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Adverse Childhood Experiences and HIV Risk Behaviors Among Transgender Populations

Linda Baggio
Walden University

Walden University

College of Health Professions

This is to certify that the doctoral study by

Linda Baggio

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Review Committee
Dr. Patrick Tschida, Committee Chairperson, Public Health Faculty
Dr. Bin Cai, Committee Member, Public Health Faculty
Dr. Tolulope Osoba, University Reviewer, Public Health Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
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Abstract

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by

Linda Baggio

MPH, National University, 2017

BS, University of California, Riverside, 2013

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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Abstract

Adverse childhood experiences (ACEs) have a negative impact on health and have created a social challenge in managing HIV risk behavior in the transgender population. The aim of this study was to determine the association between ACEs and HIV risk behavior among the transgender population and identify the association between ACE score (1, 2, 3, 4, or more) and HIV risk behavior among the transgender population. This involved a quantitative methodology using a Behavioral Risk Factor Surveillance System (BRFSS) questionnaire to obtain data from 323 transgender participants. Multivariable regression analyses were conducted to determine the association between ACEs and HIV risk behavior. ACEs had a statistically significant relationship with HIV risk behavior among transgender individuals (adjusted OR: 12.7; 95% CI: 1.51 – 42.2). Distribution of ACE score was statistically significant by age ($p < 0.001$) and race/ethnicity ($p = 0.01$). In addition, respondents who experienced four or more ACEs were 26 times more likely to report HIV risk behavior (OR: 25.5; 95% CI: 2.82–231.8) compared to respondents who did not report any ACEs. The results imply that ACEs have a negative impact on transgender social and behavioral health and increase risk for factors that accentuate HIV susceptibility which is a major challenge in mitigating the HIV pandemic. Therefore, the findings indicate the need for an enhanced focus on the role of ACEs and toxic stress with interventions aimed towards reducing HIV risk behavior among transgender individuals. Such social changes would positively affect society, improving the approaches to dealing with ACE, toxic stress and reducing the associated health complications.

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Dedication

I dedicate my capstone to God and my son. Because of God, I had the courage, strength, and endurance to complete my doctoral journey. Because of my son, I have a renewed will to dream bigger than I have ever thought possible.

Acknowledgments

I acknowledge and thank my committee chairperson, Dr. Patrick Tschida, for his encouragement, shared passion, and support of my progression through my doctoral process. I thank my committee member, Dr. Bin Cai, for his valuable feedback and expert guidance. Thank you to Dr. Frederick Schulze for your service in guiding me through the initial stages of my doctoral research and providing valuable feedback. My deepest gratitude goes to my sister Desiree Nwigwe and her husband, Ikenna Nwigwe, who have inspired and encouraged me throughout my doctoral academic journey. My gratitude extends to my husband Gregory Baggio for believing in me. I am also thankful to my mentor Dr. Monique Brown for guiding, supporting, and motivating me to achieve my goals.

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Section 1: Foundation of the Study and Literature Review

Adverse childhood experiences (ACEs) are stressful or traumatic events experienced by an individual by 18 years old. They include 10 categories of adversities in three domains: child abuse (physical, emotional, or sexual), neglect (physical or emotional), and household dysfunction (growing up with household incarceration, mental illness, substance dependence, parental separation or divorce, or intimate partner violence; Bhushan et al., 2020). Exposure to ACEs creates a toxic stress response and health conditions known as ACE-associated health conditions. ACEs have been linked to a variety of adverse health outcomes, including cardiovascular disease, chronic obstructive pulmonary disease, liver disease, cancer, diabetes, obesity, cognitive impairments, risky sexual behaviors, early and high-risk substance use, depression, suicidality, poor self-rated health, and premature mortality (Bhushan et al., 2020), and HIV/sexually transmitted infection diagnosis (Brown et al., 2017). As of 2020, approximately 64% of the U.S. general population has experienced at least one ACE (Kids Data, 2020).

Current primary, secondary, and tertiary prevention efforts aim to prevent, identify, and lessen the exposure and outcome of harmful events that lead to disease or adverse behavioral and health outcomes (Bhushan et al., 2020). Primary prevention prevents the occurrence of harmful exposures related to ACEs and other risk factors for toxic stress. These include economic supports, home visitation, quality mental and physical care, and physical and mindfulness activities. Secondary prevention focuses on screening efforts before the onset of disease by identifying individuals with an increased

risk of toxic stress. Finally, tertiary prevention focuses on individuals who have experienced ACEs and have developed adverse health outcomes due to the toxic stress response with disease or social outcomes. State and national intervention efforts for prevention for the general public include monitoring systemic conditions and exposures that alter unhealthy or unsafe behaviors, increasing protective factors, and building resilience to reduce risk factors for toxic stress.

Despite these prevention efforts, there is a high prevalence of ACEs, which is associated with persistent social problems that remain inadequately addressed among communities. Further, some populations are disproportionately impacted by ACEs such as members of the LGBTQ+ community (Bhushan et al., 2020; Chakrapani et al., 2017). Historically, childhood mistreatment, trauma, and stigma are prevalent among transgender individuals in the United States and are linked to poor health outcomes. Moreover, ACEs such as emotional abuse, emotional neglect, and physical neglect cases are more common among transgender populations compared to the general population (Kattari et al., 2016). Understanding the influence and outcome of ACEs is necessary to guide public health interventions and policy efforts aimed towards high-risk behavioral outcomes such as HIV.

In this study, 10 categories of ACEs were evaluated as potential factors that may be associated with HIV risk behavior among the transgender population. The results will fill a gap in the existing literature. Research has shown that HIV prevalence (Centers for Disease Control and Prevention [CDC], 2019) and rates of ACEs (Austin et al., 2016) are high among sexual and gender minority populations; however, no study has examined the

relationship between ACEs and HIV risk behavior among transgender populations. By determining whether specific ACEs are associated with HIV risk behavior, the results of this study may lead to social change by informing future HIV prevention and intervention programs geared toward transgender populations. Improved health status is expected to result from the inclusion of trauma-informed practice principles to reduce HIV prevalence among the transgender population (Fang et al., 2016). Additionally, the estimated financial burden of ACEs is $112.5 billion annually in addition to affecting community functioning, impacting learning, development, behavior problems, high school noncompletion, unemployment, poverty, homelessness, and felony charges. The elimination of the burden of HIV can be supported by addressing the adverse health outcomes associated with ACEs.

This section will discuss the disproportionate impact of ACEs and HIV risk behavior, its relevance, and the need for a new paradigm to investigate and eliminate HIV nationally. I will explore the research and knowledge gap in eliminating HIV among transgender populations. I will also state the theoretical framework for the research, and the section will conclude with a literature review, assumptions, delimitations, limitations, significance, and a summary.

Background

Understanding the history of transgender people will help in understanding the gaps concerning transgender health. Transgender people can be defined as persons whose gender identity differ from their sex at birth (Meerwijk & Sevelius, 2017). From a historical perspective, being transgender was treated as an illness, and transgender

persons were believed to engage in unacceptable sexual practices (Kolysh, 2016). Further, crossdressing and change of behavior were the only options for transgender people who wished to change their gender identity until the 20th century when Harry Benjamin acknowledged the need for medical intervention in the form of sex reassignment surgery and (Kolysh, 2016). Additionally, the transgender population for a long time has remained unknown because official data records, including the census, did not contain gender identity data until recently some organizations drew attention to transgender persons (Kolysh, 2016). An estimated 390 persons out of 100,000 are transgender persons, translating to approximately 1 out of 250 adults (Meerwijk & Sevelius, 2017). Future surveys may find higher numbers of transgender people in the United States.

History of HIV and its Impact on Transgender Populations

The epidemiology of HIV and accompanying AIDS illness began with uncertainty, fear, unexplained fatalities that doctors could not precisely explain before 1983. However, HIV/AIDS was demystified following the global epidemic of HIV (AVERT, 2020). Although HIV has remained a chronic concern for scientists and medical researchers who are yet to secure a vaccine or cure, scientific development such as antiretroviral drugs, post-exposure prophylaxis techniques, and extensive access to healthcare prolong the lives of patients (Office of Disease Prevention and Health Promotion, 2020).

Populations such as people with high sexual activity, LGBT individuals, and injectable drug users, among others, are classified as high-risk populations (National

Institute on Drug Abuse, 2020). Further, HIV prevalence is higher among sexual minorities, indicating that studying HIV/AIDS among transgender persons is critical (National Institute on Drug Abuse, 2020). Between 2009 and 2014, 2,351 transgender people were diagnosed with HIV in the United States (CDC, 2019b), and approximately 20% of transgender people have HIV globally (Baral et al., 2013). A systematic review also the estimated prevalence of HIV among the transgender population was 9.2% in the United States (Becasen et al., 2019). Transgender populations are often faced with different forms of adversity that can increase vulnerability to HIV such as lack of legal protection, discrimination, and lack of access to health services (Sherman et al., 2019). Additionally, transgender populations are reported to have high risk-taking behavior that increases their chance of contracting HIV. The prevalence of HIV was eight times higher among transgender female sex workers than cisgender female sex workers (Sherman et al., 2019). Transgender women were less likely to use condoms with partners compared to men who have sex with men (Poteat et al., 2020). With the higher HIV prevalence estimates among transgender people, more research is needed examining risk factors of HIV risk behavior among this population.

History of ACEs and its Impact on HIV Risk Behavior

The term *adverse childhood experiences* (ACEs) comes from the landmark 1998 study by Dr. Robert Anda of the CDC and Dr. Vincent Felitti of Kaiser Permanente. ACEs refer to the 10 categories of adversities in three domains experienced from 0–17 years that were evaluated in the study. The ACE study was one of the largest investigations ever to assess the association between childhood maltreatment and later

health and well-being (Felliti et al., 1998). Findings surrounding the impact of childhood sexual abuse trauma gave the first indication of persistent poor health and unhealthy behaviors in adults (Nelson, 2019). The initial study that led to the discovery of ACEs was first observed in Felitti's obesity clinic, where he misspoke a question asking how much a female client weighed when she first became sexually active (Stevens, 2012). Response to the misspoken question provided evidence of several protective ways individuals cope with their child sexual abuse trauma. The findings triggered the ongoing ACE studies. The study also gave strong evidence that shows how ACEs lead directly to adverse health issues later in life.

