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Alcohol, Marijuana & Illicit Drug Use at the Intersection of Sexual Identity and Race/Ethnicity in a National Sample of High School Youth

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2018

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Behavioral Social, and Health Education Sciences
2021

Abstract

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By Marisa DiPaolo

Introduction: LGBTQ+ youth are more likely to use alcohol, marijuana, and illicit substances than heterosexual youth, and rates of substance use have risen among racial/ethnic minority youth in the past two decades. Substance use is a multifaceted health issue, intertwined with psychosocial factors like mental health, violence, and victimization, which disproportionately affect LGBTQ+ and racial/ethnic minority youth. However, few quantitative studies have thoroughly considered the role of intersectionality in shaping youth substance use behaviors.

Methods: This study applied an intersectional lens to minority stress theory through secondary analysis of nationally representative Youth Risk Behavior Survey data collected from 2015-2019 (n=44,066). Sequential logistic regressions produced adjusted odds ratios (AORs) for alcohol, marijuana, and illicit drug use outcomes, with main effects and interaction effects for sexual identity and race/ethnicity. Models also considered the role of related psychosocial factors (including depression, bullying, victimization and sexual violence).

Results: After adjusting for age, sex, and psychosocial factors, Black gay/lesbian youth had higher odds of alcohol use (AOR=2.23, $p<.05$) and illicit drug use (AOR=3.90, $p<.01$) and Black bisexual youth had higher odds of alcohol use (AOR=2.42, $p<.001$) and illicit drug use (AOR=1.78, $p<.05$) compared to white heterosexual youth. Interactions terms for Hispanic/Latinx unsure youth for alcohol use, and Black gay/lesbian and bisexual youth for marijuana use, all became non-significant after the addition of psychosocial factors to the model.

Discussion: Significant interaction effects reveal important differences in youth substance use behaviors depending on the intersecting identities they hold, above and beyond the effects of sexual identity or race/ethnicity alone. In addition, psychosocial factors had strong relationships with all three substance use behaviors, and partial support for applying an intersectional lens to minority stress theory was found. Intersectionality must be applied to future research in order to consider the simultaneous and interlocking identities that affect youth health behaviors.

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Acknowledgements

I would like to thank, first and foremost, my incredible support system of family and friends for supporting and encouraging me throughout my academic journey. Especially, I want to thank my incredible partner for being there for me through this project, and my dog, Juno for all the emotional support. In addition, I feel so grateful for the incredible mentors who have offered their guidance and advised me throughout my undergraduate and graduate school careers and helped me along the way so that I could get to the point of completing this thesis project. Special thanks go to Dr. Amy Partridge, Dawn Ravine, Elizabeth Peeler, and Booker Marshall, for all their support of my career up to this point. Last but not least, I want to acknowledge Dr. Eric Nehl and Dr. Casey Xavier Hall for all of their support throughout this project, I am so appreciative of all the wisdom, guidance, and encouragement that they have offered.

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CHAPTER 1: INTRODUCTION

Introduction

It is well documented that youth who identify as Lesbian, Gay, Bisexual, Queer and Questioning (LGBQ)[1] experience high rates of mental health problems including depression, suicidal ideation and attempts, and substance use and misuse (Baiden et al., 2020; Bostwick et al., 2014; Johns et al., 2018; Phillips II et al., 2019). In addition, studies have shown striking rates of increases in drug use among racial and ethnic minority youth that have been largely masked by overall downward trends in youth substance use during the past 10-20 years (Johnson et al., 2015; Keyes et al., 2017; National Institute on Drug Abuse, 2019, 2020). In considering these differential outcomes by both sexual identity and race/ethnicity simultaneously, studies have found significant variability in depression, suicidality and substance use outcomes among youth with distinct combinations of social identities (Baiden et al., 2020; Bostwick et al., 2014; Feinstein et al., 2019). Informed by minority stress theory and intersectionality theory, the present study considers the interactive effects of sexual identity and race/ethnicity on alcohol, marijuana, and illicit drug use behaviors in a nationally representative sample of high school youth.

Theoretical Framework

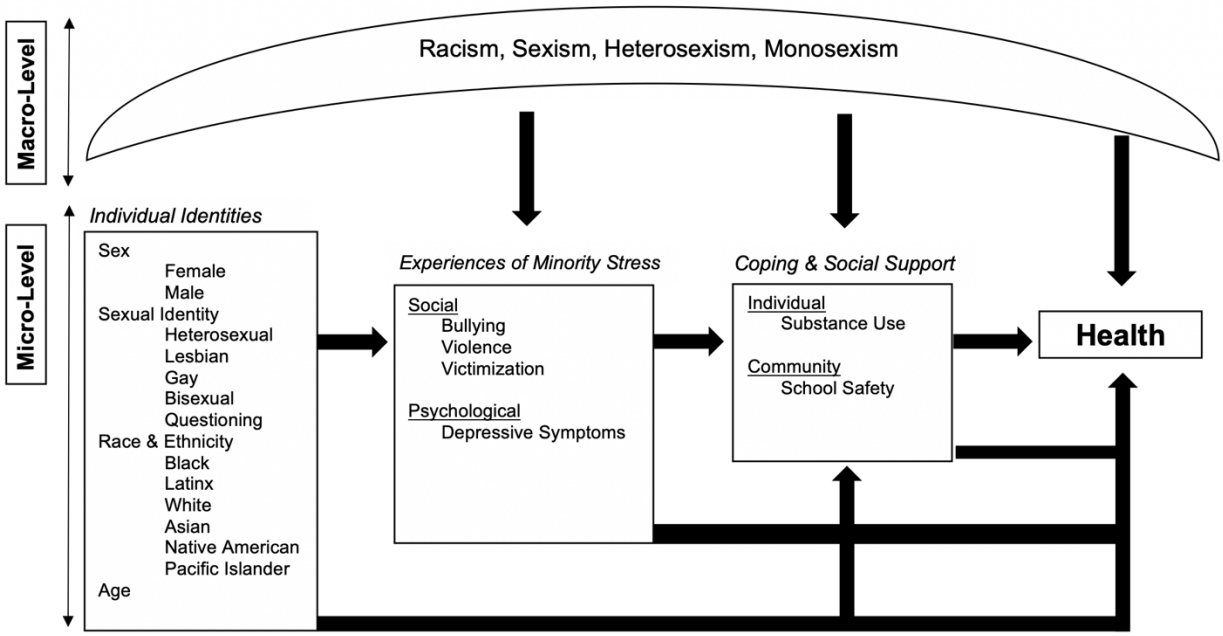
Minority stress theory describes the impact of increased stressors on sexual minorities due to stigma and discrimination, and it has often been used to explain health disparities in the LGBQ population (Meyer, 2003). Since its conception, minority stress theory has been widely

[1] The acronym LGBQ is used throughout this paper to refer to sexual minority youth who identify as Lesbian, Gay, Bisexual and Queer or Questioning. Transgender students are excluded from the study population because the data source used for this study did not collect data on gender identity. The acronym LGBTQ may be used throughout this paper in reference to other studies that did include transgender individuals in their samples, or LGBTQ+ may be used to refer to the queer community at large, in order to be inclusive of all queer identities.

applied to studies of LGBQ health and used to investigate and understand the causes of disparate health outcomes, from mental health to physical health, in minority populations (Baiden et al., 2020; Bostwick et al., 2014; Goldbach et al., 2015). While Meyer's theory was first developed with a focus on sexual minority individuals, it has also been applied to study health outcomes among racial and ethnic minority groups (Baiden et al., 2020; Bostwick et al., 2014; Cyrus, 2017). Figure 1 describes the theoretical framework for this study, an adaptation of minority stress theory that incorporates ideas from intersectionality theory in order to consider the various social identities that impact health outcomes for youth. The various social identities taken into account in this study are listed in the first box of Figure 1.

Figure 1.

Minority Stress Through an Intersectional Lens: A Theoretical Framework (adapted from: Meyer, 2003; Bowleg, 2012; Crenshaw, 1991).



Meyer's theory considers how the circumstances in a person's environment contribute both to general stressors, and to minority stressors based on sexual orientation, gender and race/ethnicity. Minority stress based on LGBQ identities can take the form of social factors, such as experiences of prejudice and discrimination including homophobia, and psychological factors, such as expectations of rejection, concealment, and internalized homophobia. These social and psychological stressors interact with the experience of minority identity to contribute to the coping strategies and social support networks of minority individuals, and all of these constructs work together to produce mental health outcomes (Meyer, 2003).

The framework presented in Figure 1 describes the specific psychosocial factors that may take the shape of minority stressors for young people, including bullying, victimization, violence, and depressive symptoms. As displayed in the figure, individual identities influence the psychosocial factors that may in turn impact the coping and social support in an individual's life, which in turn impact health outcomes. However, identities are also directly related to the coping and social support youth engage with, as well as their health outcomes.

Minority stress theory has been applied in studies which investigate how experiences of prejudice, violence and discrimination interact with psychological factors and coping strategies to contribute to health outcomes in LGBQ communities. When it comes to youth experiences of minority stress in particular, a 2002 study found that at-school victimization played a particular role in health outcomes among sexual minority youth. This study found that, among youth who had experienced high levels of at-school victimization, LGBQ youth reported higher levels of substance use, suicidality, and sexual risk behaviors compared to heterosexual youth. Yet, among youth who reported low levels of at-school victimization, LGBQ youth and heterosexual youth reported similar levels of substance use, suicidality, and sexual risk behaviors (Bontempo &

D'Augelli, 2002). These findings highlight an important relationship between at-school victimization and the mental health and substance use outcomes of youth.

The association between substance use and minority stress was further explored through a model developed to test the constructs of minority stress theory and their relationships with marijuana use among LGBQ youth. This model revealed a strong relationship between minority stress, namely violence & victimization, outness, and community connectedness, and psychological distress, and a marginal relationship between psychological distresses and marijuana use (Goldbach et al., 2015).

The evidence is clear that experiences of violence and victimization, such as at-school bullying, and online bullying, play a significant role in mental health and substance use outcomes of LGBQ youth. However, approaches to studying sexual identity and sexual orientation in the field of public health have often led to the classification of individuals into two broad categories of "sexual minority" or "sexual majority" without regard for the heterogeneity of experience and identity which constitutes the "sexual minority" category (Gattamorta et al., 2019; Mereish et al., 2017; Mereish et al., 2019; Pollitt et al., 2018; Vu et al., 2019)

A 2018 study revealed that, when stratified by sex and sexual identity, experiences of violence and victimization varied greatly among sexual minority youth, with bisexual female students experiencing greater disparities than lesbian or heterosexual female youth, and associations between sexual minority status and victimization were stronger among male youth than female youth (Johns et al., 2018). Substance use outcomes also varied depending on the sexual identity of participants, with lesbian and bisexual female students reporting higher levels of use of alcohol, cigarette, and marijuana use than heterosexual youth (Johns et al., 2018). While the overall trend remained, that all sexual minority youth were more likely to engage in

high-risk substance use than heterosexual youth, unique experiences of sex and sexual identity led to disparate outcomes *within* the broader category of sexual minority.

A pattern of exacerbated health disparities for bisexual populations has emerged within the literature (Feinstein and Dyar, 2017). When considering the sources of LGBQ health disparities, minority stress theory primarily focuses on the experience of discrimination based on homophobia (as a social, or distal, stressor) and internalized homophobia (as a psychological, or proximal, stressor). However, bisexual individuals also experience unique forms of discrimination that stem from biphobia and monosexism. Monosexism is defined as "a social structure operating through a presumption that everyone is, or should be, monosexual (attracted to no more than one gender). This system includes institutional and social rewards for monosexual people, and oppression against bisexual people and others who are attracted to more than one gender" (Eisner, 2016). This is distinct from biphobia, which is a term used to describe negative attitudes and discriminatory behaviors against bisexual people (Eisner, 2016).

Bisexual people may experience biphobia and monosexism *in addition to* homophobia, and they may experience these kinds of discrimination from both LGBTQ+ and heterosexual populations (a phenomenon referred to as "double discrimination"). Bisexual-specific minority stress has thus emerged as a possible explanation for the disparate health outcomes experienced by bisexual people. A number of studies have found evidence that bisexual-specific minority stress, biphobia, monosexism, and double discrimination contribute to the health disparities bisexual individuals face (Feinstein & Dyar, 2017; Friedman et al., 2014; Roberts et al., 2015).

Further, researchers found that greater bisexual-specific minority stress predicted poorer overall physical health above and beyond the effects of sexual minority stress alone (Katz-Wise et al., 2017). In addition, a qualitative study which asked bisexual individuals about the factors

they believed contributed to their mental and emotional wellbeing found that monosexism and biphobia had significant impacts on health in this population (Ross et al., 2010). As a result, classifying youth into categories of "minority" vs. "majority" for the purposes of quantitatively examining health disparities is limiting in its ability to describe the nuances in the experiences of discrimination that impact health outcomes.

This heterogeneity of experience becomes even more pronounced when considering the wide range of intersecting gender, sexual and racial/ethnic identities that interact to produce unique lived experiences among adolescents. Researchers of LGBTQ+ health disparities have thus begun to further expand upon minority stress theory by considering the ways that minority stress due to lesbian, gay, or bisexual identities intersects with minority stress related to racial/ethnic identities using intersectionality theory (Baiden et al., 2020; Bostwick et al., 2014; Feinstein et al., 2019; Swann et al., 2020).

Intersectionality is a term that was coined by legal scholar Kimberlé Crenshaw in 1991. While intersectionality is rooted in Black Feminist Theory, it has since been applied to public health to consider the ways that social identities do not exist independently, but instead work together to contribute to a person's health (Bowleg, 2012; Crenshaw, 1991). A core tenant of intersectionality is the idea that social categories, such as race, gender and sexual orientation, are multiple, interdependent, and mutually constitutive (Bowleg, 2012). Intersectionality challenges an idea that public health frequently employs, which attempts to address health disparities by studying a single analytical category (such a gender, race or sexual orientation alone). Another core tenant that Bowleg identifies is the social-structural context of health, which acknowledges how multiple social identities at the individual level (such as individual experiences of discrimination) intersect with multiple macro-level social inequities (such as racist, homophobic,

sexist and monosexist systems of power and oppression) (Bowleg, 2012). This framework requires that research take into account multiple levels of influence, across which multiple-interlocking identities operate, when investigating the impacts of social identities on health.

Public health has been called upon to take an intersectionality-informed approach to quantitative data analysis in order for findings to better reflect the complexities of the social determinants of health (Bowleg, 2012). Indeed, recent studies that have incorporated an intersectional framework in their analyses have found a great deal of heterogeneity among sexual minority youth with differing racial/ethnic identities for mental health outcomes including substance use, depression, and suicidal ideation and attempts (Baiden et al., 2020; Bostwick et al., 2014; Feinstein et al., 2019; Swann et al., 2020).

While minority stress theory establishes specific, testable constructs that describe the ways minority status (and particularly, sexual minority status) impacts health outcomes, intersectionality offers a broader, overarching framework that asks researchers to consider the multitude of identities that impact a person's lived experience, and therefore, their health. As a result, this study is grounded in a theoretical framework which applies both of these theories simultaneously, in order to acknowledge the multitude of identities LGBQ youth hold, and quantitatively investigates how those identities (namely, race & ethnicity, sexual identity, and sex) interact to produce variable health outcomes across different social identities. As displayed in Figure 1*,* the present study applies an intersectional lens to minority stress theory by 1) considering multiple, interlocking social identity categories simultaneously, and 2) recognizing that systems of oppression, (including racism, sexism, heterosexism, and monosexism) on the macro-level have a direct impact on individual experiences at the micro-level.

There exists a significant gap in the quantitative research literature which considers the ways that multiple experiences of identity that go beyond dichotomous "minority" versus "majority" categorizations, exist simultaneously and interact to influence health, particularly in considering substance use outcomes among LGBQ youth. Thus, this study will investigate the ways that social minority stressors, such as bullying, violence, and victimization, impact psychological stressors, such as depressive symptoms and suicidality, which interact to produce health outcomes among LGBQ youth. However, this analysis will not consider homogenous "sexual minority" or "racial/ethnic minority" groups, but instead will take into account the multiple and interlocking identities that compound to produce unique experiences based on a young person's sexual orientation, sex, race and ethnicity.

Problem Statement

While quantitative public health research has begun to consider the intersectional realities of social identities in investigations of the social determinants of health, existing studies of youth substance use outcomes have oversimplified the realities of sexual identities and racial/ethnic identities. By categorizing youth into two "minority" and "majority" categories based on sexual identity and race/ethnicity, studies have failed to consider the complexities of multiple and overlapping systems of oppression, power, and privilege that lead to vastly different experiences of minority stress *within* minority groups. The lived experiences of youth differ greatly depending on the specific sexual identity and racial/ethnic identity they hold, and this combined experience uniquely informs health and risk behaviors.

A thorough understanding of how social identities impact youth health is necessary so that future public health research and programs can begin to address the disproportionate health problems facing diverse communities of LGBQ youth. To date, no nationally representative

study has investigated the interactive effects of race/ethnicity and sexual identity on substance use, namely alcohol, marijuana and illicit drug use, among high school youth.

This study aims to fill a gap in the literature by framing youth health behaviors as the product of their complex and interlocking identities and considering within-group differences among sexual minority and racial/ethnic minority groups. The present study explicitly addresses the intersections of race/ethnicity and sexual identity using interaction effects to investigate whether social identities, including sexual identity and race/ethnicity, impact alcohol, marijuana and illicit drug use outcomes among youth. By utilizing nationally representative data, the results of this study can be widely applied to the national population of youth, and therefore provide valuable insight for public health researchers and practitioners to create adaptive programming and research studies that meet the needs of diverse groups of young people.

Research Question

This research aims to answer the following research question: In what ways are the intersecting identities of sexual identity and race/ethnicity associated with alcohol use, marijuana use and illicit drug use in a nationally representative sample of high school students?

The study will address the following research aims:

1. To evaluate the interacting effects of race/ethnicity and sexual identity on the outcomes of alcohol use, marijuana use, and illicit drug use in high school youth.
2. To consider the associations of depression, bullying, victimization and violence on the outcomes of current alcohol use, current marijuana use, and lifetime illicit drug use among youth based on sexual identity and race/ethnicity.

Significance Statement

This project takes an innovative and intersectional approach to quantitative analysis by considering the roles of race/ethnicity and sexual identity simultaneously, while taking into account the impacts of psychosocial factors that may affect alcohol, marijuana and illicit drug use among youth. Furthermore, this study contributes to the growing body of public health research which recognizes the importance of identity-related experiences of minority stress on youth substance use behaviors.

A number of studies in the public health and health behavior literature about adolescent drug and alcohol use frame such substance use in this population as a "risk behavior," or a possible predictor of other negative health outcomes, such as violence, including teen dating violence and poor mental health (Guttmannova et al., 2017; Mercado-Crespo & Mbah, 2013; Rostad et al., 2020; Temple & Freeman, 2010). However, evidence is clear that substance use and mental health disorders co-occur at high rates, and, multiple psychology studies have found longitudinal evidence that mental health disorders are significant predictors of substance use, abuse and dependence later in life (Mericle et al., 2012; Pardini et al., 2007; Swendsen et al., 2010; Wilens et al., 2008). In particular, a systematic review of longitudinal studies found a trend of positive associations between externalizing disorders and depression in adolescence and alcohol use and abuse later in life (Ning et al., 2020).

As a result, this study intends to disrupt the notion that substance use among youth is merely a "risky behavior" that leads to other adverse health outcomes in adolescence and young adulthood. This framing is problematic when considered in conjunction with health disparities research which reveals a greater prevalence of health burden of substance use upon certain groups of young people. As numerous studies have shown, childhood sexual abuse, depression,

adverse childhood experiences, discrimination and mental health disorders have been longitudinally associated with substance use in adolescence and adulthood (Benjet et al., 2013; Brody et al., 2012; Dyar et al., 2019; Forster et al., 2018; Forster et al., 2019; Roberts et al., 2018; Sartor et al., 2013; Swendsen et al., 2010). Many of these same factors which may lead to substance use behaviors also have a disproportionate impact on LGBTQ+ youth and youth of color (Forster et al., 2019; Gattamorta et al., 2019; Goldbach et al., 2014; Huebner et al., 2015; Johns et al., 2018; Lowry et al., 2017; Mereish et al., 2019; Pollitt et al., 2018; Vu et al., 2019).

Therefore, the present study is intentional about the framing of substance use as a health behavior that can be treated as an outcome, as it is the product of the interaction of numerous psychosocial and identity-related factors that work together to produce particular behaviors among youth. Substance use is a health risk behavior that does not occur in a vacuum – but as the product of the complex and nuanced lived experiences of youth.

By applying minority stress theory and intersectionality theory to investigate the relationship between identity, psychosocial factors and substance use in a large, nationally representative sample, the results of this study will be widely applicable to public health research and practice across the United States. This research intends to lay groundwork for future public health interventions and research that address youth substance use through an intersectional, trauma-informed, harm-reduction lens, and seek to find and address root-causes of health risk behaviors like substance use in order to reduce their negative implications on the lives of young people.

Definition of Key Terms

Biphobia: A term used to describe negative attitudes and discriminatory behaviors against bisexual people (Eisner, 2016).

Bisexual: A sexual orientation that refers to a person who has the capacity for emotional, romantic, and/or physical attraction to more than one gender. A bisexual orientation speaks to the potential for, but not requirement of, involvement with more than one gender. This is different from being attracted to only men or only women (Future of Sex Education Initiative, 2020).

Lesbian: A sexual orientation that refers to a self-identified woman who is romantically, emotionally, and/or sexually attracted to other women (Future of Sex Education Initiative, 2020).

LGBTQ+: The LGBTQ+ acronym is used in this paper as an umbrella term which includes Lesbian, Gay, Bisexual, Transgender, Queer and Questioning youth. The '+' refers to all other queer identities which may not fall into one of the previously listed identity categories. The LGBTQ+ acronym is used throughout this paper as an all-encompassing term in lieu of the term "sexual minority," as the acronym acknowledges the heterogeneity of "sexual minority" identities.

LGBQ: Is used in place of "LGBTQ+" when samples in studies include only Lesbian, Gay, Bisexual and Questioning youth but not transgender youth or youth of other queer identities. Many quantitative studies have not asked about gender identity, and therefore transgender youth have not been accounted for in every sample of youth studied.

Gay: A sexual orientation that refers to a person who is romantically, emotionally, and/or sexually attracted to people of their same gender. Gay often refers to a self-identified man who is romantically, emotionally, and/or physically attracted to other men (Future of Sex Education Initiative, 2020)

Heterosexism: Refers to the cultural ideology that reproduces the normative and privileged status of heterosexuality in most aspects of people's lives, vilifying and stigmatizing non-heterosexual (or, LGBTQ+) behaviors, identities, relationships, and communities. Heterosexism includes institutionalized negative attitudes and beliefs about LGBTQ+ sexualities as inferior, unnatural, and deviant, thereby reproducing sexual stigma (Rumens, 2016).

Homophobia: A widely used and accepted umbrella term broadly describing the social stigma associated with same-sex desire or discrimination against people identified as or presumed to be same-sex desiring (Davis, 2015).

Intersectionality: A term coined by Kimberlé Crenshaw which describes a theoretical framework for understanding how multiple social identities such as race, gender, sexual orientation, socio-economic status, and disability intersect at the micro-level of individual experience in such a way that reflects interlocking systems of privilege and oppression (i.e., racism, sexism, heterosexism, classism) at the macro-level (Bowleg, 2012; Crenshaw, 1991).

Minority Stress: The that stigma, prejudice, and discrimination create a hostile and stressful social environment that causes mental health problems (Meyer, 2003).

Monosexism: A social structure operating through a presumption that everyone is, or should be, monosexual (attracted to no more than one gender). This system includes institutional and social rewards for monosexual people, and oppression against bisexual people and others who are attracted to more than one gender" (Eisner, 2016).

