0.769
Some College/Associates	1.53	-0.647	0.668	3.503	0.315	3.628*	-2.546	0.917	14.359	0.066
Past 30-Day Substance Use										
No	(REF)					(REF)				
Yes	0.82	-0.306	0.394	1.705	0.595	1.01	-0.81	0.21	4.864	0.99
Age										
Age	1.024*	-0.013	0.998	1.05	0.066	0.962*	-0.023	0.918	1.007	0.1

Lifetime Experience of Homelessness										
No	(REF)					(REF)				
Yes	2.977***	-1.053	1.489	5.955	0.002	2.146	-1.836	0.401	11.48	0.372
Constant	1.196	-0.821	0.311	4.593	0.794	29.453*	-56.986	0.664	1,306.51	0.08
*** p<0.01, ** p<0.05, * p<0.1										

¹Police interaction while engaging in sex work or while police thought they were engaging in sex work.

4.2 Aim 2: Mediation Analysis

4.2.1 Mediation Analysis: HIV Status

Mediation analysis was conducted utilizing the counterfactual approach to mediation analysis. The counterfactual approach allows for binary mediator and outcome variables (Valeri & Vanderweele, 2013; VanderWeele, 2016) in addition to controlling for potential treatment variable and mediator variable confounding. This approach breaks down the total effect of a treatment variable on an outcome variable that is mediated by a third, mediator variable into three effects: controlled direct effect (CDE), natural direct effect (NDE), and the natural indirect effect (NIE). The CDE is the effect that engaging in street-based sex work has on HIV status that is not mediated by police interaction. These analyses identified a statistically significant controlled direct effect (CDE: 5.483, 95% CI: 3.191 to 9.434, $p < 0.001$) of street-based sex work on HIV status (Table 5). This indicates a significantly increased risk of being HIV positive for those engaging in street-based sex work that is not mediated through police interaction.

The NDE is the effect engaging in street-based sex work has on HIV status when police interaction status is allowed to vary. In other words, the NDE quantifies the direct impact of street-based sex work on HIV status that is not mediated through changes in the police interaction status. These analyses identified statistically significant natural direct effects (NDE: 5.976, 95% CI: 3.951 to 9.041, $p < 0.001$) of engaging in street-based sex work on HIV status that is not mediated through police interactions.

The NIE measures the role of police interaction as a mediating variable on HIV status. In other words, the natural indirect effect accounts for the effect size street-based sex work have on HIV status that flows through police interactions. These analyses did not identify a statistically significant natural indirect effect (NIE: 0.984, 95% CI: 0.942 to 1.027, $p = 0.458$) of police interaction on HIV status.

The total effect identifies the overall impact engaging in street-based sex work has on HIV status including the mediating effect of police interaction. These analyses identified a statistically significant total effect (TE: 5.879, 95% CI: 3.924 to 8.808, $p < 0.001$) of engaging in street-based sex work has on HIV status, including the mediating effect of police interactions. This result indicates there is a statistically significantly increased odds of being HIV positive for individuals who engage in street-based sex work and interact with the police.

Table 5: Mediation Analysis Results Investigating the Mediating Effect of Police Interactions on the Association between Engaging in Sex Work and HIV Status Among Transgender Populations (Bootstrap sample size: 27,055).

	Coef	Std. Err	95% C I lb	95% CI ub	p-value
Controlled Direct Effect	5.483	0.276	3.191	9.423	<0.0001
Natural Direct Effect	5.976	0.211	3.951	9.041	<0.0001
Natural Indirect Effect	0.984	0.022	0.942	1.027	0.458
Marginal Total Effect	5.879	0.206	3.924	8.808	<0.0001

4.2.2 Mediation Analysis: HIV Testing

For the second mediation analysis, the CDE was the effect that engaging in street-based sex work had on HIV testing that was not mediated by police interaction. These analyses identified a statistically significant controlled direct effect (CDE: 5.255, 95% CI: 3.359 to 8.221, $p < 0.001$) of street-based sex work on HIV testing (Table 6). This indicates a statistically significantly increased risk of undergoing HIV testing for those engaging in street-based sex work that is not mediated through police interaction.