Ten categories of ACEs were identified in the landmark CDC/Kaiser Permanente study but are not the only identified risk factors for toxic stress. Other adversities such as being a victim of violence in the community, discrimination, medical trauma, or social determinants of health are risk factors for developing adverse health outcomes resulting from toxic stress. However, they are separated from the ACE score range to retain integrity in the data (Bhushan et al., 2020).

ACEs are also higher among sexual and gender minority populations (Austin et al., 2016; Sherman et al., 2019) and may be linked to adverse outcomes and behaviors. LGB populations showed a higher prevalence of ACEs compared to their heterosexual counterparts (Austin et al., 2016). Emotional abuse and neglect were more commonly reported among transgender populations compared to LGB cisgender populations (Schnarrs et al., 2019). Neglect during childhood is common among transgender populations (Schnarrs et al., 2019). The higher prevalence of ACEs among the LGB

people may influence excess risk for poor health outcomes such as vulnerability to HIV infections (Austin et al., 2016). Childhood sexual trauma was also associated with HIV among transgender female sex workers (Sherman et al., 2019). Verbal abuse during childhood was associated with binge drinking in adulthood among transgender women (Yi et al., 2020). Researchers have also found a significant relationship between syndemic experiences such as binge drinking, depressive symptoms, intimate partner violence in adulthood, childhood sexual abuse, and increased HIV vulnerability among LGBT populations (Logie et al., 2019). Based on these findings, ACEs may be associated with HIV risk behavior among transgender populations.

Problem Statement

ACEs are highly prevalent, impacting all communities and causing the most common severe health conditions. In a 1998 study, 52% of the respondents reported at least one ACE, and 6.2% of respondents reported four or more ACEs (Felitti et al. 1998). The higher the ACE score of an individual, the greater the likelihood of adverse health problems. However, studies have placed LGBTQ populations at higher risk for a toxic stress response (Bhushan et al., 2020). HIV infection rates are high among high-risk individuals such as LGBTQ+ and transgender populations, who are 49 times at risk of acquiring HIV compared to the general public (CDC, 2016). Behaviors such as unprotected anal sex and needle-sharing increase the risk of acquiring HIV (CDC, 2019c). Such high-risk behaviors adopted by transgender populations can be connected to their high risk for ACE exposure and toxic stress (Bhushan et al., 2020). An individual with four or more ACEs can have an increased likelihood of downstream consequences

such as being 10.2 times likely to be dependent on substances (injected drug, crack cocaine, or heroin use) and being 5.9 times likely to be exposed to sexually transmitted infections (Bhushan et al., 2020).

Despite the connection between ACEs and HIV risk behaviors, most of the literature on HIV/AIDS has focused more on the diagnosis aspects of the epidemic and the treatment (Ransome et al., 2018). This excludes socioeconomic factors such as income level that can influence risk-taking behavior (Ransome et al., 2018). For instance, experiencing economic hardship can be a predictor of sexual promiscuity such as prostitution, creating a higher risk of HIV. However, the connection between ACEs and the high-risk behavior related to other adversities that lead to toxic stress has been unexplored. Despite the available evidence about the high vulnerability of transgender people to HIV infections and high cases of ACEs, I found no studies that examined the association between ACEs and HIV risk behavior among transgender populations. Similarly, little is known about the independent associations of ACEs and HIV risk behavior, yet HIV and ACEs remain significant influences as a cause of death. Therefore, this research is significant to inform recommendations for addressing HIV high-risk behaviors with a trauma-informed lens.

Purpose of the Study

In this study, the association between ACEs and HIV risk behavior among transgender populations was examined. The transgender population was selected due to their increased vulnerability to HIV and noted high cases of ACEs. The U.S. government has invested heavily in the healthcare sector, especially in dealing with the HIV

pandemic; however, no particular development has been effective (Jones & Salazar, 2016). The U.S. government must know how the transgender population is mainly susceptible to infection. Therefore, the purpose of this study was to develop a comprehensive understanding of the association between ACEs and HIV risk behavior among transgender populations. Many studies have assessed the factors that put the LGBTQ community at high risk of HIV infection, but there is still a gap in knowledge regarding the specific factors that may increase the vulnerability of transgender people to HIV (Becasen et al., 2019; Schnarrs et al., 2019). This study aimed to determine whether ACEs may increase the vulnerability of transgender populations to HIV risk behaviors.

Research Questions

This study aimed to develop a comprehensive understanding of the association between ACEs (independent variables) and HIV-related risk behaviors (dependent variable) among transgender populations. I wished to determine whether ACEs may increase the vulnerability of transgender populations to HIV risk behaviors. The following research questions and hypotheses were designed to address this purpose:

Research Question 1: What is the association between ACEs and HIV risk behavior among the transgender population?

$H_0$1: There is no significant association between ACEs and HIV risk behavior among the transgender population with direct adjustment for age, race, income, and education.

H_a1: There is a significant association between ACEs and HIV risk behavior among the transgender population with direct adjustment for age, race, income, and education.

Research Question 2: What is the association between ACE score (1, 2, 3, 4, or more) and HIV risk behavior among the transgender population?

H_02: There is no significant association between ACE score and HIV risk behavior among the transgender population with direct adjustment for age, race, income, and education.

H_a2: There is a significant association between ACE score and HIV risk behavior among the transgender population with direct adjustment for age, race, income, and education.

Nature of the Study

A quantitative research approach was used to examine the association between ACEs and HIV risk behavior. The quantitative approach was supported by data obtained from the CDC database based on the outcomes from the survey conducted using the Behavioral Risk Factor Surveillance System (BRFSS) in 2019. A cross-sectional design involving the analysis of secondary data was used to understand the impacts of ACEs on HIV risk behaviors among transgender people. A cross-sectional study involves assessing data collected from a given population within a specific time (Setia, 2016). The cross-sectional design is relatively easy to perform and produces more comprehensive outcomes than other research designs such as the longitudinal design (Sedgwick, 2014). The participants in this study are recruited using particular variables of interest. In line

with this design, the BRFSS aimed to collect data on health-related behaviors, health conditions, and the use of preventive services. Despite criticisms of the cross-sectional design such as weak evidence to support the relationship between exposure and outcomes (Setia, 2016), the design was chosen to determine the association between ACEs (occurring before age 18) and HIV risk behavior (within the past year) among transgender people. Detailed background on the research design will be further discussed in Section 2.

Literature Search Strategy

To support the study, research and data from the database EBSCO, PsycINFO, PsychARTICLES, and CINAHL were used using search terms *transgender adults*, *HIV* OR *AIDS*, *HIV susceptibility*, *transgender risk-taking behaviors*, *ACEs*, and *transgender* AND *ACEs*. Statistics on HIV infection rates among transgender people from the CDC and the BRFSS database report were aslo incorporated.

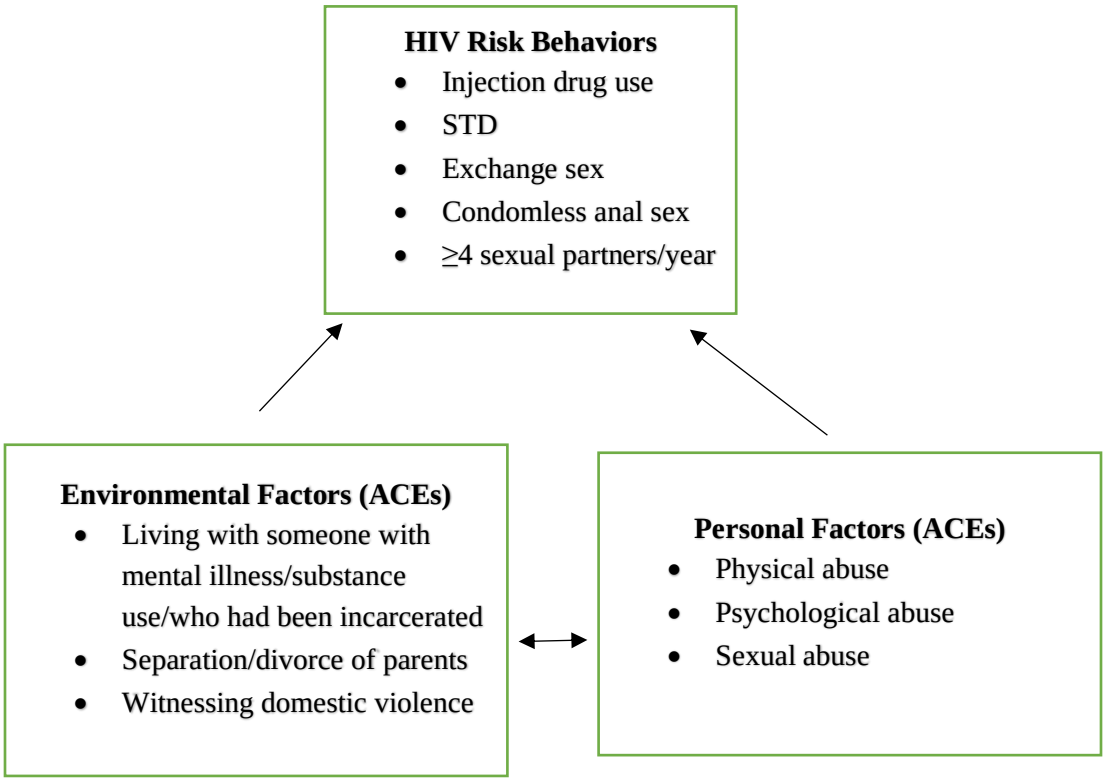
Theoretical Framework

The social cognitive theory was used as a framework for understanding the role of ACEs in HIV risk behavior among transgender people. The social cognitive theory states that individual experiences, the actions of others, and environmental factors impact individual behaviors (Rural Health Information Hub, 2021). The theory provides opportunities for social support by instilling self-efficacy and expectations and allowing for the use of observational learning, among other reinforcements, to enhance the realization of behavioral change.

