

HIV TESTING AND ASSOCIATED CHARACTERISTICS AMONG BLACK CISGENDER
AND TRANSGENDER WOMEN IN THE UNITED STATES

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ABSTRACT

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Background: In the United States, Black cisgender and transgender women are disproportionately affected by HIV. HIV testing is one of the primary modes of HIV prevention, but a large majority of the HIV testing literature focuses on individual level risk behaviors. Furthermore, there is little known about HIV testing among Black transgender women. This study aims to contribute to the existing literature by (1) examining the HIV testing behaviors of Black transgender women (2) using socioecological theory to assess what sociodemographic factors are associated with HIV testing among Black cisgender and transgender women.

Methods: This study uses secondary data from the 2014-2017 modules of the Behavioral Risk Factor Surveillance System. Analyses included multiple hierarchical regression. **Results:** There are no major differences in HIV testing between Black cisgender and transgender women. A number of sociodemographic characteristics have been shown to predict HIV testing among Black cisgender women, but only employment status and age were significant predictors of HIV testing among Black transgender women. A moderation analyses suggested that gender identity significantly moderates the association between employment status and HIV testing such that the relationship between employment status and receiving an HIV test differs by gender identity.

Discussion: The findings of this study highlight nuances that are useful for improving HIV testing as a mode of HIV prevention. Overall, the findings contribute to our understanding of HIV testing practices among Black cisgender and transgender women.

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INTRODUCTION

Current estimates suggest that one in seven transgender (hereafter, trans) women have HIV (Becasen et al., 2019). It is suspected that the rates are even higher among Black trans women. HIV testing is an important step in prevention, yet there is a gap in the literature concerning HIV testing among Black trans women. In the current study, I examined HIV testing behaviors among Black trans and cisgender (hereafter, cis) women. Specifically, I examined whether rates of HIV testing vary between groups and whether HIV risk is a particularly strong predictor of HIV testing among these groups.

The Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) epidemic is a major health concern in the United States. The overall health and well-being of Black Americans is threatened by HIV as they bear the largest burden of HIV in the United States. It is estimated that one in seven Black Americans do not know that they are infected; therefore, they are not receiving treatment and are likely to continue to engage in risky sexual behaviors that further contributes to the increased rates of HIV in the Black community (Centers for Disease Control and Prevention [CDC], 2019b; Marks et al., 2005). The prevalence of HIV/AIDS among Black women is particularly alarming (Prejean et al., 2011) with Black women comprising 11% of all new HIV diagnoses and 60% of HIV diagnoses among all American women (CDC, 2018). At one point, Black women had 46 times greater odds of testing positive for HIV compared to White women (Operario et al., 2015). Among Black women, the rates of infection are 15 times higher than White women and five times higher than Latina women (CDC, 2019b). In recent years, the rate of infection among Black women has declined but is still significantly higher than other ethnicities (CDC, 2019a).

Trans women, women who were assigned male at birth but currently identify as female,

are considered to be high risk for HIV and are 34 times more likely to acquire HIV in the United States relative to the general population (Baral et al., 2013b; Clements-Nolle et al., 2001). Similar to trends among Black cis women, Black trans women are more susceptible to HIV infection. The literature suggests that of all racial and sexual minority groups, Black trans women are the most susceptible to HIV infections and diagnosis (California Department of Health Services, 2006; Herbst et al., 2008; Hwahng & Nuttbrock, 2007). Research attributes the high rates of HIV among Black trans women to factors such as inflated rates of unstable housing, poverty, stigma, high levels of engagement in sex work, riskier sexual behavior, substance abuse and intravenous drug use (De Santis JP, 2009; Hwahng & Nuttbrock. 2007; Reback & Fletcher, 2014; Sevelius et al., 2009; Wansom, Guadamuz, & Vasan, 2016).

The needs of trans communities are distinct and independent from those of other groups, and thus require a separate analysis from the typical, dichotomous understanding of gender (World Health Organization, 2014). Often times, research exploring HIV among trans women has not been distinguished from findings on HIV among men who have sex with men (MSM) (Frye et al., 2015; Golub & Gamarel, 2013; Muessig et al., 2014; Poteat, German, & Flynn, 2016). HIV research that presents trans women and MSM in the same analysis leaves unanswered whether trans women are at a uniquely higher risk of HIV. It is crucial to conduct HIV research that focuses explicitly on trans women, as studies have demonstrated that discrimination, stigma, and social oppression of individuals with marginalized identities may be a more significant determinant HIV testing and acquisition than the aforementioned risk behaviors (Peterson et al., 2014; Ransome et al., 2016b).

LITERATURE REVIEW

HIV is transmitted perinatally or through bodily fluids (e.g. blood, semen, vaginal fluids, rectal fluids, breast milk) from a person living with HIV (PLWH). In the United States, HIV is most commonly spread by having unprotected sex with a PLWH who is not on HIV treatment medication. There is a myriad of factors that can contribute to one's risk of acquiring HIV. Research has consistently pointed to both psychosocial factors and ecological processes as determinants of HIV risk (Gerbi et al., 2012; Harper et al., 2013; Latkin et al., 2013; Roy et al., 2012). In many instances, psychosocial factors and ecological processes have a reciprocal relationship with HIV risk. That is, individuals who are at high risk of HIV acquisition because of certain psychosocial factors are also affected by ecological processes that contribute to their high-risk status.

Psychosocial Determinants of HIV Acquisition

Psychosocial factors contribute to HIV acquisition. Psychosocial factors are generally conceptualized and measured at the individual level, meaning they are primarily comprised of behavior, attitudes, and personal characteristics. Factors can include self-efficacy, perceived vulnerability, and risk behaviors such as multiple sexual partners, condomless sex, alcohol and substance use while engaging in sex, and sharing needles (DiClemente et al., 2008; Faryna & Morales, 2000; Pellowski et al., 2013; Pflieger et al., 2013; Qiao, Li, & Stanton, 2014; Roberts & Kennedy, 2006; Roy et al., 2012). According to Gerbi et al. (2012), psychosocial problems exhibited through depression, alcohol consumption, and a loss of interest in life are highly related to HIV risk behaviors like intravenous drug use, sharing needles, and multiple sex partners. For example, Gerbi and colleagues (2012) argue that psychosocial conditions like depression, for example, can impair cognitive functioning and inhibit one's decision to practice

safe behaviors, leading to engagement in HIV risk behaviors. Furthermore, social conditions such as unemployment are associated with other social determinants of health including an elevated risk for HIV (Bowleg & Raj, 2012; Nuttbrock et al., 2009).

Studies of perceived HIV risk and vulnerability have varied findings. Studies on the relationship between self-efficacy, social support, and HIV risk generally suggest that high levels of social support and self-efficacy are protective against HIV and low levels of social support and self-efficacy present as an HIV risk (Baral et al., 2013a; Kang et al., 2004; Lauby et al., 2012; Qiao, Li, & Stanton, 2014; Ramiro et al., 2013). When exploring risky sexual behaviors associated with HIV acquisition, one study found that high levels of perceived vulnerability were associated with engagement in more risky sex behaviors (Roy et al., 2012). On the contrary, more recent studies have shown that individuals often underestimate their perceived risk and thus continue to engage in risky behaviors (Pringle, Merchant, & Clark, 2013; Stephenson et al., 2015). This underestimation of HIV risk creates a gap in HIV testing and leaves room for HIV transmission (Nunn et al., 2011). Ultimately, the literature suggests that while psychosocial factors are not a direct cause of HIV, they largely influence engagement in HIV risk behaviors. Therefore, exploring the impact of psychosocial factors is crucial to a comprehensive understanding of the HIV epidemic.

Ecological Processes of HIV Acquisition and Prevention

In recent years, researchers have begun incorporating an ecological perspective to understanding the HIV epidemic. The ecological lens includes an analysis of factors beyond the individual and considers societal and community-level factors. There is no sole definition of what are considered ecological processes, but they can include economic, social, political, and organizational factors that contribute to social inequities and health disparities (Baral et al.,

2013a; Harper et al., 2013; Logie et al., 2016). Social inequities themselves do not lead to health disparities; however, they can increase vulnerability to certain diseases. For example, a community environment that is low in socioeconomic status, education, and high in poverty may have higher rates of HIV, as residents may not have access to condom education or health facilities (Bärnighausen & Tanser, 2009; Pellowski et al., 2013).

Access to healthcare is a key component of HIV prevention. Having access to adequate healthcare could potentially provide services that address HIV risks such as substance use or a positive HIV diagnosis (Baral et al., 2013a). While HIV stigma has been primarily studied with regard to experiences of people living with HIV, HIV-related stigma and discrimination have also been cited as an ecological determinant of HIV acquisition (Gesese et al., 2017; Yakob & Ncama, 2016).

Geographic location is also an important factor to consider when examining the ecological processes of HIV acquisition and prevention. In the United States, HIV is primarily concentrated in urban areas (Hall et al., 2010). Given this, where one resides may play an important role in HIV acquisition and transmission dynamics. In general, the scientific literature has reported that geographic location has an influence on sexual and reproductive healthcare access and utilization (Weiner, 2010; Yao et al., 2012; Yao et al., 2013). More specifically, geographic location has been reported to influence processes at the prevention and treatment stages of HIV care. Interestingly, Freeman et al. (2010) found that PLWH presumed they would receive a lower quality of care because of their geographic location. Further research about HIV treatment and prevention programs has suggested that many efforts are concentrated in urban areas, with less of a focus on prevention in rural areas (Foster et al., 2011; Kempf et al., 2010; Tripp-Reimer et al., 2001). One recent study on metropolitan status and the HIV care continuum

indicated that those in metropolitan areas have significantly higher levels of retention in care and viral retention than those in rural and urban areas as a result of more available treatment programs (Nelson et al., 2018)

Specific Risk Factors for Black Adults

The interdependence of psychosocial factors and ecological processes contributes to HIV risk among Black adults. Much like the general population, Blacks experience risk at the individual (e.g. substance use, unprotected sex), social (e.g., sexual networks, concurrent partnerships), community (e.g., residential segregation), and societal (e.g., social inequality, de facto racial segregation, and income inequality) levels (Adimora et al., 2009; Adimora et al., 2014; Alleyne & Wodarski, 2009; Brooks et al., 2013; Earnshaw et al., 2013; Hogben & Leichter, 2008; Holtgrave & Crosby, 2003; Robinson & Moodie-Mills, 2012; Ward & Rönn, 2010; Williams & Collins, 2016).