The NDE is the effect engaging in street-based sex work has on HIV testing when police interaction status is allowed to vary. In other words, the NDE quantifies the direct impact of

street-based sex work on HIV testing that was not mediated through changes in police interaction status. These analyses identified statistically significant natural direct effects (NDE: 5.808, 95% CI: 4.199 to 8.032, $p < 0.001$) of engaging in street-based sex work on HIV testing that was not mediated through police interactions.

The NIE measures the role of police interaction as a mediating variable on HIV testing. In other words, the NIE accounts for the effect size street-based sex work has on HIV testing that flows through police interactions. These analyses did not identify a statistically significant natural indirect effect (NIE: 1.010, 95% CI: 0.967 to 1.055, $p = 0.658$) of police interaction on HIV testing.

The total effect identifies the overall impact engaging in street-based sex work has on HIV testing, including the mediating effect of police interaction. These analyses identified a statistically significant total effect (TE: 5.865, 95% CI: 4.257 to 8.081, $p < 0.001$) of engaging in street-based sex work on HIV testing, including the mediating effect of police interactions. This result indicates statistically significantly increased odds of undergoing HIV testing for individuals who engaged in street-based sex work and interacted with the police.

Table 6: Mediation Analysis Results Investigating the Mediating Effect of Police Interactions on the Association between Engaging in Sex Work and HIV Testing Among Transgender Populations (Bootstrap sample: 27,055).

	Coef	Std. Err	95%CI lb	95%CI ub	p-value
Controlled Direct Effect	5.255	0.228	3.359	8.221	<0.0001
Natural Direct Effect	5.808	0.165	4.199	8.032	<0.0001
Natural Indirect Effect	1.01	0.223	0.967	1.055	0.658
Marginal Total Effect	5.865	0.164	4.257	8.081	<0.0001

Chapter 5: Discussion, Recommendations, and Conclusion

Understanding the intricate relationship between policing as a structural determinant and HIV status among transgender individuals engaged in sex work is critical in understanding how system-level factors impact health disparities. This dissertation investigates the role of policing as a pivotal structural determinant of health, anchored in the structural vulnerability framework proposed by Quesada, Hart, and Bourgois (2011). This framework elucidates that health outcomes extend beyond individual behaviors, being intricately shaped by the wider social, economic, and political landscape. The structural vulnerability framework argues that policing, as an institutional force, profoundly intersects with these broader structures, systematically influencing health outcomes by perpetuating conditions of vulnerability and inequality. The structural vulnerability framework thereby serves as a critical lens for understanding how policing practices contribute to health disparities, emphasizing the necessity of considering the interplay of societal forces in shaping health outcomes, particularly related to HIV status. For transgender individuals involved in sex work, these broader social, economic, and political structures create a heightened risk environment for HIV infection, stemming from the criminalization of their activities and intersecting social, political, and economic challenges (Vanwesenbeeck, 2017).

Transgender individuals engaged in sex work face heightened vulnerability for HIV infection due to intersecting societal and political issues that contribute to their structural vulnerability (National Center for Transgender Equality, 2019, 2021, n.d.-a, n.d.-b; Vanwesenbeeck, 2017). The criminalization of sex work places individuals engaging in sex work in a precarious position within society, subjecting them to heightened levels of stigma, discrimination, and legal ramifications (Bruckert & Hannem, 2013; Krüsi, Kerr, Taylor, Rhodes, & Shannon, 2016). These social and political factors, coupled with the criminalization of sex work, contribute to an

environment where the risk of HIV infection is disproportionately elevated (Shannon & Montaner, 2012). By investigating policing as a structural determinant within this framework, this dissertation aimed to untangle the complex web of factors contributing to the health disparities experienced by transgender individuals engaged in sex work.