I chose the theory because it can used as a theoretical framework in different populations and settings because of its ability to describe behavior among members of at-risk populations (Beauchamp et al., 2019; Merlin et al., 2018). The key variables considered in the current study are presented in an adapted version of the social cognitive theory in Figure 1: personal factors, environmental factors, and HIV risk behavior. The figure includes ACEs that are considered direct ACEs (personal factors), environmental ACEs (environmental factors), and HIV risk behaviors. Direct ACEs include those events directed toward the child, such as physical, sexual, or psychological abuse. Environmental ACEs include those that were not directed towards the child but describe the child's surroundings, such as living with someone with a mental illness, substance use issues, or who had been incarcerated. In addition, other environmental ACEs may include separation or divorce of parents and/or witnessing domestic violence in the home. HIV risk behaviors include a variety of factors such as injection drug use, being treated for an STD, exchange sex, condomless anal sex, and four or more partners in the past year.

Figure 1

Associations Between Adverse Childhood Experiences and HIV Risk Behaviors Based on Social Cognitive Theory



Literature Review Related to Key Variables and/or Concepts

I examined ACEs as the independent variable and HIV-related risk behaviors as the dependent variable, which assisted in identifying any associations between ACEs, ACE scores, and HIV risk behavior. Several studies have examined the association of ACEs with adverse health outcomes using data from the BRFSS (Brown et al., 2013; Chanlongbutra et al., 2018). ACEs have been operationalized as each ACE, direct or environmental ACEs, or an ACE score (the number of reported ACEs experienced by an individual). As the BRFSS is a cross-sectional survey, these studies have used a cross-sectional design. For example, Chanlongbutra et al. (2018) examined ACEs and health-related quality of life and chronic disease risks in rural areas of the United States, using ACEs scores and confounders such as age, sex, race/ethnicity, and education. Brown et al. (2013) examined the association between ACEs and a cancer diagnosis using BRFSS data, focusing on sexual abuse, environmental ACEs, and physical/psychological abuse. Relevant confounders used included age, sex, race/ethnicity, income, education, and marital status. Other studies have examined ACE disparities by examining adverse childhood events in American Indian/Alaskan Native populations (Giano et al., 2021) and how ACEs intersect with race/ethnicity and asthma outcomes (Hall et al., 2020). In the current study, I examined separate ACEs as well as the ACE score.

Some studies have also examined HIV risk behavior using BRFSS data. One study examined the prevalence of ever tested for HIV and HIV risk behaviors among people with visual and/or hearing impairments. The prevalence of HIV risk behaviors was 7.1% among people with visual impairments, 3.9% among people with hearing

impairments, 3.5% among people with visual and hearing impairments, and 5.9% among people with no impairments (Olakunde & Pharr, 2020). Another study examined HIV risk behaviors and their correlation with Papanicolau (Pap), human papillomavirus (HPV), and HIV screening among women in the U.S. HIV risk behaviors applied to approximately 5% of women and were correlated with Pap and HIV testing (Merrill, Williams, & Fuhriman, 2020). The HIV risk behavior variable has also been used to define the target population in previous research. For example, Zhang and colleagues examined the association between cervical cancer screening and healthcare access and HIV testing among women with high-risk behaviors (Zhang et al., 2020). For the current study, I examined HIV risk behaviors as the dependent variable. To date, no study has assessed the association between ACEs and HIV risk behavior among transgender populations. However, previous work has shown that transgender populations or gender nonconforming people are at risk of experiencing ACEs, especially child abuse (Tobin and Delaney, 2019). Even among sexual minorities, transgender populations are more likely to report ACEs than lesbian, gay, and bisexual populations. For example, previous research has also shown that transgender participants were more likely to report ACEs such as emotional abuse and neglect (physical and emotional) compared to cisgender lesbian, gay and bisexual participants (Schnarr et al., 2019). Researchers found a dose-response relationship between the number of psychosocial syndemic issues (polydrug use in the past four months excluding stimulant use; heavy alcohol use in the past four months; childhood sexual abuse; stimulant use in the past four months; lifetime intimate partner violence; clinically significant depressive symptoms; experiencing lifetime

transgender-specific violence; and HIV risk behavior (condomless anal or vaginal sex) among young transgender women (Mimiaga et al., 2019).

One study examined the link between potentially traumatic events (such as hate crime and childhood abuse) and sexual risk behavior among LGBTQ individuals. Researchers found that exposure to at least one potentially traumatic event was associated with shame, loneliness, and substance use, which were then linked to sexual risk behavior (Scheer, & Antebi-Gruszka, 2019). However, this study did not differentiate potentially traumatic events nor reported results by a sexual minority group. The impact of ACEs may differ from the effect of hate crimes, and the impact on sexual risk behavior may differ by a sexual minority group. Therefore, this study determined a link between ACEs and HIV risk behavior among transgender people, who are disproportionately affected by HIV infection (Ackerley, Poteat, & Kelley, 2019).

Definitions

Adverse childhood experience (ACE) categories: Ten categories in three domains that are factors for toxic stress. These domains include child abuse which encompasses physical, emotional, or sexual abuse; neglect encompasses physical or emotional neglect; and household challenges include growing up with household incarceration, mental illness, substance dependence, parental separation or divorce, or intimate partner violence (Bhushan et al., 2020).

Adverse childhood experience (ACE) score: the ACE score is a total sum of cumulative exposure to adverse childhood conditions reported by participants. Participant exposure to any single ACE condition is counted as one point. If a person experienced

none of the conditions in childhood, the ACE score is zero. Points are then totaled for a final ACE score (CDC, 2021).

Adverse childhood experiences (ACEs): Traumatic experiences of abuse, neglect, and household challenges that occur during childhood before the age of 18 (ACE Resource Network, 2021).

Age: The amount of time that has passed from an individual's birth to the given date. Age identities are estimated for a representative sample of the transgender U.S. population between 18 and 65 (Barrett, 2003).

Education: The acquisition of training, knowledge, and skills that an individual has achieved in their lives. Levels of education include kindergarten/elementary, high school or equivalent, some college, post-secondary, associate degree, bachelor's degree, master's degree, and a doctoral or professional degree (Torpey & Watson, 2014)

Gender identity: Rosenthal (2016) defined gender identity as a person's inner sense of being male or female

HIV/AIDS: Human Immunodeficiency Virus reduces body immunity to fight opportunistic infections, thus leading to Acquired Immune Deficiency Syndrome. (Asghari et al., 2020).

HIV-related risk behaviors: Are a set of behaviors that exposes an individual to HIV, such as drug-related risk behaviors (e.g., drug use, sharing needles) and sex-related risk behaviors (e.g., multiple sexual partners, unprotected sexual intercourse) (Qiao, Li, Stanton, 2014).

Income: Earnings such as wages, salaries, and self-employment earnings. Income distribution differs by household with class differences notes as low-income, middle income, and high-income (Congressional Research Service, 2016).

Race: Physical differences that groups and cultures consider socially significant. It consists of personal identity and group identity facets (Ford and Kelly, 2005).

Sex: Sex refers to physical traits that characterize the maleness or femaleness of a person (Rosenthal, 2016)

Socioeconomic status: A measure of a combination of a person's economic and social status associated with health positively or negatively (Baker, 2014).

Toxic stress: ACEs create toxic stress in the body and can have a lasting impact on one's health (CDPH et al., 2020). A consensus of scientific evidence demonstrates that high doses of cumulative adversity experienced during critical and sensitive periods of early life development, without the buffering protection of safe, stable, and nurturing relationships cause long-term disruptions of brain development, immune and hormonal systems, and genetic regulatory mechanisms – a condition now known as the "toxic stress response." (Bhushan et al., 2020).

Transgender persons: Transgender persons refer to people with different gender identity from the birth certificate gender. For instance, a person who was born male but identified as female (Meerwijk and Sevelius, 2017; Rosenthal, 2016)

Assumptions

I assumed that the data provided through BRFSS provided a broad study sample that accurately represented the transgender population. I also assumed that self-reported

response on ACE questions (broken down into 1 of 8 ACE categories: physical abuse, emotional abuse, sexual abuse, household mental illness, household substance use, incarcerated household member, parental separation or divorce, and household domestic violence) would show significant rates of a high ACE score.

Scope and Delimitations

The study surveyed transgender male to female, female to male, and gender non-conforming, 18 years of age or older living in the U.S. Data were obtained from the CDC 2019 BRFSS database. The BRFSS is a statewide system of continuous health-related telephone surveys designed to collect data on health-related risk behaviors related to the leading cause of death and disability among the non-institutionalized adult population aged 18 years or older in the United States (CDC, 2020). The 2019 BRFSS was implemented in fifty-three states and territories and assessed factors that included health status, healthy days/health-related quality of life, health care access, exercise, inadequate sleep, chronic health conditions, oral health, tobacco use, e-cigarettes, alcohol consumption, immunization, falls, seat belt use, drinking and driving, breast- and cervical cancer screening, prostate cancer screening, colorectal cancer screening, and HIV/AIDS knowledge (CDC, 2020).

States were given additional optional modules to implement. ACE questions and questions on sexual and gender minorities were included as optional modules in 2019. Variables selected to support this study resulted from unexplored research surrounding transgender individuals and ACEs where current preventions fail to explore the impact of childhood trauma. Awareness supported by this study will promote shared learning and

quality improvement in ensuring programs are equipped with evidence-based tools to address HIV high-risk behaviors with a trauma-informed lens. This study intends to encourage a public health response to improving health equity and preventing HIV by ensuring communities are "ACEs Aware."

Limitations

As the data collected in the BRFSS were self-reported, participants may be subject to social desirability bias. They may be less likely to report ACEs, sexual and gender minority status, and HIV risk behavior. This underreporting may result in underestimates of the "true association" between ACEs and HIV risk behavior. One drawback with using cross-sectional data is the inability to establish temporal sequences. Even though the data are cross-sectional, the ACEs occurred before participants were 18 years old, and HIV risk behavior occurred during the past year. Therefore, the temporal sequence would have been established for the majority of participants in the survey. Some of the questions on ACEs measured frequency, but questions did not address severity. The question on HIV risk behavior also did not differentiate among the different behaviors, but I will determine the association between ACEs and a global measure of HIV risk behavior.