Interestingly, evidence has consistently cited that, although Blacks have a higher prevalence of HIV, they engage in *fewer* risk behaviors than members of other racial/ethnic groups (Brooks et al., 2013; Hallfors et al., 2007; Mustanski et al., 2019). It is important to examine both psychosocial factors and ecological processes and their connections to better understand the epidemic among members of the Black community. It is worthwhile to acknowledge that social support has frequently been cited as being instrumental in Black communities, and perhaps a buffer to other risks that Black people may face (Bowleg et al., 2013; Galvan et al., 2008; Grieb, Davey-Rothwell, & Latkin, 2012).

HIV in the Trans Community

Recent studies have suggested that between 1 and 1.4 million Americans identify as trans (Flores et al., 2016a; Meerwijk & Sevelius, 2017). An estimated 55% of trans people are White,

16% are Black, 21% are Latinx, and 8% identify as another race (Flores et al., 2016b). Additionally, research suggests that Black or Latinx people are more likely to identify as trans compared to White people (Flores et al., 2016b). The trans community worldwide is disproportionately affected by HIV. In recent years, the focus has begun to move towards acknowledging the epidemic in the trans community. In 2016, the World Health Organization (WHO) released guidelines on HIV prevention and treatment for key populations and included specific recommendations for the trans community for the first time (WHO, 2016). A 2012 meta-analysis of HIV burden among trans women worldwide indicated that trans women are 48 times more likely to contract HIV compared to other adults of reproductive age. The findings from this study emphasize the severity of HIV that is consistent across the trans community in several countries, including the United States (Baral et al., 2013b). Individuals who identify as trans are estimated to account for less than 1% of the adult population in the United States, however; between 25%-28% of this population is estimated to be HIV positive (Becasen et al., 2019). Between 2009 and 2014, 2,351 trans people were diagnosed with HIV (CDC, 2019c). Across all HIV testing events reported to the CDC, the percentage of new trans HIV diagnoses was 3 times higher than the national average (CDC, 2019c).

Trends indicate that trans women have an increased prevalence of HIV compared to trans men (Herbst et al., 2008; CDC, 2011; Baral et al., 2013b). Some findings estimate that trans women have 34.2 times higher odds of being HIV positive compared to the general adult population in the United States (Baral et al., 2013b). Moreover, racial disparities persist in the distribution of HIV among trans women. Much like HIV among Black cis women, rates of HIV are even more concentrated among Black trans women (Garofalo et al., 2016; Herbst et al., 2008; Nuttbrock et al., 2009; Operario et al., 2011). The report of the National Transgender

Discrimination Survey found that 24.9% of the Black respondents were HIV positive and 10% did not know their HIV status (Grant et al., 2011). This is particularly alarming given that Black trans women make up less than 16% of the trans population in the United States. It is imperative to understand psychosocial factors and ecological processes associated with HIV prevention and acquisition in order to promote health and well-being among Black trans women and the trans community more broadly. Limited research explores HIV risk factors among Black trans women, but research among Black cis women can provide some insight.

HIV Risk Factors for Black Women

Unique HIV risks are associated with gender identity. HIV risks are elevated for individuals with marginalized racial and gender identities, like Black women. Even at the beginning of the HIV epidemic, there were little to no guidelines or recommendations for women to prevent transmission or engage in effective management. Although the needs of women have since become visible within the HIV continuum of care, women still face relatively different risks than men. Understanding the unique risks that women are faced with requires an acknowledgment of power dynamics and various sociocultural issues.

Gender ratio. Some researchers suggest that the imbalanced sex ratio of more women than men in the Black community increases vulnerability to HIV risk for Black women (El-Bassel et al., 2009; Newsome & Airhihenbuwa 2013; Newsome, Davis, & Dinac, 2015; Pouget, 2017). The social dynamics around an uneven sex ratio often leads to limited partner availability and concurrent sexual partnerships. Concurrent and other sexual partnerships that overlap in time are more likely to result in HIV transmission than if the relationships were to be exclusive or occur sequentially (Morris & Kretzschmar, 1995).

Another interesting point to consider is that cis Black women are more likely than other races and ethnicities to choose a Black male partner (Yancey, 2009). With limited availability of Black men, sexual networks become smaller and carry a greater potential for HIV transmission. Black men are at a place of privilege with the ability to negotiate the terms of the relationships since there is a larger demand for Black men than there are available. Ultimately, this gives men the power and decision-making ability in the relationship (Newsome & Airhihenbuwa, 2013). Wingood and DiClemente (2000) argue that the more power men have in relationships, the greater the health risk for women.

Safe sex negotiation. The male condom is considered to be a primary form of HIV prevention. While Black people are not less likely to use condoms compared to other racial groups (Essien et al., 2005; Kusunoki et al., 2016), a growing body of evidence has highlighted the inability to engage in condom negotiation as an HIV risk factor for Black women. Condom negotiation is directly influenced by power and gender roles. The ability to negotiate condom use or safe sex practices, in general, may be difficult for many Black women in situations where the man has the power in the relationship (Adimora, Schoenbach, & Doherty, 2006). Several qualitative studies have found that fear of losing a relationship may influence a woman's ability to negotiate condom use (Jarama et al., 2007; Smith, 2015). Other evidence suggests that a woman's preference for condom use could be largely influenced by her male partner's preference (Newsome, Davis, & Dinac, 2015).

Intimate partner violence. Intimate partner violence (IPV) is more prevalent among Black women than other racial groups (Black et al., 2011; The Status of Black Women in the United States, 2017) and is associated with negative health outcomes including HIV (Montgomery et al., 2018; Renzetti, 2013; Shrestha & Copenhaver, 2016) There is some

evidence that IPV through the form of forced sex increases women's vulnerability to HIV (Campbell et al., 2013). First, forced sex limits a woman's ability to negotiate options for safe sex (Campbell et al., 2013; Miller et al., 2007). Campbell and colleagues (2013) also argued that physically forced sex can lead to increased physiological susceptibility to HIV. There are also implications for increased HIV risk behaviors among victims of IPV and their partners who are perpetrators of IPV. IPV could be associated with multiple sexual partners and inconsistent condom use (Seth et al., 2010; Silverman et al., 2011). Results from a cross-sectional study found that some HIV risk behaviors (e.g., exchanging sex and binge drinking) are correlated with increased odds of violence occurring across six months (Montgomery et al., 2018), further complicating the relationship between IPV and HIV risk. Black women who reported experiences of IPV, specifically physical abuse, often also reported some degree of sexual coercion (Josephs & Abel, 2009). Ultimately, IPV presents as an HIV risk that largely influences women's sexual decision-making ability.

HIV Testing

HIV testing is key in reducing the amount of future HIV diagnoses and increasing HIV prevention efforts. As previously stated, 1 in 7 Black Americans who are HIV positive do not know that they have been infected (CDC, 2019b), and having an unknown HIV status a major contributing factor for increased risk in this population. Furthermore, treatment for HIV is solely dependent on a positive HIV diagnosis—people need to know they have it to seek treatment (Beckwith et al., 2005; CDC, 2019b). Early detection of HIV allows for the implementation of antiretroviral treatment while the CD4 count is still high, thus decreasing the chance of transmission while improving life expectancy and other long-term health outcomes (Insight Start Study Group, 2015; Rutstein et al., 2017).

In 2006, the CDC released recommendations for HIV testing recommending that all individuals 13-64 years old be tested for HIV. Individuals who are considered to be high risk (e.g., injection drug use, exchanging sex for money or drugs, having sex with an HIV infected person, being a man who has sex with other men, or having multiple sexual partners) should be tested for HIV at least annually (Branson et al., 2006). The National HIV Surveillance System (NHSS) and the National HIV Behavioral Surveillance System indicated that many high-risk individuals are not being screened annually, leading to continued late HIV diagnosis (Dailey et al., 2017).

HIV testing among Black cis women. Studies have shown that delayed HIV diagnosis is common among Black women, further contributing to morbidity and mortality rates (Chopel et al., 2015; Stein, 2016). In a study on HIV Testing and service delivery among Black females in the United States, researchers analyzed National HIV Prevention Program Monitoring and Evaluation data that focused on HIV prevention and testing services funded by the CDC. The results indicated that from 2012-2014, the HIV rates among Black women remained stable, yet the number of HIV testing events among Black women slightly declined (Stein, 2016). A decline in HIV testing events for Black women presents a potential challenge to addressing the HIV disparity among Black women. Missed opportunities for HIV testing through organized testing events could possibly lead to late diagnoses (Duffus et al., 2012; Liggett et al., 2016). In other words, without opportunities for testing, women may be less likely to get tested, and this could lead to late diagnosis if they are HIV positive.

Literature also cites structural factors that contribute to delayed HIV testing and relatedly delayed HIV diagnosis (Chopel et al., 2015; Ransome et al., 2016a; Ransome et al., 2016b). For instance, neighborhood income, inequality, low socioeconomic status, and high concentration of

Black individuals living in an area have been associated with late HIV diagnosis (Ransome et al., 2016b). At the same time, neighborhoods with the highest concentration of Blacks were also associated with a higher risk of late HIV diagnosis (Ransome et al., 2016a). Both Black cis and trans women may be more likely to have delayed HIV testing because of “racialized risk environments” (Ransome et al., 2016b, p.4) which can be impacted by stigma, social networks, attitudes, incarceration, and discrimination (Cooper et al., 2016; Pouget et al., 2010). While Black racial concentration within communities is shown to be a significant determinant of late HIV diagnosis, it is important to explore literature on other correlates of HIV testing for Black people.