CHAPTER 2: REVIEW OF THE LITERATURE

Introduction

The following chapter provides an overview of current research on youth substance use by sexual identity and race/ethnicity, situated within the theoretical context of minority stress theory and intersectionality theory. A brief review of the theoretical framework upon which this study is grounded is provided, followed by an overview of the scope of the problem of youth substance use in the United States and the prevalence of alcohol, marijuana and illicit drug use among all youth, as well as disaggregated by race/ethnicity, sexual identity, age and sex. Furthermore, the psychosocial correlates of youth substance use are explored within the context of minority stress theory, and current evidence for differences in the associations of these psychosocial correlates with substance use by race/ethnicity and sexual identity are provided. Finally, evidence is presented for the relevance of applying minority stress theory at the intersection of race/ethnicity and sexual identity, and a gap in the literature is identified.

Minority Stress & Intersectionality

The theoretical framework which guides this study, described in detail in the first chapter (see Figure 1), is adapted from minority stress theory and intersectionality theory (Bowleg, 2012; Crenshaw, 1991; Meyer, 2003). Minority stress theory has been applied to a growing body of public health research which indicates that identity-related experiences including prejudice, discrimination, rejection, concealment, internalized shame and stigma all constitute added stress caused by minority identity-related experiences, and that this added stress contributes to poor health among minority groups (Meyer, 2003).

While Meyer's theory was first developed with a focus on sexual minority individuals, it has also been applied to study health outcomes among racial and ethnic minority groups (Baiden

et al., 2020; Bostwick et al., 2014; Cyrus, 2017). In considering the experiences of youth based on both sexual identity and race and ethnicity, the theoretical grounding of the present study also incorporates ideas from intersectionality theory. Intersectionality has since been applied to public health research in an effort to consider the ways that social identities do not exist independently, but compound to produce unique experiences which contribute to a person's health (Bowleg, 2012; Crenshaw, 1991). In particular, this theory is used to describe the interlocking systems of oppression that work together produce disparite health outcomes for individuals with multiple marginalized identities (Bowleg, 2012; Crenshaw, 1991; Cyrus, 2017).

When it comes to addressing the needs of LGBTQ youth in particular, attendees of The State of LGBTQ Youth Health and Wellbeing Symposium, held in Chicago, Illinois in 2017, asserted the particular need for intersectional approaches to addressing LGBTQ youth health disparities (Johns et al., 2019). The authors called upon public health research and practice to consider the unique experiences of LGBTQ young people across all of their social identities in order to successfully address youth health and wellbeing (Johns et al., 2019).

Why Study Youth Substance Use?

Youth substance use is of particular concern to public health researchers because adolescence is the most common age at which substance use is initiated (Gray & Squeglia, 2018). In addition, substance use disorders in adults occur most commonly among people who began using alcohol or drugs as a teen or young adult, so considering the factors that may influence substance use at younger ages is a key component of long-term risk reduction (U.S. Department of Health and Human Services (HHS), 2016).

Furthermore, substance use also poses significant health problems during adolescence, contributing to other health issues that negatively impact quality of life or may be life

threatening, including sleep disturbances, depression, anxiety, and suicidality. In a recent review of the literature, adolescent tobacco, alcohol and marijuana use were positively associated with sleep disturbances in the domains of regularity, timing, efficiency and duration for sleep health (Kwon et al., 2019). In addition, substance use disorders among adolescents and young adults frequently co-occur with other mental health disorders, including externalizing (such as ADHD or conduct problems) and internalizing problems (such as depression or anxiety) (Hawke et al., 2018). Depressive symptoms have also been linked to adolescent substance use, with a particularly strong association among female youth (Luk et al., 2010; Zapolski et al., 2018).

Most strikingly, substance use has been consistently linked with suicidal behaviors, and suicidality is a health issue of increasing concern for adolescent populations (Baiden et al., 2020; Litwiller & Brausch, 2013; Wong et al., 2013). Among adolescents and young adults in the United States, rates of suicide increased in 2017 to their highest point since 2000, with particular increases in male populations and those aged 15-19 years (Miron et al., 2019). In 2017, suicide was the second leading cause of death among adolescents aged 15-19 (Heron, 2019).

The relationship between suicidality and substance use among adolescents is well-established. Substance use has been directly linked to suicidal behaviors (including suicidal ideation, planning, self-injury and attempts) among U.S. high school students, and particularly strong associations have been indicated for illicit substance use, with heroin use having the strongest association, followed by methamphetamines, followed by cocaine, ecstasy, hallucinogens and inhalants (Litwiller & Brausch, 2013; Wong et al., 2013). Marijuana, alcohol and tobacco were also significantly associated with suicidal behaviors, and all substances studied remained significantly associated with suicidal behaviors in analyses which controlled for potential confounders, except for alcohol use (Wong et al., 2013). In addition, the number of

substances youth had used had a dose-response relationship to suicidal behaviors, with increased substance use associated with more severe suicidal behaviors (Wong et al., 2013).

Youth Substance Use Prevalence

On a national level, declining rates of alcohol, marijuana and other drug use have been observed over the last 10-20 years. According to the National Surveys on Drug Use and Health, from 2002 to 2014, the 12-month prevalence of any substance use (alcohol, tobacco, marijuana, and any non-marijuana illicit drug use) decreased by over 27% among youth aged 12-17. However, during the same period, the prevalence of marijuana use only, alcohol use only, and marijuana use disorders increased, despite most other trends being downward (Han et al., 2017).

These findings are relatively consistent with data from the 2019 and 2020 Monitoring the Future Surveys, conducted by the National Institute on Drug Abuse (NIDA). Consistent downward trends in alcohol use were observed up until 2019, for both past-year alcohol use and binge drinking (National Institute on Drug Abuse, 2019, 2020). In 2020, 55.3% of 12th grade students had reported past-year alcohol use, (National Institute on Drug Abuse, 2020). The 2020 survey also indicates that rates of marijuana use have been consistent over the past 10 years, with 35.2% of 12th grade students having used marijuana in the past 12 months. In 2019, 11.5% of 12th grade students had used any illegal drug other than marijuana in the past 12 months (National Institute on Drug Abuse, 2019).

According to the 2019 National Youth Risk Behavior Survey (YRBS), in a nationally representative sample of high school youth, 3.6% had ever used ecstasy, 3.9% had ever used cocaine, 2.1% had ever used methamphetamines, 6.4% had ever used inhalants, 7.0% had ever used hallucinogenic drugs, and 1.8% had ever used heroin (Centers for Disease Control and

Prevention (CDC), 2019). Overall, 14.8% of high school youth had ever used any one of the aforementioned illicit drugs (CDC, 2019).

Youth Substance Use Trends by Race/Ethnicity

It is important to consider that national trends in substance use are not necessarily reflective of the experiences of particular subgroups of adolescents. From 1999-2013, while marijuana use decreased among all youth, those trends were not consistent among all racial/ethnic groups during the same time period (Johnson et al., 2015). In more recent years (2005-2013) marijuana use has increased for Black youth and Asian youth, and from 2007-2013, marijuana use increased for Hispanic youth. Furthermore, 2013 was the first year that the prevalence of current marijuana use for Black youth significantly surpassed the prevalence for white youth (29% vs. 20%) (Johnson et al., 2015).

Similarly, based on data from the Monitoring the Future survey, between 2006 and 2015, among 10th and 12th grade youth, Black students increased their use of marijuana where white students did not (Keyes et al., 2017). Among 12th grade youth, marijuana use also increased for Hispanic and multiracial youth, while it did not increase among white youth. While rates among white and multiracial youth were higher than Hispanic and Black youth in 2006, this disparity had diminished by 2015, to the point where white students no longer had higher rates of marijuana use compared to Hispanic and Black students. This increase trend was also greater for Black and Hispanic youth in larger class sizes and in urban areas, which suggests that environmental factors may play a role in increasing rates of marijuana use among students of color (Keyes et al., 2017). Consistent with the finding that disparities in marijuana use by

race/ethnicity had diminished by 2015, another study conducted in 2018 found no significant differences in past-month marijuana use by race and ethnicity (Park et al., 2018).

Trends in alcohol use behaviors have been more consistent over time, often indicating that white, Native American and students of mixed race/ethnicities tend to engage in more alcohol use compared with their Black, Hispanic, and Asian peers (Khan et al., 2014; Park et al., 2018; Terry-McElrath & Patrick, 2020). From 2005 to 2016, significant racial/ethnic differences in any past 12-month alcohol use, high-risk drinking, and reported desire to reduce or stop drinking among alcohol users were found among 12th-grade students (Terry-McElrath & Patrick, 2020). The highest rates of alcohol use were reported by white, Native American, and mixed-race students, but the felt need to reduce/stop alcohol use was highest among Native students and lowest among white students (Terry-McElrath & Patrick, 2020). Levels of alcohol use and reported alcohol-related problems have also been found to be more common among white youth than other racial/ethnic groups (Khan et al., 2014). Further, in a study that controlled for gender and socioeconomic status, African American and Hispanic youth were less likely than white students to drink heavily (Park et al., 2018). In addition, longitudinal risk trajectories for alcohol use from adolescence to young adulthood indicated that lower-risk trajectories were more common among Black and Hispanic youth than white youth (Park et al., 2018).

Fewer studies have assessed recent trends over time for illicit drug use by race and ethnicity. Based on the 2019 National Youth Risk Behavior Survey (YRBS), the percentage of youth who had ever used any illicit drug in their lifetime (including, cocaine, heroin, ecstasy, methamphetamines, inhalants, or hallucinogens) was 7.7% among Asian youth, 14.6% among Black or African American youth, 15.5% among Hispanic or Latinx youth, 14.3% among white youth and 18.3% among youth of multiple race/ethnicities. The only statistically significant

difference by race/ethnicity was that Asian youth were significantly less likely than white, Hispanic or Latinx and multiple race youth to have ever used illicit drugs. Since 2009, frequencies of illicit drug use have declined significantly for Asian youth (from 16.3% in 2009, $p=0.03$), Hispanic or Latinx youth (from 25.8% in 2009, $p<.01$), and white youth (from 19.5% in 2009, $p<.01$) (CDC, 2019).

Youth Substance Use Trends by Sexual Identity

When considering trends in adolescent substance use over time, downward trends in alcohol use across all youth may be particularly misleading without considering trends over time for LGBQ youth (Phillips II et al., 2019). Despite overall declines in alcohol use in the youth population from 2007 to 2017, disparities between heterosexual youth and LGBQ youth remain significant. LGBQ youth continued to demonstrate markedly high prevalence of alcohol use behaviors compared with heterosexual peers across all time points (Phillips II et al., 2019).

Furthermore, from 1999 to 2013, disparities in alcohol and marijuana use between gay or bisexual male youth compared to heterosexual male youth had stayed the same or declined, but the same disparities had worsened over the same period for lesbian and bisexual female youth (Watson et al., 2018). While no significant disparities in binge drinking were present for bisexual female youth compared with heterosexual female youth in 1999, significant disparities were present in 2013 ($OR=1.86$, $p<.05$). Likewise, lesbian female youth were significantly more likely than heterosexual female youth to report past month marijuana use in 2013 ($OR=5.24$, $p<.05$) but there were no significant disparities for the same group in 1999. In addition, significant marijuana use disparities were maintained over time for bisexual female youth compared to

heterosexual female youth (Watson et al., 2018). The results of this study highlight the need to consider differences in trends over time within the LGBQ subgroup of youth.

Particularly heightened risk of substance use among bisexual youth and LGBQ female youth have been observed across a number of studies (Corliss et al., 2010; Feinstein & Dyar, 2017; Johns et al., 2018). Based on pooled data from the 2015 and 2017 YRBS, lesbian and bisexual female students reported more lifetime alcohol use (Adjusted Prevalence Ratios=1.1, 1.2, respectively), cigarette use (APRs=1.8, 1.8) and marijuana use (APRs=1.5, 1.6) than heterosexual female students. Among male students, bisexual youth were more likely to have used cigarettes than heterosexual youth (APR=1.4), but no other significant differences were present. However, all sexual minority youth reported significantly higher rates of lifetime illicit drug use (cocaine, heroin, methamphetamines, ecstasy and inhalants) compared to their heterosexual counterparts (APRs=1.8-8.1) (Johns et al., 2018).

Furthermore, a longitudinal study of high school students revealed that LGBQ youth were more likely to have used illicit drugs or to have misused prescription drugs compared with heterosexual youth. However, gender and age played a role – bisexual female youth were at the highest risk of drug use, and sexual orientation disparities were more pronounced during adolescence (ages 12-17) compared to young adulthood (ages 18-23) (Corliss et al., 2010). Disproportionately high rates of substance use among bisexual individuals was also confirmed by a recent review of the literature (Feinstein & Dyar, 2017).

Substance Use Trends by Age and Sex

Two other demographic factors related to adolescent substance use prevalence are age and sex. Generally, among high school aged youth, older students are more likely to have

engaged in substance use than younger students. Based on the 2019 YRBS, significantly less 9th grade students (19.0%) drank alcohol in the past 30 days compared to 12th grade students (39.9%) (CDC, 2019). Likewise, 14.6% of 9th grade students used marijuana in the past 30 days, which was significantly fewer than the 28.3% of 12th grade students who currently used marijuana. Likewise, less 9th graders (11.3%) had ever used an illicit drug, compared with 12th graders (17.4%). (CDC, 2019). This age difference was more pronounced for males than females, with 10.0% of 9th grade male students having ever used an illicit drug, compared with 19.6% of 12th grade male students, while this percentage was 12.5% for female 9th grade students compared with 14.8% of female 12th grade students. Yet, among all high school students, no significant difference in lifetime illicit drug use was evident between male students (14.0%) and female students (15.1%) (CDC, 2019). In terms of alcohol use, female high school students were significantly more likely to have consumed alcohol in the past 30 days compared to male students (31.9% and 26.4%, respectively). Finally, 20.8% of female students had used marijuana in the past 30 days compared with 22.5% of male students, this difference was not statistically significant (CDC, 2019).

Minority Stress & Substance Use

Given the extensive evidence of disparities in substance use among youth by race/ethnicity, sexual identity and sex, many researchers have sought to identify the factors which may be contributing to these disparities. Minority stress theory, upon which this paper is grounded, has often been applied to study and describe health disparities among sexual minority communities in particular, but its applications have expanded to other subgroups, including racial and ethnic minorities. As minority stress theory describes, circumstances in a person's environment contribute to general stressors and to minority stressors based on sexual orientation,

gender and race/ethnicity. Meyer describes both social factors, which include experiences of prejudice and discrimination, and psychological factors such as expectations of rejection, concealment, and internalized homophobia (described hereafter as psychosocial factors). These factors work together with identity-related experiences to impact the coping strategies and social support networks of minority youth, and ultimately produce health outcomes (Meyer, 2003).

In considering the association between some of these psychosocial factors and substance use, in particular, a meta-analysis which analyzed results from 12 unique studies of LGB youth found that some of the most significant predictors of substance use included victimization, lack of supportive environments, psychological stress, and internalizing/externalizing problems (Goldbach et al., 2014). The following sections describe these and other psychosocial correlates of youth substance use in more depth and consider evidence for their particular relevance to minority stress-related experiences among youth based on race/ethnicity and sexual identity.

Stress and Substance Use Among Youth

In general, higher overall stress has been associated with higher rates of alcohol, tobacco, and other drug use among youth (Debnam et al., 2016). Numerous studies have also linked chronic stress in adolescence, childhood adversity, and adverse childhood experiences (ACEs) to increased substance use among youth (Benjet et al., 2013; Forster et al., 2018; Forster et al., 2019; Roberts et al., 2018). In particular, review of 109 relevant articles found that cumulative stressors –including chronic stress and stressful life events in adolescence, as well as ACEs – were linked to substance use behaviors in adolescence (Hoffmann & Jones, 2020). Evidence of a dose-response relationship between cumulative stressors and substance use was also indicated, such that increased stressors led to increased substance use (Hoffmann & Jones, 2020).

Among college students, ACE scores were also associated with substance use behaviors, and a dose-response relationship between ACE score and marijuana use, tobacco use and binge drinking was observed (Forster et al., 2019). In addition, there was significant variation in ACE exposure by race/ethnicity, and the effects of ACEs on substance use varied by racial/ethnic identity. White and Asian/Pacific Islander students were significantly less likely than Black, Hispanic and multiracial students to report any ACEs. Further, for Black students, as ACEs increased, they had the highest probability of binge drinking compared to their non-Black peers, even though non-ACE-exposed Black students had lower rates of binge drinking relative to their peers (Forster et al., 2019). Additionally, while Hispanic students had similar alcohol use patterns to white students, with increased ACE scores, their odds of binge drinking increased to surpass those of white students. A similar pattern was also found for Asian/Pacific Islander students, who had low prevalence of marijuana and tobacco use overall, but their odds of using these substances exceeded all other groups as ACE scores increased (Forster et al., 2019).

This is consistent with findings from a 2017 study of adults, which revealed that ACEs were significantly associated with depression and excessive alcohol use, and that race/ethnicity moderated the relationship between ACEs and alcohol use. Black adults exposed to ACEs were 2.5-3 times as likely to drink heavily, compared with white ACE-exposed adults who were 1.5-2 times more likely to drink heavily, and Hispanic adults were up to 11 times more likely to drink heavily, depending on the type and number of ACEs they were exposed to (Lee & Chen, 2017). These differential impacts of ACEs by race and ethnicity are important to consider in the context of minority stress, as Black, Hispanic, and multiracial students are more likely to have been exposed to ACEs, and substance use among students of color appears to be more significantly impacted by ACE scores than it was for white students.

ACE scores may also disproportionately impact mental health among lesbian, gay and bisexual adults. Among LGB adults, ACE scores mediated the relationship between LGB identity and mental distress, indicating that at least some of the mental health disparities faced by LGB adults can be explained by ACEs. (Blosnich & Andersen, 2015). Furthermore, among high school youth, disparities in alcohol, cocaine, methamphetamine, and heroin use by sexual identity were eliminated completely after controlling for social stressors (Lowry et al., 2017). These social stressors, including at-school victimization and sexual violence, occurred at two to three times the rate among lesbian, gay and bisexual youth compared to heterosexual youth (Lowry et al., 2017). This finding is consistent with minority stress theory, as higher rates of substance use among sexual minority youth are at least partially explained by social stressors.

Bullying & Peer Victimization

Among all youth, bullying and peer victimization have been linked to substance use. In a national sample of 10th grade students, victimization was associated with drinking alcohol, being drunk, smoking cigarettes, and past 30-day marijuana use (Luk et al., 2010). In addition, a longitudinal study of 6th-12th grade adolescents followed over 3 years found a significant indirect effect of peer victimization on substance use through depressive symptoms for female youth, but the same effect was not significant for male youth (Zapolski et al., 2018). Furthermore, bullying victimization was associated with adolescent prescription drug misuse based on 2017 YRBS data, such that those who experienced both school bullying and cyberbullying victimization were 1.66 times more likely to misuse prescription drugs (Baiden & Tadeo, 2019). Other correlates of prescription drug misuse included being LGB, feeling sad or hopeless, binge drinking, cannabis use, and illicit drug use (Baiden & Tadeo, 2019).

Youth who were involved in bullying, either as bullies or as victims of bullying, were also more likely to use alcohol and marijuana, and students who were victims of bullying had the highest levels of alcohol use (Radliff et al., 2012). In a large quantitative study of Canadian youth, bullying emerged as a unique risk factor for substance youth, as it was a more significant predictor than other factors (Lambe & Craig, 2017). Bullying victimization was also indirectly associated with cannabis use through the mediation pathway of negative affect. This study also revealed that neighborhood factors, such as neighborhood socioeconomic status, were associated with substance use vulnerability above and beyond individual risk factors, indicating that other aspects of youths' environments may be contributing to this behavior (Lambe & Craig, 2017).

The impacts of bullying and victimization on substance use also vary by race and ethnicity. In considering the role of victimization on adolescent marijuana and alcohol use, physical victimization had a direct, positive effect for Hispanics and African American youth. In addition, verbal bullying and witnessing violence were indirectly associated with alcohol and marijuana use (Steele, 2016). Additionally, a study of African American youth on Chicago's southside found that negative peer norms and bullying were independently associated with substance use. Although peer victimization was not directly associated with substance use, an indirect pathway between peer victimization and substance use emerged, by way of internalizing problems (such as depression, anxiety and low self-esteem) (Hong et al., 2018).

Bullying, victimization and substance use also all disproportionately affect LGBQ youth. Based on pooled YRBS data from 2015 and 2017, bisexual female students and gay, bisexual and unsure male students were all at heightened risk of victimization (such as feeling unsafe or having been threatened on school property) compared to heterosexual students (Johns et al., 2018). In addition, bisexual male and female students and gay male students were more likely to

have been bullied electronically or on school property compared to heterosexual male and female students. Lesbian and bisexual female students also reported more alcohol, cigarette and marijuana use than heterosexual female students and all sexual minority youth report higher rates of illicit drug use compared to their heterosexual peers (Johns et al., 2018).

Moreover, victimization is a significant predictor of substance use among LGBQ youth (Birkett et al., 2015; Huebner et al., 2015; Johns et al., 2018; Li et al., 2018; Mereish et al., 2019; Swann et al., 2019). Among young sexual minority men, higher victimization was significantly associated with higher alcohol use frequency, increased marijuana use, and increased drug use (Swann et al., 2019). Psychological distress was also associated with prior experiences of victimization among LGBQ youth, with greater victimization leading to greater distress, based on time-lagged analyses and mediation analysis (Birkett et al., 2015). In addition, a study of sexual orientation disparities among Black American youth found that cyber-based and bias-based victimization significantly mediated the relationship between sexual orientation and depression and suicidality, and bias-based victimization alone significantly mediated the relationship between sexual orientation and recent substance use (Mereish et al., 2019).

Further, bullying specific to LGBTQ-identities has also been associated with increased substance use (Huebner et al., 2015; Pollitt et al., 2018). LGBT adolescents who reported more anti-gay victimization at school exhibited more severe substance abuse, and this finding was also true for victimization perceived to occur for other reasons, such as ethnicity or weight (Huebner et al., 2015). In addition, homophobic bullying has been found to mediate the relationship between sexual identity and alcohol use (both frequency of use and heavy episodic drinking). These effects varied by sexual identity, sex, and race – homophobic bullying mediated the

relationship with drinking frequency for all sexual minority groups of Latina females, gay and unsure Black males, gay and bisexual Latino males, and gay white males (Pollitt et al., 2018).

Discrimination

Examining the role of discrimination in predicting substance use behaviors among youth is particularly important to the study of minority stress. In considering the role of perceived racial/ethnic discrimination on substance use, one study found that those experiencing discrimination were more likely to smoke cigarettes, engage in risky alcohol use, and use marijuana, and Black and Hispanic young adults faced higher rates of discrimination than their peers (Rose et al., 2019). Furthermore, a longitudinal study of rural African American youth found evidence that perceived racial discrimination significantly predicted substance use, and that discrimination preceded substance use rather than vice versa (Brody et al., 2012). This offers important causal evidence in support of the application of minority stress theory in explaining substance use disparities, at least among African American males.

In another longitudinal study, experiencing minority stress more than usual predicted increased alcohol problems among those who already drank alcohol, and one minority stressor, microaggressions, was associated with increased marijuana use problems among those who used marijuana. However, these stressors were not prospectively associated with substance use problems after six months, which suggests these minority stressors may have a more direct impact on these behaviors among those youth who already use substances (Dyar et al., 2019).

Researchers have also considered the overlapping impacts of sexual orientation-based and race-based discrimination on substance use and mental health outcomes. Compared to women experiencing no discrimination, women experiencing both forms of discrimination had

higher depressive symptoms, alcohol use, tobacco use, and marijuana use (Vu et al., 2019). Among men, compared to those who were white and heterosexual, white sexual minorities had higher depressive symptoms and higher odds of using marijuana, but no significantly higher risks were observed for black heterosexual or sexual minority men (Vu et al., 2019). Likewise, a study of assigned-female-at-birth youth found that enacted stigma based on both race/ethnicity and sexual and gender minority status were significantly associated with negative mental health outcomes and alcohol-related problems within the same model, indicating that both may uniquely contribute to these health concerns (Swann et al., 2020). In this model, marijuana use problems were best explained by race-based discrimination alone. In addition, this study did not find significant interactive effects between these two forms of discrimination, which indicated that while experiencing both forms of discrimination did lead to poorer health, there was not a multiplicative effect between the two (Swann et al., 2020).