Transgender individuals, particularly those engaged in sex work, are disproportionately subjected to negative interactions with law enforcement officers (James, 2016; National Center for Transgender Equality, 2019). Extra-legal procedures refer to actions or behaviors that occur outside the established legal framework or judicial process (Footer et al., 2016). In the context of policing, extra-legal behaviors involve law enforcement actions conducted without proper legal authority or in violation of established legal procedures (Footer et al., 2016). Examples of extra-legal policing behaviors in the context of sex work may include unlawful arrests, the use of excessive force, or forced sexual activity, each of which disproportionately impacts transgender populations (James, 2016). The prevalence of documented extra-legal practices by police towards individuals engaged in sex work underscores the increased exposure to structural vulnerability for this population (Krüsi et al., 2016). Instances of police misconduct, ranging from unwarranted arrests to violence and harassment, exacerbate the structural vulnerability of this population (Footer, Silberzahn, Tormohlen, & Sherman, 2016). The unequal treatment and discriminatory practices experienced by transgender individuals at the hands of law enforcement officers contribute to a pervasive atmosphere of mistrust and fear (Girardi, 2022; James, 2016). In turn, this strained relationship with the police further amplifies the risk environment for HIV infection among transgender individuals, creating a critical intersection between structural determinants, social injustice, and health outcomes. This discussion section aims to unravel these complexities and shed light on the urgent need for targeted interventions that address the

structural vulnerabilities faced by transgender individuals engaged in sex work to mitigate the heightened risk of HIV transmission.

5.1 Quantitative Analysis Findings Contextualized with Current Research

This dissertation investigated the relationship between police interactions and HIV status among transgender populations engaged in sex work through logistic regression analyses and mediation analyses. Notably, a third form of analyses was posited, but the structural equation modeling was not feasible because the models failed to converge. This is likely due to the limited sample size in the dataset relating to the sample subset of individuals engaged in street-based sex work.

In this dissertation, police interactions were statistically significantly associated with higher odds of HIV infection among transgender individuals engaged in sex work. In addition to corroborating existing literature linking HIV infection among sex workers with various police behaviors such as arrest, sexual coercion, and other extra-legal practices (Footer et al., 2016), this study contributes novel insights. Specifically, the findings from this dissertation underscore policing as a structural determinant of HIV status within the context of sex work. Building upon prior findings (Footer et al., 2016), this dissertation extends previous analyses by employing mediation analysis, offering a quantitative exploration of potential causal pathways to HIV status among individuals engaged in sex work including policing as a mediating variable for HIV status among this population. By extending the current literature in this manner, this research not only aligns with established knowledge but also introduces valuable approaches for investigating the role of structural influences on individual outcomes in the context of sex work, policing, and HIV.

5.2 Aim 1: Logistic Regression

5.2.1 *HIV Status*

In line with the broader context established by the extant literature (Chen et al., 2012; M. R. Decker et al., 2017; Michele R. Decker, Pearson, Illangasekare, Clark, & Sherman, 2013; Erausquin, Reed, & Blankenship, 2011; Footer et al., 2016), the results of the logistic regression analyses conducted in this dissertation lend further credence to the increased risk for HIV infection in relation to police interaction. Specifically, a statistically significant association was identified between HIV infection and police interactions among trans individuals engaged in sex work. Those who interacted with the police had higher odds of HIV infection compared to those who did not interact with police.

This finding aligns with previous literature emphasizing the role of policing as a structural determinant for HIV status among populations engaged in sex work (Footer et al., 2016). Policies and law enforcement practices shape the environment in which individuals engaged in sex work operate, and existing literature underscores the criminalization of sex work as a significant policy-level determinant of HIV health (Lyons et al., 2020; Vanwesenbeeck, 2017). Moreover, variations between written legislation and actual enforcement at the interpersonal level, both legal and extra-legal, have been identified as influential factors impacting HIV transmission among individuals engaged in sex work (Footer et al., 2016). Examples include the use of carrying condoms as evidence for arrest or the confiscation and destruction of condoms (Erausquin et al., 2011; Erausquin, Reed, & Blankenship, 2015). Consequently, such street-level policing directly undermines common effective HIV transmission prevention techniques (Centers for Disease Control and Prevention, 2021b), contributing to a lower likelihood of engaging in protected sexual activity and an increased risk of HIV transmission (Footer et al., 2016). Additionally, previous research has highlighted police practices related to substance use