In a systematic review of social determinants of late HIV testing among Blacks and Latinos, researchers utilized a socio-ecological framework to determine how factors at the individual, community, and societal levels interact and influence each other. Researchers noted that a large amount of the literature only focused on individual-level factors (Chopel et al., 2015). Individual-level factors included health behaviors, attitudes towards testing, and HIV knowledge. A few studies in the review cited access to testing, targeted HIV prevention efforts, and health care as community-level factors. Fewer studies recognized societal factors and their interplay with HIV testing disparities and late HIV diagnosis. Researchers highlighted a 2005 study in which there were strong associations between structural factors and a timely HIV diagnosis compared to associations with individual-level factors (Bond et al., 2005). Incarceration, drug treatment programs, access to healthcare, opportunities for testing, and prenatal testing requirements were all defined as structural level factors (Bond et al., 2005).

HIV testing among Black trans women. Currently, there is very little known about HIV testing patterns among trans individuals. Some of the known correlates of HIV testing among

trans women include HIV knowledge, sex work, perceived HIV risk, age, and having a healthcare provider (Logie et al., 2016; Rutledge et al., 2018). Habarta and colleagues (2015) conducted a quantitative study of CDC-funded testing events to examine the association between sociodemographic risk characteristics and a positive HIV status among trans women. Compared to cis individuals, a large amount of HIV testing events for trans individuals were conducted in non-healthcare settings. The researchers cited a lack of health insurance and trans discrimination as possible reasons that trans individuals may test in non-healthcare settings (Habarta et al., 2015). Other studies describe access to care as a contributor to HIV testing behaviors among Black trans women (Bukowski et al., 2018). An analysis of HIV testing among urban trans individuals found that among trans people, characteristics like identifying as female, Black, having a positive HIV status, a history of incarceration and sex work, or stable housing were associated with higher numbers of HIV testing (Juarez-Cuellar & Chang, 2017). To be more specific, in this sample, Black participants had the highest number of HIV tests compared to other racial groups. Understanding the testing behaviors of Black trans women, the ways in which sociodemographic characteristics, structural level factors, and their interaction influence their HIV testing behaviors would be useful in preventing late diagnoses and improving overall HIV outcomes for Black trans women. A better understanding of HIV testing among Black trans women and acknowledging the differences from cis women would help inform specific interventions for Black trans women.

Gender Minority Stress and Stigma

Gender minority stress and stigma are two important factors to consider when working with one of the target populations of this study. The concept of gender minority stress emerged from a study that discovered that identification with a minority sexual orientation creates a

unique set of stressors as a result of having a sexual minority identity (Lindquist & Hirabayshi, 1979). Ultimately, gender minority stress has been shown to have a negative effect on the well-being of lesbian, gay, and bisexual populations, including adverse mental and physical health outcomes (Kelleher, 2009; Meyer & Frost, 2013). More recent research has extended the concept of gender minority stress and stigma to include trans individuals (Adrinopoulous et al., 2015; Bockting et al., 2013; Hendricks & Testa, 2012; Reisener et al., 2014; Testa et al., 2015). The findings from these studies suggest that the stressors and stigma experienced by sexual minorities can also be experienced by gender minorities. Researchers have also identified unique stressors that are specific to trans and gender-nonconforming people (Sevelius, 2013; Hendricks & Testa, 2012; Testa et al., 2015). To be specific trans individuals may experience external events consisting of transphobia, discrimination based on trans identity, and even violence or hate crimes because of bias towards trans people (Hendricks & Testa, 2012). It is also possible that trans individuals may begin to expect future stressful external events, causing greater attempts to hide their trans or gender non-conforming identity (Hendricks & Testa, 2012). Hendricks and Testa (2012) also suggested that trans people may internalize transphobia as a result of stress and stigma.

While this study does not incorporate a gender minority stress and stigma theoretical framework, they are still worth considering. Within the context of this study, it is important to acknowledge that Black trans women may struggle with a different set of social challenges that influence their experiences with HIV testing. For example, a systematic literature review on attitudes towards lesbian, gay, bisexual and transgender (LGBT) patients revealed that all articles in the review reported the presence of negative attitudes towards LGBT patients (Dorsen, 2012). Although literature on trans discrimination in healthcare settings is limited, another study found

that LGBT medical providers reported noticing discriminatory care of an LGBT patient (Eliason, Dibble & Robertson, 2011). These types of experiences may discourage HIV testing among Black trans women.

Intersectionality and the HIV Care Continuum

Both cis and trans Black women are at the intersection of multiple marginalized identities of gender, race, and sex. From an intersectional lens, no single identity or form of oppression is more salient than the other. An intersectional approach acknowledges that identities are fluid, constantly changing, and often shaped by power dynamics (Crenshaw, 1990). As explained by an ecological perspective, barriers or factors associated with HIV testing operate on multiple levels. Oftentimes, mesosystem level characteristics, like engaging in sex work or a lack of engagement with healthcare professionals, are linked to individual identities at the microsystem or individual level (Bowleg, 2012; Gwadz et al., 2018)

Though intersectional approaches have been used to study stigma and the HIV care continuum (Gwadz et al., 2016; Rao, Andrasik, & Lipira, 2018; Watkins-Hayes, 2014), there is a dearth of literature that focuses on intersectionality and HIV testing specifically. Rao and colleagues (2018) point out the problematic nature of much of the existing HIV research in treating gender and race as discrete categories. Race and gender should not be isolated and viewed as mutually exclusive contributors to health outcomes. Another study suggests that the HIV/AIDS epidemic in the United States is driven by intersected inequality based on gender, sex, race, and class as well as sexual inequalities at multiple levels (Watkins-Hayes, 2014).

Existing studies that assess intersectionality and HIV testing specifically examine intersectional stigma and HIV testing. Intersectional stigma is defined by an experience of a combination of HIV stigma, racial, sexual orientation, and/or gender-based stigmas (Gupta,

2018). One qualitative study that examined how multiple types of stigma affects marginalized individuals found that racism, homophobia, and HIV-related stigma are barriers to HIV testing (Arnold, Rebchook, & Kegeles, 2014). Although participants experienced support from their family or churches as a buffer against racism, participants indicated that they experienced homophobic and HIV-related stigma from these very same entities (Arnold, Rebchook, & Kegeles, 2014). In a similar qualitative study, researchers found that the compounded effect of HIV related stigma and other types of social stigma deterred HIV testing (Gwadz et al., 2018). In this study particularly, participants were faced with racial and socioeconomic/classist-based stigma. Participants neglected HIV testing out of fear of the ways that a positive result would lead to further stigma, discrimination, and poverty (Gwadz et al., 2018). Based on these studies, capturing the intersection of identities is beneficial for understanding health risks, disease transmission, and overall health outcomes of Black women who hold multiple marginalized identities.

While intersectionality is being used across a variety of fields, some studies have highlighted the methodological challenges of studying intersectionality because of its complexity (Bowleg, 2012; McCall, 2005). One recurring critique is that an intersectional approach is better suited for qualitative or mixed methods (Bowleg, 2008; Bowleg, 2012; Shields, 2008; Syed, 2010). On the other hand, some researchers suggest that intersectionality is not either a “quantitative or qualitative methodology,” it is an informed approach to research committed to understanding how identities in multiple social categories influence health disparities (Bowleg, 2012; Else-Quest & Hyde, 2016). Utilizing an intersectional approach would involve understanding social categories as a part of the individual while also acknowledging social categories as a part of a social context (Else-Quest & Hyde, 2016). Intersectional research

requires that one analyzes data about gender, ethnicity, race, class, sex, disability status, and sexual orientation, while acknowledging how those identities are connected (Bowleg, 2012). Despite the complexity of intersectionality, researchers with an interest in Black women (cis and trans) should embrace intersectional theory in their work.

Theoretical Approaches

Guided by an intersectional approach and ecological theory, this quantitative study evaluated a variety of sociodemographic factors characterized by one's individual and community-level influences and their association with HIV testing. This study only looked at variables in the individual and community levels of the Modified Socio-Ecological Model.

Modified Socio-Ecological Model. It is important to acknowledge that the disparities around the HIV epidemic and HIV testing are not caused by a single factor. These disparities can be attributed to larger macro level factors such as history, politics, and social issues, or smaller micro level factors like individual behaviors. Although trans women only make up a small percentage of the population in the United States, many studies have demonstrated that trans women, and Black trans women in particular, face significant amounts of systemic oppression that has led to devastating health outcomes among the population (Grant et al., 2011; Reisner et al., 2016). A socio-ecological framework allows for analysis of the ways that societal, individual, interpersonal, and community factors influence health (Bronfenbrenner, 1994). Socio-ecological models also capture the complex associations between the different levels of factors, all while considering context. Furthermore, using a socio-ecological model is useful in developing sustainable and effective interventions that address all levels of factors.

Previous studies have cited Bronfenbrenner's Ecological Systems Theory (EST) as a useful theoretical framework for understanding risk, protective factors, and barriers along the

HIV care continuum. This is because the theory allows for the examination of individuals within a given context while also examining the mutual relationship between individuals and their environment (Harper et al., 2014; DiClemente et al., 2007). In 2013, Baral and colleagues built upon EST and developed the Modified Socio-Ecological Model (MSEM) (Baral et al., 2013a). In their model, Baral et al., (2013a), examine the multiple layers that influence HIV risk. Similar to EST, this model proposes that both individual and higher societal and structural level factors influence HIV risk. The MSEM includes five stages: the individual stage, the social and sexual networks stage, the community stage, the public policy stage, and the HIV epidemic stage. Individual-level factors include increased biological susceptibility to HIV or individual behaviors that increase risk for HIV (Baral et al., 2013a; Poundstone et al., 2004). Social and sexual networks are defined by relationships with family, friends, neighbors, or any other intrapersonal relationship that influence health or health behaviors. Sexual networks within the MSEM are defined as a group of people that have a higher chance of exposure to infection either through sexual contact or sharing needles. In the context of the MSEM, community is comprised of culture, religion, access to care, and political or geographic regions. Risk for marginalized populations is directly and indirectly influenced by laws and policies. Laws and policies can either facilitate health promotion or limit the community's ability to decrease risk. The final level, the stage of the epidemic is what determines the risk of acquiring an illness (Baral et al., 2013a). While each of the other stages provides a condition that either increases or decreases the odds of acquiring a disease, the stage of the epidemic determines quantified risk as defined by incidence and prevalence. Simply stated, the epidemic stage is the incidence and prevalence at the population level. An adapted version of the MSEM will be used as a theoretical framework for this study.