Sexual Violence & Dating Violence

Sexual violence and dating violence are two psychosocial correlates of youth substance use that disproportionately impact LGBQ youth. Based on YRBS data, lesbian and bisexual female youth (APRs=1.7, 2.8) and gay, bisexual and unsure male youth (APRs=6.6, 3.3, 4.7) were all more likely to have experienced forced sexual intercourse compared to heterosexual youth. In addition, bisexual and unsure female youth were more likely to have experienced dating violence compared to heterosexual female students (APRs=1.5-1.9) and gay, bisexual and unsure male youth were all more likely to have experienced dating violence compared to heterosexual male students (APRs=2.5-3.3) (Johns et al., 2018).

Additionally, youth who had experienced teen dating violence victimization were more likely to report using most types of substances, and differences were more pronounced among female students compared with male students (Rostad et al., 2020). These results are consistent with those of a 2010 study, which revealed that youth who experienced dating violence were more likely to drink alcohol, binge drink, use inhalants, and use marijuana, ecstasy, Vicodin, or Xanax. The effects of teen dating violence on alcohol and cigarette use remained significant in a model which controlled for all other substance use (Temple & Freeman, 2010).

Furthermore, a study of prescription drug misuse found heightened risk among male students who had experienced forced sexual intercourse, as well as those who were gay (Li et al., 2018). In addition, a study of female twins found that childhood sexual abuse was significantly associated with increased rates of alcohol and cigarette use in adolescence, and with increased rates of cannabis use in adolescence and young adulthood. Particularly high risk was found for early-onset alcohol use (Sartor et al., 2013). Taken together, these findings indicate that sexual violence and dating violence are important predictors of substance use in adolescence.

Mental Health Problems

Numerous studies have indicated that mental health problems, including psychological distress, anxiety, and depression, are significantly associated with substance use in adolescence and that substance use problems tend to co-occur with mental health problems. One such study found that the prevalence of co-occurring substance use and mental health disorders varied significantly by race/ethnicity, with the highest rate among white adolescents, followed by Black and Latinx adolescents, and the lowest rates among Asian adolescents. In this study, the majority of those with co-occurring disorders reported that symptoms of mental health disorders had

occurred before symptoms of substance use disorders, suggesting that mental health problems likely appear before substance use disorders (Mericle et al., 2012). Among adolescents and young adults seeking services for substance use disorders, substance use often co-occurred with internalizing problems (such as depression and anxiety) and externalizing problems (such as ADHD or conduct problems). Female youth were more likely to display co-occurring mental health and substance use problems, although this co-occurrence was prevalent for all youth (Hawke et al., 2018).

Furthermore, a study of high school adolescents focused on suicidality noted that cigarette smoking and illicit drug use were significantly associated with suicidal ideation and suicide attempts, even when controlling for other substance use, depression, sexual identity, race/ethnicity and other covariates (Baiden et al., 2020). Bullying victimization also remained a significant predictor of suicidality in a multivariable model, with those who had been victimized having two to three times higher odds of suicidality (Baiden et al., 2020). Along these lines, research has also found a consistent pattern that the relationship between peer victimization and substance use may be explained through a pathway of depressive symptoms, but this pattern has only been observed among female youth (Li et al., 2018; Luk et al., 2010; Zapolski et al., 2018). Longitudinal data from middle and high school youth revealed an indirect effect of peer victimization on substance use through the pathway of depressive symptoms, though this effect was only significant for female youth (Zapolski et al., 2018). In addition, depression mediated the relationship between victimization and substance use among female youth, while among male youth, depression was associated with victimization but not with substance use (Luk et al., 2010). Prescription drug misuse has also been associated with depressive symptoms and victimization among female youth in particular (Li et al., 2018).

In considering these patterns among LGBQ youth, another study found a significant association between sexual orientation and substance use among female youth, after adjusting for psychosocial factors (primarily mental health problems), and the magnitude of association between sexual orientation and substance use score decreased by greater than 10% for lesbian and bisexual female youth. While sexual orientation remained significant in the model, these findings suggest that mental health factors confound the relationship (Schauer et al., 2013).

Unique Impacts of Minority Stress on Adolescents

The evidence is clear that the psychosocial factors of minority stress theory may explain higher rates of substance use among particular groups of adolescents. However, research also indicates that these minority stressors have a more profound impact on adolescents compared to young adults. In a longitudinal cohort study, higher rates of illicit drug use were observed among sexual minority youth compared to heterosexual youth, and these disparities were greater during adolescence (ages 12-17) compared with young adulthood (ages 18-23) (Corliss et al., 2010). Indeed, the effects of victimization on substance use also decrease with age, such that, in one study, for every year of life, the effects of victimization on alcohol use decreased by 0.14, and this pattern was similar for marijuana use and drug use (Swann et al., 2019). The reduction in victimization that young sexual minority men experienced as they got older was also associated with a reduction in negative mental health and substance use outcomes. Therefore, effects of victimization on substance may be most pronounced when adolescents are younger (Swann et al., 2019). A 2015 study of LGBTQ young people similarly found that both psychological distress and victimization decreased from adolescence to early adulthood, and the effects of victimization on psychological distress was more pronounced in adolescence than in young

adulthood (Birkett et al., 2015). This evidence reveals that special attention must be paid to the impact of minority stressors on mental health and substance use outcomes among adolescents.

Impacts of Minority Stress on Substance Use Disparities by Sexual Identity

While minority stress theory has proven useful in assessing the impacts of discrimination on sexual minority health, lesbian, gay, and bisexual individuals all experience minority stress differently, which may lead to uniquely disparate health outcomes among each of these groups. Evidence of exacerbated disparities in mental health and substance use among bisexual individuals compared to other sexual minority groups makes clear that researchers must consider the distinct identities of LGBQ subgroups separately.

Significant variability in health risk behaviors has been observed within the LGBTQ community, with bisexual individuals at particularly high risk for all forms of substance use (Smalley et al., 2016). One study of undergraduate women found that, compared to heterosexual and lesbian women, bisexual women had greater odds of using alcohol, tobacco, and marijuana and certain illicit drugs, in addition to the higher rates of illicit drug use among lesbian and bisexual women experienced compared to heterosexual women. (Kerr et al., 2015).

Similarly, another study of college students revealed that the relationship between substance use and sexual identity was strongest for bisexual women. In this case, the relationship between bisexual identity and substance use was mediated by psychosocial factors (including depressive symptoms, perceived stress, life satisfaction and sensation seeking), while this mediation was not significant for lesbian women (Schauer et al., 2013). This study provides evidence that added stress from these psychosocial factors may uniquely impact substance use among bisexual women (Schauer et al., 2013).

Indeed, a growing body of evidence reveals that bisexual-specific minority stress constitutes a unique type of stress, consistent with minority stress theory, faced by bisexual individuals, and this may contribute to poorer health outcomes within this group (Feinstein & Dyar, 2017; Friedman et al., 2014; Katz-Wise et al., 2017; Roberts et al., 2015). One such study found that bisexual-specific minority stress was associated with poor physical health of adults with bisexual orientation above and beyond the effects of sexual minority stress (Katz-Wise et al., 2017). These findings indicate that minority stress theory can be extended to examine the impact of bisexual-specific minority stress on the health of bisexual individuals.

Bisexual individuals face disproportionate rates of stereotyping and stigma, such as biphobia, bi-negativity and double discrimination, which may lead to dramatic disparities in depression, anxiety, stress, and other health outcomes (Friedman et al., 2014). Even after controlling for race/ethnicity and gender, bisexual men and women faced significantly higher rates of negative attitudes from heterosexual and gay/lesbian individuals relative to bisexual individuals, which indicates that bisexual individuals face discrimination from both heterosexual and gay and lesbian communities (Friedman et al., 2014). Furthermore, a review of the literature concluded that evidence of increased risk for substance use among bisexual individuals was strong, and suggested that these disparate outcomes were related to the unique forms of stigma and discrimination faced by this group (Feinstein & Dyar, 2017).

This evidence makes clear that all sub-groups of sexual minority individuals do not face minority stressors equally, and within-group differences must be taken into account. Though no studies have been identified which explored the impacts of bisexual-specific minority stress on youth substance use, those studies that have considered within-group differences in substance use among sexual minority youth have found consistent evidence that bisexual youth, and

bisexual female youth in particular, are at higher risk of alcohol, marijuana and illicit drug use (Corliss et al., 2010; Johns et al., 2018; Watson et al., 2018).

Impacts of Minority Stress on Substance Use Disparities by Race & Ethnicity

The effects of minority stress on substance use among racial and ethnic minorities appear to be more nuanced and less consistent across the literature than they are for sexual identity. Given significant changes in substance use trends among youth by race/ethnicity over the past 10-20 years, it is possible that one reason for inconsistent findings is that patterns of substance use by race/ethnicity have been changing (Johnson et al., 2015; Keyes et al., 2017). Thus, findings by race and ethnicity may vary significantly depending on the timing of data collection.

Recent evidence suggests that marijuana use among youth does not differ significantly by race and ethnicity (Keyes et al., 2017; Park et al., 2018). In addition, studies have shown that Black and Hispanic youth tend to be at lower risk for alcohol use than white youth (Khan et al., 2014; Park et al., 2018; Terry-McElrath & Patrick, 2020). Few significant differences in illicit drug use by race/ethnicity were evident from results of the 2019 Youth Risk Behavior Survey, except that Asian youth were less likely to engage in illicit drug use than white, Hispanic/Latinx or multiracial youth (CDC, 2019).

Still, evidence that minority stressors impact substance use among Black and Hispanic youth has been found in a number of studies, and thus the lack of significant differences in overall rates of substance use by race and ethnicity may mask the impacts of minority stressors on some young people. One study found that discrimination was associated with increased cigarette, alcohol, and marijuana use among Black and Hispanic youth (Rose et al., 2019). Another study of Black youth in Chicago found that bullying was associated with substance use, and that peer victimization may have an indirect association with substance use via internalizing

problems (indicators of depression, anxiety and low self-esteem), which is consistent with minority stress theory (Hong et al., 2018). Physical victimization also had a direct, positive effect on marijuana and alcohol use for Black and Hispanic youth in another study (Steele, 2016)

One longitudinal study did find causal evidence of a pathway from discrimination to substance use among African American youth, though this finding was only significant among male youth (Brody et al., 2012). Furthermore, evidence that adverse childhood experiences may have stronger associations with substance use among racial and ethnic minority groups provides further support for the relevance of minority stress theory to these groups (Forster 2019). While results of recent studies on differences in youth substance use by race/ethnicity do not reveal consistent disparities, further research is warranted to understand the impacts of psychosocial factors such as bullying, victimization, violence and mental health problems on the substance use behaviors of racial and ethnic minority youth.

Minority Stress at the Intersections of Racial/Ethnic and Sexual Identities

Public health has been called upon to take an intersectional approach to quantitative research on the social determinants of health, and researchers have begun to consider the effects of multiple marginalized identities on health in general, and adolescent health in particular (Bowleg, 2012; Cyrus, 2017; Johns et al., 2019). Cyrus applied the minority stress model to LGBTQ people of color, and suggests that researchers consider multiple environmental factors, such as socioeconomic status, and an individual's minority status, which interacts with external (discrimination/prejudice) and internal (self-doubt/rumination) stressors to shape experiences of multiple-minority groups (Cyrus, 2017).

Still, results of quantitative studies considering multiple marginalized identities are mixed. One study found results consistent with the "intersectionality paradox" – which suggests

that the interaction of different identities does not always compound to produce poorer or better health outcomes, as intersecting high and low status identities may interact in complex ways (Vu et al., 2019). However, another study found that while sexual orientation-based discrimination and race/ethnicity-based discrimination both independently predicted mental health and alcohol use outcomes among female sexual minority youth, interactive effects between the two forms of discrimination were non-significant, which suggests there may be an additive, rather than multiplicative impact of multiple forms of discrimination (Swann et al., 2020).

Furthermore, among studies of youth substance use that have considered the impacts of both racial/ethnic identity and sexual identity, the majority have inconsistently grouped youth into dichotomous "minority" or "majority" groups, making it difficult to compare findings across studies, and limiting the ability to draw conclusions about differences within subgroups of "minority" groups. For instance, one analysis of YRBS data from 2015 found that sexual minority youth were at higher risk of substance use than heterosexual youth, and those who were also racial/ethnic minorities were even more likely to use substances (Gattamorta et al., 2019). Specifically, white and Hispanic sexual minority youth were at increased risk of alcohol and other drug use, Hispanic sexual minority youth were at increased risk of marijuana use, and Black sexual minority youth were at the highest risk of other drug use compared to white heterosexual youth (Gattamorta et al., 2019). However, in another study, researchers did not find significant differences between all sexual minority people of color and all white sexual minorities, but, when stratified by sex, sexual minority women of color had higher odds of substance use problems than white sexual minority women (AOR=2.41), while sexual minority men of color had lower odds of substance use problems than white sexual minority men (Mereish & Bradford, 2014).

A small number of studies have considered substance use or mental health outcomes by sexual identity and race/ethnicity without grouping youth into dichotomized "minority" and "majority" groups. For instance, when racial/ethnic disparities in substance use were studied in a sample of bisexual youth, differences by race/ethnicity varied depending on the substance. Black bisexual female youth were less likely to report cigarette use, binge drinking, and other illicit drug use than White bisexual female youth, but Black bisexual youth were more likely to report marijuana use than White bisexual youth (Feinstein et al., 2019). However, this study was limited to only bisexual youth and could not draw comparisons across other identities.

Another study found that all sexual minority youth had higher rates of drug use than heterosexual youth, with more pronounced differences among bisexual students, and found that, overall, racial minority students reported lower prevalence of drug use behaviors than white students (Newcomb et al., 2014). However, these differences in the prevalence of some drug use behaviors between white and Black students were less pronounced among bisexual and unsure students (Newcomb et al., 2014). These results suggest that racial/ethnic disparities in substance use may vary by sexual identity. Importantly, the data used for this study were collected from 2005-2007, and were only representative of one U.S. state, Massachusetts. Patterns of youth substance use by sexual identity and race/ethnicity may have since changed significantly since then and may also differ with more representative data.

One study of high school youth found that non-white sexual minority adolescents, overall, were less likely to report suicidal ideation than their heterosexual peers (Baiden et al., 2020). However, this study also applied interaction terms for sexual identity and race/ethnicity, which revealed that Hispanic lesbian or gay youth, Black bisexual youth, and American Indian/Native Hawaiian/Pacific Islander bisexual youth had disproportionately high odds of

making a suicide attempt. This revealed important nuances in suicidality based on intersecting racial/ethnic and sexual identities, which can better inform suicide prevention efforts than if only dichotomized measures of these identities had been considered (Baiden et al., 2020).

Summary of the Current Problem

A 2017 review of the literature on health disparities among sexual minority youth of color found that few reports intentionally considered intersecting identities, and noted that minority stress and coping were key areas upon which future research should focus (Toomey et al., 2017). The present review of the literature is consistent with these findings, in that the results of existing studies on youth substance use that consider both race/ethnicity and sexual identity are mixed and require further study.

When it comes to substance use among youth, research into disparities by both race/ethnicity and sexual identity simultaneously is both limited and inconsistent. There is a gap in the literature which considers the effects of both race/ethnicity and sexual identity, while investigating the nuances present within the categories of "racial/ethnic minority" and "sexual minority," by looking at more than dichotomized minority/majority groups. The present study seeks to fill this gap by considering the interactive effects of racial/ethnic identities (white, Black, Hispanic/Latinx, and other) and sexual identities (heterosexual, gay/lesbian, bisexual and unsure) on substance use in a large, nationally representative sample of high school youth.

CHAPTER 3: METHODS

Introduction

Study Purpose

The purpose of this study was to investigate the substance use outcomes experienced by high school youth depending on their unique combination of racial, ethnic identities and sexual identities. This study aimed to fill a gap in the literature by explicitly addressing the intersections of race/ethnicity and sexual identity using interaction effects, to understand the way these experiences of identity uniquely impact substance use outcomes. In addition, this study considered the effects of known psychosocial correlates of youth substance use, including depression, violence and victimization, on the relationship between sexual identity, race/ethnicity and alcohol, marijuana and illicit drug use. The study was a secondary analysis of publicly available data from the Centers for Disease Control and Prevention collected from 2015-2019. By utilizing a large nationally representative sample of youth, the results of this study can be widely applied to the national population of high school adolescents, and therefore provide valuable insight for public health researchers and practitioners to create adaptive programming and research studies that meet the needs of diverse groups of young people. This study was theoretically grounded in minority stress theory and intersectionality theory, as described in-depth in Chapter 1 (see Figure 1).

This research sought to answer the following research question: In what ways is the intersection of sexual identity and race/ethnicity associated with alcohol use, marijuana use and illicit drug use in a nationally representative sample of high school students?

Research Aims

The study was designed to address the following two research aims:

1. To evaluate the interacting effects of race/ethnicity and sexual identity on the outcomes of alcohol use, marijuana use, and illicit drug use in high school youth.
2. To consider the associations of depression, bullying, victimization and violence on the outcomes of current alcohol use, current marijuana use, and lifetime illicit drug use among youth based on sexual identity and race/ethnicity.

Human Subjects Approval

This thesis project was a secondary analysis of a large, nationally representative, and publicly available dataset. Data for this study were combined from three administrations of the National Youth Risk Behavior Survey (YRBS), collected in 2015, 2017 and 2019, and conducted by the Centers for Disease Control and Prevention (CDC). Data were collected anonymously from high school students across the United States. Participants were provided with a cover page informing them that no identifying information would be attached to their responses. All responses were filled out in a multiple-choice format on a computer-scannable answer sheet, they were informed that participation was voluntary, and that they could stop filling out the survey at any time. In addition, because participants were under the age of 18, local parental permissions procedures were followed in each jurisdiction in which the survey was administered.

The YRBS study protocols were approved by the CDC's Institutional Review Board (IRB) and the data are publicly available. YRBS data are anonymous, as no identifying information about youth respondents was collected, and the publicly available dataset was fully de-identified. Therefore, Emory University's Institutional Review Board deemed this project

"non-human subjects research" based upon the Non-Human Subjects Research Determination form made available by the Emory University IRB *[see Appendix A]*. Thus, no additional IRB approval was required for this study.

Population and Sample

Youth Risk Behavior Survey

The Youth Risk Behavior Survey (YRBS) was established by the Centers for Disease Control and Prevention (CDC) in 1991 and has been conducted biennially since then (Centers for Disease Control and Prevention, 2013). The surveillance system was designed to monitor six categories of priority health-risk behaviors among youth. Priority health-risk behaviors are those that are associated with the leading causes of morbidity and mortality in the population. The six health behavior areas surveyed by YRBS include: (1) behaviors that contribute to unintentional injuries and violence; (2) sexual behaviors that contribute to HIV and other sexual transmitted infections, and unintended pregnancy; (3) tobacco use; (4) alcohol and other drug use; (5) unhealthy dietary behaviors; (6) physical inactivity (CDC, 2013).

Youth Risk Behavior Survey Sampling Methodology

Every two years, the national YRBS obtains a nationally representative sample of U.S. high school students using a three-stage, cluster sample design. The target population for the national YRBS is made up of all public and private schools serving students in grades 9–12 in the 50 states and the District of Columbia, excluding U.S. territories. (CDC, 2013). Estimates produced from the national YRBS sample have been designed for accuracy within ±5% at a 95% confidence level. This holds true for overall estimates and for those broken down by sex, grade,

race/ethnicity, grade by sex, and race/ethnicity by sex subgroups. For grade by race/ethnicity, the standard for accuracy is ±5% at a 90% confidence level.

The sampling frame at the first stage of sampling for each national survey includes primary sampling units (PSUs) which consist of large sized counties or groups of smaller, adjacent counties. PSUs that are large enough to be selected with certainty are then divided into smaller sub-PSUs. Next, schools are sorted by size and assigned in rotation to newly created sub-PSU units. PSUs are then selected from 16 strata which have been categorized based on the metropolitan statistical area (MSA) status and the percentages of Black and Hispanic students within the PSU (CDC, 2013). PSUs are then selected, at a probability proportionate to size.

The second stage of sampling involves selection of schools from PSUs. Schools are sorted to account for the grades they serve, such that schools serving less grades than 9-12 are combined with other schools to create a "cluster school" that is treated as a school serving grades 9-12. Schools are divided into large or small school categories based on enrollment, and one quarter of schools selected are chosen, with probability proportional to size, from small schools, and three quarters are chosen with probability proportional to size, from large schools. In the process of selecting schools and classes, CDC uses strategies to over-sample Black and Hispanic students so that an accurately representative sample of students can be achieved (CDC, 2013).

The third and final stage of sampling requires the random selection of one to two entire classes in each chosen school in each grade, 9-12. Classes are selected from a list of required classes for all students, either one specific class all students take, or one class period of the day, and all students in selected classes are eligible to participate. Sampled schools, classes, and students who refuse to participate in the survey are not replaced. Sampling without replacement

is intended to maintain the integrity of the sample design and it also helps avoid any introduction of unmeasurable bias (CDC, 2013).

After data collection, a sampling weight based on sex, race/ethnicity, and grade is applied to the data to adjust for nonresponse as well as to adjust for oversampling of Black and Hispanic students. Statisticians use an iterative process to trim and distribute weights exceeding a criterion value among untrimmed weights in order to avoid inflated sampling variances. The final overall weights are then scaled, such that the weighted count of students equals the total sample size and the weighted proportions of students in each grade match national population projections for the survey year. Therefore, weighted estimates are representative of all students in grades 9–12 who attend public and private schools across the U.S. (CDC, 2013).

Survey Administration

The national school based YRBS is administered via a contract with ICF Macro Inc. since 1990. The CDC oversees the sample design and sample selection which is conducted by ICF Macro Inc. Schools are selected with probability proportional to the size of student enrollment in grades 9-12. The contractor selects schools, obtains appropriate state and school-level clearances, and works with sampled schools to select classes and schedule data collection, and obtains parental permission. Local procedures for obtaining parental permission are followed before administering the YRBS questionnaire at a school. Some schools use active permission, which means that parents must send back a signed form agreeing that their child may participate in the survey. Other schools use passive permission, meaning parents only need to send back a signed form if they do not want their child to participate (CDC, 2013).

Trained data collectors travel to schools to administer YRBS questionnaires to students in their classrooms and read a standardized script to participating students. The data collectors also record details about the school and the classroom (such as grade-level information and enrollment numbers within sampled classes), which is later used to verify sample selection and for the weighting of the data (CDC, 2013). Survey procedures are designed to protect student privacy and ensure anonymity. YRBS questionnaires are self-administered, with students self-reporting their responses on a computer-scannable booklet or answer sheet. Students are encouraged to cover their responses with a cover sheet and, when possible, students are spread around the room to minimize others ability to view their responses. Skip patterns, which ask respondents to skip groups of questions that do not apply to them, are not used in any YRBS questionnaires, in order to help ensure anonymity of the survey, so that other students would not see obvious differences between answer sheets, and so that the surveys take a similar amount of time for all students to complete. Students who are absent on the day of survey administration are also able to make-up the questionnaire in a setting that ensures their privacy (CDC, 2013).

Validity and Reliability

CDC has conducted two analyses of the reliability of the YRBS questionnaire, one in 1992 and one in 2000 (Brener et al., 1995; Brener et al., 2002). Both of these analyses tested the test-retest reliability, and questions were deemed not reliable if they had both a kappa of less than 61%, and if they had significantly different prevalence estimates at time-1 and time-2. After these assessments, any questions with questionable reliability were removed and not included in future questionnaires (CDC, 2013). No formal test of validity for all self-reported measures on the YRBS has been conducted, however, scientists at CDC reviewed empirical literature in 2003

and determined that there is no way to consistently measure validity across all questions on the survey, as some can be validated with objective measures and others cannot. Therefore, it is up to policy makers and researchers to determine if self-reported data is best for the particular health issue in question (CDC, 2013).