Significance of Study

The discoveries of this study will have positive implications on practices, policies for HIV prevention for transgender persons, and future research work on the subject. The knowledge generated will contribute to the body of knowledge by filling a critical gap in the existing literature within the transgender population. The study will lead to

transformational positive social change at the individual, community, county, state, federal, and national levels. Groundbreaking studies surrounding ACEs are a driving force to creating trauma-informed networks to care, which could minimize the susceptibility of vulnerable populations by interrupting the progression from early adversity to disease and early death (Bhushan et al., 2020). Healthcare providers, public health organizations, and cross-sector community services can benefit from practices that inform early detection, prevention, and management of high-risk behaviors that lead to acquiring HIV. The study outcomes are expected to empower advocacy and increase awareness of the need to consider historic adversities. The findings will also aid the health and social sector policymakers in identifying problems that affect transgender individuals and developing relevant measures and policies to curb the difficulties noted. The study will also be significant in informing employers of legal obligations on the employment of transgender individuals.

Given that transgender persons are at risk of getting infected with HIV at a very high rate, the findings will inform health practitioners to instill measures that will help curb the spread of the disease. The individual, their family, and the supporting community could be involved and informed on ways to mitigate the impact of ACEs and HIV in the transgender population using the clinical evidence of toxic stress response. Transgender individuals will also develop positive resilience coping strategies resulting from poor health outcomes due to ACEs.

Summary and Conclusions

HIV/AIDS is a prevalent disease where there is an increase in new infections despite the massive investments by the U.S. government to reduce infections and access to healthcare services. The literature shows that sexual minority populations, for example, transgender populations, may be more likely to be exposed to ACEs and are at risk for HIV risky behavior. In the study, I critically assess a connection between ACEs and HIV risk behavior among the transgender population. I also assess the association between ACE score and HIV risk behavior among the transgender population.

Section 2: Research Design and Data Collection

The purpose of this study was to examine the association between ACEs and HIV risk behavior among transgender populations. In this section, I will state the study variables and identify the research design. I will also describe the data analysis and threats to validity.

Research Design and Rationale

The study was conducted to determine whether ACEs are associated with HIV risk behavior among transgender individuals. The independent variable was ACEs, and the dependent variable was HIV-related risk behaviors. Confounding variables for the study were age, race, education, and income. This study followed a cross-sectional design as the BRFSS data are cross-sectional. This design enabled me to determine whether ACEs are associated with HIV risk behavior at one point in time. There were no time and resource constraints related to the design choice.

Methodology

The target population included transgender individuals who participated in the 2019 BRFSS Survey. The total number of transgender individuals who participated was 955. Respondents were included in the study if they answered identified as being transgender individuals. Respondents were excluded if they answered “no” or did not respond to the transgender identity question. Respondents were also excluded if they were missing data on all ACEs and did not respond to the HIV risk behavior question (using the complete case approach to handle missing data).

The BRFSS collects data on health-related risk behaviors, chronic diseases, and the use of preventive and screening services in all 50 states, Washington, DC, and three territories (CDC, 2019d). More than 400,000 surveys are completed each year. Data was collected via in-house interviews or phone surveys continuously throughout the year. The type of sampling procedure used was random sampling. Random digit dialing is used to survey both landlines and cell phones. BRFSS data were also weighted using several variables, including age, sex, ethnicity, geographic regions within states, marital status, education level, homeownership, and type of phone ownership. Concerning the exclusion criteria, institutionalized individuals are not included in the BRFSS survey.

Data are publicly available and can be downloaded from the BRFSS website. The BRFSS was the best dataset for the current study as it collects data on ACEs, HIV risk behaviors, and confounding factors such as age, race, education, and income. BRFSS participants were also a nationally representative sample of the United States. To obtain a calculation for sample size, using the power of 0.80, alpha level 0.05, assuming risk behavior in subjects without ACEs is 10%, and the difference between the two groups (had ACEs vs. no ACEs) is 10%, the sample size needed was 85. The total number of transgender people in the BRFSS that was used for the current study is 305.

ACEs were operationalized using 11 items from the BRFSS survey. The ACE module consisted of 11 questions that explore an individual's exposure to adversity experienced before 18 years of age. The ACE questions were broken down into one of eight ACE categories: physical abuse, emotional abuse, sexual abuse, household mental illness, household substance use, incarcerated household member, parental separation or

divorce, and household domestic violence (Merrick et al., 2018). The questions used to determine ACEs are: Now, looking back before you were 18 years of age---.

1. Did you live with anyone who was depressed, mentally ill, or suicidal?
2. Did you live with anyone who was a problem drinker or alcoholic?
3. Did you live with anyone who used illegal street drugs or who abused prescription medications?
4. Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?
5. Were your parents separated or divorced?
6. How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up?
7. Not including spanking (before age 18), how often did a parent or adult in your home ever hit, beat, kick, or physically hurt you in any way?
8. How often did a parent or adult in your home ever swear at you, insult you, or put you down?
9. How often did anyone at least 5 years older than you or an adult ever touch you sexually?
10. How often did anyone, at least 5 years older than you or an adult, try to make you touch them sexually?
11. How often did anyone at least 5 years older than you or an adult, force you to have sex?

Response options for Questions 1 to 5 were *yes* or *no*. Response options for Questions 6 to 11 were *never*, *once*, or *more than once*. The ACE score was determined by tallying the number of ACEs (1, 2, 3, 4, or more vs. 0 ACEs) from all 11 questions. Questions that are answered with *yes*, *once*, or *more than once* were scored 1, and questions with an answer of *no* or *never* had a score of 0. If the answer to ACEs was blank, I counted it as 0. For Research Question 1, ACEs was operationalized by ever experiencing at least one ACE.

The question used to determine transgender status was "Do you consider yourself to be transgender?" Answer options included transgender, male-to-female; transgender, female to male; transgender, gender nonconforming; and no. Respondents were included in the study if they answered one of three options for being transgender individuals. Respondents were excluded if they answered *no* or did not respond to the transgender identity question.

The following questions determined HIV risk behavior:

- You have injected any drug other than those prescribed for you in the past year.
- You have been treated for a sexually transmitted disease or STD in the past year.
- You have given or received money or drugs in exchange for sex in the past year.
- You had anal sex without a condom in the past year.
- You had four or more sex partners in the past year.

Response options were *yes* or *no*.

Analysis

The study population was first described overall and by ACE status using frequencies and percentages for categorical variables. I also used Chi-square *p* values to determine statistically significant differences in ACEs by age, gender, race, income, and education. For this study, the independent variables are ACEs (defined as yes/no and ACE score), and the dependent variable is HIV-related risk behaviors (yes/no). When determining the association between ACEs and HIV risk behavior, I used logistic regression models and adjusted for socioeconomic characteristics such as age, race, income, and education. Previous research has shown differences in ACEs by age, race, income, and education (Brown et al., 2015). There may also be age, race, income, and education status differences in HIV risk behaviors. The data were analyzed using *SAS version 9.4*, which allows for the logistic regression analysis of the involved variables. I used complete case analysis to handle missing data.

Research Questions

Research Question 1: What is the association between ACEs and HIV risk behavior among the transgender population?

$H_0$1: There is no significant association between ACEs and HIV risk behavior among the transgender population with direct adjustment for age, race, income, and education.

H_a1: There is a significant association between ACEs and HIV risk behavior among the transgender population with direct adjustment for age, race, income, and education.

Research Question 2: What is the association between ACE score and HIV risk behavior among the transgender population?

$H_0 2$: There is no significant association between ACE score and HIV risk behavior among the transgender population with direct adjustment for age, race, income, and education.

$H_a 2$: There is a significant association between ACE score and HIV risk behavior among the transgender population with direct adjustment for age, race, income, and education.

I used logistic regression to test the hypotheses. There were a few assumptions associated with logistic regression. Binary logistic regression requires that the dependent or outcome variable is binary. In this study, HIV risk behavior was the binary outcome (yes vs. no). Second, logistic regression assumes that the observations are independent of each other. I assumed that the observations collected from BRFSS, a random representative sample of the United States, are independent, as individuals participate in the BRFSS only once. Third, logistic regression assumes little or no multicollinearity among independent variables; thus, I examined collinearity among ACE, race, age, income, and education using a correlation table. Fourth, logistic regression also requires a large sample size. The previous sample calculation has shown that the sample size (N = 955) is sufficient for the current study.

In addition, I used crude odds ratios, adjusted odds ratios, and 95% confidence intervals as the effective measures. I examined model fit using three characteristics: deviance, the Pearson chi-square, and the Hosmer-Lemeshow test. A number between 0 and 1 (p-value) was obtained, with higher values indicating a better fit (Allison, 2021). For the logistic regression model, if the odds ratio was greater than 1 and the 95% confidence interval did not contain 1, ACEs were considered positively associated with HIV risk behavior. If the odds ratio was less than 1 and did not contain 1, ACEs were negatively associated with HIV risk behavior. If the 95% confidence interval contained 1, then the findings were not statistically significant. I treated the independent variable ACE score as several binary variables (1 ACEs vs. 0 ACE; 2 ACEs vs. 0 ACE; 3 ACES vs. 0 ACE; ≥ 4 ACEs vs. 0 ACE).

I also ran a Pearson correlation analysis to determine correlation between confounders. Table 1 shows the correlation statistics of sociodemographic characteristics. Age and race, race and income, race and education, and income and education were significantly correlated with each other. However, correlation coefficients (r) were ≤ 0.320, which suggests that correlations were not very strong and supports independence of confounders.