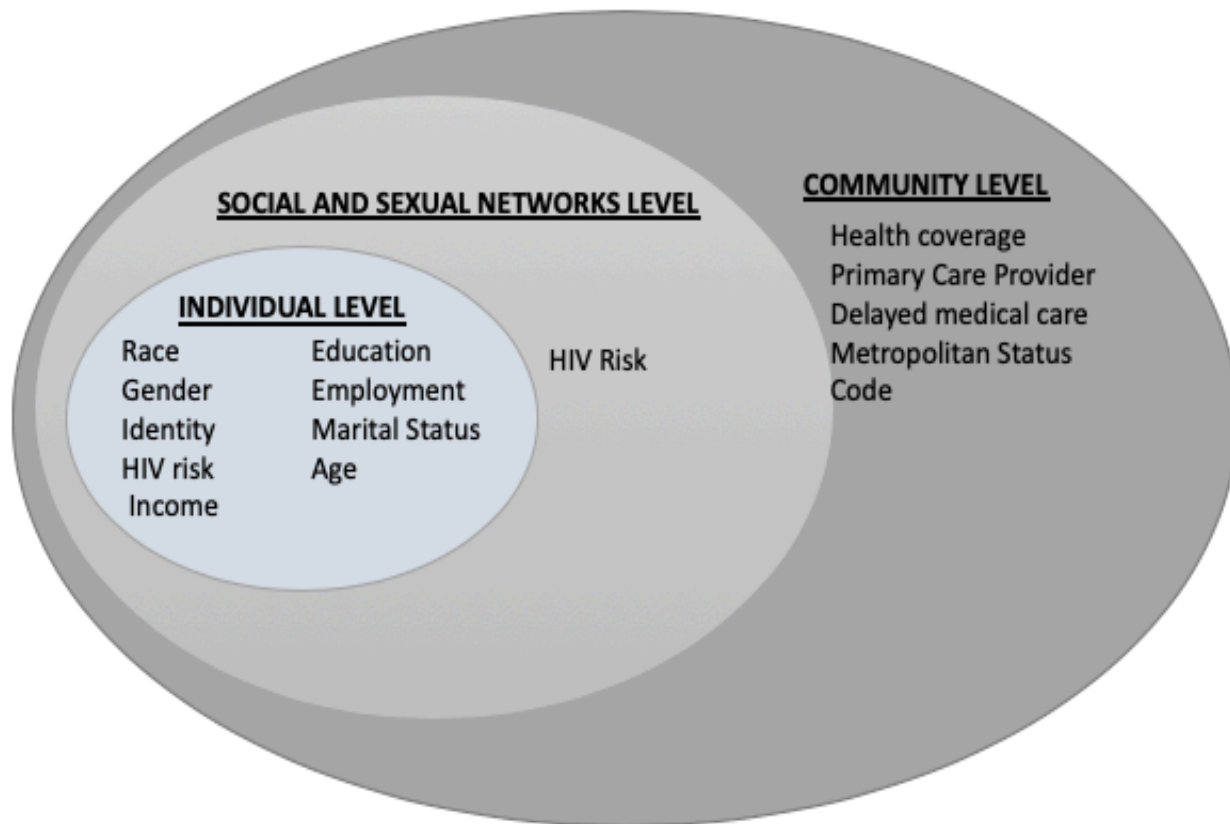


Figure 1. *A socio-ecological perspective of HIV testing predictors.* (Adapted from Baral et al., 2013a).

THE CURRENT STUDY

In order to reduce gaps in the literature and advance HIV research among Black cis and trans women, the current study aimed to explore HIV testing trends and related sociodemographic factors among Black cis and trans women. The HIV testing trends and related sociodemographic factors from both groups will be analyzed together and separately to help elucidate similarities and differences amongst these populations. Using data from the Behavioral Risk Factor Surveillance System (BRFSS), this study examined the following research questions:

1. What are the HIV testing behaviors among Black trans women?
 - a. To what extent do HIV testing behaviors differ between cis and trans Black women?
2. What sociodemographic factors are associated with HIV testing among Black trans women?
 - a. Does gender identity moderate or influence the relationship between sociodemographic factors and HIV testing behaviors?
3. To what extent does engagement in high risk behavior affect HIV testing behaviors differently for cis and trans Black women?

I hypothesize that 1) Black trans women are significantly less likely to have received an HIV test in their lifetime compared to their Black cis women counterparts 2) gender identity will significantly moderate the association between sociodemographic factors and HIV testing, and 3) both cis and trans women who engage in high risk behaviors will be less likely to receive an HIV test.

METHODS

This study used secondary data from the BRFSS to explore HIV testing behaviors, the association between sociodemographic factors and HIV testing, and the association between high risk behaviors and HIV testing among Black cis and trans women. This study received approval from the Institutional Review Board at MSU (MSU STUDY ID: STUDY00003157).

Sample

The sample for this study was constructed from participants in the CDC's 2014-2017 BRFSS modules, a national telephone survey that assesses health risk in the United States. The 2014-2017 BRFSS modules were administered to non-institutionalized adults (i.e., age ≥ 18) in the United States. Across all four years, there was a total of 1,842,439 participants in the BRFSS modules. Participants were contacted via cell phone and landlines. Disproportionate stratified sampling was used for landline samples and simple random sampling was used for cellular samples. The median response rate for cellphones and landlines 2014-2017 was 46.13% across all states. Only self-identified Black women were selected for this study ($n = 36,056$). A subpopulation of trans women ($n = 170$) was drawn to examine the odds of a lifetime HIV test and associated sociodemographic factors among Black trans women alone.

Measures and Variables

The data for this study focused on sociodemographic characteristics, gender identity, HIV risk, and HIV testing behaviors. Sociodemographic variables, gender identity, and receiving an HIV test were asked in each year that was used for this study. HIV risk was only assessed in 2016 and 2017. The variables selected for this study were chosen to evaluate the association between gender identity and receiving an HIV test, while also comparing if the associations between sociodemographic variables and risk were the same for Black cis women and Black

trans women. The primary outcome variable was self-reported HIV testing behavior, which assessed if one has ever received an HIV test in their lifetime. Predictor variables included gender identity, HIV risk, sex, and race. Sociodemographic characteristics were also included as covariates to assess their impact on HIV testing behaviors. Variables are outlined in Table 1.

Table 1.

Study variables, operationalization, and measurement

Variable	Operationalization and Measurement
<i>Outcome Variable</i>	
Taking an HIV test	One item that assesses if participant had ever been tested for HIV (two categorical options; yes or no).
<i>Predictor Variables</i>	
Transgender status	One item where participants reported whether or not they identify as transgender (two categorical options; yes or no). If yes, participants were asked if they considered themselves to be male-to-female-, female-to-male, or gender non-conforming).
HIV Risk	One item where participants responded to if a certain situation replied to them (three categorical options)/
Sex	One item where participants indicated their sex (two categorical options; yes or no).
Race	One item where participants reported their preferred race category (six categorical options, mark all that apply).
<i>Covariates</i>	
Age	One item where participants reported their age (continuous).

Table 1 (cont'd)

Primary Care Provider	One item where participants indicate if they have one person they think of as their personal doctor or health care provider.
Delayed care	One item where participants reported reasons for delaying medical care in the past twelve months (five categorical options).
Health Plan	One item where participants indicated if they have any type of health coverage (two categorical options; yes or no).
Metropolitan Status	One item where participants report their metropolitan statistical area (four categorical options).

Data Preparation and Management

The data for the 2014-2017 BRFSS modules were downloaded by year from the CDC’s website and stored in SPSS. The data files for each year were then merged into one, matching by variable. Prior to data analysis, I removed all of the additional variables that would not be included in the analysis. All data analyses were conducted using SPSS software.

Missing Data

Missing data analyses were conducted on the outcome variable and all sociodemographic values. In order to conduct the missing data analysis, I created a dummy variable for cases with missing values and non-missing values for the outcome variable. I then conducted an independent samples *t*-test between the missing dummy variable, income, education, and age. The results of the *t*-test suggested that the mean scores between the missing and non-missing values for income were not statistically significant, $t(31,205) = .281, p = .78$). The results for education were also nonsignificant, indicating that there was no statistically significant difference between the missing and non-missing values for education, $t(944.83) = 1.23, p = .22$). However, the results for age were significant, $t(-12.26) = 958.16, p < .001$). Because the results

were statistically significant, I computed Cohen's d to determine the effect size of the differences. The Cohen's d for the difference between missing and non-missing age values was .40.

Next, I conducted a chi-square test between the "missing" dummy variable and employment level, marital status, metropolitan status, health care coverage, primary care, and delaying care. The results of the chi-square test suggest that the missing data were less likely to come from those who were unemployed compared to those without missing data, [$\chi^2(3) = 76.62, p < .001$.] Among participants who are not married a greater percentage reported non-missing data compared to participants with missing data, [$\chi^2(2) = 29.61, p < .001$.] The two groups are similar as far as their metropolitan status ($p = .287$). Additionally, participants were more likely to have health care coverage [$\chi^2(1) = 7.88, p = .005$] and a primary care doctor in comparison to participants without missing data [$\chi^2(2) = 11.22, p = .004$]. The difference between the two groups is relatively small because a large proportion of the sample reported having primary care doctors. The two groups were comparable in their delay of care ($p = .609$).

Data Analysis

I used logistic regression to complete all hypothesis testing. Prior to completing the hypothesis testing, I recoded my categorical variables using the dummy coding method. Age was recoded into three categories (18-34 years old, 35-49 years old, 50 years or older). Originally, BRFSS had six categorical options for education, the items were recoded into two categories (high school or less, college or more). The items for employment were recoded from eight categorical options into three categorical options (employed, unemployed, retired and other [students and home makers]). Marital status was recoded into three categorical items (married/partnered, not married, widowed). Metropolitan status was recoded into three

categorical items (metropolitan, suburban, not metropolitan). Having a primary care doctor, health insurance, and delaying care were all coded dichotomously (0=no 1=yes). To answer my first research question, I reported the descriptive statistics of HIV testing for trans Black women. To answer the second part of my first research question, I ran a logistic regression with gender identity as a predictor of HIV testing. For research question two, I ran a logistic regression with gender identity, age, income, education, employment status, marital status, health care coverage, metropolitan status, having a primary care provider, and delaying medical care as predictors. I aggregated the results by gender identity, so that I could analyze the effects of the sociodemographic predictors for both gender identities separately. I then created interaction terms between each of the statistically significant sociodemographic predictors and gender identity to determine if gender identity moderated the relationship between the sociodemographic predictors and HIV testing. For my third research question, I entered HIV risk into the model as a predictor and created an interaction term between HIV risk and gender identity.