Data Quality

CDC is committed to ensuring data is of the utmost quality. The previously described strategies to ensure adequate response rates, test the reliability of the survey, and ensure standardization questionnaire administration procedures are used to ensure adequate data quality. A series of studies of the YRBS methodology have been conducted, and determined that the questions produce high quality responses, survey questions are reliable, and the majority of questions achieve a non-response rate of below 5% (CDC, 2013).

Sample

The sample for this study consists of high school student respondents to the 2015, 2017 and 2019 YRBS. Pooled data were used to increase the analytic sample size for this study. The CDC's combined data set, publicly available on the CDC website, was downloaded as an SPSS file and used to combine the datasets from 2015, 2017 and 2019. Within the combined dataset, all entries with a year between 2015-2019 were retained, and all other entries (from any year before 2015) were deleted. The survey record counts across all three survey years totaled a combined sample of 44,066 high school youth. The 2015 YRBS school response rate was 69%, and the student response rate was 86%, resulting in an overall response rate of 60% (Centers for Disease Control and Prevention, 2016). For the 2017 survey, the school response rate was 75%,

the student response rate was 81%, and the total overall response rate was 60% (Centers for Disease Control and Prevention, 2018). In 2019, the school response rate was 75.1%, the student response rate was 80.3% and the overall response rate was 60.3% (Centers for Disease Control and Prevention, 2020a).

Measures

Alcohol, Marijuana and Illicit Drug Use

The outcome variables addressed by this study include current alcohol use, current marijuana use, and lifetime illicit drug use. All variables were dichotomized into two groups: whether students had used the substance(s) over the specified time period or not.

Alcohol use was measured with the question: "During the past 30 days, on how many days did you have at least one drink of alcohol?" with response options: "0 days," "1 or 2 days," "3 to 5 days," "6 to 9 days," "10 to 19 days," "20 to 29 days," and "All 30 days." This variable was recoded to be dichotomous, with participants who responded with any option greater than "0 days" coded 1 for current alcohol use, and those who responded "0 days" were coded 2 for no current alcohol use.

Marijuana use was measured with the question: "During the past 30 days, how many times did you use marijuana?" with response options, "0 times," "1 or 2 times," "3 to 9 times," "10 to 19 times," "20 to 39 times," or "40 or more times." This variable was recoded to be dichotomous, such that all participants who responded with any option greater than "0 times" were coded 1 for current marijuana use, and any participant who responded "0 times" was coded 2 for no current marijuana use.

Lifetime illicit drug use was measured with four questions that were consistently asked across the 2015, 2017 and 2019 YRBS questionnaires. The substances included were cocaine,

heroin, methamphetamine, and ecstasy. The following questions were asked on the survey regarding the use of these substances: “During your life, how many times have you used any form of cocaine, including powder, crack, or freebase?” “During your life, how many times have you used heroin (also called smack, junk, or China White)?” and “During your life, how many times have you used ecstasy (also called MDMA)?” In 2015 and 2017, the following question was asked regarding the use of methamphetamines: “During your life, how many times have you used methamphetamines (also called speed, crystal, crank or ice)?” In 2019, this question was revised to include “crystal meth” and “meth” in the list of slang terms for the substance. For all of these questions, students could respond with one of the following options: “0 times,” “1 or 2 times,” “3 to 9 times,” “10 to 19 times,” “20 to 39 times,” or “40 or more times.”

Responses to all of these questions were combined by first recoding each variable (cocaine use, heroin use, ecstasy use, and methamphetamine use) to be dichotomous, such that 0 indicated that they had used the substance 0 times in their life and 1 indicated that they had used the substance 1 or more times. Then, responses were totaled to combine these variables into a sum of those four dichotomous variables. Finally, the sum variable was recoded to create a single binary variable in which 2 indicated no lifetime illicit drug use, and 1 indicated any lifetime illicit drug use. Students were included in this variable if they responded to any one of the four questions and excluded as missing only if they did not respond to all four questions. Substance use measures were selected and dichotomized in this way based on previous literature (Feinstein et al., 2019; Rostad et al., 2020).

The question: “During your life, how many times have you sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high?” was not included in the illicit drug use variable due to a high rate of missing responses to this question in the

combined 2015-2019 dataset. Questions about prescription pain medication misuse were also not included in this study because they were not asked on the 2015 YRBS.

Personal Demographic Characteristics

In this study, the primary variables of interest were sexual identity and race/ethnicity. Sexual identity was measured as a categorical variable, which asked, "Which of the following best describes you?" with response options, "heterosexual (straight)" "gay or lesbian" "bisexual" and "not sure." This variable was originally coded into 4 categories (0=heterosexual, 1=lesbian or gay, 2=bisexual, 3=unsure) and was recoded such that the reference group would have the highest number for logistic regression analyses (1=unsure, 2=bisexual, 3=gay or lesbian, 4=heterosexual). Race/ethnicity was also a categorical variable, which was recoded into 7 categories based on student responses to two questions "Are you Hispanic or Latino" and "What is your race? (select one or more responses)". Race options included White, Black or African American, Asian, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Multiracial. Students of all races who selected "Hispanic" were coded as Hispanic/Latinx regardless of their race. All other race/ethnicity categories therefore consist of non-Hispanic/Latinx students. Race/ethnicity was analyzed at the bivariate level with all seven race/ethnicity categories, but groups with sample sizes too small to produce meaningful results were excluded from multivariable models. The seven-level race/ethnicity variable was recoded such that the reference group would have the highest number for logistic regression analyses: 1= American Indian/Alaska Native, 2 = Asian, 3 = Black or African American, 4 = Hispanic/Latinx, 5=Native Hawaiian/other Pacific Islander, 6=Multiracial, and 7=White.

The remaining demographic variables which were controlled for in this study were sex and grade in school. Sex was measured with a single question "What is your sex?" with binary options of "Male" or "Female" (1=female, 2=male). Grade in school was measured with the question "In what grade you?" with the options of "9th grade," "10th grade," "11th grade," "12th grade," and "Ungraded or other grade." Only students who responded that they were in grades 9-12 were included in the final variable, which was recoded: 1=12th grade, 2=11th grade, 3=10th grade, 4=9th grade. Grade and sex were both controlled for in multivariable models.

Additional Variables of Interest

Depression, violence and victimization are the psychosocial factors which were analyzed as other variables of interest in this study. Depression was measured with a single question, "During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?" Students who responded yes were coded 1=felt depressed; students who responded no were coded 2=did not feel depressed.

Bullying victimization was measured with two questions. On the YRBS questionnaire, bullying was defined as: "Bullying is when 1 or more students tease, threaten, spread rumors about, hit, shove, or hurt another student over and over again. It is not bullying when 2 students of about the same strength or power argue or fight or tease each other in a friendly way." Bullying at school was measured with the question "During the past 12 months, have you ever been bullied on school property?" Electronic Bullying was measured with the question: "During the past 12 months, have you ever been electronically bullied? (Count being bullied through texting, Instagram, Facebook, or other social media.)" Each of these questions were coded as dichotomous, with 1=yes and 2=no.

The YRBS asks a number of additional questions about violence and victimization. Students are asked whether they have ever missed school due to feeling unsafe, with the question: “During the past 30 days, on how many days did you not go to school because you felt you would be unsafe at school or on your way to or from school?” Responses to this question were dichotomized into 2=Never missed school due to feeling unsafe in the past 30 days or 1=Missed school due to feeling unsafe in the past 30 days. Participants were also asked, “During the past 12 months, how many times has someone threatened or injured you with a weapon such as a gun, knife, or club on school property?” and responses were coded into 2=Not threatened or injured at school in the past 12 months and 1=Threatened or injured at school in the past 12 months. Finally, participants were asked whether they had ever been physically forced to have sexual intercourse, with the question: “Have you ever been physically forced to have sexual intercourse when you did not want to?” with response options of no (coded 2) or yes (coded 1).

Data Analysis Methodology

Preliminary Analyses

Data analyses were conducted using Statistical Package for Social Science (SPSS) version 27.0. Guidance from the CDC on software for analysis of YRBS data was followed in order to prepare the dataset for analysis using the SPSS Complex Samples Analysis Preparation Wizard (Centers for Disease Control and Prevention, 2020b). These data preparation steps accounted for the three-stage cluster sampling methodology of the YRBS, and the data had to be prepared for analysis using the dataset variables of stratum, primary sampling unit, and weight. This process applied weights to the data to account for oversampling of particular racial/ethnic groups of youth, and also indicated that sampling was conducted without replacement (CDC, 2020b). Once the data were prepared for analysis, all further analyses were conducted using

Complex Samples options in SPSS, to account for the complex sampling methodologies and apply the appropriate strategies to produce a weighted sample for analysis.

The first step in the preliminary analysis of the data was to produce frequency tables including unweighted counts for all study variables, which were assessed for missing data quantities. It was determined that missing data did not need to be imputed due to low percentages of non-response for all study variables (below 10% for all variables, below 5% for the majority of variables) and the large analytic sample available without imputing missing data (Tabachnick & Fidell, 2013).

Second, the distribution of all study variables in the overall sample were analyzed using basic univariate analysis. Frequency tables were produced to examine the weighted percentage and unweighted frequency of demographic variables, outcome variables, and other variables of interest. Univariate statistics were analyzed to assess the accuracy of the data output, and ensure that values produced were plausible (Tabachnick & Fidell, 2013). Demographic variables included sexual identity, race/ethnicity, sex and age; outcome variables included past 30-day alcohol use, past 30-day marijuana use, and lifetime illicit drug use, and other variables of interest included depression, school bullying, electronic bullying, school safety, victimization, and forced sexual intercourse.

Third, the explanatory variables of race/ethnicity and sexual identity were cross-tabulated. This analysis step was completed in order to determine whether any crude associations existed between the two primary variables of interest before other study variables were added to the analysis. Statistical differences in sexual identity by race/ethnicity were examined using a Pearson Chi-Square test. Significant differences were assessed at a value of $\alpha=0.05$. Fourth, sexual identity and race/ethnicity were also cross tabulated with each of the outcome variables to

assess the prevalence of each substance use behavior by sexual identity and by race/ethnicity. These cross tabulations were assessed for significant associations using a Pearson Chi-Square test, and significance was determined at a value of $\alpha=0.05$.

Fifth, bivariate logistic regression analyses were run to assess the crude association of each study variable with each outcome variable. This step was included to ensure that all variables included in the multivariable models were significantly associated with the outcome variable at the bivariate level. In building the final multivariable models for this study, only variables which were both theoretically relevant to the study and statistically significantly associated with the outcome variable were included in the final model (Aneshensel, 2013). For each outcome variable, current alcohol use, current marijuana use, and lifetime illicit substance use, only those psychosocial factors which were significantly associated with that outcome on the bivariate level were included in the final multivariable model (Aneshensel, 2013). For each bivariate association, odds ratios (ORs), along with their 95% confidence intervals and associated p-values were reported. Significance was assessed at a value of $\alpha=0.05$.

Sixth, a correlation matrix was produced to check for multicollinearity between study variables. The cut-off correlation value of 0.70 or above was used to assess whether any of the study variables were too highly correlated with each other to both be included in a multivariable model, because this would lead to redundancy in the analysis (Tabachnick & Fidell, 2013). If any of the study variables were too highly correlated with each other, one of them would not have been included in the multivariable model in order to prevent multicollinearity in the final models.

Primary Analyses

After these initial data analysis steps were completed, the primary study analyses of multivariable logistic regression models were carried out. Sequential logistic regression models were produced for each of the three outcome variables: current, or past 30-day, alcohol use, current, or past 30-day, marijuana use, and lifetime illicit drug use. In the first step of the multivariable models, race/ethnicity, sexual identity, sex and age were included to test the associations of demographic variables with the outcomes in a multivariable logistic regression. In the second step of the models, the same main effects for these demographic variables were included, along with an interaction term for sexual identity and race/ethnicity in order to assess effects of the interacting relationship between sexual identity and race/ethnicity on each outcome, while controlling for other demographics. In the third step of the models, the psychosocial factors which were significantly associated with the outcome at the bivariate level were added to the model along with the main effects of the demographic variables. In the fourth and final step of the models, all demographic variables, psychosocial factors, and interaction effects for sexual identity and race/ethnicity were all entered into the model. These sequential logistic regression models were fitted for each of the three outcome variables. This process for building sequential logistic regression models is consistent with similar studies which have considered the demographics and psychosocial factors which are associated with adolescent health outcomes (Baiden et al., 2020; Li et al., 2018). The Nagelkerke R^2 was reported for each model in order to determine the percentage of variance in the outcome variable that could be explained by the variables in the model (Tabachnick & Fidell, 2013). Finally, for each variable in the model, the adjusted odds ratios (AOR) with their 95% confidence intervals and

accompanying p-value are reported (Tabachnick & Fidell, 2013). Significance was assessed at a value of $\alpha=0.05$.

Assessment of Research Aims

This study was designed to assess two specific research aims, and the specific statistical analyses associated with each of these aims are described here:

1. To evaluate the interacting effects of race/ethnicity and sexual identity on the outcomes of alcohol use, marijuana use, and illicit drug use in high school youth.

This first study aim was assessed through the first and second steps in the multivariable logistic regression models. In the first step of the models, demographics were included only as main effects, so the independent effects of sexual identity and race/ethnicity on each outcome could be assessed. In the second step of the models, interaction terms for sexual identity and race/ethnicity were added to the model, in order to consider the simultaneous impacts of both race/ethnicity with sexual identity on each outcome of alcohol use, marijuana use, and illicit drug use. These models were designed to assess whether the combined effect of a unique combination of racial/ethnic and sexual identities had a different impact on substance use outcomes that differed from the impact of race/ethnicity and sexual identity independently. In the assessment of this research aim, the multivariable models indicated whether youth with specific combinations of sexual identities and racial/ethnic identities were more likely to engage in current alcohol use, current marijuana use, or lifetime illicit drug use.

2. To consider the associations of depression, bullying, victimization and violence on the outcomes of current alcohol use, current marijuana use, and lifetime illicit drug use among youth based on sexual identity and race/ethnicity.

The secondary aim of this study was to consider the role of psychosocial factors known to be correlated with youth substance use, including depression, bullying, victimization and violence on the outcomes of current alcohol use, current marijuana use, and lifetime illicit drug. In addition, this research aim sought to determine whether the inclusion of these psychosocial factors in multivariable models would impact the relationship between sexual identity, race/ethnicity and the outcome variables. This research aim was assessed with the third and fourth steps of the multivariable models. First, the third step of the models were designed to consider whether the inclusion of psychosocial factors would alter the main effects of sexual identity and race/ethnicity, and thus the third step model was compared to the first step model, which contained only demographics variables. Secondly, the fourth step models were designed to assess whether the inclusion of psychosocial factors would alter the interactive effects of sexual identity and race/ethnicity on each substance use outcome. If effects of sexual identity and race/ethnicity were altered as a result of the inclusion of psychosocial factors in the models, that would suggest that some of the variation in substance use by sexual identity and/or race/ethnicity may be explained by these particular psychosocial factors.

CHAPTER 4: RESULTS

Introduction

Study Purpose

The purpose of this study is to investigate the substance use outcomes experienced by high school youth depending on their unique combination of racial/ethnic identities and sexual identities. This study uses a large, nationally representative sample of youth attending high schools in the United States in order to consider the relationship between sexual identity, race/ethnicity and other psychosocial factors with the outcomes of past 30-day alcohol use, past 30-day marijuana use, and lifetime illicit drug use.

This research sought to answer the following research question: In what ways is the intersection of sexual identity and race/ethnicity associated with alcohol use, marijuana use and illicit drug use in a nationally representative sample of high school students?

Research Aims

1. To evaluate the interacting effects of race/ethnicity and sexual identity on the outcomes of alcohol use, marijuana use, and illicit drug use in high school youth.
2. To consider the associations of depression, bullying, victimization and violence on the outcomes of current alcohol use, current marijuana use, and lifetime illicit drug use among youth based on sexual identity and race/ethnicity.

Key Findings

Preliminary Analyses

Univariate Analyses

The demographic characteristics of the study sample are presented in Table 1. The total sample consisted of 44,066 high school students. The sample was 49.6% female and 50.4% male. The sample consisted of a relatively even distribution of students in grades 9-12, with 27.1% of participants in 9th grade, 25.6% in 10th grade, 24.0% in 11th grade, and 23.2% in 12th grade. The majority (86.3%) of students described their sexual identity as heterosexual, 2.3% were gay or lesbian, 7.5% were bisexual, and 3.9% reported that they were unsure how they would describe their sexual identity. The sample was 53.1% non-Hispanic white, 13.1% African American or Black, 23.6% Hispanic/Latinx, 4.1% Asian, 0.6% American Indian or Alaska Native, 0.6% Native Hawaiian or other Pacific Islander and 4.9% multiracial.

Table 1.

Personal Demographic Characteristics of Study Sample

Variable	Weighted Percent	Unweighted Count
	% (95% CI)	*n*
Sex		
Female	49.6 (48.1-51.1)	22,168
Male	50.4 (48.9-51.9)	21,502
Grade in School		
9th Grade	27.1 (26.2-28.0)	11,561
10th Grade	25.6 (24.8-26.5)	11,370
11th Grade	24.0 (23.4-24.7)	10,854
12th grade	23.2 (22.7-23.8)	9,834
Sexual Identity		
Heterosexual	86.3 (85.4-87.1)	35,819
Gay or Lesbian	2.3 (2.1-2.5)	1,061
Bisexual	7.5 (7.0-8.1)	3,210
Unsure	3.9 (3.6-4.3)	1,696
Race/Ethnicity		
White [a]	53.1 (49.9-56.3)	19,778
Black or African American [a]	13.1 (11.7-14.7)	6,503
Hispanic or Latinx	23.6 (21.0-26.5)	11,806
Asian [a]	4.1 (3.2-5.2)	1,893
Native Hawaiian/Other Pacific Islander [a]	0.6 (0.4-0.8)	285
American Indian/Alaska Native [a]	0.6 (0.5-0.7)	445
Multiracial [a]	4.9 (4.4-5.4)	2,223
Total	--	44,066

CI=Confidence Interval
[a] Non-Hispanic

Univariate analyses of the remaining study variables are presented in Table 2. Across the study sample, 19.6% of students had experienced school-based bullying in the 12 months before the survey, and 15.6% of students had experienced bullying electronically in the same time period. In the 30 days before the survey, 6.9% had ever missed school because they felt unsafe either at school or on their way to school. In the 12 months before the survey, 6.4% of students had been threatened or injured with a weapon on school property, and 32.5% reported that they

had felt so sad or hopeless for a period of two weeks or more that they stopped doing some usual activities (felt depressed). In addition, 7.1% had ever been forced to have sexual intercourse in their lifetime. The percentages of students who had engaged in each of the outcome variables was 30.7% for current, or past 30-day, alcohol use, 21.1% for current, or past 30-day, marijuana use, and 6.9% for lifetime illicit drug use.

Table 2.

Univariate Analysis of Study Variables

Variable	Weighted Percent	Unweighted Count
	% (95% CI)	*n*
Experienced bullying at school [a]	19.6 (18.8-20.4)	8,324
Experienced electronic bullying [a]	15.4 (14.7-16.1)	6,519
Missed school due to feeling unsafe [b]	6.9 (6.3-7.6)	3,104
Were threatened or injured with a weapon on school property [a]	6.4 (6.0-6.9)	2,956
Felt depressed [a]	32.5 (31.4-33.7)	14,346
Were ever physically forced to have sexual intercourse	7.1 (6.6-7.7)	3,094
Used alcohol in the past 30 days (current alcohol use)	30.7 (29.3-32.0)	12,088
Used marijuana in the past 30 days (current marijuana use)	21.1 (19.9-22.3)	9,167
Ever used an illicit drug (lifetime illicit drug use)	6.9 (6.3-7.6)	3,297

Note. Reported values reflect the number and percentage of youth responding "yes" for each question.
CI=Confidence Interval.
[a] In the past 12 months
[b] In the past 30 days

Bivariate Analyses

Because the purpose of this study was to understand the interactive effects of sexual identity and race/ethnicity, these two variables were cross tabulated to determine if there were significant differences in sexual identity by race/ethnicity. Results of a Chi-Square test of

independence revealed that there were statistically significant differences in sexual identity by race/ethnicity (χ^2=86.771, p<.001). As shown in Table 3, smaller percentages of Black and multiracial youth identified as heterosexual compared to all other racial/ethnic groups. Specifically, a larger proportion of Black youth identified as gay or lesbian compared to most other racial/ethnic groups, and a larger proportion of Black and multiracial youth identified as bisexual compared to most other racial/ethnic groups. Furthermore, a higher percentage of Asian youth indicated that they were unsure of their sexual identity compared to other groups.

Table 3.

Cross Tabulation of Sexual Identity by Race/Ethnicity

	Sexual Identity			
	Heterosexual % (95% CI)	Gay or Lesbian % (95% CI)	Bisexual % (95% CI)	Unsure % (95% CI)
Race/Ethnicity	*n*	*n*	*n*	*n*
White [a]	87.1 (85.9-88.3) 16,277	2.0 (1.7-2.3) 413	7.3 (6.6-8.1) 1,413	3.6 (3.1-4.1) 683
Black or African American [a]	83.8 (82.2-85.3) 5,096	3.6 (3.0-4.3) 220	8.6 (7.4-10.0) 528	3.9 (3.3-4.7) 243
Hispanic/ Latinx	86.6 (85.5-87.6) 9,794	2.1 (1.8-2.5) 272	7.2 (6.5-8.0) 789	4.1 (3.5-4.8) 468
Am. Indian/ Alaska Native [a]	86.3 (81.2-90.1) 348	3.5 (1.8-6.9) 15	5.8 (3.7-9.1) 31	4.4 (2.6-7.4) 22
Asian [a]	86.1 (83.1-88.6) 1,556	1.6 (1.0-2.5) 28	5.6 (4.2-7.4) 104	6.8 (5.2-8.7) 113
Native Hawaiian/ other PI [a]	90.2 (85.1-93.6) 218	1.5 (0.7-3.3) 9	5.2 (1.4-3.0) 18	3.2 (1.4-7.2) 13
Multiracial [a]	82.9 (80.7-84.9) 1,744	2.9 (1.9-4.3) 58	10.6 (9.0-12.4) 240	3.7 (2.7-5.0) 80
Total	*86.3 (85.5-87.2)* *35,033*	*2.3 (2.0-2.5)* *1,015*	*7.5 (7.0-8.1)* *3,123*	*3.9 (3.6-4.2)* *1,622*

χ^2=86.771, p<.001

Note. Weighted precents are presented with unweighted counts.

CI=Confidence Interval

[a] Non-Hispanic

Additionally, the frequencies of each outcome variable were cross tabulated with the two primary variables of interest, race/ethnicity and sexual identity, as shown in Table 4. Chi-square tests indicated that significant differences by sexual identity and race/ethnicity were present for all three outcome variables. Bisexual youth had the highest percentage of current alcohol use compared to all other sexual identity groups (χ^2=82.543, p<.001). In addition, the highest percentages of current marijuana use were observed for gay or lesbian and bisexual youth (χ^2=255.890, p<.001). Further, gay or lesbian youth had the highest percentage of lifetime illicit drug use (χ^2=455.61, p<.001).

In considering each of these outcome variables by race/ethnicity, Asian and Black youth had the lowest percentages of current alcohol use, and a chi-square test indicated that differences by race/ethnicity were significant (χ^2=578.18, p<.001). In terms of current marijuana use, the highest percentage was observed for American Indian/Alaska Native youth, and the lowest for Asian youth (χ^2=299.47, p<.001). Finally, American Indian/Alaska Native youth had the highest percentages of lifetime illicit drug use, where the lowest percentages of lifetime illicit drug use were observed among Asian, white, and Black youth (χ^2=221.54, p<.001).

Table 4.