Table 1

Correlation Table of Sociodemographic Characteristics

	Age	Race	Income	Education
Age	1.00			
Race	-0.189***	1.00		
Income	0.014	-0.173**	1.00	
Education	-0.008	-0.222***	0.320***	1.00

***$p < 0.001$; **$p < 0.01$

Threats to Validity

As this study includes a nationally representative sample of the United States, findings may not reflect other transgender populations in other global regions due to cultural and societal differences. Nevertheless, the BRFSS data are of high quality and have been used in several studies, though the ACEs measured in the BRFSS exclude other potential ACEs such as bullying, discrimination, living in foster care, adverse neighborhood experience, and witnessing violence in the neighborhood. Despite this limited definition, the definition of ACEs and the ACE score has been established in previous research (Fang et al., 2016). Using these operationalizations, I determined exposure to ACEs quantitatively and qualitatively and how ACEs impact HIV risk behavior among transgender populations. I used a global measure of HIV risk behavior and was not be able to tell the impact of ACEs on different HIV risk behaviors. I assessed that all assumptions for logistic regression are met for the current study. If assumptions for logistic regression were violated, I addressed them as they occurred. For example, if there was high multicollinearity among the independent variables, I examined the inclusion of other confounders in the model.

Ethical Procedures

Data were de-identified before being made publicly available, and no authorization is needed from the CDC before using the BRFSS data. However, I did obtain institutional review board approval from Walden University following the four-step directions for obtaining ethics approval for a doctoral study (Walden University, 2021). The approval number through the CITI program course is 44131843.

Summary

In this study I examined the association between ACEs and HIV risk behavior. The study was conducted using a cross-sectional design. Logistic regression was used to obtain crude and adjusted odds ratios and 95% confidence intervals. Adjusted models controlled for sociodemographic confounders. All analyses were conducted in SAS. The following section will present the results and findings.

Section 3: Presentation of the Results and Findings

This study aimed to determine the association between ACEs and HIV risk behavior among transgender individuals. I hypothesized that those exposed to ACEs would be more likely to report HIV risk behavior than those not exposed. The research questions addressed the association between ACEs and HIV risk behavior among the transgender population after adjusting for age, race, income, and education. This section presents weighted prevalence estimates and the distribution of sociodemographic characteristics overall and by ACEs status. The weighted estimates represent national demographic characteristics. I also present the crude and adjusted (controlling for age, race/ethnicity, education, and income) associations between ACEs and HIV risk behavior among transgender individuals. This section also contains details on accessing the BRFSS dataset for secondary analysis, the descriptive findings, and the association between ACEs and risky HIV behavior.

Data Analysis Plan

Data were analyzed using SAS. Data analysis included descriptive and inferential statistics and the creation of tables. Descriptive statistics were used to examine the difference between ACE groups in sociodemographic characteristics (and potential confounders) of the study population including age (categorical:18–34, 35–49, 50–64, 65+), race/ethnicity (Black, NH; White, NH; Other, NH; Hispanic/Latino), income (categorical: < $15,000, $15,000–< $50,000, ≥ $50,000), and education (< high school, high school, some college/technical school, college graduate). Crude and adjusted logistic regression models were used to determine the association between ACEs, ACE score, and

HIV risk behavior. Odds ratios and 95% confidence intervals were the effect estimates used in the current study. The predictor variables (ACEs and ACEs score) were tested to determine if there was violation of the assumption of the linearity of the logit. The predictor variables (ACEs and ACEs score) in the logistic regression were found to contribute to the model.

Accessing the Dataset for Secondary Analysis

Data were obtained from the 2019 BRFSS Survey for the study's secondary analysis. The dataset is public and readily available for use by the general public on the CDC website; therefore, no permissions were required for access. However, Walden's Institutional Review Board approval process provided required permission for the analysis of the data. The 2019 BRFSS survey was chosen because it contained the most recent and relevant national data responses with relevant ACEs questionnaire and large sample size and supporting responses from transgender individuals. The dataset was prepared for analysis using the SAS version 9.4 software.

The BRFSS Survey conducts in-house interviews or establishes contracts with call centers and/or universities to administer the surveys throughout each year. Survey information was gathered through telephone (landline and cell phone). Random digit dialing was used to conduct the survey on landlines and cell phones. Data were collected on health risk behaviors, chronic conditions, and preventive services use. Data on emerging health issues were also collected, including data on vaccinations and flu-like illness. Questions asked were either from the standardized core, optional modules, or state-added questions. Twenty-one states included the ACE questionnaire in 2019

Alabama, Delaware, Florida, Indiana, Iowa, Kansas, Michigan, Mississippi, Missouri, New Mexico, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, Wisconsin.

There were 955 transgender individuals in the 2019 BRFSS; however, individuals who were in states that did not ask ACEs were omitted, which brought the sample size to 340 transgender participants. Further, 17 participants were missing data on HIV risk behavior, and 18 were missing on all ACE questions, resulting in a final sample size of 305 for analysis. Therefore, the sample size is smaller than initially projected in Section 2. Nevertheless, BRFSS participants were a nationally representative sample of the U.S. population, though it is possible that transgender participants in the study might not be nationally representative of the study population. Approximately 39% identified as male-to-female, 37% identified as female-to-male, and approximately one in four identified as gender nonconforming.

Table 2 shows the descriptive analyses for ACEs. Approximately one in three participants reported living with someone who was mentally ill, depressed, or suicidal, and 28% reported living with a problem drinker. About 17% reported living with someone who used illegal drugs or abused prescription medications, and about 14% reported living with someone who served time or was sentenced to serve time in a prison, jail, or other correctional facility. Approximately one in three participants reported that their parents were divorced or separated, and 22% reported witnessing domestic violence in the home. Thirty-one percent (31%) reported being physically abused, 43% emotionally abused, 12% reported being touched sexually, 8% reported that an adult tried

to make the respondent touch them sexually, and 7% reported being forced to have sex. High-risk situations applied to 10.2% (n = 31) of the study population, whereas 89.8% (n = 274) did not report any HIV risk behavior in the past year.

Table 2

Descriptive Analysis for Adverse Childhood Experiences

	Response	*N*	%
Did you live with anyone who was depressed, mentally ill, or suicidal?	Yes	99	32.5
	No	200	65.6
	Missing	6	2.0
Did you live with anyone who was a problem drinker or alcoholic?	Yes	84	27.5
	No	219	71.8
	Missing	2	0.7
Did you live with anyone who used illegal street drugs or who abused prescription medications?	Yes	53	17.4
	No	247	81.0
	Missing	5	1.6
Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?	Yes	42	13.8
	No	258	84.6
	Missing	5	1.6
Were your parents separated or divorced?	Yes	98	32.1
	No	191	62.6
	Missing	16	5.3
How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up?	Never	228	74.8
	Once	16	5.3
	More than once	50	16.4
	Missing	11	3.6
Not including spanking, (before age 18), how often did a parent or adult in your home ever hit, beat, kick, or physically hurt you in any way? Was it…	Never	204	66.9
	Once	22	7.2
	More than once	72	23.6
	Missing	7	2.3
How often did a parent or adult in your home ever swear at you, insult you, or put you down?	Never	164	53.8
	Once	19	6.2
	More than once	113	37.0
	Missing	9	3.0
How often did anyone at least 5 years older than you or an adult, ever touch you sexually?	Never	256	83.9
	Once	17	5.6
	More than once	20	6.6
	Missing	12	3.9
How often did anyone at least 5 years older than you or an adult, try to make you touch them sexually?	Never	270	88.5
	Once	8	2.6
	More than once	17	5.6
	Missing	10	3.3
How often did anyone at least 5 years older than you or an adult, force you to have sex?	Never	271	88.9
	Once	10	3.3
	More than once	11	3.6
	Missing	13	4.3

Assumptions and Hypothesis Testing

Logistic regression was used to analyze the association between ACEs and HIV risk behavior. HIV risk behavior (outcome) was a binary variable, and the predictor variable was also binary (ACEs vs. no ACES). I assumed that the observations were independent of each other and that there was little multicollinearity among independent variables (ACEs, age, race, income, education). In addition, by using logistic regression, I assumed that the independent variables are linearly related to the log odds.

Logistic regression was also used to analyze the association between ACE score and HIV risk behavior. HIV risk behavior (outcome) was a binary variable, and the predictor variables were also binary (1 ACE vs. 0 ACE; 2ACEs vs. 0 ACE; 3 ACEs vs. 0 ACE; ≥4 ACEs vs. 0 ACE). I assumed that the observations were independent of each other and that there was little multicollinearity among independent variables. In addition, by using logistic regression, I assumed that the independent variables are linearly related to the log odds.

Results

Research Question 1

For Research Question 1, I wanted to determine the association between ACEs and HIV risk behavior among the transgender population. Table 3 presents the univariate analysis for the sample. The weighted prevalence estimates and distribution of sociodemographic characteristics are shown in Table 4. Most participants were between ages 18 and 34 (61.9%) and White (73.4%). Approximately one in four participants earned less than $15,000 per year (23.3%) and had some college or technical school

education (26.0%). Younger participants had a higher percentage of ACEs compared to older participants. As age group increased, the percentages of ACEs decreased (18–34 [86%]; 35–49 [82%]; 50–64 [69%]; and 65+ [38%]), but the difference was not statistically significant ($p = 0.110$). Hispanic and Black participants had a higher percentage of ACEs compared to Other and White participants, but the difference was not statistically significant ($p = 0.112$). Participants who earned the lowest income (<$15,000) had the highest percentage of ACEs (93%), and those who earned between $15,000 and $50,000 had the lowest percentage of ACEs (71%), but again the difference was not statistically significant ($p = 0.076$). Approximately 85% of participants who had less than a high school education and a high school education reported ACEs while 68% of those who had some college or technical school education reported ACEs, but the difference was not statistically significant ($p = 0.265$). Almost 100% of participants who reported HIV risk behavior reported ACEs, whereas only 75% of those who did not report HIV risk behavior reported ACEs. This difference was statistically significant ($p < 0.001$).