as a potential association with HIV status (Beletsky et al., 2013; Footer et al., 2016; Rusakova, Rakhmetova, & Strathdee, 2015), with the confiscation of injection-based drugs and drug paraphernalia being linked to an elevated risk of HIV infection. This increased risk may be attributed to heightened needle-sharing among individuals engaged in injection drug use, a known transmission source for HIV (Centers for Disease Control and Prevention, 2021a). Notably, illicit substance use was not found to be statistically significantly associated with HIV infection in these logistic regression models. Further, It is important to note the environmental and societal context within which street-based sex work is taking place. Due to the criminalization of most forms of sex work in the U.S., those engaging in this form of work are often forced into higher risk environments where police are more likely to patrol and/or interact with individuals engaged in criminalized forms of work. As such, the identified association between police interaction and HIV status may be biased by environmental and societal context. As such, future research ought to investigate specific forms of police interactions including arrests, violence, day-to-day interactions, among others.

In this dissertation, a significant association between police interactions and HIV infection was identified. This association may be attributed to the direct and indirect influence of policing behavior on trans individuals engaged in sex work. For trans individuals involved in sex work, nearly 86% indicated they have previously experienced more than one form of mistreatment by the police including misgendering, verbal harassment, or sexual assault (James, 2016). These findings emphasize the urgent need for comprehensive interventions that address the systemic issues of extra-legal policing behaviors, ensuring the protection of the rights and well-being of trans individuals engaged in sex work to mitigate the heightened risk of HIV transmission associated with such interactions. Such interventions ought to include policy-level, police

organizational level, and individual level changes to best address HIV infection health disparities among trans populations. These interventions are discussed in more detail in the ‘Future Research’ section below.

In both unadjusted and adjusted analyses examining the relationship between police interactions and HIV status, significant associations emerged, linking HIV status with covariates such as race/ethnicity and education. Specifically, Black/African American identifying trans individuals had significantly higher odds of HIV infection compared to their White counterparts. An intersectional perspective suggests that the convergence of minoritized identities may contribute to the observed association between race/ethnicity and HIV status, highlighting the heightened vulnerability of Black trans populations, particularly Black trans women, to HIV infection—a trend consistent with existing literature (James, 2016; Klein, Psihopaidas, Xavier, & Cohen, 2020; Siembida, Eaton, Maksut, Driffin, & Baldwin, 2016). Due to the disproportionate impact of HIV infection on trans individuals with intersecting minoritized or criminalized identities, it is imperative to adopt a health equity and intersectional lens in interventions concerning HIV infection in the U.S.

Moreover, individuals with lower educational attainment demonstrated higher odds of HIV infection compared to those with a bachelor’s degree or higher. This finding aligns with prior research indicating a lower risk of HIV infection among individuals with higher educational attainment (Control & Prevention, 2011). This association may be linked to socio-economic status, as educational attainment can serve as a proxy for household income (Kayeyi, Sandøy, & Fylkesnes, 2009). Additionally, educational attainment may be associated with employment and therefore employment-based insurance (Waynor, Gill, Reinhardt-Wood, Nanni, & Gao, 2018). Insurance coverage is an important factor in accessing preventive services related to HIV such as

PrEP, a medication that reduces the risk of sexual transmission of HIV (Spinner et al., 2016). As such, recognizing and addressing these intersecting factors is crucial for developing effective interventions to mitigate HIV risk among diverse populations.

Adjusted analyses were utilized to explore associations between police interactions and HIV status, revealing statistically significant associations with Black/African American race, educational attainment, and age. Notably, each of these findings exhibited a consistent direction but with greater magnitude compared to the unadjusted analyses. Unlike the unadjusted analysis, the adjusted analysis identified a statistically significant association between age and HIV status. With each one-year increase in age, there was 1.088 times the odds of being HIV positive (95% CI: 1.02-1.16). Considering the advancements in modern medicine that provide available and effective treatments for HIV, individuals with HIV can now live longer, healthier lives (Centers for Disease Control and Prevention, 2022). Furthermore, almost half of all individuals living with HIV are 50 years and older (National Institute on Aging, 2021). Therefore, it becomes crucial to consider an aging population living with HIV when considering potential interventions or policies (Mahy, Autenrieth, Stanecki, & Wynd, 2014). It is essential to ensure that testing and treatment for HIV are inclusive of a broad age range. In addressing the multifaceted associations uncovered in this analysis, it is necessary to adopt a comprehensive approach that not only acknowledges the heightened vulnerabilities experienced by trans populations but also recognizes the evolving demographic landscape of individuals living with HIV, ensuring inclusivity across age groups in the design and implementation of effective interventions and policies.