Frequency of Outcome Variables by Sexual Identity and Race/Ethnicity

Variable	Current Alcohol Use % (95% CI)	Current Marijuana Use % (95% CI)	Lifetime Illicit Drug Use % (95% CI)
Sexual Identity			
Heterosexual	30.3 (28.9-31.7)	20.2 (19.0-21.5)	5.8 (5.3-6.4)
Gay or Lesbian	34.2 (30.0-38.6)	31.0 (27.2-35.1)	18.0 (14.1-22.8)
Bisexual	37.7 (34.9-40.5)	31.3 (28.8-33.8)	11.6 (10.0-13.4)
Unsure	26.6 (23.4-30.1)	21.2 (18.5-24.1)	13.3 (11.0-16.0)
Pearson Chi Square	*82.543 (p<.001)*	*255.890 (p<.001)*	*455.61 (p<.001)*
Race/Ethnicity			
White	34.0 (32.0-36.0)	19.8 (18.2-21.5)	5.8 (5.1-6.5)
Black or African American	20.7 (18.2-23.5)	24.9 (23.1-26.8)	5.9 (4.9-7.1)
Hispanic/Latinx	31.4 (29.8-32.9)	23.4 (21.8-25.1)	9.1 (8.1-10.1)
American Indian/ Alaska Native	37.9 (30.1-46.4)	30.0 (23.6-37.3)	18.5 (13.4-24.9)
Asian	13.1 (11.1-15.5)	8.1 (6.4-10.0)	4.0 (2.8-5.6)
Native Hawaiian/ Other PI	30.2 (22.1-39.7)	16.2 (11.7-22.1)	12.6 (7.5-20.3)
Multiracial	33.1 (30.2-36.1)	23.5 (20.9-26.3)	8.7 (7.1-10.6)
Pearson Chi Square	*578.18 (p<.001)*	*299.47 (p<.001)*	*221.54 (p<.001)*
All Students	30.8 (29.3-32.0)	21.1 (19.9-22.3)	6.8 (6.2-7.4)
Total n	*38,767*	*41,910*	*41,923*

Note. Weighted precents are presented along with their 95% Confidence Intervals. Number of participants differs for each variable due to missing data.
CI=Confidence Interval

The association between each study variable and each outcome variable was then assessed using bivariate logistic regression models, which are presented in Table 5. A separate bivariate logistic regression model was run for each variable with each of the outcome variables. All study variables were significantly associated with all three outcome variables at the bivariate level. Female students were significantly more likely to drink alcohol than male students (OR=1.18; p<.001), while female students were significantly less likely than male students to use marijuana (OR=0.90; p<.05) or to have ever used an illicit drug (OR=0.62; p<.001). Students in 10th, 11th and 12th grade were more likely than students in 9th grade to currently drink alcohol

(AOR=1.48, p<.001; AOR=2.10, p<.011; AOR=2.70, p<.001, respectively), currently use marijuana (AOR=1.45, p<.001; AOR=1.91, p<.011; AOR=2.24, p<.001) or to ever have used an illicit drug (AOR=1.35, p<.001; AOR=1.62, p<.011; AOR=2.17, p<.001).

Overall, gay or lesbian students were more likely to currently use marijuana (OR=1.77; p<.001) and over three and a half times more likely to have ever used an illicit drug (OR=3.57; p<.001) compared with heterosexual students, but were not significantly more likely to currently use alcohol. Bisexual students, on the other hand, were significantly more likely to currently use alcohol (OR=1.39, p<.001), currently use marijuana (OR=1.79; p<.001) and to have ever used an illicit drug (OR=2.13; p<.001) than heterosexual students. For students who were unsure of their sexual identity, associations varied depending on the substance. Unsure students were significantly less likely than heterosexual students to currently use alcohol (OR=0.84; p<.05) but were more likely to have ever used an illicit drug (OR=2.48; p<.001). There was no significant association between unsure sexual identity and current marijuana use.

Associations with alcohol, marijuana and illicit drug use varied by race/ethnicity. Black students were less likely to currently drink alcohol (OR=0.51, p<.001) compared to white students, but significantly more likely to use marijuana (OR=1.34, p<.001). Hispanic/Latinx students were less likely than white students to currently drink alcohol (OR=0.89; p<.05) but more likely to currently use marijuana (OR=1.24, p<.01) and more likely to have ever used illicit drugs (OR=1.62, p<.001). American Indian/Alaska Native students were more likely than white students to use marijuana (OR=1.73, p<.001) and more likely to have ever used illicit drugs (OR=3.68, p<.001). Asian youth were significantly less likely than white students to currently drink alcohol (OR=.29; p<.001), currently use marijuana (OR=.36, p<.001) or have ever used an illicit drug (OR=.67; p<.05). Students who were Native Hawaiian/Other Pacific Islander were

not significantly more or less likely than white students to currently use alcohol or marijuana but were more likely to have ever use an illicit drug (OR=2.35, p<.01). Finally, multiracial students were more likely to currently use marijuana (OR=1.24, p<.01) and more likely to have ever used an illicit drug (OR=1.55, p<.01) compared to white students.

In considering the relationship between psychosocial factors and substance use, all six predictors tested were significantly associated with all three outcome variables at the bivariate level. Students who had experienced at-school bullying were more likely to currently use alcohol (OR=1.51, p<.001) currently use marijuana (OR=1.33, p<.001) and ever have used an illicit drug (OR=1.86, p<.001) compared to students who had not experienced at-school bullying in the past 12 months. Those who experienced electronic bullying were also more likely to currently use alcohol (OR=1.97, p<.001), currently use marijuana (OR=1.59, p<.001) and ever have used an illicit drug (OR=2.34, p<.001). Students who reported feeling depressed in the past 12 months were over twice as likely to currently use alcohol (OR=2.04, p<.001) currently use marijuana (OR=2.21, p<.001) and have ever used an illicit drug (OR=2.52, p<.001). Students who had missed school because they felt unsafe at school or on their way to school in the past 30 days were significantly more likely to currently use alcohol (OR=1.88, p<.001), currently use marijuana (OR=2.13, p<.001) and over four times more likely to have ever used an illicit drug (OR=4.09, p<.001). Further, those who had been threatened or injured with a weapon on school property in the past 12 months were more likely to currently use alcohol (OR=2.66, p<.001), more likely to currently use marijuana (OR=2.79, p<.001) and nearly seven times more likely to have ever used illicit drugs (OR=6.84, p<.001). Finally, students who were ever forced to have sexual intercourse were nearly three times more likely to currently use alcohol (OR=2.88, p<.001) or currently use marijuana (OR=2.97, p<.001), and nearly five times more likely to have

ever used an illicit drug (OR=4.86, p<.001). Across all psychosocial variables in this study, effect sizes were consistently largest for illicit drug use. Furthermore, missing school due to feeling unsafe, having been threatened or injured with a weapon at school, and ever having been forced to have sexual intercourse were the strongest predictors of illicit drug use at the bivariate level.

Bivariate logistic regression results also showed the odds of using alcohol, marijuana or illicit drug use were significantly higher for youth who also engaged in another form of substance use. This suggests a high degree of polysubstance use among the study sample. Because this study was not focused on polysubstance use, substance use variables were not included as predictors for each of the other substance use models in multivariable models.

The final preliminary analysis step was to assess a correlation matrix of all study variables, to evaluate potential multicollinearity among predictors that were to be entered into multivariable models. Correlations between two dichotomous variables were assessed using the Phi coefficient, while correlations between categorical variables and dichotomous or categorical variables were assessed with Cramer's V. More details about how multicollinearity was assessed was described in Chapter 3. As shown in Table 6, all variables of interest were significantly correlated with each of the outcome variables, but no correlations exceed the multicollinearity cut-off of 0.70. Based on these results and the results of all other bivariate analyses, all study variables were included in each of the multivariable models described in the next section.

Table 5.

Bivariate Associations Between Study Variables and Substance Use Outcomes

Variable (Ref)	Current Alcohol Use	Current Marijuana Use	Lifetime Illicit Drug Use
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Sex (Male)			
Female	1.18*** (1.10-1.28)	.90* (0.83-0.98)	.62*** (0.55-0.69)
Grade in school (9th)			
10th	1.48*** (.28-1.71)	1.45*** (1.29-1.63)	1.35*** (1.82-2.59)
11th	2.10*** (1.87-2.33)	1.91*** (1.72-2.12)	1.62*** (1.35-1.95)
12th	2.70*** (2.38-3.07)	2.24*** (1.99-2.52)	2.17*** (1.82-2.59)
Sexual Identity (Heterosexual)			
Gay or Lesbian	1.20 (0.98-1.45)	1.77*** (1.46-2.16)	3.57*** (2.67-4.76)
Bisexual	1.39*** (1.24-1.60)	1.79*** (1.59-2.03)	2.13*** (1.78-2.55)
Unsure	.84* (0.71-0.99)	1.06 (0.90-1.25)	2.48*** (2.03-3.03)
Race/Ethnicity (White)			
Black or African American	.51*** (0.43-0.61)	1.34*** (1.17-1.55)	1.02 (0.82-1.27)
Hispanic/Latinx	.89* (0.80-0.99)	1.24** (1.09-1.40)	1.62*** (1.39-1.90)
American Indian/Alaska Native	1.19 (.83-1.70)	1.73** (1.25-2.39)	3.68*** (2.51-5.41)
Asian	.29*** (.24-.36)	.36*** (.28-.26)	.67* (.46-.98)
Native Hawaiian/Other PI	.84 (.55-1.28)	.78 (.53-1.17)	2.35** (1.32-1.98)
Multiracial	.96 (.82-1.13)	1.24** (1.08-1.43)	1.55** (1.21-1.98)
Bullied at school (No)	1.51*** (1.41-1.63)	1.33*** (1.21-1.45)	1.86*** (1.66-2.07)
Bullied electronically (No)	1.97*** (1.82-2.13)	1.74*** (1.59-1.91)	2.34*** (2.08-2.64)
Felt depressed (No)	2.04*** (1.90-2.18)	2.21*** (2.03-2.40)	2.52*** (2.23-2.83)
Missed school due to feeling unsafe (No)	1.88*** (1.66-2.14)	2.13*** (1.88-2.42)	4.09*** (3.43-4.88)
Threatened or injured with a weapon at school (No)	2.66*** (2.37-2.98)	2.79*** (2.45-3.18)	6.84*** (5.88-7.95)
Ever forced to have sexual intercourse (No)	2.88*** (2.59-3.20)	2.97*** (2.65-3.33)	4.86*** (4.21-5.61)
Currently used alcohol (No)	--	10.00*** (9.22-10.84)	10.11*** (8.72-11.73)
Currently use marijuana (No)	10.00*** (9.22-10.84)	--	11.66*** (10.37-13.10)
Ever used illicit drugs (No)	10.11*** (8.72-11.73)	11.66*** (10.37-13.10)	--

Note. Unadjusted odds ratios are reported from bivariate logistic regressions between each variable and current alcohol use.
Ref=Reference group; OR=Odds Ratio; 95% C.I.=95% Confidence Interval
*p<.05; **p<.01; ***p<.001

Table 6.

Correlation Matrix

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Sex	--												
2. Grade in school	.01[a]	--											
3. Sexual Identity	.02[a] ***	.02[a]***	--										
4. Race/Ethnicity	.01[a]	.02[a]***	.03[a]***	--									
5. Bullied at school	.09***	.04[a]***	.12[a]***	.10[a]***	--								
6. Bullied electronically	.14***	.08[a]***	.12[a]***	.10[a]***	.49***	--							
7. Felt depressed	.21***	.02[a]*	.23[a]***	.06[a]***	.26***	.26***	--						
8. Missed school due to feeling unsafe	.03***	.03[a]***	.09[a]***	.06[a]***	.18***	.18***	.15***	--					
9. Threatened or injured with a weapon at school	-.06***	.04[a]***	.09[a]***	.03[a]***	.20***	.19***	.12***	.28***	--				
10. Ever forced to have sexual intercourse	.13***	.04[a]***	.16[a]***	.02[a]**	.17***	.19***	.20***	.15***	.13***	--			
11. Current alcohol use	.04***	.16[a]***	.06[a]***	.11[a]***	.08***	.12***	.15***	.09***	.12***	.13***	--		
12. Current marijuana use	-.02***	.12[a]***	.08[a]***	.05[a]***	.05***	.08***	.14***	.10***	.13***	.14***	.45***	--	
13. Ever used an illicit drug	-.07***	.06[a]***	.12[a]***	.06[a]***	.08***	.10***	.11***	.17***	.24***	.17***	.27***	.32***	--

Note. Phi Coefficients are reported unless otherwise denoted.
[a]Cramer's V
*p<.05; **p<.01; ***p<.001

Primary Analyses by Study Aim

Research Aim 1

The first aim of this study was to evaluate the interacting effects of race/ethnicity and sexual identity on the outcomes of alcohol use, marijuana use, and illicit drug use in high school youth. This aim was assessed using the first and second steps of the sequential multivariable logistic regression models. The first step of the models included the main effects for demographic variables including sex, grade in school, sexual identity and race/ethnicity. The second step of the models included these main effects along with interaction effects of sexual identity and race/ethnicity in order to understand how the combined effects of sexual identity and racial/ethnic identity impact substance use outcomes.

It should be noted that only three categories for race/ethnicity were included in the multivariable models. Because of small sample sizes for many racial/ethnic groups when cross tabulated with sexual identity, concerns arose about the accuracy of multivariable models if such small sample sizes were included. In addition, smaller race/ethnicity groups were not aggregated into an "other" group because of stark differences in the relationship with each of the outcome variables across these categories, as shown in Table 4 and Table 5. Therefore, the racial/ethnic identities included in the multivariable models were limited to Black or African American, Hispanic/Latinx and white students, with white students serving as the reference group.

The results of the first step of the final models are presented in Table 7, with three separate models displayed for current alcohol use, current marijuana use, and lifetime illicit drug use. The first step model for current alcohol use reveals that sex, grade in school, bisexual and unsure sexual identity, and Black and Hispanic/Latinx race/ethnicity remained significantly associated with alcohol use after all other demographic variables were included in the model.

Female students were more likely to currently drink alcohol than male students (AOR=1.16, p<.001) and 10th, 11th and 12th grade students were all more likely than 9th grade students to currently drink alcohol (AOR=1.51, p<001; AOR==2.11, p<.001; AOR=2.73, p<.001, respectively). Bisexual students were more likely to currently drink alcohol than heterosexual students (AOR=1.35, p<.001), however there were no significant differences in alcohol use for gay or lesbian or unsure students compared to heterosexual students. Effect sizes for Black and Hispanic/Latinx race/ethnicity stayed nearly constant compared to bivariate models after controlling for other demographics, with Black and Hispanic/Latinx students less likely to currently drink alcohol than white students (AOR=.50, p<.001; AOR=.89, p<.05, respectively). The Nagelkerke R^2 for this model was .059, indicating that approximately 5.9% of the variance in current alcohol use in this sample could be explained by the model.

Similarly, in the first step model for current marijuana use, associations between marijuana use and sex, grade in school, gay or lesbian and bisexual sexual identity, and Black and Hispanic/Latinx race/ethnicity remained significant, with fairly constant effect sizes for each of these variables compared to bivariate models after controlling for all other demographics. Female students were less likely to currently use marijuana than male students (AOR=.83, p<.001) and 10th, 11th and 12th grade students were all more likely than 9th grade students to currently use marijuana (AOR=1.51, p<001; AOR==1.95, p<.001; AOR=2.32, p<.001, respectively). Both gay or lesbian and bisexual students were more likely than heterosexual students to currently use marijuana (AOR=1.70, p<.001; AOR=1.94, p<.001, respectively) as were Black and Hispanic/Latinx students compared to their white peers (AOR=1.33, p<.001; AOR=1.24, p<.01). For this model, the Nagelkerke R^2 was 0.037, indicating that approximately 3.7% of the variance in current marijuana use was explained by the model.

For lifetime illicit drug use, significance and effect sizes for each variable were also fairly consistent with the bivariate models. Female students were less likely to have ever used an illicit drug than male students (AOR=.52, p<.001) and 10th, 11th and 12th grade students were all more likely than 9th grade students to have ever used an illicit drug (AOR=1.41, p<001; AOR==1.71, p<.001; AOR=2.40, p<.001, respectively). In this model, gay or lesbian, bisexual and unsure students were all significantly more likely than heterosexual students to have engaged in illicit drug use in their lifetime (AOR=3.18, p<.001; AOR=2.92, p<.001; AOR=2.62, p<.001, respectively). Additionally, Hispanic/Latinx students were more likely to have used illicit drugs than white students (AOR=1.63, p<.001) but no such effect was observed for Black or African American students. The Nagelkerke R^2 for this model was 0.056, indicating that approximately 5.6% of the variance in lifetime illicit drug use was explained by the model.

Table 7.

Multivariable Model Step 1: Logistic Regression with Demographic Variables

Variable (Ref)	Current Alcohol Use	Current Marijuana Use	Lifetime Illicit Drug Use
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Sex (Male)			
Female	1.16** (1.06-1.27)	.83*** (.75-.90)	.52*** (.46-.59)
Grade in school (9th)			
10th	1.51*** (1.29-1.77)	1.51*** (1.33-1.71)	1.41*** (1.17-1.70)
11th	2.11*** (1.88-2.37)	1.95*** (1.73-2.19)	1.71*** (1.40-2.07)
12th	2.73*** (2.38-3.13)	2.32*** (2.04-2.63)	2.40*** (1.99-2.89)
Sexual Identity (Heterosexual)			
Gay or Lesbian	1.15 (.93-1.43)	1.70*** (1.40-2.07)	3.18*** (2.39-4.22)
Bisexual	1.35*** (1.17-1.56)	1.94***(1.69-2.23	2.92*** (2.40-3.56)
Unsure	.83 (.68-1.02)	1.09 (.91-1.32)	2.62*** (2.05-3.35)
Race/Ethnicity (White)			
Black or African American	.50*** (.41-.60)	1.33*** (1.16-1.53)	.93 (.75-1.16)
Hispanic/Latinx	.89* (.79-1.00)	1.24** (1.09-1.40)	1.63*** (1.39-1.90)
Nagelkerke Pseudo R^2	*.059*	*.037*	*.056*
Unweighted Count	*32,610*	*35,321*	*35,260*

Note. Separate models were run for each outcome variable.
Ref=Reference group; AOR=Adjusted Odds Ratio; 95% C.I.=95% Confidence Interval
*p<.05; **p<.01; ***p<.001

Table 8 presents the results of step two of the final multivariable models. Main effects for demographic variables are included, as in step one, along with interaction terms for sexual identity and race/ethnicity. In the second step model for current alcohol use, female youth were still more likely to currently use alcohol than male youth (AOR=1.16, p<.001), and 10th, 11th and 12th grade youth were all more likely than 9th grade youth to have ever used an illicit drug (AOR=1.51, p<001; AOR=2.11, p<.001; AOR=2.73, p<.001, respectively). These effect sizes were identical to the previous step of the model. Furthermore, the interaction terms for sexual identity by race/ethnicity showed significant interactions for gay or lesbian and bisexual Black youth and unsure Hispanic/Latinx youth., but not for any other groups of youth. Gay or lesbian

and bisexual Black youth were more likely than their heterosexual white counterparts to currently drink alcohol (AOR=1.85, p<.05; AOR=2.24, p<.001, respectively). Likewise, Hispanic/Latinx youth who were unsure of their sexual identity were more likely to currently drink alcohol than white heterosexual youth (AOR=1.64, p<.05). The Nagelkerke R^2 for this model was 0.061, indicating that approximately 6.1% of the variance in current alcohol use in this sample could be explained by the model.

In the second step model for current marijuana use, female youth were still less likely to currently use marijuana than male youth (AOR=.83, p<.001), and 10th, 11th and 12th grade youth were all more likely than 9th grade youth to currently use marijuana (AOR=1.51, p<001; AOR==1.95, p<.001; AOR=2.31, p<.001, respectively). The interaction term for sexual identity by race/ethnicity was significant, with significant effects for gay or lesbian and bisexual Black youth, but none of the other interaction terms in the model were significantly associated with current marijuana use. Gay or lesbian Black youth were significantly more likely than white heterosexual youth to currently use marijuana (AOR=1.74, p<.05), however, bisexual Black youth were significantly less likely to currently use marijuana than white heterosexual youth (AOR=.68, p<.01). The Nagelkerke R^2 for this model was 0.038, indicating that approximately 3.8% of the variance in current marijuana use in this sample could be explained by the model.

In the second step model for lifetime illicit drug use, female youth were still less likely to have ever used illicit drugs than male youth (AOR=.52, p<.001), and 10th, 11th and 12th grade youth were all more likely than 9th grade youth to have ever used an illicit drug (AOR=1.41, p<001; AOR==1.71, p<.001; AOR=2.39, p<.001, respectively). These effect sizes were consistent with the previous step of the model. The interaction term for sexual identity by race/ethnicity was significant for lifetime illicit drug use, but the only significant interaction

effect found was for gay or lesbian Black youth, who were more likely than their white, heterosexual peers to have ever used illicit drugs (AOR=3.69, p<.01). The Nagelkerke R^2 for this model was 0.059, indicating that approximately 5.9% of the variance in current marijuana use in this sample could be explained by the model.

Table 8.

Multivariable Model Step 2: Logistic Regression with Demographic Variables, with Interaction Effects of Sexual Identity and Race/Ethnicity

Variable (Ref)	Current Alcohol Use	Current Marijuana Use	Lifetime Illicit Drug Use
	AOR (95% CI)	AOR (95% CI)	AOR
Main Effects			
Sex (Male)			
Female	1.16** (1.06-1.26)	.83*** (.76-.91)	.52*** (.46-.58)
Grade in school (9th)			
10th	1.51*** (1.29-1.78)	1.51*** (1.33-1.71)	1.41*** (1.16-1.70)
11th	2.11*** (1.88-2.37)	1.95*** (1.73-2.19)	1.71*** (1.40-2.07)
12th	2.73*** (2.38-3.13)	2.31*** (2.03-2.63)	2.39*** (1.98-2.88)
Sexual Identity (Heterosexual)			
Gay or Lesbian	.97 (.70-1.35)	1.35 (.97-1.88)	2.65** (1.90-3.70)
Bisexual	1.14 (.95-1.37)	2.13** (1.77-2.56)	3.04*** (2.35-3.93)
Unsure	.69* (.53-.90)	1.02 (.79-1.30)	2.23*** (1.31-3.81)
Race/Ethnicity (White)			
Black or African American	.44*** (.36-.55)	1.36*** (1.17-1.59)	.77* (.60-.98)
Hispanic/Latinx	.85** (.75-.97)	1.23** (1.08-1.40)	1.69*** (1.40-2.03)
Interaction Effects			
Sexual Identity x Race/Ethnicity			
Gay/Lesbian, Black	1.85* (1.03-3.29)	1.74* (1.00-3.01)	3.69** (1.65-8.28)
Gay/Lesbian, Hispanic/Latinx	1.31 (.75-2.29)	1.28 (.78-2.10)	1.13 (.54-2.35)
Bisexual, Black	2.24*** (1.60-3.13)	.68** (.50-.93)	1.57 (0.99-2.51)
Bisexual, Hispanic/Latinx	1.24 (.93-1.65)	.89 (.68-1.16)	.73 (.50-1.05)
Unsure, Black	1.44 (.75-2.76)	.88 (.54-1.44)	1.21 (.64-2.28)
Unsure, Hispanic/Latinx	1.64* (1.11-2.42)	1.36 (.93-2.01)	.91 (.51-1.65)
Nagelkerke R^2	*.061*	*.038*	*.059*
Unweighted Count	*32,610*	*35,321*	*35,260*

Ref=Reference group; AOR=Adjusted Odds Ratio; 95% C.I.=95% Confidence Interval
*p<.05; **p<.01; ***p<.001

Research Aim 2

The second research aim of the study was to consider the associations of depression, bullying, victimization and violence on the outcomes of current alcohol use, current marijuana use, and lifetime illicit drug use among high school youth based on sexual identity and race/ethnicity. This aim was assessed using the third and fourth steps of the final sequential multivariable logistic regression models for the study. The third step of the multivariable models included main effects for all demographic variables in the study plus known psychosocial correlates of youth substance use. These results are presented in Table 9. All of these variables plus interaction terms for sexual identity and race/ethnicity were included in the fourth and final step of the multivariable models, displayed in Table 10.