Table 3

Weighted Prevalence Percentages and Distribution of Sociodemographic Characteristics Overall and by ACEs Status

	n (%)	*n* (%) ACEs	*n* (%) No ACEs	Chi-square P-value
Age Group				0.110
18-34	111 (61.9)	98 (85.8)	13 (14.2)	
35-49	44 (13.9)	30 (82.1)	14 (17.9)	
50-64	62 (14.0)	41 (68.9)	21 (31.1)	
65+	72 (10.2)	36 (38.0)	36 (62.0)	
Race/Ethnicity				0.112
White, NH	206 (73.4)	145 (76.3)	61 (23.7)	
Black, NH	30 (8.6)	21 (84.3)	9 (15.7)	
Other, NH	28 (5.5)	22 (75.0)	6 (25.0)	
Hispanic/Latino	33 (12.5)	22 (94.0)	11 (6.0)	
Income				0.076
<$15,000	51 (23.2)	37 (92.9)	14 (7.1)	
$15,000-<$50,000	119 (45.5)	84 (70.8)	35 (29.2)	
≥$50,000	78 (31.3)	53 (76.3)	25 (23.7)	
Education				0.265
<High School	47 (18.9)	31 (84.8)	16 (15.2)	
High School	99 (35.0)	64 (84.9)	35 (15.1)	
Some College/Technical	71 (26.0)	58 (67.5)	13 (32.5)	
School	78 (20.0)	56 (79.4)	22 (20.6)	
College Graduate				
HIV Risk Behavior				<0.001
Yes	31 (15.5)	30 (99.8)	1 (0.2)	
No	266 (84.5)	180 (75.4)	86 (24.6)	

Note. The weighting variable "_FINALWT" was used to obtain weighted percentages

Table 4 shows HIV risk behavior by sociodemographic risk factors. No individual 65 years old and older reported HIV risk behavior in the past year. Approximately 45% of Hispanic/Latino respondents reported HIV risk behavior in the past year. Nineteen percent of individuals who earned less than $15,000, and 19% of those who earned between $15000 and $50,000 reported HIV risk behavior in the past year. Approximately 27% of respondents who earned less than a high school education reported HIV risk behavior in the past year.

Table 4

HIV Risk Behavior by Sociodemographic Risk Factors

	HIV Risk Behavior	No HIV Risk Behavior	Chi square P-Value
Age Group			--
18-34	23 (19.9)	90 (80.1)	
35-49	6 (23.3)	39 (76.7)	
50-64	2 (1.1)	61 (98.9)	
65+	0 (0.0)	78 (100.0)	
Race/Ethnicity			0.010
White, NH	14 (10.2)	196 (89.8)	
Black, NH	6 (15.9)	28 (84.1)	
Other, NH	3 (9.5)	25 (90.5)	
Hispanic/Latino	8 (44.7)	27 (55.3)	
Income			0.740
<$15,000	5 (19.2)	46 (80.8)	
$15,000-<$50,000	14 (19.0)	108 (81.0)	
≥$50,000	7 (11.5)	73 (88.5)	
Education			0.315
<High School	8 (27.3)	41 (72.7)	
High School	7 (10.6)	96 (89.4)	
Some College/Technical School	7 (8.8)	66 (91.2)	
College Graduate	9 (17.9)	71 (82.1)	

-- P-value was not obtained due to 0 cell size.

The crude results showed that among transgender populations, those who experienced ACEs were 14 times more likely (odds ratio: 14.3; 95% confidence interval: 1.92–106.8) to report HIV risk behavior compared to respondents who did not experience ACEs. The unstandardized Beta weight for the Constant was B = -4.454, SE = 1.006, Wald = 19.6134, $p < 0.001$. The unstandardized Beta weight for the predictor variable was B = 2.663, SE = 1.025, Wald = 6.749, $p = 0.009$). In addition, those who were aged 18 to 49 were 16 times more likely to report HIV risk behavior (odds ratio: 15.6; 95% confidence interval: 3.66–66.8) compared to respondents who were aged 50 and older. Black respondents were three times more likely (odds ratio: 2.97; 95% confidence interval: 1.06–8.36) to report HIV risk behavior compared to White respondents. In addition, Hispanic respondents were four times more likely (odds ratio: 4.11; 95% confidence interval: 1.58–10.7).

After adjusting for age, race, income, and education, those who experienced ACEs were 13 times more likely (OR: 12.7; 95% CI: 1.51 – 42.2) to report HIV risk behavior compared to respondents who did not report ACEs. The unstandardized Beta weight for the Constant was B = -6.223, SE = 1.364, Wald = 20.821, $p < 0.001$). The unstandardized Beta weight for the predictor variable was B = 2.540, SE = 1.084, Wald = 5.488, $p = 0.019$). In addition, those who were aged 18 to 49 were 9 times more likely to report HIV risk behavior (odds ratio: 8.92; 95% confidence interval: 1.88–42.2) compared to respondents who were aged 50 and older. Black respondents were six times more likely (odds ratio: 6.18; 95% confidence interval: 1.69–22.6) to report HIV risk behavior compared to White respondents. In addition, Hispanic respondents were five

times more likely (odds ratio: 5.58; 95% confidence interval: 1.35–23.0). This finding suggests that even after considering sociodemographic characteristics as potential confounders in the association between ACEs and HIV risk behavior, a positive association between ACEs and HIV risk behavior remains among the transgender population.

Table 5 shows the association between ACEs and HIV risk behavior. I decided to use the deviance and the Pearson chi-square to determine model fit. P values were all high ($p > 0.05$) for the adjusted models, which suggested a good fit.

Table 5

Association Between Adverse Childhood Experiences and HIV Risk Behavior

	OR (95% CI)	aOR (95% CI)[a]	aOR (95% CI)[b]
ACEs (overall)	**14.3 (1.92 – 106.8)**	7.86 (1.02 – 60.6)	**12.7 (1.51 – 42.2)**
Age group*			
18-49 vs. 50+	**15.6 (3.66 – 66.8)**	**11.5 (2.67 – 49.7)**	**8.92 (1.88 – 42.2)**
Race	--	--	
Black vs. White	**2.97 (1.06 – 8.36)**	--	**6.18 (1.69 – 22.6)**
Other vs. White	1.66 (0.45 – 6.19)	--	0.83 (0.16 – 4.38)
Hispanic vs. White	**4.11 (1.58 – 10.7)**	--	**5.58 (1.35 – 23.0)**
Income			
<$15,000 vs. ≥$50,000	1.12 (0.34 – 3.73)	--	1.34 (0.30 – 5.91)
$15,000-<$50,000 vs. ≥$50,000	1.35 (0.52 – 3.50)	--	1.82 (0.56 – 5.94)
Education	--	--	
<HS vs. Col. Grad	1.58 (0.56 – 4.41)		0.62 (0.14 – 2.85)
HS vs. Col. Grad	0.58 (0.21 – 1.64)		0.22 (0.05 – 0.96)
Some College/Technical School vs. Col. Grad	0.84 (0.30 – 2.37)		0.44 (0.12 – 1.64)

*Age groups were collapsed due to small cell sizes – HIV risk behavior was not reported by those 65+.

Bolded estimates are statistically significant at $p < 0.05$

[a]Adjusted models controlled for age

[b]Adjusted models controlled for age, race, income, and education

Research Question 2

For Research Question 2, I determined the association between ACE score and HV risk behavior. Table 6 shows the distribution of sociodemographic characteristics by ACE score. Approximately 50% of respondents aged 18–34 experienced four or more ACEs compared to 29% of those aged 65+. Differences in ACE score by age group were statistically significant ($p < 0.001$). Approximately 54% of Other respondents reported four or more ACEs compared to 27% of Black respondents. Differences in ACE score were statistically significant ($p = 0.010$). Half of respondents who earned between $15,000 and $50,000 reported four or more ACEs, whereas 32% of those who earned $50,000 or more reported four or more ACEs, but these differences were not statistically significant ($p = 0.487$). Approximately half of those who earned some college or technical school education reported experiencing four or more ACEs, and approximately one in four of college graduates reported experiencing four or more ACEs. However, these differences were not statistically significant ($p = 0.651$). Approximately two in three respondents who reported HIV risk behavior reported experiencing four or more ACEs while four in 10 of those who did not report HIV risk behavior reported experiencing four or more ACEs. However, these differences were not statistically significant ($p = 0.144$).

Table 6

Sociodemographic Characteristics by Adverse Childhood Experience Score

	ACE Score				Chi-square p-value
	1	2	3	≥4	
Age					<0.001
18-34	20 (21.2)	12 (20.9)	15 (7.7)	51 (50.2)	
35-49	11 (36.2)	2 (12.5)	5 (6.8)	12 (44.5)	
50-64	11 (31.7)	6 (9.4)	11 (31.2)	13 (27.7)	
65+	12 (55.8)	9 (9.2)	4 (5.8)	11 (29.2)	
Race/Ethnicity					0.010
White, NH	35 (21.6)	22 (18.1)	27 (12.3)	61 (48.0)	
Black, NH	8 (33.3)	5 (37.9)	2 (2.2)	6 (26.5)	
Other, NH	5 (17.7)	1 (17.8)	3 (10.2)	13 (54.3)	
Hispanic/Latino	8 (55.0)	1 (1.2)	4 (5.3)	9 (38.5)	
Income					0.487
<$15,000	10 (40.4)	3 (17.0)	9 (7.8)	15 (34.7)	
$15,000-<$50,000	24 (27.3)	10 (14.4)	12 (7.9)	38 (50.4)	
≥$50,000	18 (27.9)	10 (19.8)	9 (20.7)	16 (31.6)	
Education					0.651
<High School	8 (31.8)	3 (15.0)	5 (5.0)	15 (48.1)	
High School	15 (26.7)	9 (15.1)	11 (9.2)	29 (49.0)	
Some College/Technical School	11 (17.4)	8 (19.8)	9 (10.6)	30 (52.3)	
College Graduate	21 (35.6)	9 (21.1)	11 (17.0)	15 (26.3)	
HIV Risk Behavior					0.144
Yes	4 (15.6)	2 (4.2)	6 (14.6)	18 (65.6)	
No	52 (30.3)	27 (20.5)	30 (9.2)	71 (40.0)	

Table 7 shows the association between ACE score and HIV risk behavior. The crude model shows that respondents who experienced three ACEs were 18 times more likely to report HIV risk behavior (odds ratio: 18.8; 95% confidence interval: 2.18–162.3) compared to respondents who did not report any ACEs. The crude model shows that respondents who experienced four or more ACEs were 24 times more likely to report HIV risk behavior (odds ratio: 23.8; 95% confidence interval: 3.11–182.7) compared to respondents who did not report any ACEs. The unstandardized Beta weight for the Constant was B = -4.564, SE = 1.005, Wald = 20.619, $p < 0.001$. The unstandardized Beta weight for ACE Score 1: B = 1.999, SE = 1.131, Wald = 3.124, $p = 0.077$; ACE Score 2: B = 1.962, SE = 1.244, Wald = 2.487, $p = 0.115$; ACE Score 3: B = 2.955, SE = 1.100, Wald = 7.214, $p = 0.007$; and ACE Score ≥4: B = 3.192, SE = 1.039, Wald = 9.434, $p = 0.002$.