5.2.2 HIV Testing

In analyses of self-report HIV testing, this dissertation did not find a statistically significant association between police interactions and self-report of HIV testing—an outcome diverging from existing literature that links police arrests to increased HIV testing among individuals involved in sex work (Footer, Silberzahn, Tormohlen, & Sherman, 2016; Qiao et al., 2014). The absence of a statistically significant link in this analysis may stem from the specific type of police interaction examined, differing from other studies. While prior research highlighted arrests as linked to HIV testing (Footer et al., 2016), this analysis concentrated solely on police interactions, irrespective of arrest, as the predictor for HIV testing. Arrests might be associated with HIV testing due to its integration into the judicial process, either at the request of the detained individual or as a standard part of legal proceedings (Control & Prevention, 2010). Future research should delve deeper into the connection between HIV testing and policing to ascertain whether arrests are the primary correlates of HIV testing or if alternative avenues exist to promote HIV testing among individuals engaged in sex work.

5.3 Aim 2: Mediation Analysis

5.3.1 HIV Status

While previous research has identified potential associations between policing, sex work, and HIV status (Erausquin, Reed, & Blankenship, 2011, 2015; Footer et al., 2016), there remains a notable gap in understanding how these systems interact with each other. Notably, no prior research has investigated policing as a mediating factor between sex work and HIV status. The existing body of knowledge has highlighted that both policing practices related to individuals engaged in sex work and the nature of the work itself contribute to an elevated risk of HIV infection (Footer et al., 2016). What remains unknown is whether these factors mediate each other and to what extent. This dissertation addressed this research gap by identifying sex work as

having a large total effect size on HIV status. However, police interaction was not identified as a statistically significant mediating factor for HIV status among transgender populations when considering sex work, police interactions, and HIV status.

Built upon previous research linking police behaviors—such as arrest, condom confiscation, drug/drug paraphernalia confiscation, violence, and forced sex—to HIV status (Erausquin et al., 2011, 2015; Footer et al., 2016), this mediation analysis focuses on overall police interactions. While specific police behaviors were not individually captured in the analysis, the variable of police interactions was used to investigate policing as a mediating factor for HIV status among trans individuals engaged in sex work. Consequently, this variable may be too broad of a categorization to adequately identify the impact of policing on HIV status. Regardless, this analysis provides crucial evidence to bridge the gap in literature concerning the influence of policing as a structural determinant of HIV status among those engaged in sex work. While police interactions, in general, may not act as a mediating factor for HIV status, specific police behaviors, including extra-legal behaviors need to be investigated as potential mediating factors for HIV status.

5.3.2 HIV Testing

Similarly, police interactions were not identified as a statistically significant mediator between engaging in street-based sex work and HIV testing. Previous research has identified police behaviors as being associated with increased HIV testing (Qiao et al., 2014). The finding in this dissertation extends beyond previous literature to investigate police interactions as a potential mediator between HIV testing and engaging in street-based sex work. While the logistic regression analysis did not find a statistically significant association between HIV testing and police interactions, previous research has shown that a statistically significant finding is not

necessary for a variable to act as a mediating variable (O'Rourke & MacKinnon, 2018). As such, this dissertation explored an important potential structural influence on HIV secondary prevention – police interactions. While a statistically significant association was not identified between police interactions and HIV testing, future research ought to investigate different police behaviors, including arrests, as being associated with HIV testing.