In the third step model for current alcohol use, it is evident that the inclusion of psychosocial factors impacted the significance and effect size of some associations between the primary variables of interest – sexual identity and race/ethnicity – and current alcohol use, compared to the first step model, where psychosocial factors were not included. Most notably, the effect of bisexual identity on current alcohol use was no longer significant after psychosocial factors were added, which indicated that the psychosocial factors included may explain the relationship between bisexual identity and current alcohol use. In this model, youth who were unsure of their sexual identity were less likely than heterosexual youth to use alcohol (AOR=.66, $p<.001$). Like the first step model, Black and Hispanic/Latinx youth were still significantly less likely to drink alcohol compared to their white peers (AOR=.51, $p<.001$; AOR=.86, $p<.01$). In addition, female sex was no longer a significant predictor in this model, which suggests that psychosocial factors may impact the relationship between female sex and current alcohol use as

well. The association between grade in school and current alcohol use did not change as a result of psychosocial factors being included in the model.

Furthermore, at-school bullying was not a significant predictor of current alcohol use in the third step model, which suggests that other psychosocial factors were stronger predictors of alcohol use than at-school bullying. All other psychosocial factors maintained significant associations with alcohol use, though the effect sizes were significantly smaller for all psychosocial factors compared to their bivariate associations with the outcome. The strongest predictors of current alcohol use were having been threatened or injured with a weapon on school property (AOR=2.01; p<.001), ever having been forced to have sexual intercourse (AOR=1.98; p<.001) and having felt depressed (AOR=1.69; p<.001). The Nagelkerke R^2 for this model was 0.107, which indicates that approximately 10.7% of the variation in current alcohol use can be explained by the demographic and psychosocial factors included in the model.

In the third step model for current marijuana use, there were significant changes in the relationships between sexual identity and marijuana use compared to the first step model, but no significant changes in effect size by race/ethnicity. There was no longer a significant association between gay or lesbian identity and marijuana use in this model, suggesting that the psychosocial factors included may explain some of that relationship. In addition, the effect size of the association between bisexual identity and marijuana use significantly decreased (AOR=1.34, p<.001), suggesting that this relationship may be partially, but not fully, explained by these psychosocial factors. The relationship between Black and Hispanic/Latinx race/ethnicity did not change significantly due to the inclusion of these variables, which suggests that the psychosocial factors included may be unrelated to the relationship between race/ethnicity and current marijuana use. In this model, Black and Hispanic/Latinx youth were still more likely to currently

use marijuana compared to their white peers (AOR=1.40, p<.001; AOR=1.21, p<.01, respectively). Likewise, the odds of current marijuana use by grade in school did not change due to the inclusion of psychosocial variables, 10th graders, 11th graders, and 12th graders were still more likely than 9th graders to currently use marijuana (AOR=1.55, p<.001; AOR=1.99, p<.001; AOR=2.41, p<.001, respectively). In addition, the association between female sex and current marijuana remained significant in the second model, with female students less likely than male students to currently use marijuana (AOR=.68, p<.001). The size of this association significantly decreased from the first step model, which suggests that the relationship between female sex and current marijuana use was at least partially explained by psychosocial factors.

In this model, all psychosocial factors included were positively associated with current marijuana use, with the exception of at-school bullying. In this case, the relationship between at-school bullying and marijuana use is reversed from the bivariate model. In the multivariable model, youth who had been bullied at school were less likely than other youth to currently use marijuana, after controlling for demographics and other psychosocial factors (AOR=0.83, p<.001). All other psychosocial factors included in the model were significant predictors of current marijuana use, but the strongest predictors were ever having been forced to have sexual intercourse (AOR=2.01, p<.001), having felt depressed (AOR=1.97, p<.001) and having been threatened or injured with a weapon on school property (AOR=1.96, p<.001). The Nagelkerke R^2 for this model was 0.096, which indicates that approximately 9.6% of the variation in current marijuana use could be explained by this model.

In the third step model for lifetime illicit drug use, the odds of having used illicit drugs remained relatively consistent based on grade in school and sex compared with the first step model. Female youth were significantly less likely to have ever used illicit drugs (AOR=.42,

p<.001), and 10th, 11th and 12th graders were still more likely than 9th graders to have ever used illicit drugs (AOR=1.46, p<.01; AOR=1.83, p<.001; AOR=2.65, p<.001, respectively).

However, the odds of having used illicit drugs declined significantly for gay or lesbian, bisexual, and unsure students after psychosocial factors were added to the model, though all remained significant predictors of illicit drug use (AOR=2.01, p<.01; AOR=1.53, p<.001; AOR=1.57, p<.001, respectively). This indicates that at least some of the variation in illicit drug use by sexual identity was explained by the psychosocial factors included in the model. By race/ethnicity, in the first model, there was no significant association between Black race/ethnicity and lifetime illicit drug use, but in the third step model, Black students were significantly less likely than white students to have ever used illicit drugs (AOR=.73, p<.01). This suggest that at least some of the variation in illicit drug use among Black students is explained by the psychosocial factors included in the model. For Hispanic/Latinx students compared to white students, the effect size did not significantly change, and Hispanic/Latinx students were still significantly more likely than white students to have ever used illicit drugs after controlling for these psychosocial factors (AOR=1.59, p<.001).

In terms of psychosocial factors, in this model, effect sizes for all variables were reduced compared with bivariate models, but the association between at-school bullying and ever having used illicit drugs attenuated completely with the inclusion of all other variables in the model. The effect size for having missed school due to feeling unsafe was reduced the most drastically, though it remained a significantly associated with lifetime illicit drug use (AOR=1.55, p<.001). The two strongest psychosocial predictors of lifetime illicit drug use in this model were having been threatened or injured with a weapon on school property (AOR=3.23, p<.001) and ever having been forced to have sexual intercourse (AOR=3.01**,** p<.001). The Nagelkerke R^2 for this

model was 0.138, which indicates that approximately 13.8% of the variance in lifetime illicit drug use can be explained by this model.

Table 9.

Multivariable Model Step 3: Logistic Regression with Demographic & Psychosocial Variables

Variable (Ref)	Current Alcohol Use	Current Marijuana Use	Lifetime Illicit Drug Use
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Sex (Male)			
Female	1.00 (.91-1.10)	.68*** (.62-.75)	.42*** (.36-.49)
Grade in school (9th)			
10th	1.54*** (1.30-1.81)	1.55*** (1.37-1.77)	1.46** (1.18-1.80)
11th	2.14*** (1.90-2.42)	1.99*** (1.76-2.25)	1.83*** (1.47-2.26)
12th	2.81*** (2.43-3.25)	2.41*** (2.11-2.75)	2.65*** (2.19-3.21)
Sexual Identity (Heterosexual)			
Gay or Lesbian	.89 (.71-1.13)	1.24 (.99-1.56)	2.01** (1.44-2.82)
Bisexual	.94 (.82-1.08)	1.34*** (1.15-1.57)	1.52*** (1.25-1.85)
Unsure	.66*** (.53-.82)	.87 (.71-1.06)	1.57*** (1.23-2.00)
Race/Ethnicity (White)			
Black or African American	.51*** (.42-.62)	1.40*** (1.22-1.62)	.73** (.59-.90)
Hispanic/Latinx	.86** (.77-.97)	1.21** (1.06-1.37)	1.59*** (1.33-1.90)
Bullied at school (No)			
Yes	.93 (.85-1.03)	.83*** (.74-.92)	.89 (.75-1.06)
Bullied electronically (No)			
Yes	1.36*** (1.21-1.53)	1.34*** (1.18-1.51)	1.38** (1.15-1.66)
Felt depressed (No)			
Yes	1.69*** (1.52-1.87)	1.97*** (1.80-2.17)	1.84*** (1.57-2.15)
Missed school due to feeling unsafe (No)			
Yes	1.20* (1.01-1.43)	1.33*** (1.14-1.55)	1.55*** (1.25-1.93)
Threatened or injured with a weapon at school (No)			
Yes	2.01*** (1.72-2.35)	1.96*** (1.66-2.31)	3.23*** (2.71-3.86)
Ever forced to have sexual intercourse (No)	1.98*** (1.72-2.28)	2.01*** (1.74-2.32)	3.01*** (2.53-3.59)
Yes			
Nagelkerke R^2	*0.107*	*0.096*	*0.138*
Unweighted Count	*28,268*	*30,778*	*30,527*

Ref=Reference group; AOR=Adjusted Odds Ratio; 95% C.I.=95% Confidence Interval
*p<.05; **p<.01; ***p<.001

The final step multivariable models are presented in Table 10 and include both psychosocial factors as in the third step model, as well as the interaction terms for sexual identity and race/ethnicity that were included in the second step models.

In the final step of the model for current alcohol use, female sex was not a significant predictor, as in step three, and grade in school remained a consistent predictor of current alcohol use after the addition of both psychosocial variables and interaction terms. In addition, none of the associations between any of the psychosocial factors and alcohol use were altered after the inclusion of interaction terms, compared to the step three model. Importantly, significant interaction terms for sexual identity by race/ethnicity were present in this model in this model, though they changed slightly from the step two model. The interaction terms revealed that Black gay or lesbian students were 2.23 times more likely than white heterosexual students to currently drink alcohol ($p<.05$) and Black bisexual students were 2.42 times more likely than white heterosexual students to currently drink alcohol ($p<.001$). These interaction effects were similar to the second step model despite the inclusion of psychosocial factors, which suggests that the psychosocial factors included do not explain the disproportionate rates of alcohol use among gay or lesbian and bisexual Black students. In contrast, the interaction effect for unsure Hispanic/Latinx students was no longer significant in the final model, which suggests that this relationship may be explained by the psychosocial factors included in the model. No other interaction terms were significant in the final model. In this final step of the model for current alcohol use, the Nagelkerke R^2 was 0.109, indicating that approximately 10.9% of the variance in current alcohol use could be explained by this model.

In the final step of the model for current marijuana use, the size of the association between female sex and marijuana use was consistent with the step three model, and associations

between grade in school and marijuana use also remained consistent with the previous models. Effect sizes for the psychosocial factors included in the model remained nearly identical after interaction terms were included. Interestingly, the interaction term for sexual identity by race/ethnicity was not significant in the final model after psychosocial factors were included. This suggests that the significant interaction effects found for gay or lesbian and bisexual Black youth in the second step model for current marijuana use may be explained by the psychosocial factors included in the final model. The main effects for sexual identity and race/ethnicity were nearly identical to those in the previous step of the model for marijuana use. These results showed a reduced effect size for the association between bisexual identity and current marijuana use (AOR=1.39, $p<.01$) after the inclusion of psychosocial factors in the model. In contrast, main effects for race/ethnicity remained consistent after psychosocial factors were added, indicating that Black and Hispanic/Latinx youth were more still likely than their white peers, overall, to use marijuana after the inclusion of psychosocial factors and interaction terms (AOR=1.41, $p<.001$; AOR=1.19, $p<.05$). The Nagelkerke R^2 for this model was 0.097, indicating that approximately 9.7% of the variance in current marijuana use could be explained by this model.

Finally, in the fourth step of the model for lifetime illicit drug use, female youth were still significantly less likely than male youth to have ever used illicit drugs (AOR=.42, $p<.001$) after the inclusion of psychosocial factors in the model, this effect size was unchanged. The effects of grade in school also remained significant and did not change significantly from the previous step of the model. Interaction terms for Black gay or lesbian students and Black bisexual students were significant for lifetime illicit drug use after the inclusion of psychosocial factors in the final step model. This model revealed that Black gay or lesbian students were 3.90 times more likely to have ever used illicit drugs compared with white heterosexual students ($p<.01$), and Black

bisexual students were 1.78 times more likely to have ever used illicit drugs compared with white heterosexual students ($p<.05$). These interaction terms were significant even after the inclusion of psychosocial factors in the model, which suggests that the effects of having both gay, lesbian or bisexual and Black identities on lifetime illicit drug use was significant above and beyond the effects of psychosocial factors included in the model. None of the other interaction terms were significant predictors of lifetime illicit drug use. The Nagelkerke R^2 for this model was 0.140, which indicates that approximately 14% of the variance in lifetime illicit drug use could be explained by this model.

Table 10.

Multivariable Model Step 4: Logistic Regression with Demographic & Psychosocial Variables, with Interaction Effects of Sexual Identity and Race/Ethnicity

Variable (Ref)	Current Alcohol Use	Current Marijuana Use	Lifetime Illicit Drug Use
	AOR (95% CI)	AOR (95% CI)	AOR
Main effects			
Sex (Male)			
Female	1.00 (.91-1.10)	.68*** (.62-.75)	.42*** (.36-.49)
Grade in school (9th)			
10th	1.54*** (1.30-1.82)	1.55*** (1.37-1.77)	1.45** (1.18-1.80)
11th	2.15*** (1.90-2.42)	1.99*** (1.76-2.24)	1.83*** (1.48-2.27)
12th	2.81*** (2.43-3.26)	2.40*** (2.11-2.74)	2.64*** (2.19-3.20)
Sexual Identity (Heterosexual)			
Gay or Lesbian	.75 (.54-1.03)	1.01 (.72-1.42)	1.42 (.77-2.64)
Bisexual	.78** (.66-.93)	1.39** (1.14-1.70)	1.65** (1.25-2.19)
Unsure	.56*** (.42-.74)	.81 (.61-1.07)	1.71** (1.17-2.50)
Race/Ethnicity (White)			
Black or African American	.49*** (.36-.56)	1.41*** (1.20-1.66)	.59*** (.46-.76)
Hispanic/Latinx	.83** (.74-.94)	1.19* (1.04-1.36)	1.64*** (1.34-1.99)
Bullied at school (No)			
Yes	.94 (.85-1.04)	.83** (.74-.92)	.91 (.76-1.07)
Bullied electronically (No)			
Yes	1.36*** (1.21-1.54)	1.33*** (1.18-1.51)	1.38** (1.15-1.66)
Felt depressed (No)			
Yes	1.70*** (1.53-1.89)	1.98*** (1.80-2.18)	1.86*** (1.59-2.17)
Missed school due to feeling unsafe (No)			
Yes	1.20* (1.01-1.43)	1.33*** (1.14-1.55)	1.54*** (1.24-1.91)
Threatened or injured with a weapon at school (No)			
Yes	2.01*** (1.72-2.36)	1.95*** (1.65-2.30)	3.20*** (2.69-3.81)
Ever forced to have sexual intercourse (No)			
Yes	1.98*** (1.72-2.28)	2.01*** (1.74-2.32)	3.01*** (2.52-3.58)
Interaction Effects			
Sexual Identity x Race/Ethnicity			
Gay/Lesbian, Black	2.23* (1.18-4.22)	1.03 (.55-1.92)	3.90** (1.45-10.50)
Gay/Lesbian, Hispanic/Latinx	1.28 (.70-2.35)	1.30 (.75-2.24)	1.05 (.42-2.61)
Bisexual, Black	2.42*** (1.66-3.53)	.75 (.52-1.08)	1.78* (1.03-3.09)
Bisexual, Hispanic/Latinx	1.32 (.97-1.79)	1.01 (.76-1.34)	.82 (.54-1.25)
Unsure, Black	1.63 (.74-3.63)	1.85 (.97-3.54)	1.44 (.67-3.10)
Unsure, Hispanic/Latinx	1.48 (.99-2.21)	1.24 (.80-1.91)	.81 (.45-1.49)
Nagelkerke R^2	*0.109*	*0.097*	*0.140*
Unweighted Count	28,268	30,778	30,527

Ref=Reference group; AOR=Adjusted Odds Ratio; 95% C.I.=95% Confidence Interval
*p<.05; **p<.01; ***p<.001

Summary of Findings

Overall, this study found significant effects of the interaction between sexual identity and race/ethnicity for substance use outcomes among high school youth. Black gay or lesbian and bisexual students, and Hispanic/Latinx students who were unsure of their sexual identity were all more likely to engage in current alcohol use compared to their white and heterosexual peers, while controlling for other demographics. Additionally, Black gay or lesbian students were more likely to currently use marijuana, while Black bisexual students were less likely to use marijuana compared to their white heterosexual counterparts. Finally, Black gay or lesbian students were also more likely to have ever used illicit drugs in their lifetime compared to white heterosexual students. These results revealed significant differences in the odds of substance use among youth depending on their intersecting sexual identities and racial/ethnic identities, above and beyond the effects of sexual identity or race/ethnicity alone. In addition, the effects of sexual identity and race/ethnicity on substance use vary by the type of substance use being considered, in addition to varying by within-group identity among LGBQ and racial/ethnic minority youth.

The secondary aim of this study was to consider the effects of known psychosocial correlates of youth substance use related to mental health, violence, and victimization, on the relationship between sexual identity, race/ethnicity and these outcomes. Results indicated that psychosocial factors were stronger predictors of current marijuana use than the interacting effects of sexual identity and race/ethnicity, but interaction terms for gay, lesbian and bisexual Black youth remained significant predictors of current alcohol use and lifetime illicit drug use after the addition of psychosocial factors. In addition, the inclusion of psychosocial factors significantly altered associations between sexual identity and alcohol, marijuana and illicit drug use, which indicates that these psychosocial factors may play a role in the disparities observed for gay,

lesbian, bisexual and unsure youth. However, these psychosocial factors did not significantly alter the main effects of race/ethnicity on alcohol, marijuana or illicit drug use, which suggests that observed disparities in substance use by race/ethnicity may not be explained by these factors. Furthermore, the two violence-related and potentially traumatic experiences which were included as psychosocial predictors (having been threatened or injured with a weapon and having experienced forced sexual intercourse) were consistently the strongest predictors of alcohol, marijuana and illicit drug use in multivariable models, and emerged as especially strong predictors of lifetime illicit drug use.

CHAPTER 5: DISCUSSION

Introduction

This study was informed by a conceptual model, Minority Stress Through an Intersectional Lens, to consider the impact of intersecting identities and experiences of minority stress on substance use behaviors among youth (see Figure 1). This conceptual model was adapted from minority stress theory and intersectionality theory, and addresses the critical need for public health to take intersectional approaches to quantitative research (Bowleg, 2012; Crenshaw, 1991; Meyer, 2003). The present study applied an intersectional lens to minority stress theory by 1) considering multiple, interlocking social identity categories simultaneously, and 2) recognizing the systems of oppression, (including racism, sexism, heterosexism, and monosexism) on the macro-level that have a direct impact on individual experiences at the micro-level. This study was intentional about avoiding the use of aggregated "sexual minority" or "racial/ethnic minority" groups, but instead took into account multiple and interlocking identities by considering within-group differences within the categories of sexual identity and race/ethnicity to allow for comparisons beyond dichotomized "minority" and "majority" groups.

Summary of Study

The purpose of this study was to investigate the substance use outcomes of high school youth depending on their unique combination of racial/ethnic and sexual identities. To the knowledge of the authors, this study was the first of its kind to apply intersectionality theory to substance use outcomes using interaction terms in a nationally representative sample of high school students. This study was a secondary analysis of data from youth attending high schools in the United States, and considered the relationship between sexual identity, race/ethnicity and other psychosocial factors with the outcomes of past 30-day alcohol use, past 30-day marijuana

use, and lifetime illicit drug use. This research was designed to answer the following research question: In what ways is the intersection of sexual identity and race/ethnicity associated with alcohol use, marijuana use and illicit drug use in a nationally representative sample of high school students?

Discussion of Key Results

Research Aim 1

The first aim of this study was:

1. To evaluate the interacting effects of race/ethnicity and sexual identity on the outcomes of alcohol use, marijuana use, and illicit drug use in high school youth.

Prior studies considering the simultaneous impacts of race/ethnicity and sexual identity on youth substance use are limited and have produced inconsistent results. One such study found that white and Hispanic sexual minority youth were at increased risk of alcohol and other drug use, Hispanic sexual minority youth were at increased risk of marijuana use, and Black sexual minority youth were at the highest risk of other drug use compared to white heterosexual youth (Gattamorta et al., 2019). In another study, researchers did not find significant differences between all sexual minority people of color and all white sexual minorities, but when stratified by sex, sexual minority women of color had higher odds of substance use problems than white sexual minority women, while sexual minority men of color had lower odds compared to white sexual minority men. These studies have been limited by “minority” and “majority” classification of identities which are much more complex and nuanced than dichotomized groups can show (Gattamorta et al., 2019; Mereish & Bradford, 2014). One study which did not dichotomize sexual and racial/ethnic identity categories looked specifically at substance use among bisexual youth, and found that Black bisexual female youth were less likely to report

binge drinking and illicit drug use than White bisexual female youth, but Black bisexual youth were more likely to report marijuana use than White bisexual youth (Feinstein et al., 2019).

This study found that Black gay or lesbian youth had significantly higher odds of lifetime illicit drug use compared to their white heterosexual peers, which is consistent with prior research indicating that Black sexual minority youth had the highest rates of illicit drug use, however, this study did not find higher rates of illicit drug use among bisexual or unsure Black youth (Gattamorta et al., 2019). In addition, contrary to the findings of Feinstein and colleagues, Black bisexual youth were significantly less likely to use marijuana than their white heterosexual peers (Feinstein et al., 2019). However, Black gay or lesbian students were more likely to use marijuana than their white heterosexual counterparts. This study did not find significant interaction effects for any category of Hispanic/Latinx LGBQ youth for marijuana use, which is inconsistent with the findings of Gattamora and colleagues, who found that Hispanic sexual minority youth were at increased risk of marijuana use (Gattamorta et al., 2019). In terms of alcohol use, significant interaction effects were found for Black gay or lesbian youth, Black bisexual youth, and Hispanic/Latinx youth who were unsure of their sexual identity, all of whom had higher odds of current alcohol use compared to white heterosexual youth. Furthermore, in contrast to prior findings that white and Hispanic sexual minority youth were at increased risk of alcohol use, this study found that that overall, Hispanic/Latinx youth were less likely to use alcohol compared to white youth, but Hispanic/Latinx youth who were unsure of their sexual identity were more likely to currently use alcohol (Gattamorta et al., 2019).

Taken together, these results reveal important differences in youth substance use behaviors depending on the intersecting identities they hold, above and beyond the effects of sexual identity or race/ethnicity alone. Black gay or lesbian youth, Black bisexual youth, and

Hispanic/Latinx unsure youth had higher odds of alcohol use, Black gay or lesbian youth had higher odds of marijuana use and Black bisexual youth had lower odds of marijuana use, and Black gay or lesbian youth had higher odds of lifetime illicit drug use, compared to their white heterosexual peers.

Research Aim 2

The secondary aim of this study was:

2. To consider the associations of depression, bullying, victimization and violence on the outcomes of current alcohol use, current marijuana use, and lifetime illicit drug use among youth based on sexual identity and race/ethnicity.

Many studies have found evidence that mental health problems, including depression, are significantly associated with adolescent substance use, often co-occur with substance use disorders, and are likely to appear before substance use behaviors in adolescence (Hawke et al., 2018; Mericle et al., 2012). Additionally, peer victimization has been identified as a possible mediator on the pathway between mental health and substance use, especially for female youth (Li et al., 2018; Luk et al., 2010; Zapolski et al., 2018). In particular, bullying victimization is directly associated with a variety of substance use outcomes (Baiden & Tadeo, 2019; Radliff et al., 2012). Sexual violence is another factor which has been repeatedly found to be associated with substance use among youth (Johns et al., 2018; Li et al., 2018; Sartor et al., 2013). These psychosocial factors are important correlates of youth substance use, and many of them have a disproportionate impact on LGBTQ+ youth and youth of color (Birkett et al., 2015; Hong et al., 2018; Johns et al., 2018; Steele, 2016; Swann et al., 2019). As a result, these psychosocial factors were included in this study as proxy measures for minority stress.