There was no statistically significant association between experiencing one ACE or two ACEs and HIV risk behavior. Those who were aged 18 to 49 were 16 times more likely to report HIV risk behavior (odds ratio: 15.6; 95% confidence interval: 3.66–66.8) compared to respondents who were aged 50 and older. In the crude model, Black respondents were three times more likely to report HIV risk behavior compared to White respondents (odds ratio: 2.97; 95% confidence interval: 1.06–8.36). In the crude model, Hispanic/Latino respondents were four times more likely to report HIV risk behavior compared to White respondents (odds ratio: 4.11; 95% confidence interval: 1.58–10.7).

Table 7

Association Between Adverse Childhood Experience Score and HIV Risk Behavior

	OR (95% CI)	aOR (95% CI)[a]	aOR (95% CI)[b]
ACE Score			
1 vs. 0	7.23 (0.79 – 66.4)	4.78 (0.51 – 45.0)	5.26 (0.51 – 54.3)
2 vs. 0	6.96 (0.61 – 79.8)	5.17 (0.44 – 61.3)	10.3 (0.70 – 152.1)
3 vs. 0	**18.8 (2.18 – 162.3)**	**13.3 (1.49 – 118.8)**	**19.2 (1.67 – 221.7)**
4 vs. 0	**23.8 (3.11 – 182.7)**	**13.2 (1.68 – 103.6)**	**25.5 (2.82 – 231.8)**
Age*			
18-49 vs. 50+	**15.6 (3.66 – 66.8)**	**10.6 (2.43 – 46.4)**	**9.16 (1.80 – 46.5)**
Race	--	--	
Black vs. White	**2.97 (1.06 – 8.36)**		**8.52 (2.08 – 35.0)**
Other vs. White	1.66 (0.45 – 6.19)		0.76 (0.14 – 4.22)
Hispanic vs. White	**4.11 (1.58 – 10.7)**		**6.00 (1.42 – 25.3)**
Income		--	
<$15,000 vs. ≥$50,000	1.12 (0.34 – 3.73)		1.22 (0.27 – 5.57)
$15,000-<$50,000 vs. ≥$50,000	1.35 (0.52 – 3.50)		1.57 (0.47 – 5.29)
Education		--	
<HS vs. Col. Grad	1.58 (0.56 – 4.41)		0.56 (0.12 – 2.54)
HS vs. Col. Grad	0.58 (0.21 – 1.64)		**0.19 (0.04 – 0.86)**
Some College/Technical School vs. Col. Grad	0.84 (0.30 – 2.37)		0.31 (0.08 – 1.23)

*Age groups were collapsed due to small cell sizes – HIV risk behavior was not reported by those 65+.

[a]Adjusted models controlled for age

[b]Adjusted models controlled for age, race, income, and education

After adjusting for age, race, income, and education, respondents who experienced three ACEs were 19 times more likely to report HIV risk behavior (adjusted odds ratio: 19.2; 95% confidence interval: 1.67–221.7) compared to respondents who did not report any ACEs. After adjusting for age, race, income, and education, respondents who experienced four or more ACEs were 26 times more likely to report HIV risk behavior (odds ratio: 25.5; 95% confidence interval: 2.82–231.8) compared to respondents who did not report any ACEs. The unstandardized Beta weight for the Constant was B = -6.245, SE = 1.408, Wald = 19.687, $p < 0.001$). The unstandardized Beta weight for ACE Score 1: B = 1.661, SE = 1.191, Wald = 1.945, $p = 0.163$; ACE Score 2: B = 2.334, SE = 1.373, Wald = 2.891, $p = 0.089$; ACE Score 3: B = 2.957, SE = 1.247, Wald = 5.621, $p = 0.018$; and ACE Score ≥ 4: B = 3.240, SE = 1.125, Wald = 8.293, $p = 0.004$).

In the adjusted model, Black respondents were nine times more likely to report HIV risk behavior compared to White respondents (odds ratio: 8.52; 95% confidence interval: 2.08–35.0). In the adjusted model, Hispanic/Latino respondents were six times more likely to report HIV risk behavior compared to White respondents (odds ratio: 6.00; 95% confidence interval: 1.42–25.3). In the adjusted model, compared to respondents who were college graduates, those who graduated high school were 81% less likely to report HIV risk behavior (adjusted odds ratio: 0.19; 95% confidence interval: 0.04–0.86). I decided to use the deviance and the Pearson chi-square to determine model fit. P values were all high ($p > 0.05$) for the adjusted models, which suggested good fit.

Summary

Those who experienced ACEs had 13 times higher odds of reporting HIV risk behavior compared to respondents who reported no ACES after adjusting for age, race, income, and education. The findings were statistically significant ($p = 0.019$); therefore, the null hypothesis for Research Question 1 was rejected. Those who reported three and four or more ACES had 10 and 19 times higher odds of reporting HIV risk behavior, respectively ($p = 0.018$; $p = 0.004$), compared to those who reported no ACEs after adjusting for age, race, income, and education. Therefore, the null hypothesis for Research Question 2 was also rejected. Overall, I found an association between ACEs and HIV risk behavior. The results suggested that among transgender individuals, those who experienced ACEs were more likely to report HIV risk behavior in adulthood. The findings also suggested that those who experienced four or more ACEs were more likely to report HIV risk behavior in adulthood. The next section will include the interpretation of the study findings, limitations of the study, recommendations, implications for professional practice and social change, and the conclusion.

Section 4: Application to Professional Practice and Implications for Social Change

The purpose of this quantitative cross-sectional study was to develop a comprehensive understanding of the association between ACEs and HIV risk behavior among transgender populations. Transgender individuals historically have disproportionately faced adverse experiences and are unaware of the contributing impact their traumatic past may have on their behavior. Previous studies have analyzed the relationship between ACEs and HIV-related risk factors that lead to adverse health outcomes with 5.9 times increased likelihood of exposure to sexually transmitted infections (Bhushan et al., 2020). This study aimed to further the knowledge on factors contributing to increased HIV risk behavior among transgender people. It also aimed to add literature in support of a social change that develops strategies to address the HIV pandemic and mitigate the increased susceptibility of infection by assessing how ACEs may increase the vulnerability of transgender populations to HIV risk behaviors.

Achieving this aim became possible through a coordinated selection of methodologies which featured primarily a quantitative design with 2019 BRFSS questionnaires used to gather data. The study's independent variable was ACEs, and the dependent variable was HIV-related risk behaviors. Covariates for the study were age, race, income, and education, which historically include a range of social, economic, and demographic factors that predict HIV risk behavior (HIV.gov, 2021).

Research questions and hypotheses were developed to guide the project with the discussed methodology used in obtaining sufficient evidence to draw conclusions based on interpretations presented in this chapter. The results yielding from the study affirmed

an association between ACEs and HIV risk behavior among the transgender. Moreover, the findings indicate that the higher the ACE score, the higher the HIV risk behavior exhibited by transgender individuals. These results are further interpreted in this section, which also covers the limitations of the study, providing recommendations, implications for research, and conclusions.

Interpretation of Findings

Association Between ACEs and HIV Risk Behavior

The data collection and analysis results affirmed that exposure of individuals to ACEs increased their likelihood of exhibiting HIV risk behavior. The trauma and toxic stress associated with ACEs precipitate HIV risk behavior with special conditions of individuals escalating the risk. This result showed a significant association between personal factors like physical abuse, psychological abuse, and sexual abuse and HIV risk behavior among the transgender population with direct adjustment for age, race, income, and education. These findings consistent with previous findings showing that ACEs were positively associated with the overall HIV risk behaviors, with significant differences between males and females (Austin et al., 2016; Fang et al., 2016). Similarly, researchers like Chakrapani et al. (2017) reaffirmed the association between ACEs and HIV risk behavior within the LGBTQ+ population by showing a sample of special conditions that increase the likelihood of exposure to ACEs. Emotional abuse, physical abuse, and sexual abuse manifest in the lives of the LGBTQ+ community (Kattari et al., 2016), elevating their exposure to HIV risk behavior. Therefore, understanding the influence of ACEs on transgender individuals contributes to sustainable solutions to address the problem,

enabling better management and prevention of HIV risk behavior in the target population. The ideal approach would be reducing exposure to ACEs to reduce the mental and physical burden carried by the transgender population.

The research outcomes also affirmed that adjusting for age reduced the likelihood of ACEs leading to HIV risk behavior in the transgender population from fourteen times to nine times. Considering that ACEs relate to the experiences of individuals in childhood before reaching 18 years of age, the effect of the traumatic experiences and the ability of individuals to deal with these may improve with age (ACE Resource Network, 2021). ACEs create toxic stress in the child's body with a lasting impact on the health of individuals (California Department of Public Health et al., 2020). However, the toxic stress seems to reduce with age with the factors such as resiliency, uptake of stress busters, and the development of supportive relationships in older age, enabling better responses. Alternatively, the ability to build resilience over time against the toxic stress established during childhood also explains the improvement registered for individuals with age in reducing the association between ACEs and HIV risk behavior. Such an indication affirmed why adjusting for age reduced the predisposition of individuals to HIV risk behavior irrespective of suffering ACEs.

In addition to the potential for building resilience with age, the introduction of other subjective elements, including income, race, and education had the likelihood of ACEs influencing HIV risk behavior reducing from 14 registered in the absence of either of these to 11. This finding suggests that controlling for age combined with other demographic components of income, race, and education slightly decreased the odds of

HIV risk behavior. Bhushan et al. (2020) indicate that experience of adversity throughout an individual's life increased their resilience, brain development, hormonal system function, and genetic regulatory mechanisms. Therefore, the experiences of individuals in their upbringing resulted in a higher level of resilience for the individuals, enabling them to deal with the ensuing toxic stress. However, the impact of other traumatic experiences suffered in ages from childhood to eighteen helped them deal with their ACEs experiences. Increased traumatic experiences later in life compounded with the ACEs would have devastating effects as the findings indicate that the study population of transgender individuals report HIV risk behavior.