5.4 Structural Vulnerability: A Theoretical Analysis of Policing, Sex Work, and HIV

Through the structural vulnerability framework, transgender individuals who engage in sex work are at an intersection of multiple forms of social, economic, and political oppression (Rhodes et al., 2012). The findings from this dissertation have illuminated crucial insights into the complex interplay between police interactions, sex work, and HIV status, offering a nuanced interpretation within this framework. In this dissertation, I identified a statistically significant association between police interactions and HIV status. This finding underscores the structural determinant role of policing in shaping health outcomes (Footer et al., 2016). These findings align with the current literature in that institutional practices among police contribute to health disparities (Footer et al., 2016), placing individuals engaged in sex work in a structurally vulnerable position. Moreover, the disparities revealed among different demographic groups, particularly in terms of race/ethnicity and education, underscore the intersectionality of vulnerabilities. Black/African American trans individuals engaged in sex work face significantly higher odds of HIV infection, emphasizing how multiple social identities can compound health risks within the structural vulnerability framework.

The dissertation's unique contribution, investigating police interactions as a mediating factor between sex work and HIV status, further elucidates the need for research into the structural influence of policing on HIV status and testing. While policing was statistically

significantly associated with HIV status in the logistic regression analyses, mediation analyses did not identify policing as a mediating factor for HIV status among transgender populations. Together, these findings suggest that the structural vulnerability created by policing practices may influence the relationship between engagement in sex work and the risk of HIV infection, but more research is needed. Additionally, the statistically significant association between age and HIV status highlights the evolving demographic landscape of individuals living with HIV, adding a temporal dimension to the structural vulnerability framework. Understanding these nuances is crucial for designing interventions that address the multifaceted aspects of HIV transmission and health disparities among trans populations.

However, the absence of a significant association between police interactions and HIV testing in both logistic regression analysis and mediation analysis introduces a layer of complexity. This may indicate that while policing contributes to the structural vulnerability for HIV infection, it might not directly impact self-report of HIV testing. These nuanced findings underscore the importance of a comprehensive and targeted approach in interventions, acknowledging the diverse factors influencing health outcomes among transgender individuals engaged in sex work within the structural vulnerability framework.

5.5 Future Research

Literature investigating the role of policing as a structural determinant of HIV health is still in its nascent stage. A recent systematic review of policing as a structural determinant of HIV status among individuals who engage in sex work identified 14 articles that included related outcomes (Footer et al., 2016). These articles found that globally, policing behaviors including legal and extra-legal practices were positively associated with HIV infection among individuals engaging in sex work (Beletsky et al., 2013; Erausquin et al., 2011, 2015; Footer et al., 2016).

This dissertation contributes to this finding, but more research is needed to identify intervention points, structural interventions, and modifiable mechanisms within the broader structural environment. Specifically, more research is needed within the U.S. context to further identify policing and policy as structural determinants of HIV status among individuals engaging in sex work, including trans populations.

Future research ought to focus on law enforcement as a mechanism for change. This dissertation identified policing as a structural determinant of HIV status, specifically that interacting with police may increase an individual engaging in sex work's odds of being HIV positive. This is a critical area for intervention as trans populations experience heightened risk for violence from law enforcement (James, 2017). Consequentially, trans individuals engaging in sex work are more at risk for police interaction and violence due to their marginalized identity and criminalized form of work. As such, law enforcement interventions are required to both eliminate police violence and improve health disparities among marginalized populations.

Interventions relating to HIV prevention or HIV treatment must focus on broader political forces, particularly for trans individuals and individuals engaging in sex work. Future research and interventions must include how decriminalization of sex work can impact HIV transmission and HIV treatment among vulnerable populations. Estimates suggest that the decriminalization of sex work can decrease new HIV infections by 46% among individuals engaged in sex work and may reduce new HIV infections overall by 20% (World Health Organization, 2023). Further, trans populations experience a disproportionate burden of HIV infection compared to the general U.S. population (James, 2016). In addition to increased HIV risk, transgender individuals are at a nexus of political, cultural, and economic precarity that necessitates change. Future research and interventions need to explore how exclusionary policies towards trans populations can have

detrimental impacts on health outcomes and how to mitigate or reverse such exclusionary policies.

This dissertation utilized the 2015 U.S. transgender survey data to identify associations between policing, sex work, and HIV status. Another iteration of the U.S. Transgender Survey including data from 2022 will be potentially available by the end of 2023 (2022 U.S. Trans Survey, 2023). Future research can investigate trends in policing, sex work, and HIV status between 2015 and 2022. In addition, the role of policing can be further investigated among trans populations through the analysis of both surveys to increase the sample sizes for analysis.