Indeed, results of bivariate logistic regressions revealed that all six psychosocial factors tested were significantly associated with alcohol, marijuana and illicit drug use among high school youth, which is consistent with the prior research described above. In multivariable models with demographic variables and psychosocial predictors, all psychosocial factors were significantly positively associated with all three substance use outcomes, with the exception of at-school bullying. Having been bullied at school was not significantly associated with current alcohol use or lifetime illicit drug use, and it was negatively associated with current marijuana use. This important finding revealed that demographics and other psychosocial factors were stronger predictors of substance use than at-school bullying. This finding differs from those of Baiden and Tadeo, who found that youth who had been bullied at school were more likely to have misused prescription drugs (Baiden & Tadeo, 2019). This might suggest that the inclusion of demographics and other psychosocial factors reduced the association between at-school bullying and substance use, or that at-school bullying is more closely correlated with prescription drug misuse than with alcohol, marijuana and illicit drug use.

Additionally, inclusion of these psychosocial factors in multivariable models altered the main effects for sexual identity but had less of an effect on main effects for race/ethnicity, for all substance use outcomes. After psychosocial variables were added to the model, gay, lesbian and bisexual youth were no longer significantly more likely to use alcohol. Additionally, main effects of gay or lesbian identity for marijuana use were no longer significant, and effect sizes for the relationship between bisexual identity and marijuana use, and gay, lesbian, bisexual and unsure identities for illicit drug use were all reduced after the inclusion of psychosocial factors. This suggests that at least some of the variation in substance use among LGBQ youth can be explained by experiences of electronic bullying, depression, school victimization and sexual

violence. This finding is consistent with other studies that have found victimization and violence to be associated with substance use among LGBQ youth, and one in particular which found that disparities in substance use by sexual identity attenuated completely after social stressors were accounted for, including at-school victimization and sexual violence (Lowry et al., 2017).

In contrast, main effects for Black or Hispanic/Latinx race/ethnicity for each of the substance use outcomes remained significant and effect sizes largely unchanged after psychosocial factors were added to the models. This suggests that the psychosocial factors included in the model did not appear to explain the relationship between race/ethnicity and substance use, while they did appear to explain at least some of the relationship between sexual identity and substance use. Other researchers have found that factors that go beyond the individual level, such as community violence, neighborhood factors, socioeconomic status, and interpersonal racial discrimination have been associated with increased substance use, and that these factors have a differential impact on Black and Hispanic/Latinx youth (Brody et al., 2012; Lambe & Craig, 2017; Rose et al., 2019; Woods-Jaeger et al., 2019). Further research which considers factors beyond the scope of the present study is needed in order to better understand the relationship between race/ethnicity and substance use.

Furthermore, when psychosocial factors were added to the models with interaction terms for sexual identity and race/ethnicity, a few interaction terms became non-significant. These results constitute novel findings which add to the literature exploring intersectional identities as predictors of health behaviors among youth. Hispanic/Latinx youth who were unsure of their sexual identity were no longer more likely to use alcohol compared to white heterosexual youth after psychosocial factors were added. Additionally, interaction terms for Black gay, lesbian and bisexual youth became non-significant altogether for marijuana use after psychosocial factors

were added, which suggests that the inclusion of these variables may explain some of the variation in marijuana use. Further, after the inclusion of psychosocial factors, one interaction term became significant, showing that Black bisexual youth were significantly more likely to have used illicit drugs compared to white heterosexual youth. This suggests that the psychosocial factors included in the model did not explain much of the relationship between Black gay, lesbian or bisexual identity and illicit drug use.

Overall Findings

This study was the first of its kind to consider interaction effects for sexual identity and race/ethnicity and their relationship to youth substance use behaviors, and to consider the role of psychosocial factors in this relationship, using a nationally representative sample. The study sought to respond to calls for quantitative public health research to take a more nuanced approach to studying associations between intersectional identities and health (Bowleg, 2012). The conceptual model for this study was informed by minority stress theory and intersectionality theory, and the study findings are somewhat consistent with the proposed model. All psychosocial factors, which were included in this study as proxy measures of minority stress, were significantly associated with each of the outcome variables in all multivariable models, with the exception of at-school bullying. In addition, interaction terms for sexual identity by race/ethnicity were significantly associated with alcohol and illicit drug use behaviors for some groups with intersecting marginalized identities, even while controlling for psychosocial factors. However, this was not the case for marijuana use. Further research using direct measures of specific minority stressors related to racism, heterosexism, and monosexism is needed to further explore the effectiveness of this conceptual model for studying substance use among youth.

Overall, this study revealed a great deal of heterogeneity in the substance use behaviors youth engage in based on intersecting sexual and racial/ethnic identities, which is consistent with prior research that has sought to apply an intersectional lens to issues of youth mental health and substance use (Baiden et al., 2020; Bostwick et al., 2014; Feinstein et al., 2019; Swann et al., 2020). In particular, this study found strong interaction effects for Black gay, lesbian or bisexual youth for alcohol use and illicit drug use, even after accounting for psychosocial factors. To an extent, these findings are consistent with the idea that multiple-minority groups face heightened levels of minority stress, due to stressors from both sexual identity-related factors and race-related factors (Cyrus, 2017; Swann et al., 2020). Further research is needed to understand the direct relationship between minority stressors and substance use among multiple-minority youth.

Across this study's findings, the effects of sexual identity and race/ethnicity on alcohol, marijuana, and illicit drug use outcomes were not consistent across different sexual identities and race/ethnicities and were also not consistent across different types of substance use behaviors. This provides evidence that the use of terms like "sexual minority" and "racial/ethnic minority" overgeneralize the complex identities and experiences of diverse groups of young people, and do not paint a clear or accurate picture of substance use disparities among youth. In actuality, the data revealed nuanced patterns in substance use behaviors among youth that varied by identity group, but also depending on the substance. Future studies must work to disaggregate sexual identity and race/ethnicity groups in order to discover within-group differences by sexual identity and race/ethnicity, and to study different substance use behaviors independently.

Furthermore, five of the six psychosocial factors included in this study remained significantly associated with all three substance use outcomes in every model, even while controlling for demographic variables, sexual identity and race/ethnicity interactions, and other

psychosocial factors. In particular, two violence-related and potentially traumatic experiences (having been threatened or injured with a weapon on school property and having experienced forced sexual intercourse) were consistently the strongest predictors of alcohol, marijuana and illicit drug use in multivariable models, and emerged as especially strong predictors of lifetime illicit drug use. This was consistent with a review of the literature which found a link between stressful life events in adolescence and substance use (Hoffmann & Jones, 2020). Stressful life events, trauma, chronic stress and ACEs also disproportionately effect youth of color and LGBQ individuals (Blosnich & Andersen, 2015; Forster et al., 2019; Lee & Chen, 2017; Lowry et al., 2017). Further research on the relationship between violence, trauma and youth substance use is called for, and should consider how these issues uniquely impact LGBTQ+ youth of color.

Strengths and Limitations

Strengths

A key strength of this study was its use of a nationally representative sample, which allows these findings to be widely applicable to high school students across the United States. In addition, the use of a large dataset allowed sexual identity and race/ethnicity categories to be disaggregated, without grouping youth into broad "sexual minority" and "racial/ethnic minority" groups. This acknowledges the significant differences in health behaviors depending on distinct sexual identities and racial/ethnic identities. The use of a large dataset also allowed this study to consider intersecting identities using quantitative methods.

An additional strength of this study was its treatment of substance use as an outcome rather than a predictor, in order to disrupt the notion that substance use is merely a "risky behavior" without acknowledging the many precursors of substance use. Evidence shows that childhood sexual abuse, depression, adverse childhood experiences, discrimination and mental

health disorders are longitudinally associated with substance use in adolescence and adulthood, and many of these factors disproportionately affect LGBTQ+ youth and youth of color (Benjet et al., 2013; Brody et al., 2012; Dyar et al., 2019; Forster et al., 2018; Forster et al., 2019; Gattamorta et al., 2019; Lowry et al., 2017; Roberts et al., 2018; Sartor et al., 2013; Swendsen et al., 2010; Vu et al., 2019). This study therefore considered some of the factors that have been shown to be precursors of substance use, including psychosocial factors and minority stress.

Limitations

Despite its strengths, this study was also constrained by several limitations. The primary limitation was the use of individual identity, rather than measures of discrimination or oppression on higher levels of the socio-ecological model, in the application of minority stress and intersectionality theories. The theoretical framework on which this study was based acknowledged the impact of macro-level systems of oppression on individual health, however, no measures of these larger systems of oppression were included in the study analyses. Because of the limitations of secondary data analysis, this study was not able to include direct measures of minority stress or discrimination, but instead considered health outcomes of all sexual minority and racial/ethnic minority youth on the population-level.

Furthermore, there were limitations to applying intersectionality theory using quantitative methods. Intersectional identities are inherently complex, and only so much nuance can be captured using quantitative statistical methods to consider the impacts of individual lived experiences and identities on health. In addition, this study was cross-sectional in nature, which limited its ability to make causal claims about the predictors and outcomes under study.

In addition, demographic questions included in the Youth Risk Behavior Survey (YRBS) are not entirely inclusive or representative of all gender, sexual or racial/ethnic identities. The only YRBS question that asked about gender or sex asked, "what is your sex?" with only two response options: "male" and "female." This question did not provide a definition of "sex" or specify whether to report sex-assigned-at-birth or gender identity. Many youth do not identify within these binary options, so their sex or gender may not have been accurately reflected in the data (The Trevor Project, 2020). Because the YRBS does not include a question for gender identity, transgender and non-binary identities were not represented in this study. Additionally, the question about sexual identity included only four response options: (1) heterosexual (2) gay or lesbian (3) bisexual (4) unsure. There are many other terms used by youth to describe their identities (e.g. queer, pansexual, asexual, and more) and those youth may have felt alienated or not represented due to these limited options, which may have impacted their responses (The Trevor Project, 2020).

Furthermore, despite efforts of YRBS to oversample Black and Hispanic/Latinx youth to produce a nationally representative sample, a combined dataset of over 44,000 responses did not produce a large enough sample to analyze multiracial, Asian, American Indian/Alaska Native or Native Hawaiian/Pacific Islander identities in multivariable models. The exclusion of these groups from multivariable models limited the ability of this study to adequately analyze the variety of racial/ethnic identities represented in the dataset as originally planned.

Implications and Recommendations

Implications for School Health Promotion

The findings of this study have a number of implications for health promotion programming in high schools across the United States. First, school health promotion programs

must be inclusive of all identities represented in their schools and both acknowledge and value the multidimensional aspects of students' identities. As previous researchers have argued, all efforts to promote health and wellbeing in schools must apply an intersectional lens (Johns et al., 2019). In addition, as described in the conceptual model for this study, macro-level systems of oppression, including racism, sexism, and homophobia, have the power to directly influence health among young people, and so schools must acknowledge and actively work to dismantle these oppressive systems, in order to effectively promote health and wellbeing for students.

Secondly, substance use behaviors should not be characterized as "risky" or "problematic," as this may serve to perpetuate stigma around a behavior which already disproportionately affects some marginalized youth, and multiply marginalized youth especially. School health officials must acknowledge that substance occurs within a broader context of mental and physical health and wellbeing. This study found that, in many cases, psychosocial factors such as depression, violence and victimization were stronger predictors of substance use than race/ethnicity or sexual identity. As a result, health promotion programs must employ harm-reduction strategies to addressing substance use and consider the many experiences and factors that may co-occur with substance use, including mental health issues, violence and victimization.

Future Directions

Future studies of intersectional identities and substance use among youth should be conducted with direct measures of minority stress and discrimination. Measures should be developed and validated to understand how identity-related experiences including stigma, discrimination and systemic oppression have affected youth, and also consider the role of intersecting identities in shaping those experiences. While this cross-sectional study found

associations between substance use and mental health, violence and victimization, longitudinal research is also necessary to understand the causal pathways of these relationships.

In addition, mixed methods should be applied to future studies of intersectionality and substance use among youth. Despite a large and representative sample, this study was unable to capture much of the nuance involved with complex experiences of identity, and especially, experiences of marginalization and oppression. In particular, in-depth studies should be conducted with LGBTQ+ youth of color, or with specific subgroups of LGBTQ+ youth of color, in order to better understand their lived experiences and the way these experiences affect their health. Studies that dive more deeply into experiences of one racial/ethnic group are also necessary to elevate the voices of minority groups that may not be represented in larger studies due to small sample sizes. Youth who are multiracial, Asian, American Indian and Pacific Islander need to be intentionally recruited for larger studies, so that they can be represented.

Furthermore, future studies need to be inclusive of transgender and non-binary youth. Studies should utilize inclusive survey methods when collecting demographic information, so that gender identity and sex-assigned-at-birth are not conflated, and transgender and non-binary youth are represented in research. In addition, measures of sexual identity and gender identity should be informed by youth, as terminology changes rapidly and youth have more expertise than adult researchers about the language being used to describe their identities.

Conclusion

This study applied minority stress and intersectionality theories to a large nationally representative sample of U.S. high school students and found that Black gay/lesbian and bisexual youth had higher odds of alcohol use and higher odds of illicit drug use, compared to white heterosexual youth, after controlling for other demographics and psychosocial factors.

Interactions terms for Hispanic/Latinx unsure youth for alcohol use, and Black gay/lesbian and bisexual youth for marijuana use, all became non-significant after the addition of psychosocial factors. These significant interaction effects revealed important differences in substance use behaviors depending on the intersecting identities youth hold, above and beyond the effects of sexual identity or race/ethnicity alone. Intersectional identities must be considered in future research on youth health, and particularly in addressing youth substance use.

References

Aneshensel, C. S. (2013). *Theory-Based Data Analysis for the Social Sciences* (2 ed.). SAGE Publications, Inc. https://doi.org/10.4135/9781506335094

Baiden, P., LaBrenz, C. A., Asiedua-Baiden, G., & Muehlenkamp, J. J. (2020, 2020/06/01/). Examining the intersection of race/ethnicity and sexual orientation on suicidal ideation and suicide attempt among adolescents: Findings from the 2017 Youth Risk Behavior Survey. *Journal of Psychiatric Research, 125*, 13-20. https://doi.org/https://doi.org/10.1016/j.jpsychires.2020.02.029

Baiden, P., & Tadeo, S. K. (2019, 2019/12/01/). Examining the association between bullying victimization and prescription drug misuse among adolescents in the United States. *Journal of Affective Disorders, 259*, 317-324. https://doi.org/https://doi.org/10.1016/j.jad.2019.08.063

Benjet, C., Borges, G., Medina-Mora, M. E., & Méndez, E. (2013, Jul 1). Chronic childhood adversity and stages of substance use involvement in adolescents. *Drug Alcohol Depend, 131*(1-2), 85-91. https://doi.org/10.1016/j.drugalcdep.2012.12.002

Birkett, M., Newcomb, M. E., & Mustanski, B. (2015, 2015/03/01/). Does It Get Better? A Longitudinal Analysis of Psychological Distress and Victimization in Lesbian, Gay, Bisexual, Transgender, and Questioning Youth. *Journal of Adolescent Health, 56*(3), 280-285. https://doi.org/https://doi.org/10.1016/j.jadohealth.2014.10.275

Blosnich, J. R., & Andersen, J. P. (2015, 2015/02/01). Thursday's child: the role of adverse childhood experiences in explaining mental health disparities among lesbian, gay, and bisexual US adults. *Social Psychiatry and Psychiatric Epidemiology, 50*(2), 335-338. https://doi.org/10.1007/s00127-014-0955-4

Bontempo, D. E., & D'Augelli, A. R. (2002, 2002/05/01/). Effects of at-school victimization and sexual orientation on lesbian, gay, or bisexual youths' health risk behavior. *Journal of Adolescent Health, 30*(5), 364-374. https://doi.org/https://doi.org/10.1016/S1054-139X(01)00415-3

Bostwick, W. B., Meyer, I., Aranda, F., Russell, S., Hughes, T., Birkett, M., & Mustanski, B. (2014). Mental Health and Suicidality Among Racially/Ethnically Diverse Sexual Minority Youths. *American Journal of Public Health, 104*(6), 1129-1136. https://doi.org/10.2105/ajph.2013.301749

Bowleg, L. (2012). The Problem With the Phrase Women and Minorities: Intersectionality—an Important Theoretical Framework for Public Health. *American Journal of Public Health, 102*(7), 1267-1273. https://doi.org/10.2105/ajph.2012.300750

Brener, N. D., Collins, J. L., Kann, L., Warren, C. W., & Williams, B. I. (1995, Mar 15). Reliability of the Youth Risk Behavior Survey Questionnaire. *Am J Epidemiol, 141*(6), 575-580. https://doi.org/10.1093/oxfordjournals.aje.a117473

Brener, N. D., Kann, L., McManus, T., Kinchen, S. A., Sundberg, E. C., & Ross, J. G. (2002, Oct). Reliability of the 1999 youth risk behavior survey questionnaire. *J Adolesc Health, 31*(4), 336-342. https://doi.org/10.1016/s1054-139x(02)00339-7

Brody, G. H., Kogan, S. M., & Chen, Y.-f. (2012). Perceived Discrimination and Longitudinal Increases in Adolescent Substance Use: Gender Differences and Mediational Pathways. *American Journal of Public Health, 102*(5), 1006-1011. https://doi.org/10.2105/ajph.2011.300588

Centers for Disease Control and Prevention. (2013). Methodology of the Youth Risk Behavior Surveillance System. *MMWR, 62*(1), 1-20.

Centers for Disease Control and Prevention. (2016). 2015 YRBS Data User's Guide. www.cdc.gov/yrbss

Centers for Disease Control and Prevention. (2018, June 2018). 2017 YRBS Data User's Guide. www.cdc.gov/yrbss

Centers for Disease Control and Prevention. (2020a). 2019 YRBS Data User's Guide. www.cdc.gov/yrbss

Centers for Disease Control and Prevention. (2020b). Software for Analysis of YRBS Data. www.cdc.gov/yrbss

Centers for Disease Control and Prevention (CDC). (2019). 1991-2019 High School Youth Risk Behavior Survey Data. http://yrbs-explorer.services.cdc.gov/

Corliss, H. L., Rosario, M., Wypij, D., Wylie, S. A., Frazier, A. L., & Austin, S. B. (2010, 2010/05/01/). Sexual orientation and drug use in a longitudinal cohort study of U.S. adolescents. *Addictive Behaviors, 35*(5), 517-521. https://doi.org/https://doi.org/10.1016/j.addbeh.2009.12.019

Crenshaw, K. (1991). Mapping the Margins: Intersectionality, Identity Politics, and Violence against Women of Color. *Stanford Law Review, 43*(6), 1241-1299. https://doi.org/10.2307/1229039

Cyrus, K. (2017, 2017/07/03). Multiple minorities as multiply marginalized: Applying the minority stress theory to LGBTQ people of color. *Journal of Gay & Lesbian Mental Health, 21*(3), 194-202. https://doi.org/10.1080/19359705.2017.1320739

Davis, B. (2015). Homophobia. *Intercultural Communication, Managing Across Cultures*.

Debnam, K., Milam, A. J., Furr-Holden, C. D., & Bradshaw, C. (2016, May 11). The Role of Stress and Spirituality in Adolescent Substance Use. *Subst Use Misuse, 51*(6), 733-741. https://doi.org/10.3109/10826084.2016.1155224

Dyar, C., Newcomb, M. E., & Mustanski, B. (2019, 2019/08/01/). Longitudinal associations between minority stressors and substance use among sexual and gender minority individuals. *Drug and Alcohol Dependence, 201*, 205-211. https://doi.org/https://doi.org/10.1016/j.drugalcdep.2019.03.032

Eisner, S. (2016). Monosexism. *The SAGE Encyclopedia of LGBTQ Studies*. https://doi.org/10.4135/9781483371283.n274

Feinstein, B. A., & Dyar, C. (2017, 2017/03/01). Bisexuality, Minority Stress, and Health. *Current Sexual Health Reports, 9*(1), 42-49. https://doi.org/10.1007/s11930-017-0096-3

Feinstein, B. A., Turner, B. C., Beach, L. B., Korpak, A. K., & Phillips, G. (2019, 2019/06/01). Racial/Ethnic Differences in Mental Health, Substance Use, and Bullying Victimization Among Self-Identified Bisexual High School-Aged Youth. *LGBT Health, 6*(4), 174-183. https://doi.org/10.1089/lgbt.2018.0229

Forster, M., Grigsby, T. J., Rogers, C. J., & Benjamin, S. M. (2018, 2018/01/01/). The relationship between family-based adverse childhood experiences and substance use behaviors among a diverse sample of college students. *Addictive Behaviors, 76*, 298-304. https://doi.org/https://doi.org/10.1016/j.addbeh.2017.08.037

Forster, M., Rogers, C. J., Benjamin, S. M., Grigsby, T., Lust, K., & Eisenberg, M. E. (2019, 2019/12/06). Adverse Childhood Experiences, Ethnicity, and Substance Use among College Students: Findings from a Two-State Sample. *Substance Use & Misuse, 54*(14), 2368-2379. https://doi.org/10.1080/10826084.2019.1650772

Friedman, M. R., Dodge, B., Schick, V., Herbenick, D., Hubach, R. D., Bowling, J., Goncalves, G., Krier, S., & Reece, M. (2014, 2014/12/01). From Bias to Bisexual Health Disparities: Attitudes Toward Bisexual Men and Women in the United States. *LGBT Health, 1*(4), 309-318. https://doi.org/10.1089/lgbt.2014.0005

Future of Sex Education Initiative. (2020). *National Sex Education Standards: Core Content and Skills, K-12, Appendix: Glossary: Sex Education Terms*. http://www.advocatesforyouth.org/wp-content/uploads/2020/03/NSES-2020-web.pdf

Gattamorta, K. A., Salerno, J. P., & Castro, A. J. (2019). Intersectionality and Health Behaviors Among US High School Students: Examining Race/Ethnicity, Sexual Identity, and Sex. *Journal of School Health, 89*(10), 800-808. https://doi.org/10.1111/josh.12817

Goldbach, J. T., Schrager, S. M., Dunlap, S. L., & Holloway, I. W. (2015, 2015/02/23). The Application of Minority Stress Theory to Marijuana Use Among Sexual Minority

Adolescents. *Substance Use & Misuse, 50*(3), 366-375. https://doi.org/10.3109/10826084.2014.980958

Goldbach, J. T., Tanner-Smith, E. E., Bagwell, M., & Dunlap, S. (2014, 2014/06/01). Minority Stress and Substance Use in Sexual Minority Adolescents: A Meta-analysis. *Prevention Science, 15*(3), 350-363. https://doi.org/10.1007/s11121-013-0393-7

Gray, K. M., & Squeglia, L. M. (2018). Research Review: What have we learned about adolescent substance use? *Journal of child psychology and psychiatry, and allied disciplines, 59*(6), 618-627. https://doi.org/10.1111/jcpp.12783

Guttmannova, K., Kosterman, R., White, H. R., Bailey, J. A., Lee, J. O., Epstein, M., Jones, T. M., & Hawkins, J. D. (2017, Oct 1). The association between regular marijuana use and adult mental health outcomes. *Drug Alcohol Depend, 179*, 109-116. https://doi.org/10.1016/j.drugalcdep.2017.06.016

Han, B., Compton, W. M., Blanco, C., & DuPont, R. L. (2017, Sep). National Trends in Substance Use and Use Disorders Among Youth. *J Am Acad Child Adolesc Psychiatry, 56*(9), 747-754.e743. https://doi.org/10.1016/j.jaac.2017.06.011

Hawke, L. D., Koyama, E., & Henderson, J. (2018, 2018/08/01/). Cannabis use, other substance use, and co-occurring mental health concerns among youth presenting for substance use treatment services: Sex and age differences. *Journal of Substance Abuse Treatment, 91*, 12-19. https://doi.org/https://doi.org/10.1016/j.jsat.2018.05.001

Heron, M. (2019). *Deaths: Leading Causes for 2017* (National Center for Health Statistics Reports, Issue.