RESULTS

In this section I will describe the demographic characteristics of the sample, followed by the results of hypothesis testing.

Sociodemographic Characteristics

The sample included of a total of 32,226 Black women (see Table 1). Of that number, 99.5% ($n = 36,056$) were cis women and 0.5% ($n = 170$) identified as trans women. The sample ranged in age from 18 to 80 years ($M = 55.36$, $SD = 17.09$). The majority of the sample was married or partnered (56.3%). Approximately 35.1% of trans women had completed college or more compared to 59.1% of cis women. Among trans women, 47.5% of the sample had an income of \$20,000 or less, compared to 28.4% of cis women with an income level of \$20,000 or less. Approximately 45.8% of the sample was employed, and 70.9% lived in a metropolitan area.

Table 2.

Sociodemographic characteristics of Black women by gender identity

Sociodemographic characteristic	Cis women n (%)	Trans women n (%)	Total sample n (%)
Age			
18-34 years	6,109 (16.9)	37 (0.1)	6,146 (17.0)
35-49 years	7,517 (20.8)	24 (0.07)	7,551 (20.8)
50+ years	22,420 (61.9)	109 (0.30)	22,529 (62.2%)
Income			
less than \$20,000	10,249 (28.3)	66 (0.18)	10,315 (33.1)
\$20,000-\$49,999	11,964 (33)	50 (0.14)	12,014 (38.5)
\$50,000-\$74,999	3,732 (10.3)	9 (0.02)	3,741 (12.0)
\$75,000+	5,123 (14.1)	14 (0.04)	5,137 (16.5)
Education Level			
High School or Less	14,698 (40.6)	109 (0.30)	14,807 (40.9)
College or More	21,256 (58.7)	59 (0.16)	21,315 (58.8)
Employment Status			
Employed	16,402 (45.3)	71 (0.20)	16,473 (45.8)
Unemployed	7,304 (20.2)	49 (0.14)	7,353 (20.5)
Retired	9,431 (26.0)	38 (0.10)	9,469 (26.3)

Table 2 (cont'd)

Other	2,646 (7.3)	12 (0.03)	2,658 (7.4%)
Marital Status			
Married/Partnered	10,635 (28.6)	51 (0.14)	10,686 (29.7)
Not Married	19,320 (53.3)	93 (0.26)	19,413 (54.0)
Widowed	5,855 (16.2)	24 (0.07)	5,879 (16.3)
Metropolitan Status			
Metropolitan	15,367 (42.4)	54 (0.15)	15,691 (70.9)
Suburban	3,122(8.6)	10 (0.03)	3,132 (14.1)
Non-metropolitan	3,301 (9.1)	19 (0.05)	3,320 (15.0)

Research Question 1: Differences in HIV Testing Behaviors among Black Cis and Trans Women

I hypothesized that lifetime HIV testing would vary by gender identity. The results indicated that 50% of trans women reported lifetime HIV testing compared to 51.2% of cis women. Contrary to my hypothesis, there was no statistically significant difference in odds of lifetime HIV testing between cis and trans women (see Table 2). Although Black trans women had relatively higher odds of being tested for HIV compared to Black cis women, the results did not suggest that Black trans women were significantly less likely to receive an HIV test as hypothesized (AOR 1.05, 95% CI: 0.72- 1.53). In other words, there was a small observable difference, but it was unreliable due to a lack of statistical significance.

Research Question 2a: Sociodemographic Factors and HIV Testing among Black Trans Women vs Black Cis Women

In Table 2, there is a display of each of the sociodemographic predictors and their association with HIV testing. Only income, unemployment, and health insurance were not statistically significant predictors of HIV testing. The results were then split by gender identity to assess how the sociodemographic factors predicted HIV testing for Black cis women alone and Black trans women alone. The significance levels, odds ratios, and confidence intervals for Black cis women were nearly identical to those reported in the overall sample. For example, in the overall sample having a primary health care provider was statistically significant (AOR: 1.25, 95% CI: 1.15-1.37); and among Black cis women, having a primary healthcare provider was also statistically significant (AOR: 1.25, 95% CI: 1.14-1.36). As shown in Table 2, age and employment status were significantly associated with HIV testing among Black trans women. Specifically, Black trans women aged 50 and older had significantly lesser odds of having

received an HIV test relative to those ages 18-34 years (AOR: 0.30; 95% CI: 0.09-0.96).

Compared to employed Black trans women, unemployed Black trans women endorsed significantly greater odds of having ever received an HIV test (AOR: 4.72; 95% CI: 1.52 -14.66).

Interestingly, unemployment was one of the sociodemographic characteristics that was nonsignificant among Black cis women (AOR: 1.06, 95% CI: 0.98-1.14).

Table 3.

Regression results for sociodemographic covariates by gender

Predictor	Black Cisgender Women		Black Transgender Women		Total	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Gender Identity					1.05	(0.72, 1.53)
Age						
18-24 years old	--	--	--	--	--	--
35-49 years old	1.21***	(1.10, 1.32)	1.50	(0.37, 6.19)	1.21***	(1.10, 1.32)
50 years or older	0.29***	(0.27, 0.31)	0.30*	(0.09, 0.96)	0.29***	(0.27, 0.32)
Income	0.98	(0.95, 1.01)	0.91	(0.55, 1.50)	0.98	(0.95, 1.01)
Education	1.37***	(1.30, 1.46)	2.06	(0.83, 5.13)	1.37***	(1.30, 1.46)
Employment Status						
Employed	--	--	--	--	--	--
Unemployed	1.06	(0.98, 1.14)	4.72**	(1.52, 14.66)	1.06	(0.99, 1.15)
Retired	0.37***	(0.35, 0.40)	1.23	(0.39, 3.87)	0.37***	(0.35, 0.40)
Other	0.67***	(0.59, 0.73)	5.59	(0.80, 39.15)	0.66***	(0.60, 0.73)
Marital Status						
Married/Partnered	--	--	--	--	--	--
Not Married	1.31***	(1.23, 1.39)	0.78	(0.29, 2.14)	1.31***	(1.23, 1.39)
Widowed	0.76***	(0.70, 0.83)	0.61	(0.16, 2.34)	0.76***	(0.70, 0.97)
Metropolitan Status						
Metropolitan	--	--	--	--	--	--
Suburban	0.88*	(0.81, 0.97)	2.69	(0.54, 13.41)	0.89*	(0.81, 0.97)
Not Metropolitan	0.61***	(0.55, 0.66)	0.75	(0.21, 2.63)	0.61***	(0.55, 0.66)
Healthcare	1.03	(0.94, 1.13)	1.33	(0.35, 5.03)	1.03	(0.94, 1.14)
Primary Care Provider	1.25***	(1.14, 1.36)	2.03	(0.60, 6.89)	1.25***	(1.15, 1.37)
Delayed Care	1.33***	(1.19, 1.48)	1.41	(0.31, 5.60)	1.33***	(1.19, 1.48)

Note. * $p < .05$; ** $p < .01$; *** $p < .001$

Research Question 2b: A Moderation Analysis of Sociodemographic Predictors, Gender Identity, and HIV Testing

In addition to examining main effects of sociodemographic characteristics, I also investigated whether gender identity (e.g., cis or trans) moderated the relationship between the statistically significant sociodemographic predictors (e.g., age, employment status, marital status, metropolitan status, having a primary care provider, and receiving delayed medical care). As shown in the second block of Table 3 below, this hypothesis was not supported. While my hypothesis was unsupported, there were some interesting nuances that are worth highlighting. Once the interaction terms were added into the model, a large number of the statistically significant predictors in the first block were no longer significant. In some instances, the relationships were inverse. For example, having a primary health care provider changed from having significantly greater odds (AOR: 1.25) of receiving an HIV test to lower, nonsignificant odds (AOR: 0.69).

A similar change occurred with education. In the first block, those with more education appeared to endorse significantly greater odds of receiving an HIV test (AOR: 1.37, 95% CI: 1.30-1.46). However, the results in the second block suggest that, when including interaction terms, those with more education reported lesser odds of receiving an HIV test (AOR: 0.94, 95% CI: 0.39-2.28). The model revealed that employment status significantly moderated the association between gender identity and HIV testing across all blocks in the hierarchical regression model. I conducted an auxiliary analysis of the interaction by conducting a simple slope analysis. As shown in in Figure 2, cis women who were employed had greater odds of receiving an HIV test than their trans peers, while trans women who were unemployed, retired, or have occupations such as being a homemaker or student were significantly more likely to

receive an HIV test compared to cis women with similar occupations. It is important to note that this interaction effect only included the employment status of 49 trans women.

Table 4.