The findings discussed affirmed that the questionnaire led to sufficient data that answered the research question. Factors including the individuals' age, income, race, and education influenced the association between ACEs and HIV risk behavior. An introduction of these factors caused a slight improvement with a modest reduction in the association between ACEs and HIV risk behavior. Nonetheless, ACEs affect the HIV risk behavior of the transgender individuals examined for this research and the entire population under this group.

The wide confidence intervals seen in this study were due to the small sample size of the transgender population and further research needs to be conducted to ascertain the extent and nature of association using larger sample sizes of transgender individuals. In addition, there were small cell sizes of older adults who reported HIV risk behavior. However, the confidence intervals narrowed after adjusting for age, and more so after adjusting for additional sociodemographic factors.

The findings also suggest that race/ethnicity played an important role in HIV risk behavior. For example, Black participants and Hispanic participants were three and four times more likely to report HIV risk behavior compared to White participants in the crude model. However, in the fully adjusted model, Black and Hispanic participants were six times more likely to report HIV risk behavior, respectively. This change in odds between the crude and adjusted model suggests that even when the other variables are held constant, transgender individuals of color, particularly Black and Hispanic populations are more likely to report HIV risk behavior compared to White populations.

Association Between ACEs Scores and HIV Risk Behavior

The second research question focused on the association between ACE scores and the HIV risk behavior of transgender individuals. Like the case in ACEs and HIV risk behavior in the first research question, an association between ACE scores and HIV risk behavior also manifested. However, individuals that scored three had a higher likelihood of reporting HIV risk behavior. The individuals that scored four or more had a higher probability of nine times to report HIV risk behavior. The CDC (2021) defined the ACE score as that measure of the cumulative exposure to ACEs, with those not experiencing any reporting zero. Those with fewer incidences scored one, with others scoring two, three, and four or more. The study's outcomes affirmed the absence of a statistically significant relationship between ACEs and HIV risk behavior for those that scored less than three. The above outcomes indicated that the higher the cumulative exposure of an individual, the higher their likelihood of HIV risk behavior.

As the outcomes for the first research question, the introduction of age also showed a significant improvement in the relationship shared between ACEs and HIV risk behavior. Kids Data (2020) revealed that approximately 64% of the U.S general population have experienced at least one ACE in their lives. As the individual ages, however, the continued experience of ACEs makes the difference—a higher exposure to ACEs in childhood increases their exposure to toxic stress and the associated adverse health outcomes. Bhushan et al. (2020) emphasized that toxic stress responses exhibited by individuals suffering ACEs have resulted in disease and adverse social effects, including HIV risk behavior. However, it becomes critical to note that addressing the toxic stress increases with age, with those with lesser traumatic experiences efficiently dealing with it than those with more. Therefore, age reduces the likelihood of transgender individuals exhibiting HIV risk behavior resulting from exposure to ACEs.

Lastly, race, income, and education adding to age also affected the association between ACE score and HIV risk behavior. In this case, introducing these factors worsened the likelihood of individuals exposed to ACEs exhibiting HIV risk behavior. Those with four and above scores had 20 times more probability of showing HIV risk behavior in the adjusted model. Ransome et al. (2018) affirmed the role of income levels in influencing individuals' risk-taking behavior. Therefore, age and income factors can collaborate to increase the HIV risk behavior of individuals with ACE scores above four compounding the toxic stress suffered. Similarly, education affects the socioeconomic balance attained by individuals. The low levels of education of an individual, combined with low income and higher scores of ACEs, would therefore signal higher HIV risk

behavior. Thus, the higher the ACE score compounded with age, income, race, and education, the higher the HIV risk behavior.

Therefore, the research questions on ACE scores and their association with HIV risk behavior have also obtained answers showing that age, race, income, and education influenced the association. As in the first research question, age featured independently impacts the association between ACE scores and HIV risk behavior. The addition of factors including race, income, and education further compounds the association with increased HIV risk behavior for transgender individuals. Ultimately, the ACEs scores contribute to the development and existence of HIV risk behavior in the transgender population, affirming a link between ACEs occurrence and HIV risk behavior.

In examining the association between ACE score and HIV risk behavior, race/ethnicity and education had statistically significant findings. In the adjusted model, Black and Hispanic participants were nine and six times more likely to report HIV risk behavior, which was different from the crude model. Once again, these findings suggest that race/ethnicity plays a statistically significant role in HIV risk behavior. With respect to education, compared to those who had a college education, those who earned a high school education were less likely to report HIV risk behavior, which suggests that education also plays a statistically significant role in HIV risk behavior.

Limitations of the Study

The study conducted through quantitative methods and a survey questionnaire were subject to limitations that raised concerns regarding the outcomes' reliability, validity, and replicability. First, the study relied on self-reporting as a means of collecting

data and engaging the participants. A significant volume of individuals would not feel comfortable reporting their experiences with ACEs, further jeopardizing the research outcomes. However, the methodological limitations included the improper representation of the target population, which also featured under the self-reported nature of the data collection methods. The study did not verify the ACE cases reported; hence, increasing difficulties of representation of the actual population targeted. The BRFSS dataset did not ask “Do you have HIV” or any other relatable question; therefore, the researcher was unable to analyze the HIV status of respondents. The use of questionnaires also limited the outcomes the researcher would collect. The survey questionnaire relies on closed-ended questions that deprive the participants of a chance to provide detailed views on their experiences with ACEs. Transgender individuals face significant challenges related to ACE with a higher level of stigma from society which expands their area of trauma and toxic stress. Embracing closed-ended questions does not serve the research topic adequately. Nonetheless, the resource limitation was also worth considering as it would not allow a combination of qualitative and quantitative methods or an exploration of a larger sample than handled.

The study excluded a number of transgender subjects as some transgender individuals were in states that did not ask the ACEs module. This exclusion could have affected the national representative sample of transgendered individuals. Therefore, the findings may not be a national representation of transgender individuals in the US. Future research should include a nationally representative sample of transgender individuals so that findings can be more generalizable.

Recommendations

First, future scholars seeking to investigate the link between ACE and HIV risk behavior need to consider the integration of both the qualitative and quantitative methodologies. The two methods would provide both closed and open-ended questions that would increase the engagement area to obtain an in-depth understanding of the events associated with ACE and HIV risk behavior in transgender individuals. Future scholars investigating ACEs and HIV risk behavior in transgender populations should also consider expanding the sample covered to increase the representation of the target population.

Secondly, future scholars should also consider the impact of age, income, and education on dealing with toxic stress established due to ACEs. The research above revealed an influence that each of the above factors had on the HIV risk behavior of transgender people investigated and their experiences with ACE. Future scholars may study these elements collectively described under demographic factors to provide the necessary focus and direction to research that answers how age, income, and education affect ACE experiences and HIV risk behavior in the transgender population. For instance, studying the role of age in dealing with toxic stress may create avenues through which remedies may emerge to help address the social issue and prevent the prevalence of HIV risk behavior.

Implications for Professional Practice and Social Change

Professional Practice

At the professional level, an increased focus on toxic stress would better manage the association between ACEs and HIV risk behavior. Implementing this recommendation would mean increased training of personnel to screen for ACEs and address toxic stress in the transgender population. The recommendation emanates from the low level of reporting for ACEs. The low level of reporting has significantly contributed towards elevated levels of toxic stress that has increased HIV risk behavior. Some transgender individuals do not share their ACEs, which increases their chance of suffering toxic stress without revealing its source. There is hope. ACE exposure alone does not determine an individual's future health outcomes (Bhushan et al., 2020). Evidence shows that individuals can cultivate resilience despite adverse conditions during critical periods of development that may have led to a positive ACE score. Public health programs, organizations, and practitioners working to mitigate HIV among transgender people should use trauma-informed approaches to support resilience (Sacks & Murphey, 2018). On a system level, resilience can be applied through freedom from discrimination, supportive relationships, safe neighborhoods, and community resources, like access to high-quality healthcare, nutrition, and application of other stress buster tools such as supportive relationships, environments, and community resources. Integration of this understanding in professional training of personnel handling children at all levels is essential to support social change. Professionals should educate children and adults on the management of toxic stress, adoption, and application of stress buster strategies to

support the prevention and treatment of HIV. Moreover, expanding efforts in reporting ACEs cases would also help provide a timely solution and adequate treatment plan.

Positive Social Change

The current focus on improving society starts with the systematic changes and awareness to reduce ACE in the family as the smallest unit of societal representation. Influencing positive social change in family units will impact transgender individuals and enable organizational and policy-based initiatives to address the problem entirely. The introduction of avenues to educate family members on dealing with toxic stress may also address the link between ACEs and HIV risk behavior in society. Such social changes would positively affect society, improving the approaches to dealing with ACE, toxic stress and reducing the associated health complications, including HIV risk behavior. Therefore, positive social change would impact the association between ACEs suffered by an individual and their HIV risk behavior.

Conclusion

The research findings affirm that ACEs influence the HIV risk behavior in transgender individuals. The ACE scores have also been identified to influence the same, with an increase in score or a higher score representing higher cumulative ACE experiences for an individual. However, the essential component emerging from this research is the toxic stress arising from ACE exposure. Dealing with toxic stress can help address the ACE problem, also reducing HIV risk exposures of individuals and other health-related failures. The transgender population suffers from compounded ACEs and other stresses due to their nature, with social stigma a factor to consider. The role of age,

income, race and education in helping transgender populations deal with toxic stress is also crucial in improving the situation. However, each of these becomes possible in the continued effort to provide an environment that reduces the toxic stress faced by transgender people. Therefore, the focus should shift to creating an environment that similarly addresses toxic stress to the focus on ACEs. Integrating social mechanisms including systematic changes and awareness to reduce ACE would provide a solution as recommended above. Creating measures to educate and help address toxic stress in society for the transgender will also generate avenues of improvement that would yield better outcomes.

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