Hoffmann, J. P., & Jones, M. S. (2020). Cumulative Stressors and Adolescent Substance Use: A Review of 21st-Century Literature. *Trauma, Violence, & Abuse*, 1524838020979674. https://doi.org/10.1177/1524838020979674

Hong, J. S., Voisin, D. R., Cho, S., Smith, D. C., & Resko, S. M. (2018). Peer victimization and substance use among African American adolescents and emerging adults on Chicago's Southside. *American Journal of Orthopsychiatry, 88*(4), 431-440. https://doi.org/10.1037/ort0000247 (Bullying and Peer Victimization of Vulnerable, Marginalized, and Oppressed Youth)

Huebner, D. M., Thoma, B. C., & Neilands, T. B. (2015, 2015/07/01). School Victimization and Substance Use Among Lesbian, Gay, Bisexual, and Transgender Adolescents. *Prevention Science, 16*(5), 734-743. https://doi.org/10.1007/s11121-014-0507-x

Johns, M. M., Lowry, R., Rasberry, C. N., Dunville, R., Robin, L., Pampati, S., Stone, D. M., & Mercer Kollar, L. M. (2018). Violence Victimization, Substance Use, and Suicide Risk Among Sexual Minority High School Students - United States, 2015-2017. *MMWR.*

Morbidity and mortality weekly report, 67(43), 1211-1215. https://doi.org/10.15585/mmwr.mm6743a4

Johns, M. M., Poteat, V. P., Horn, S. S., & Kosciw, J. (2019, 2019/06/01). Strengthening Our Schools to Promote Resilience and Health Among LGBTQ Youth: Emerging Evidence and Research Priorities from The State of LGBTQ Youth Health and Wellbeing Symposium. *LGBT Health, 6*(4), 146-155. https://doi.org/10.1089/lgbt.2018.0109

Johnson, R. M., Fairman, B., Gilreath, T., Xuan, Z., Rothman, E. F., Parnham, T., & Furr-Holden, C. D. M. (2015, 2015/10/01/). Past 15-year trends in adolescent marijuana use: Differences by race/ethnicity and sex. *Drug and Alcohol Dependence, 155*, 8-15. https://doi.org/https://doi.org/10.1016/j.drugalcdep.2015.08.025

Katz-Wise, S. L., Mereish, E. H., & Woulfe, J. (2017, 2017/09/02). Associations of Bisexual-Specific Minority Stress and Health Among Cisgender and Transgender Adults with Bisexual Orientation. *The Journal of Sex Research, 54*(7), 899-910. https://doi.org/10.1080/00224499.2016.1236181

Keyes, K. M., Wall, M., Feng, T., Cerdá, M., & Hasin, D. S. (2017, Oct 1). Race/ethnicity and marijuana use in the United States: Diminishing differences in the prevalence of use, 2006-2015. *Drug Alcohol Depend, 179*, 379-386. https://doi.org/10.1016/j.drugalcdep.2017.07.027

Khan, M. R., Cleland, C. M., Scheidell, J. D., & Berger, A. T. (2014, May). Gender and racial/ethnic differences in patterns of adolescent alcohol use and associations with adolescent and adult illicit drug use. *Am J Drug Alcohol Abuse, 40*(3), 213-224. https://doi.org/10.3109/00952990.2014.892950

Kwon, M., Park, E., & Dickerson, S. S. (2019, Aug). Adolescent substance use and its association to sleep disturbances: A systematic review. *Sleep Health, 5*(4), 382-394. https://doi.org/10.1016/j.sleh.2019.06.001

Lambe, L. J., & Craig, W. M. (2017, 2017/09/01/). Bullying involvement and adolescent substance use: A multilevel investigation of individual and neighbourhood risk factors. *Drug and Alcohol Dependence, 178*, 461-468. https://doi.org/https://doi.org/10.1016/j.drugalcdep.2017.05.037

Lee, R. D., & Chen, J. (2017). Adverse childhood experiences, mental health, and excessive alcohol use: Examination of race/ethnicity and sex differences. *Child abuse & neglect, 69*, 40-48. https://doi.org/10.1016/j.chiabu.2017.04.004

Li, D. H., Turner, B. C., Mustanski, B., & Phillips, G. L. (2018, 2018/02/01/). Sexual orientation disparities in prescription drug misuse among a nationally representative sample of adolescents: Prevalence and correlates. *Addictive Behaviors, 77*, 143-151. https://doi.org/https://doi.org/10.1016/j.addbeh.2017.09.021

Litwiller, B. J., & Brausch, A. M. (2013, May 2013
2020-11-17). Cyber Bullying and Physical Bullying in Adolescent Suicide: The Role of Violent Behavior and Substance Use. *Journal of Youth and Adolescence, 42*(5), 675-684. https://doi.org/http://dx.doi.org/10.1007/s10964-013-9925-5

Lowry, R., Johns, M. M., Robin, L. E., & Kann, L. K. (2017). Social Stress and Substance Use Disparities by Sexual Orientation Among High School Students. *American Journal of Preventive Medicine, 53*(4), 547-558. https://doi.org/10.1016/j.amepre.2017.06.011

Luk, J. W., Wang, J., & Simons-Morton, B. G. (2010, 2010/12/01). Bullying Victimization and Substance Use Among U.S. Adolescents: Mediation by Depression. *Prevention Science, 11*(4), 355-359. https://doi.org/10.1007/s11121-010-0179-0

Mercado-Crespo, M. C., & Mbah, A. K. (2013, May). Race and ethnicity, substance use, and physical aggression among U.S. high school students. *J Interpers Violence, 28*(7), 1367-1384. https://doi.org/10.1177/0886260512468234

Mereish, E. H., & Bradford, J. B. (2014, 2014/01/01). Intersecting Identities and Substance Use Problems: Sexual Orientation, Gender, Race, and Lifetime Substance Use Problems. *Journal of Studies on Alcohol and Drugs, 75*(1), 179-188. https://doi.org/10.15288/jsad.2014.75.179

Mereish, E. H., Goldbach, J. T., Burgess, C., & DiBello, A. M. (2017, 2017/09/01/). Sexual orientation, minority stress, social norms, and substance use among racially diverse adolescents. *Drug and Alcohol Dependence, 178*, 49-56. https://doi.org/https://doi.org/10.1016/j.drugalcdep.2017.04.013

Mereish, E. H., Sheskier, M., Hawthorne, D. J., & Goldbach, J. T. (2019, Sep). Sexual orientation disparities in mental health and substance use among Black American young people in the USA: effects of cyber and bias-based victimisation. *Cult Health Sex, 21*(9), 985-998. https://doi.org/10.1080/13691058.2018.1532113

Mericle, A. A., Ta Park, V. M., Holck, P., & Arria, A. M. (2012, Aug). Prevalence, patterns, and correlates of co-occurring substance use and mental disorders in the United States: variations by race/ethnicity. *Compr Psychiatry, 53*(6), 657-665. https://doi.org/10.1016/j.comppsych.2011.10.002

Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological bulletin, 129*(5), 674-697. https://doi.org/10.1037/0033-2909.129.5.674

Miron, O., Yu, K.-H., Wilf-Miron, R., & Kohane, I. S. (2019). Suicide Rates Among Adolescents and Young Adults in the United States, 2000-2017. *JAMA, 321*(23), 2362-2364. https://doi.org/10.1001/jama.2019.5054

National Institute on Drug Abuse. (2019). Monitoring the Future 2019 Survey Results: Overall Findings. https://www.drugabuse.gov/drug-topics/trends-statistics/infographics/monitoring-future-2019-survey-results-overall-findings

National Institute on Drug Abuse. (2020). Monitoring the Future 2020 Survey Results. https://www.drugabuse.gov/drug-topics/related-topics/trends-statistics/infographics/monitoring-future-2020-survey-results

Newcomb, M. E., Birkett, M., Corliss, H. L., & Mustanski, B. (2014). Sexual Orientation, Gender, and Racial Differences in Illicit Drug Use in a Sample of US High School Students. *American Journal of Public Health, 104*(2), 304-310. https://doi.org/10.2105/ajph.2013.301702

Ning, K., Gondek, D., Patalay, P., & Ploubidis, G. B. (2020). The association between early life mental health and alcohol use behaviours in adulthood: A systematic review. *PloS one, 15*(2), e0228667-e0228667. https://doi.org/10.1371/journal.pone.0228667

Pardini, D., White, H. R., & Stouthamer-Loeber, M. (2007). Early adolescent psychopathology as a predictor of alcohol use disorders by young adulthood. *Drug and Alcohol Dependence, 88 Suppl 1*(Suppl 1), S38-S49. https://doi.org/10.1016/j.drugalcdep.2006.12.014

Park, E., McCoy, T. P., Erausquin, J. T., & Bartlett, R. (2018, 2018/01/01/). Trajectories of risk behaviors across adolescence and young adulthood: The role of race and ethnicity. *Addictive Behaviors, 76*, 1-7. https://doi.org/https://doi.org/10.1016/j.addbeh.2017.07.014

Phillips II, G., Turner, B., Felt, D., Han, Y., Marro, R., & Beach, L. B. (2019, 2019/12/01/). Trends in Alcohol Use Behaviors by Sexual Identity and Behavior Among High School Students, 2007–2017. *Journal of Adolescent Health, 65*(6), 760-768. https://doi.org/https://doi.org/10.1016/j.jadohealth.2019.06.007

Pollitt, A. M., Mallory, A. B., & Fish, J. N. (2018, 2018/10/01). Homophobic Bullying and Sexual Minority Youth Alcohol Use: Do Sex and Race/Ethnicity Matter? *LGBT Health, 5*(7), 412-420. https://doi.org/10.1089/lgbt.2018.0031

Radliff, K. M., Wheaton, J. E., Robinson, K., & Morris, J. (2012, 2012/04/01/). Illuminating the relationship between bullying and substance use among middle and high school youth. *Addictive Behaviors, 37*(4), 569-572. https://doi.org/https://doi.org/10.1016/j.addbeh.2012.01.001

Roberts, T. S., Horne, S. G., & Hoyt, W. T. (2015, 2015/10/02). Between a Gay and a Straight Place: Bisexual Individuals' Experiences with Monosexism. *Journal of Bisexuality, 15*(4), 554-569. https://doi.org/10.1080/15299716.2015.1111183

Roberts, Y. H., English, D., Thompson, R., & White, C. R. (2018, 2018/01/01/). The impact of childhood stressful life events on health and behavior in at-risk youth. *Children and*

Youth Services Review, 85, 117-126. https://doi.org/https://doi.org/10.1016/j.childyouth.2017.11.029

Rose, S. W., Mayo, A., Ganz, O., Perreras, L., D'Silva, J., & Cohn, A. (2019, Oct-Dec). Perceived racial/ethnic discrimination, marketing, and substance use among young adults. *J Ethn Subst Abuse, 18*(4), 558-577. https://doi.org/10.1080/15332640.2018.1425949

Ross, L. E., Dobinson, C., & Eady, A. (2010). Perceived determinants of mental health for bisexual people: a qualitative examination. *American Journal of Public Health, 100*(3), 496-502. https://doi.org/10.2105/AJPH.2008.156307

Rostad, W. L., Clayton, H. B., Estefan, L. F., & Johns, M. M. (2020, 2020/04/01). Substance Use and Disparities in Teen Dating Violence Victimization by Sexual Identity Among High School Students. *Prevention Science, 21*(3), 398-407. https://doi.org/10.1007/s11121-019-01049-7

Rumens, N. (2016). Heterosexism. *The SAGE Encyclopedia of LGBTQ Studies*.

Sartor, C. E., Waldron, M., Duncan, A. E., Grant, J. D., McCutcheon, V. V., Nelson, E. C., Madden, P. A. F., Bucholz, K. K., & Heath, A. C. (2013). Childhood sexual abuse and early substance use in adolescent girls: the role of familial influences. *Addiction (Abingdon, England), 108*(5), 993-1000. https://doi.org/https://doi.org/10.1111/add.12115

Schauer, G. L., Berg, C. J., & Bryant, L. O. (2013, 2013/07/01). Sex differences in psychosocial correlates of concurrent substance use among heterosexual, homosexual and bisexual college students. *The American Journal of Drug and Alcohol Abuse, 39*(4), 252-258. https://doi.org/10.3109/00952990.2013.796962

Steele, J. L. (2016, 2016/10/14). Race and General Strain Theory: Examining the Impact of Racial Discrimination and Fear on Adolescent Marijuana and Alcohol Use. *Substance Use & Misuse, 51*(12), 1637-1648. https://doi.org/10.1080/10826084.2016.1191513

Swann, G., Forscher, E., Bettin, E., Newcomb, M. E., & Mustanski, B. (2019, Oct). Effects of victimization on mental health and substance use trajectories in young sexual minority men. *Dev Psychopathol, 31*(4), 1423-1437. https://doi.org/10.1017/s0954579418001013

Swann, G., Stephens, J., Newcomb, M. E., & Whitton, S. W. (2020). Effects of sexual/gender minority- and race-based enacted stigma on mental health and substance use in female assigned at birth sexual minority youth. *Cultural Diversity and Ethnic Minority Psychology, 26*(2), 239-249. https://doi.org/10.1037/cdp0000292

Swendsen, J., Conway, K. P., Degenhardt, L., Glantz, M., Jin, R., Merikangas, K. R., Sampson, N., & Kessler, R. C. (2010, Jun). Mental disorders as risk factors for substance use, abuse and dependence: results from the 10-year follow-up of the National Comorbidity Survey. *Addiction (Abingdon, England), 105*(6), 1117-1128. https://doi.org/10.1111/j.1360-0443.2010.02902.x

Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics* (Sixth Edition ed.). Pearson.

Temple, J. R., & Freeman, D. H. (2010, 2011/03/01). Dating Violence and Substance Use Among Ethnically Diverse Adolescents. *Journal of Interpersonal Violence, 26*(4), 701-718. https://doi.org/10.1177/0886260510365858

Terry-McElrath, Y. M., & Patrick, M. E. (2020, 2020/01/02). U.S. adolescent alcohol use by race/ethnicity: Consumption and perceived need to reduce/stop use. *Journal of Ethnicity in Substance Abuse, 19*(1), 3-27. https://doi.org/10.1080/15332640.2018.1433094

The Trevor Project. (2020). *2020 National Survey on LGBTQ Youth Mental Health*. The Trevor Project.

Toomey, R. B., Huynh, V. W., Jones, S. K., Lee, S., & Revels-Macalinao, M. (2017, 2017/01/02). Sexual minority youth of color: A content analysis and critical review of the literature. *Journal of Gay & Lesbian Mental Health, 21*(1), 3-31. https://doi.org/10.1080/19359705.2016.1217499

U.S. Department of Health and Human Services (HHS). (2016). *Facing Addiction in America: The Surgeon General's Report on Alcohol, Drugs, and Health* (Office of the Surgeon General, Issue. https://addiction.surgeongeneral.gov/sites/default/files/surgeon-generals-report.pdf

Vu, M., Li, J., Haardörfer, R., Windle, M., & Berg, C. J. (2019, 2019/01/23). Mental health and substance use among women and men at the intersections of identities and experiences of discrimination: insights from the intersectionality framework. *BMC Public Health, 19*(1), 108. https://doi.org/10.1186/s12889-019-6430-0

Watson, R. J., Goodenow, C., Porta, C., Adjei, J., & Saewyc, E. (2018, 2018/06/07). Substance Use among Sexual Minorities: Has it Actually Gotten Better? *Substance Use & Misuse, 53*(7), 1221-1228. https://doi.org/10.1080/10826084.2017.1400563

Wilens, T. E., Biederman, J., Adamson, J. J., Henin, A., Sgambati, S., Gignac, M., Sawtelle, R., Santry, A., & Monuteaux, M. C. (2008). Further evidence of an association between adolescent bipolar disorder with smoking and substance use disorders: a controlled study. *Drug and Alcohol Dependence, 95*(3), 188-198. https://doi.org/10.1016/j.drugalcdep.2007.12.016

Wong, S. S., Zhou, B., Goebert, D., & Hishinuma, E. S. (2013, 2013/10/01). The risk of adolescent suicide across patterns of drug use: a nationally representative study of high school students in the United States from 1999 to 2009. *Social Psychiatry and Psychiatric Epidemiology, 48*(10), 1611-1620. https://doi.org/10.1007/s00127-013-0721-z

Woods-Jaeger, B., Berkley-Patton, J., Piper, K. N., O'Connor, P., Renfro, T. L., & Christensen, K. (2019, 2019/10/01). Mitigating Negative Consequences Of Community Violence Exposure: Perspectives From African American Youth. *Health Affairs, 38*(10), 1679-1686. https://doi.org/10.1377/hlthaff.2019.00607

Zapolski, T. C. B., Rowe, A. T., Fisher, S., Hensel, D. J., & Barnes-Najor, J. (2018, 2018/09/01/). Peer victimization and substance use: Understanding the indirect effect of depressive symptomatology across gender. *Addictive Behaviors, 84*, 160-166. https://doi.org/https://doi.org/10.1016/j.addbeh.2018.04.010

Appendix

EMORY UNIVERSITY
Institutional Review Board

NON-HUMAN SUBJECTS RESEARCH DETERMINATION FORM

Emory does not require IRB review of studies that do not meet the definitions of "human subjects research" (DHHS) or "clinical investigation" (FDA). This tool is to help you define your project and to ensure proper review and regulatory requirements are met.

If the tool results in an outcome of "no IRB review required," this form will serve as your documentation of that determination. Please keep the completed copy in your records.

AUDIT: The IRB will periodically audit completed forms and your written proposal to ensure that the tool is providing accurate results.

NOTE: this tool should only be used for projects completed by Emory/EHC affiliates doing work for Emory purposes. When answering the questions in this determination tool, consider only the project activities performed by Emory/EHC affiliates in the current proposed project (e.g. if your study is a secondary data analysis, do not include the primary data collection activities when considering your responses.) Emory/EHC affiliates who are completing a project for academic credit at a different institution should seek a determination from that institution's IRB.

Hi Marisa, when you submit this form, the owner will be able to see your name and email address.

* Required

1

Project Title *

Mental Health & Substance Use at the Intersections of Sexual Identity and Race/Ethnicity in a Natio

2

PROJECT LEADER (not necessarily the person filling in this form) *

Marisa DiPaolo

3

FUNDING *

Will these activities be supported by a DHHS award (e.g., NIH, NSF, DoE, DoD) through a grant, contract, subaward/subcontract, or cooperative agreement?

NOTE: If Emory is the prime recipient of a DHHS award and the funding application indicates that human subjects will be involved, IRB submission is required.

Also, if Emory is the prime recipient of a DHHS award, but contracting with another site to carry out all non-exempt human subjects research activities for that award, please contact the Emory IRB for guidance instead of using this form.
If Emory is the subrecipient, only the activities done by Emory should be considered for this form, even if other sites are performing human subjects research.

- ○ Yes
- ◉ No

4

SHARING DATA OUTSIDE OF EMORY *

Will you be sharing data (identified or de-identified) outside of Emory? If yes, you need to contact OTT (ott.emory.edu) to determine if a Data Use Agreement is needed.

- ○ Yes
- ◉ No

5

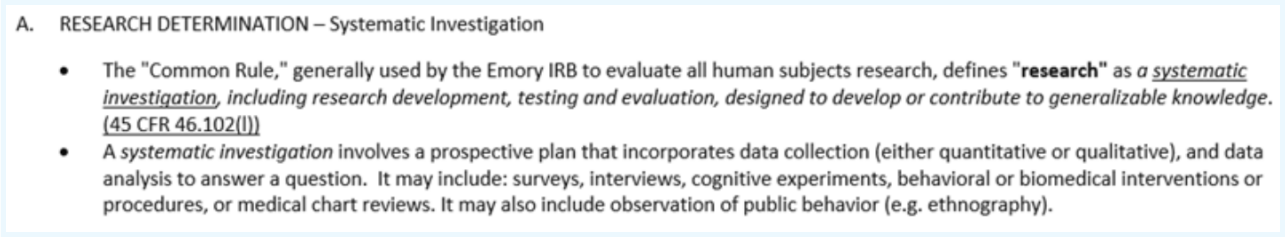
Does the project involve Veterans Affairs?
(e.g. study site, data source, researcher's affiliation) *

- ○ Yes
- ◉ No

6

RESEARCH DETERMINATION- Systematic Investigation *

Is the proposed project a "systematic investigation?" For example: are you conducting online or in-person surveys, focus group discussions, or data analysis?



A. RESEARCH DETERMINATION – Systematic Investigation

- The "Common Rule," generally used by the Emory IRB to evaluate all human subjects research, defines "**research**" as *a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.* (45 CFR 46.102(l))
- A *systematic investigation* involves a prospective plan that incorporates data collection (either quantitative or qualitative), and data analysis to answer a question. It may include: surveys, interviews, cognitive experiments, behavioral or biomedical interventions or procedures, or medical chart reviews. It may also include observation of public behavior (e.g. ethnography).

- ◉ Yes
- ○ No

7

RESEARCH DETERMINATION- Generalizable Knowledge
Is the proposed project "designed to develop or contribute to generalizable knowledge?" *

Review these links if your project falls into one of the following categories:
Case Studies/Series (http://irb.emory.edu/forms/review/casestudy.html)
Classroom Activities (http://irb.emory.edu/forms/review/classroom.html)
Public Health Practice (http://irb.emory.edu/forms/review/PH.html)
Program Evaluations (http://irb.emory.edu/forms/review/programeval.html)
Quality Improvement (http://irb.emory.edu/forms/review/QI.html)
Sociobehavioral research: Oral History/Journalism and Ethnography/Anthropology (http://irb.emory.edu/forms/socio.html)

If you still have questions, you can call our office for clarification at (404) 712-0720.

B. RESEARCH DETERMINATION – Generalizable Knowledge

Is your project *designed to develop or contribute to generalizable knowledge*? (45 CFR 46.102(l))

Your project may have results that could be useful or interesting to others. But we ask if your project is *DESIGNED* to contribute to generalizable knowledge. Your project's results may be presented without being generalizable (for example, as a case study).

Hallmarks of generalizable projects:

- Can the knowledge be applied to populations/contexts outside of the specific scope of the project?
- Is the work designed to contribute to a theoretical framework, even if the details of the population studied are unique to that population?
- Are the primary beneficiaries of the research: other researchers, scholars, and practitioners in the field of study?
- Are the results intended to be replicated in other settings?

- (●) Yes
- ( ) No

8

HUMAN SUBJECTS DETERMINATION *

Does this study involve obtaining information about living individuals? Answer "yes" if you're obtaining de-identified data or anonymous survey results if the results contain information about living people.

- (●) Yes
- ( ) No

9

If yes, does the study involve intervention or interaction with the individuals (e.g., online or in-person surveys [even if generating anonymous results], prospective collection of specimens, scans, etc.)?

- ( ) Yes
- (●) No

10

Do the activities involve accessing or generating individually identifiable and private information about living individuals?

Please review the list of identifiers for more information (http://www.irb.emory.edu/documents/phi_identifiers.pdf)

- ○ Yes
- ◉ No

11

Does the study involve analysis of existing data/specimens, where ALL data and/or specimens already exist prior to the start of the study? (Important: all parts of this question must apply if answering Yes.)

- ◉ Yes
- ○ No

12

If yes, would ANY member of the research team be able to reidentify the data/specimens, either directly, or via a code and key?
* If anyone on the newly-proposed study team took part in the original collection of the existing specimens or data, your should answer Yes.
* If there are codes on the data, but no one on the study team has access to a link: you may answer "No" to this question only if you have a documented agreement with the data/specimen providers that prohibits your team from having access to the link.

- ○ Yes
- ◉ No

13

HUMAN SUBJECTS RESEARCH DETERMINATION - FDA

Will any individual be a recipient of any test article (i.e., drug, medical device) or be used as a control?

FDA 21 CFR 56.102 (23c&e)

Human Subject- an individual who is or becomes a participant in research, either as a recipient of the test article or as a control.
Clinical Investigation- any experiment that involves a test article and one or more human subjects.

- ○ Yes
- ◉ No

14

Will any device be tested (including software, apps, in-vitro assays) using any individual's specimens or data, even if completely deidentified?

- ○ Yes
- ◉ No

15

This project does not require IRB review because it is not research with "human subjects", nor is it a "clinical investigation" as defined in the federal regulations. Please use the Microsoft Print to PDF or Microsoft XPS Document Writer option to save a copy of your responses to this form. *

- ◉ There is no eIRB submission necessary. I will protect the confidentiality of information accessed or obtained in this project. I will keep a copy of my responses to this form for my records.

☑ Send me an email receipt of my responses

Submit