Hierarchical regression results with interactions

Predictor	Block 1		Block 2		Block 3	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Gender Identity	1.05	(0.72, 1.53)	0.20	(0.03, 1.25)	0.10*	(.01, .70)
Age						
18-24 years old	--	--	--	--	--	--
35-49 years old	1.21***	(1.10, 1.32)	0.99	(0.24, 4.09)	0.86	(0.19, 3.86)
50 years or older	.290***	(0.27, 0.32)	0.29*	0.09, 0.94)	0.30	(0.9, 1.06)
Income	0.98	(0.95, 1.01)	0.98	(0.95, 1.01)	0.98	(0.95, 1.01)
Education	1.37***	(1.30, 1.46)	0.94	(0.39, 2.28)	0.79	(0.31, 2.00)
Employment Status						
Employed	--	--	--	--	--	--
Unemployed	1.06	(0.99, 1.15)	1.06	(0.98, 1.14)	1.06	(0.98, 1.14)
Retired	.37***	(0.35, 0.40)	0.37***	(0.35, .40)	0.37***	(0.35, 0.40)
Other	.66***	(0.60, 0.73)	0.66***	(0.59, .73)	0.65***	(0.59, 0.73)
Marital Status						
Married/Partnered	--	--	--	--	--	--
Not Married	1.31***	(1.23, 1.39)	2.09	(0.82, 5.32)	1.73	(0.65, 4.59)
Widowed	.76***	(0.70, 0.97)	0.91	(0.24, 3.43)	0.92	(0.23, 3.64)
Metropolitan Status						
Metropolitan	--	--	--	--	--	--
Suburban	.89*	(0.81, 0.97)	0.28	(0.06, 1.40)	0.22	(0.04, 1.13)
Not Metropolitan	.61***	(0.55, 0.66)	0.50	(0.14, 1.77)	0.42	(0.11, 1.53)
Healthcare	1.03	(0.94, 1.14)	1.03	(0.94, 1.14)	1.03	(0.94, 1.14)
Primary Care Provider	1.25***	(1.15, 1.37)	0.69	(0.23, 2.08)	0.61	(0.19, 2.01)

Table 4 (cont'd)

Delay Care	1.33***	(1.19, 1.48)	1.36	(0.32, 5.86)	1.55	(0.33, 7.24)
Gender Identity x Age						
18-34 years old			--	--	--	--
35-49 years old			1.22	(0.30, 4.99)	1.43	(0.32, 6.32)
50 years or older			1.01	(0.31, 3.27)	1.00	(0.29, 3.51)
Gender Identity x Education			1.46	(0.61, 3.50)	1.74	(0.69, 4.39)
Gender Identity x Employment Status						
Employed			--	--	--	--
Unemployed			4.57 **	(1.55, 13.48)	5.43***	(1.73, 17.10)
Retired			3.37*	(1.08, 10.46)	4.68*	(1.42, 15.46)
Other			8.33*	(1.25, 55.65)	6.52	(0.97, 44.03)
Group x Marital Status						
Married			--	--	--	--
Not Married			0.63	(0.25, 1.58)	0.75	(0.29, 2.00)
Widowed			0.84	(0.22, 3.15)	0.83	(0.21, 3.25)
Gender Identity x Metropolitan Status						
Metropolitan			--	--	--	--
Suburban			3.16	(0.64, 15.72)	4.08	(0.79, 21.11)
Not Metropolitan			1.21	(0.35, 4.27)	1.46	(0.40, 5.28)
Gender Identity x Primary Care Provider			1.80	(0.61, 5.38)	2.05	(0.63, 6.65)
Gender Identity x Delay Care			0.98	(0.23, 4.15)	0.86	(0.19, 3.96)
Risk					0.27	(0.03, 2.87)
Gender Identity x Risk					7.33	(0.72, 74.78)

Note. * $p < .05$; ** $p < .01$; *** $p < .001$

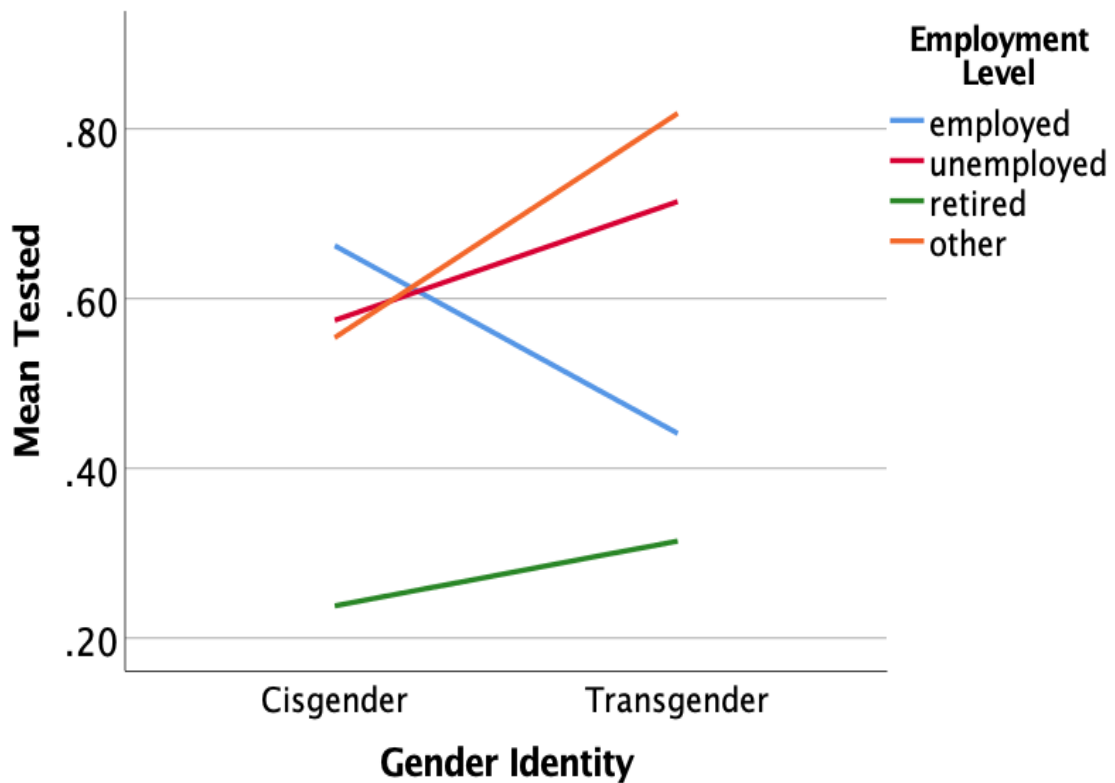


Figure 2. Interaction between employment status and gender identity.

Research Question 3: HIV Risk as a Predictor of HIV testing

With research question 3, I sought to determine the extent to which engagement in high risk behaviors affect HIV testing behaviors differently for cis and trans Black women. I hypothesized that gender identity would significantly moderate the association between HIV risk and receiving an HIV test. In order to test this hypothesis, I entered HIV risk as an additional predictor. Upon entering HIV risk as an additional predictor in the model, the results indicated that risk was not a significant predictor of HIV testing (AOR: 0.27, 95% CI: 0.03-2.87). The interaction between gender identity and HIV risk was also not statistically significant (Table 3). Despite the non-significance, it is worthwhile to note that the interaction between gender identity and risk had an adjusted odds ratio of 7.33 (95% CI:0.72-74.78). These results are shown in the

third block of Table 3. Once HIV risk was added as an additional predictor to the model gender identity emerged as a significant predictor of HIV testing (AOR: 0.10, 95% CI: 0.01-0.70).

Essentially, this indicates that Black trans women are 90% less likely to receive and HIV test compared to Black cis women. I also found that the interaction between gender identity and other employment types (students and homemakers) was no longer significant in this block.

Additionally, the odds of receiving an HIV test for this interaction between other employment types and gender identity decreased (AOR: 6.52, 95% CI: 0.97-44.03).

DISCUSSION

Guided by an intersectional approach and ecological theory, this study explored HIV testing behaviors of Black trans women and compare them to testing behaviors among Black cis women. For this study, HIV testing behaviors were defined as a person having received an HIV test at least once in their life. Furthermore, the study explored which sociodemographic factors were associated with HIV testing behaviors and if they were moderated by gender identity. Although prior studies suggest that Black trans women are disproportionately affected by a number of structural factors that contribute to increased HIV vulnerability and HIV diagnosis (Clements-Noelle et al., 2001; Herbst et al., 2008), results of this study contradict previous reports on correlates of HIV testing among trans women (Logie et al., 2016; Rutledge et al., 2018) as well as reports on the association between HIV risk and HIV status (Dailey et al., 2017; Schwarcz et al., 2011).

Auxiliary Predictors of HIV Testing

While my hypotheses were unsupported, the results did reveal some interesting findings regarding the association between age and HIV testing. The bivariate logistic regression model suggested that older Black trans women and Black cis women were less likely to receive an HIV test compared to Black cis and trans women within the 18-34 year old age range. This result is consistent with previous literature that suggests that older adults are less likely to receive an HIV test (Akers et al., 2008; Harawa et al., 2012; Wigfall et al., 2011). Findings by other researchers attributed low testing rates among older adults to factors such as limited knowledge, and low self-perceived risk (Guo & Sims, 2017; Rodgers-Farmer, 1999).

Employment status. Interestingly, gender identity was not shown as a predictor or moderator of HIV testing, which was anticipated based off of trans women's disproportionate

burden of HIV (Baral et al., 2013; Herbst et al., 2008) and their unique vulnerability to HIV (Hwahng & Nuttbrock, 2007; Poteat, Reisner, & Radix, 2014). Besides age, employment status was the only covariate that emerged as a significant predictor of HIV testing among Black trans women. To be more specific, Black trans women who were unemployed were almost five times more likely to have received an HIV test in their lifetime compared to Black trans women who were employed. This is consistent with some previous literature that suggests that those who are unemployed were more likely to report ever having received an HIV test compared to those who are employed (Brown et al., 2007). The relationship between employment status and receiving an HIV test among cis women indicated that cis women who were retired or had other types of employment (e.g., homemakers or students) were significantly less likely to receive an HIV test. It is also worthwhile to note that because some types of self-employment are nontraditional (e.g., sex work), there could be variation in how respondents classified their own employment status. Overall, the association between HIV testing and employment status has been inconsistent in previous literature. On one hand, employment status has not been shown to be a significant predictor among Black people (Benavides-Torres et al., 2012), while other studies suggest that Black people who were employed were more likely to have ever received an HIV test compared to those who were unemployed (Funk et al., 2018).

There was also a significant interaction between gender identity, employment status and HIV testing. Type of employment was shown to moderate the association between gender identity and HIV testing. Cis women who were unemployed, retired, and had other types of employment were significantly less likely to receive an HIV test compared to trans women with the same employment status, while cis women who were employed were significantly more likely to receive an HIV test compared to trans women who were employed. One possible reason

for the interaction is that cis women who are employed may be more likely to receive an HIV test because they are insured, visit the doctor more routinely, and receive HIV tests as a part of their routine check-ups; however, given the challenging social environments in which unemployed trans women may exist, they may be frequently targeted for HIV testing.