5.6 Limitations

The findings from this dissertation provide important information to the extant literature on policing, sex work, and HIV status, but analyses included significant limitations. Several limitations need to be considered when interpreting the findings of this study. First, the logistic regression analysis was constrained by a relatively small sample size, which may affect the generalizability and power of the results. However, it is important to note that logistic regression is robust enough to accommodate smaller sample sizes (Bujang, Sa'at, Sidik, & Joo, 2018), and in this study, weights were applied to enhance the national representativeness of the sample. While this mitigates some limitations associated with small sample sizes, caution should still be exercised when generalizing the findings beyond the scope of the analyzed data.

The reliance on secondary data analysis, specifically utilizing the 2015 U.S. Transgender Survey, introduces inherent limitations. Primary data collection might have offered a more tailored approach to investigating HIV status among transgender individuals engaged in sex work. However, due to time and monetary constraints, this was not feasible. The constraints associated with secondary data analysis should be acknowledged, recognizing that primary data

collection might have provided a more comprehensive understanding of the complexities surrounding the variables under investigation. Further, the data was limited due to the self-reporting of both HIV status and testing, so individuals were excluded from analyses if they indicated they did not know of their status or previous HIV tests. The self-report nature of these primary outcome variables adds potential biases to the analyses.

Additionally, the cross-sectional nature of the data presents limitations in establishing causal relationships. Although the study aims to explore potential causal pathways through mediation analysis and structural equation modeling, the cross-sectional design inherently restricts the ability to infer causality (Gianicolo, Eichler, Muensterer, Strauch, & Blettner, 2020). As a result, the identified associations should be interpreted with caution, recognizing the temporal limitations of the data and the inherent challenges in establishing causation. Despite these limitations, the study contributes valuable insights into the interactions between street-based sex work, policing, and HIV status among transgender individuals, laying the groundwork for further research with more extensive methodologies.

Finally, due to the small sample size of individuals who have engaged in sex work along with individuals who were HIV positive, this dissertation was unable to investigate the relationship between policing and HIV status using structural equation modeling analysis. This small sample size did not allow for an appropriate diagrammatic mapping of the potential causal pathways towards HIV status among trans individuals. As such, the data contains significant limitations. However, due to this constraint, HIV testing was further investigated using mediation analysis to identify other structural factors related to HIV infection among trans individuals.

5.7 Conclusion

In conclusion, this dissertation has made significant strides in addressing critical gaps within the existing literature concerning the role of policing as a structural determinant of HIV status among individuals engaged in sex work. By employing a comprehensive approach, this study successfully utilized two quantitative methods—logistic regression analysis and mediation analysis—to explore the structural impacts of policing in a novel and integrated manner. The combination of these methods offers a nuanced understanding of the intricate relationship between policing and HIV status, particularly within the context of marginalized populations engaging in criminalized activities.

The findings of this dissertation extend beyond the boundaries of current literature by investigating policing as a potential mediating factor in determining HIV status. This nuanced perspective underscores the need for future interventions and policies to adopt a broader understanding of HIV prevention and treatment. It is imperative that these initiatives consider the structural determinants rooted in policing practices, recognizing their influence on health outcomes among marginalized populations involved in criminalized activities. Interventions at multiple levels, including political, law enforcement, and community levels, are essential to not only reduce HIV transmission but also to eliminate health disparities faced by transgender populations engaged in sex work.

This dissertation contributes to the growing body of knowledge that seeks to unravel the complex relationship between structural factors in policing, the criminalized nature of sex work, and HIV status among transgender populations engaged in sex work. The identified association between policing and increased odds of HIV infection among trans individuals in sex work, emphasizes the urgent need for targeted interventions at the policy and law enforcement level.

Moving forward, efforts should focus on dismantling the structural barriers at play and fostering a comprehensive approach that addresses the health disparities within this vulnerable population.

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Nathaniel J. Webb researches the intersection between the criminal justice system and public health. Additionally, Nathaniel is particularly interested in investigating health issues utilizing a structural lens including issues of policy, discrimination, and health justice. He brings a systems-level perspective to his research in order to identify health disparities among marginalized populations and create effective interventions to advance health equity.