Education and HIV testing. A statistically significant association was shown between education level and HIV testing in the first block of the hierarchical regression. Essentially, those who were more educated were significantly more likely to have received an HIV test (AOR 1.37). This relationship disappeared when additional predictors were added into the model in the second and third blocks. In fact, in subsequent models, although not significant, the association between HIV testing and education became negative; suggesting that those with more education were less likely to get tested. Previous literature on the association between education and HIV testing has indicated education as a positive predictor of HIV testing (Ansa et al., 2016; Ogunsina et al., 2018). Education level is believed to be associated with HIV testing because of the idea that having more education is associated with making healthier choices and having better health overall (Inungu et al., 2011). While the initial analysis supported existing literature on HIV testing, future research should consider further exploring education as a predictor of HIV testing.

Geographic location & HIV testing. Initially, geographic location emerged as significantly associated with HIV testing. In the first block of the hierarchical regression, both suburban and non-metropolitan areas emerged as significantly less likely to receive an HIV test compared to those in metropolitan areas. Those in non-metropolitan were about 40% less likely than those in metropolitan areas to receive an HIV test and those in suburban areas were 10% less likely. In previous literature, living in rural areas has been associated with a decreased

likelihood of receiving an HIV test (Ohl & Perencevich, 2011; Tran, Tran & Tran, 2020). Interestingly, a significant association only existed overall and for cis women, not for trans women. Moreover, when additional predictors were added to the model in blocks two and three of the model metropolitan status was no longer statistically significant.

Nonsignificant Predictors of HIV Testing

It is worthwhile to note than in the first block of the hierarchical regression, all of the predictors besides income and health insurance emerged as statistically significant predictors. Previous literature suggests the HIV incidence and prevalence is most common among individuals who live below the poverty level (Denning & DiNenno, 2010; Pellowski et al., 2013; Wiewel et al., 2016). Interestingly socioeconomic status (SES) has been highlighted as a negative predictor of HIV testing, meaning that those who have a lower SES are less likely to receive HIV testing compared to those who have a higher SES (McGarrity and Huebner, 2014; Obermeyer et al., 2013; Ransome et al., 2016). This is important because income and education are often used as metrics of SES. Nonetheless, other literature suggests that income level is not a significant predictor of HIV testing, which is consistent with the results in this study (Morooka & Lampkins 2014; Rountree et al., 2009).

Health insurance. Although health insurance did not emerge as a significant predictor of HIV testing, the relationship between the two remains unclear. Often times people who are at a significant risk for HIV are uninsured (Newbern et al., 2013) The findings regarding health insurance as a nonsignificant predictor of HIV testing contradicts some existing literature. For example, one study suggested that having health insurance increases the likelihood of receiving an HIV test in general as well as among high-risk populations (Sood, Wagner, & Wu, 2015). Several other studies have also found health insurance to be an important factor for HIV testing

(Bond, Lauby, & Baston, 2005; Doshi et al., 2013; Nearn, Baldwin, & Clayton, 2009; Schwarcz et al., 2011). The type of health insurance (e.g., public or private) also appears to be an important predictor of whether or not one receives an HIV test. Bamford and colleagues (2014) found that individuals with public insurance were significantly less likely to have received an HIV test compared to individuals with private insurance. On the other hand, Nguyen and colleagues (2006) found the opposite; those with private insurance were less likely to report receiving an HIV test than those with public insurance. More research is needed to clarify the relationship between health insurance and HIV testing.

HIV risk. My hypothesis regarding HIV risk was not supported due to a lack of statistical significance. Those who engaged in high risk behaviors were less likely to have received an HIV test. Although nonsignificant, this result is consistent with other studies that have found engagement in high risk behaviors to be negatively associated with receiving a HIV test (Bond, Lauby, & Baston, 2005; Lopez-Quintero et al., 2005). One of the reasons for the negative association between HIV risk and HIV testing could be that those who engage in high risk behaviors may not necessarily perceive themselves to be high risk, and therefore do not see a need to get tested. On another hand, HIV risk has been documented as a significant predictor of HIV testing elsewhere (Balaji et al., 2012; Holtzman et al., 1998; Salter et al., 2016; Stephenson et al., 2015). Future research should explore perceived risk versus actual risk and evaluate how they each affect HIV testing. It is also important to consider the way that BRFSS measured HIV risk may not be an adequate measure of HIV risk. This will be further discussed in the limitations.

Limitations

There are several limitations to consider for this study. One major limitation is that all data in this study was self-reported. While the BRFSS has been shown to be a reliable and useful dataset for HIV testing research (Rountree et al., 2010), participants may have reported inaccurate responses due to issues such as recall bias or social desirability. It is also important to note that because the BRFSS collects data via landline and cellular phones, those who do not have access to a landline or cellular phone are not represented in this data (e.g., those who are institutionalized). As previously mentioned, the way that the BRFSS measured HIV risk is also a major limitation. The BRFSS used one item to assess HIV risk, which only asked participants to respond yes or no if they participated in any of the risk behaviors that were stated. This item may not have adequately captured the complex nature of risk. Other studies have found variability in the ways that different types of risk behaviors are associated with HIV risk (Emmanuel, 2019). Moreover, the BRFSS lacks data that assesses PrEP use further limiting my ability to understand what truly counts as HIV risk. Another limitation to consider is that because the data was cross-sectional, causal inferences cannot be made.

Initially, emotional support was incorporated into the study as a covariate. Literature suggested that social and emotional support were shown to be determinants of HIV acquisition, treatment and prevention (Edwards, 2006; Lelutic-Weinberger et al., 2020). Furthermore, social and emotional support have been emphasized as complimentary factors that help overcome individual and structural level barriers to HIV care among trans women of color (Maiorana et al., 2020). Unfortunately, emotional support had to be removed from the analysis due to a low cell count in the trans sample. This limited my ability to account for an important aspect that may influence the testing practices of Black cis and trans women.

The unbalanced sample size might have contributed to the unsupported hypotheses. The large sample size of Black cis women might have limited my ability to detect statistically significant results among Black trans women. Future research should consider exploring some of the covariates with a larger sample of Black trans women.

Because this was a secondary data analysis, the analysis was limited to the questions that were assessed by BRFSS. Given this, some of the important perspectives that have been shown to greatly influence the well-being of Black women were not captured in this study. For example, the BRFSS did not gather any information on experiences of discrimination in healthcare settings. In addition to conducting bivariate analyses of health outcomes of intersectional groups, gathering information on discrimination has been shown to be an important component of taking an intersectional approach (Bauer & Scheim, 2019). Having information on experiences of discrimination would have been useful for further developing the intersectional grounding of this study.

Implications and Future Directions

Despite the unsupported hypotheses and limitations of this study, the results of this study will have meaningful implications for HIV research, policy, and practice, specifically for Black women.

Research. This study aimed to close several gaps within the HIV testing literature. The disproportionate burden of HIV among Black cis and trans women has been heavily documented in previous work (Baral et al., 2013b; Garofalo et al., 2016; Herbst et al., 2008; Nuttbrock et al., 2009; Operario et al., 2011). While HIV testing behaviors of Black cis women have been explored (Chopel et al., 2015; Ransome et al., 2016a; Ransome et al., 2016b; Williams et al., 2014), HIV testing behaviors of Black trans women has been understudied. In fact, many times,

trans women are compared to or combined with MSM in HIV research (Muessig et al., 2014; Peacock, Andrinopoulos, & Hembling, 2015; Poteat, German, & Flynn, 2016; Zea et al., 2015) which presents challenges for identifying specific vulnerabilities or HIV risks for trans women. Despite the high rates of HIV prevalence and incidence among Black trans women, in general, gender identity was not a significant predictor of HIV testing. This suggests that additional study is needed on preventative HIV practices among Black trans women. The findings of this study also highlight a need for researchers to further explore the relationship between employment status, gender identity, and HIV testing. The significant interaction suggests that there may be some unique factors that contribute to HIV testing as a function of employment status among Black cis women and trans women.

Additionally, this study incorporated an intersectional lens, which allowed for a layered exploration of HIV testing among the study population. HIV research has done well in recognizing racial disparities in HIV incidence and prevalence (Aral, Adimora, & Fenton, 2008; Kraut-Becher et al., 2008; Xia et al., 2017). However, since both Black trans women and cis women are disproportionately affected by HIV, research must look beyond racial disparities and consider how multiple identities interact with each other and how they influence HIV prevention, acquisition, and treatment. This creates a more comprehensive understanding of HIV disparities which is why an intersectional approach is extremely useful in HIV research among marginalized populations. Though this study explored the HIV testing behaviors among Black cis and trans women in a way that encompassed the multidimensional barriers that affect these populations at the intersections of their identities a number of challenges with incorporating intersectionality into quantitative research has been documented (Rouhani, 2014; Schudde, 2018). There are opportunities for qualitative studies that explore the influence of sociocultural

factors on HIV testing behaviors of Black cis and trans women. Qualitative approaches may allow researchers to examine specific sociocultural factors that are difficult to capture with quantitative methods.

Policy. These findings offer important information that could inform policy decisions regarding two vulnerable populations that should be targeted for HIV testing. In recent years, policy around HIV testing has generally been guided by recommendations from the CDC. The current CDC guidance on HIV testing recommends that all individuals between the ages of 13 and 64 be tested for HIV at least once and for those who have certain risk factors to be tested at least once a year (CDC, 2020). Based on the results of this study, one can make an argument that the CDC should offer more guidance on who needs to receive an HIV test. For example, Black cis and trans women who live in non-metropolitan and suburban areas are significantly less likely to receive an HIV test, yet the spread of HIV continues to involve more rural areas (Ohl & Perencevich, 2011). Furthermore, those who live in non-metropolitan and suburban areas are more likely to be diagnosed for HIV in later stages, complicating disease management (Ohl et al., 2010; Weis et al., 2010). The results of this study indicate that older Black cis and trans women are less likely to get tested than younger age groups. Evidence suggests that older HIV positive women tend to be diagnosed later in the disease process because of missed opportunities for testing (Mugavero et al., 2007; Smith et al., 2010). Therefore, it might also be worthwhile to revisit the age recommendations for HIV testing.

Practice. This study also has several important implications for healthcare practitioners. The varied number of sociodemographic predictors that emerged as statistically significant predictors of HIV testing suggest that HIV testing interventions should not be “one-size-fits-all”. Practitioners should consider developing testing interventions that are tailored to the specific

needs of Black cis and trans women. These interventions should be guided by an understanding of how different sociodemographic factors are associated with HIV testing. The information provided in this study may help practitioners in terms of developing resources and providing guidance for vulnerable and diverse populations concerning HIV testing. Furthermore, knowing which sociodemographic groups are not getting tested increases the ability of practitioners to be able to target these groups. For example, knowing that Black trans women who are employed have lower odds of getting tested compared to those who are unemployed, retired, students, or homemakers may motivate practitioners to begin exploring ways to increase testing among employed Black trans women.

CONCLUSION

This study utilized an intersectional approach guided by socio-ecological theory to explore the HIV testing behaviors of Black cis and trans women and its association with sociodemographic characteristics and HIV risk. With Black trans and cis women being disproportionately affected by HIV, understanding correlates of HIV testing among these populations is crucial for HIV prevention interventions among this population. First, the findings of this study suggest that there was no significant difference in HIV testing behaviors between Black cis and trans women. Additionally, the results indicated that employment status moderated the association between gender identity and HIV testing. Future research should further explore this association. Lastly, this study revealed that engagement in high risk behaviors was not a significant predictor of HIV testing among Black cis and trans women. Although this study addressed several gaps in the HIV testing literature, future research should focus on elucidating the sociocultural influences on HIV testing among Black trans women.

APPENDIX

Modifications to Analyses

Due to the large nature of my sample size, along with the imbalances in my sample size, I randomly sampled a smaller portion of the 36,056 cis Black women in the sample to balance the two groups. I did consider other balancing methods such as propensity score matching, but because an initial chi-square analysis suggested that there were no major differences in HIV testing between cis and trans women, propensity score matching was not appropriate.

Data Preparation

To prepare the smaller sample for analysis, I split my grand data file for the original analysis into two separate SPSS data files. I then selected a random sample of 1% from the “cis only” data file ($n=327$). I then converted the “trans only” SPSS file and the new “cis only” random sample into excel sheets. I combined the excel sheets into one dataset and then imported them back into SPSS for analysis. The total sample size for this analysis was 497.

Hypothesis 1. I ran a logistic regression to predict HIV testing depending upon gender identity while controlling for all sociodemographic characteristics in order to test my first hypothesis. The results indicated that cis women were one and one quarter times more likely to receive an HIV test compared to trans women (AOR: 1.25, 95% CI: .80-1.95). However, the difference was not statistically significant ($p = .330$).

Hypothesis 2. Prior to testing my second hypothesis, I ran the model from hypothesis one and split it by gender identity to assess what sociodemographic factors predicted HIV testing among Black trans women. Older age, unemployment, and other employment (students and homemakers) were each statistically significant predictors. Black trans women who were 50 years or older were about 70% less likely to have received an HIV test compared to Black trans women who were younger (AOR: 0.28, 95% CI: 0.10-.083). Black trans women who were

unemployed had more than five times greater odds of receiving an HIV test compared to Black trans women who were employed (AOR: 6.36, 95% CI: 2.36-17.91.). Lastly, Black trans women that have other types of employment have almost nine times greater odds of receiving an HIV test compared to employed Black trans women (AOR: 8.73, 95% CI: 1.30-58.57).

I then used interaction terms to assess whether gender identity moderated the effect of statistically significant predictors from the previous model for HIV testing among Black trans women versus Black cis women. This model revealed that there was a statistically significant interaction between gender identity and employment status. Specifically, gender identity had a significant interaction with unemployment (AOR: 5.14, 95% CI: 1.69-15.59) and other employment (AOR: 10.48, 95% CI: 1.37, 80.46). The results of this interaction were similar to that in the first analysis where employment status moderated the association between gender identity and receiving an HIV test such that cis women who are employed have a greater odds of receiving an HIV test, while trans women who are unemployed, retired, or have occupations such as being a homemaker or student are significantly more likely to receive an HIV test compared to cis women with these similar occupations.

Hypothesis 3. I then added HIV risk to the model as a predictor and created an interaction term between gender identity and HIV risk. Neither risk nor the interaction term between risk and gender identity were statistically significant. It is important to note that those who were at risk were 37% less likely to receive an HIV test compared to those who were not at risk. The significant predictors in this model were gender identity, older age, retired employment status, as well as the interactions between gender identity and unemployment and gender identity and other employment respectively. Gender identity predicted receiving an HIV test such that trans women were 78% less likely to receive an HIV test compared to cis women (AOR: .22,

95%CI: .09-0.53). Those who were 50 years or older were 93% less likely to receive an HIV test compared to younger individuals. Similarly, those who were retired were 58% less likely to receive an HIV test compared to those who are employed. The results of the interaction term between gender identity and unemployment (AOR: 5.34, 95% CI: 1.71-16.68) and gender identity and other employment (AOR: 10.34, 95% CI: 1.30, 82.07) had trends similar to the interaction in previous models.

Table 5.

Supplemental Table 1

Predictor	Black Cisgender Women		Black Transgender Women		Total	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Gender Identity					1.25	(0.80, 1.95)
Age						
18-24 years old	--	--	--	--	--	--
35-49 years old	1.58	(0.60, 4.21)	1.20	(0.32, 4.47)	1.67	(0.80, 3.47)
50 years or older	0.18***	(0.08, 0.44)	0.28*	(0.10, 0.83)	0.25***	(0.23, 0.47)
Income	0.98	(.95, 1.01)	0.99	(0.98, 1.01)	1.00	(0.99, 1.00)
Education	1.0	(0.99, 1.01)	1.98	(0.91, 4.33)	1.30	(0.90, 1.88)
Employment Status						
Employed	--	--	--	--	--	--
Unemployed	0.76	(0.36, 1.59)	6.36***	(2.36, 17.10)	1.55	(0.89, 2.71)
Retired	0.41*	(0.19, 0.88)	1.32	(0.46, 3.75)	0.61	(0.34, 1.10)
Other	0.41	(0.12, 1.40)	8.73*	(1.30, 58.57)	1.26	(0.50, 3.15)
Marital Status						
Married/Partnered	--	--	--	--	--	--
Not Married	1.52	(0.84, 2.73)	0.82	(0.35, 1.93)	1.30	(0.82, 2.07)
Widowed	0.30*	(0.10, 0.90)	0.65	(0.19, 2.23)	0.43*	(0.20, 0.89)
Metropolitan Status						
Metropolitan	--	--	--	--	--	--
Suburban	0.82	(0.31, 2.14)	2.25	(.52, 9.71)	1.11	(0.51, 2.40)
Not Metropolitan	0.66	(0.24, 1.80)	0.88	(0.27, 2.93)	0.73	(0.35, 1.50)
Healthcare	1.24	(0.45, 3.42)	1.56	(.35, 5.03)	1.48	(0.72, 3.03)
Primary Care Provider	0.64	(0.25, 1.64)	2.03	(0.56, 4.36)	1.06	(0.56, 2.03)
Delayed Care	1.72	(0.60, 4.95)	1.79	(0.45, 7.18)	1.49	(0.66, 3.35)

Note. * $p < .05$; ** $p < .01$; *** $p < .001$

Table 6.

Supplemental Table 2

Predictor	Block 1		Block 2		Block 3	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Gender Identity	1.25	(0.80, 1.95)	.28**	(0.12, 0.64)	0.22**	(0.09, 0.53)
Age						
18-24 years old	--	--	--	--	--	--
35-49 years old	1.67	(0.80, 3.47)	1.44	(0.68, 3.09)	1.57	(0.72, 3.42)
50 years or older	0.25***	(0.23, 0.47)	0.07**	(0.01, 0.34)	0.07**	(0.01, 0.35)
Income	1.00	(0.99, 1.00)	1.00	(0.99, 1.01)	1.00	(0.99, 1.00)
Education	1.30	(0.90, 1.88)	1.32	(0.92, 1.91)	1.35	(0.94, 1.95)
Employment Status						
Employed	--	--	--	--	--	--
Unemployed	1.55	(0.89, 2.71)	0.82	(0.39, 1.70)	0.84	(0.40, 1.76)
Retired	0.61	(0.34, 1.10)	0.42	(0.20, 0.89)	0.42*	(0.20, 0.89)
Other	1.26	(0.50, 3.15)	0.55	(0.17, 1.78)	0.53	(0.16, 1.74)
Marital Status						
Married/Partnered	--	--	--	--	--	--
Not Married	1.30	(0.82, 2.07)	1.25	(0.78, 2.01)	1.34	(0.82, 2.18)
Widowed	0.43*	(0.20, 0.89)	0.09*	(0.01, 0.87)	0.10*	(0.01, 0.97)
Metropolitan Status						
Metropolitan	--	--	--	--	--	--
Suburban	1.11	(0.51, 2.40)	1.21	(0.55, 2.66)	1.30	(0.59, 2.88)
Not Metropolitan	0.73	(0.35, 1.50)	0.74	(0.35, 1.56)	0.78	(0.37, 1.65)
Healthcare	1.48	(0.72, 3.03)	1.54	(0.74, 3.21)	1.62	(0.77, 3.43)
Primary Care Provider	1.06	(0.56, 2.03)	1.02	(0.53, 1.98)	1.02	(0.52, 1.99)
Delay Care	1.49	(0.66, 3.35)	1.55	(0.68, 3.53)	1.33	(0.56, 3.13)
Gender Identity x Age						
18-34 years old			--	--	--	--
50 years or older			2.47	(0.87, 6.99)	2.63	(0.90, 7.66)
Gender Identity x Employment Status						

Table 6 (cont'd)

Employed	--	--	--	--
Unemployed	5.13**	(1.69, 15.59)	5.35**	(1.71, 16.68)
Other	10.48**	(0.79, 9.54)	10.34*	(1.30, 82.07)
Gender Identity x Marital Status				
Widowed	3.1	(0.73, 13.23)	2.98	(0.69, 12.98)
Risk			0.63	(0.00, 103.431)
Gender Identity x Risk			4.57	(0.20, 107.09)

Note. * $p < .05$; ** $p < .01$; *** $p < .001$

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