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Race Differences in Opioid Misuse and Adolescent Suicidality

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Abstract

Purpose: The rise of the opioid epidemic coincided with the increased risk of suicide as the leading causes of death among adolescents in the United States. Past research has linked non-medical prescription opioid use (NMPOU) with adolescent suicide. Less focus has been placed on race and ethnic differences among adolescents impacted by the opioid epidemic. This study examined the relationship of adolescent NMPOU and suicidality, stratified by race.

Method: The 2016 National Survey on Drug Use and Health (NSDUH) was used for this study. Weighted multivariate logistic regression analyses were conducted on a sample of 11,489 adolescent respondents to examine the effect of past-year NMPOU with the odds for serious thoughts of suicide, having a suicide plan, and making a suicide attempt.

Results: Findings indicated a higher prevalence of suicidality among adolescents who engaged in NMPOU compared to non-users. Adolescent opioid misuse was associated with 68% higher odds for having a suicide plan in the past year (OR = 1.68, 95% CI: [1.07, 2.63], $p < 0.05$). Interaction analysis found that among Asian adolescents, NMPOU was associated with higher odds for having a suicide plan compared to other race groups (OR=1.53, 95% CI: [1.04, 2.23], $p < 0.05$).

Discussion: Results indicated that adolescent opioid misuse is a risk factor for suicide, and Asians compared to other race groups were at greater risk. Social workers can serve as a nexus point in effectively engaging at-risk adolescents in substance use and mental health prevention and recovery services.

Keywords

Opioids; Adolescent; Race; Suicide

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Compliance with Ethical Standards

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This article does not contain any studies with human participants performed by any of the authors.

The data used in this study received informed consent from participants.

The rise of the opioid epidemic has been identified as one of the leading causes of death in the United States (Illgen et al., 2016), coinciding with higher rates of prescription opioid misuse (Sheridan, Laurie, Hendrickson, Fu, Kea, & Horowitz, 2016) and suicide risk (Zullig, Divin, Weiler, Haddox, & Pealer, 2015). Population health findings indicated that among all age cohorts, adolescents and young adults have the highest prevalence of suicide, substance use (Center for Behavioral Health Statistics and Quality, 2018; Sheridan et al., 2016) and mental health disorders (Edlund et al., 2015; Mojtabai, Olfson, & Han, 2016). In 2015, 31.4% of suicides involved poisoning through opioids (Stone et al., 2018) with opioid misuse contributing to higher incidence of intentional or unintentional overdose deaths among adolescents (Curtin, Tejada-Vera, & Warner, 2017).

Past research indicated that among adolescents and young adults, non-medical prescription opioid use (NMPOU) was a risk factor for serious thoughts of suicide, having a suicide plan, and making a suicide attempt (Chan et al., 2019; Baiden, Graaf, Zaami, Acolatse, & Adeku, 2019; Clayton, Bohn, Lowry, Ashley, & Ethier, 2019; Guo et al., 2016; Zullig & Divin, 2012; Zullig et al., 2015). Although evidence suggests that the initial motivation among adolescents for prescription opioid use was to reduce pain (Chung et al., 2018; McCabe, West, & Boyd, 2013), subsequent opioid misuse has been linked to polysubstance abuse and depression (Griesler, Hu, Wall, & Kandel, 2019). A sizeable body of research has identified substance use as a correlate of poor mental health outcomes (e.g., Silveira, Green, Iannaccone, Kimmel, & Conway, 2019; Cheng & Lo, 2017). Adolescents who engaged in NMPOU are at greater risk for depression, anxiety, and suicide when compared to those who did not engage in the misuse of substances such as prescription opioids (Zullig et al., 2015).

An emerging body of research has found similar risk and protective factors in prescription opioid misuse across racial and ethnic adolescent groups. Protective factors, such as strong social bonds with family and a perception that substance use is harmful among family and peers, were associated with lower risk for NMPOU among non-White and non-Hispanic White adolescents (Ford & Rigg, 2014). Risk factors, such as adverse childhood events, were linked to NMPOU, subsequent mental health problems (Quinn et al., 2019) and substance use disorders (McCabe et al., 2017; McCabe et al., 2019). This is consistent with past research which highlighted that mental health problems were associated with polysubstance use among adolescent populations (Silveira et al., 2019). Opioid misuse can continue into young adulthood (Miech, Johnston, O'Malley, Keyes, & Heard, 2015) and is a risk factor for subsequent heroin use (Martins, Santaella-Tenorio, Marshall, Maldonado, & Cerda, 2015). This highlights a problematic trajectory for adolescents across different race groups who are impacted by this epidemic.

Racial Differences in NMPOU among Adolescents

Past research has suggested that for many adolescents who engaged in NMPOU, their first initiation with opioid use was through a prescription due to medical reasons (Chung et al., 2018; Sheridan et al., 2016). This is different from the circumstances of early initiation in the use of other substances such as alcohol (Cheng & Lo, 2017; Salvy, Pedersen, Miles, Tucker, & D'Amico, 2014) and cannabis (Meier, Hill, Small, & Luthar, 2015). Findings from nationally representative data indicated that non-White children were less likely to

be prescribed an opioid by a doctor (Groenewald, Rabbitts, Hansen, & Palermo, 2018). However, trend analysis which examined the beginning of the opioid epidemic in the mid 2000s to recent years suggested that NMPOU was similar for non-White and non-Hispanic White adolescents (Pouget, Fong, & Rosenblum, 2018; Vaughn, Nelson, Salas-Wright, Qian, & Schootman, 2016).

Of concern, there is evidence that minority adolescents are less likely to receive recommended treatments for opioid use disorders such as comprehensive psychosocial treatment (Wu, Zhu, & Swartz, 2016) and pharmacotherapy in the form of buprenorphine and naltrexone (Hadland et al., 2017). In addition, analysis examining the effect of race and gender on NMPOU found that older age, residence in a rural area and higher educational attainment were protective for African American women only, but not non-Hispanic White women, men, and African American men (Nicholson & Vincent, 2019). This highlights potential differences in risk and protective factors in the relationship of opioid misuse and mental health among different adolescents from different race groups.

Race and Suicidality among Adolescents

Suicide is a serious public health concern in the U.S., and is the second leading cause of death among adolescents (Centers for Disease Control and Prevention, 2018; Heron, 2019). Trend analysis from 1999 to 2017 indicated that suicide rates have increased by 33% across all race groups, with significant increases for adolescent and young adult populations (Hedegaard, Curtin, & Warfner, 2018). The rising prevalence of adolescent depression and suicide has resulted in increases in the delivery of inpatient and outpatient mental health treatment services for this population (Mojtabai & Olfson, 2020). A review of literature found similar risk (e.g, mental health issues, substance use, poverty, family stressors) and protective factors (e.g., family support, teacher support, community support) for suicide among non-Hispanic White, African American, Hispanic and Asian American adolescents.

The Centers for Disease Control and Prevention (2020) reported that in 2018, suicide accounted for 20.6% of all deaths among adolescents and young adults. Percentages were highest among Asians (35.0%), followed by non-Hispanic Whites (25.3%), non-White Hispanics (17.6%), and African Americans (9.9%; Centers for Disease Control and Prevention, 2020). Deaths by suicide varied by race and age, suggesting differences in risk and protective factors throughout childhood and adolescence for minority youth (Balis & Postolache, 2008; Bridges et al., 2018).

Population and community-based research has found that female gender and mental health symptoms were associated with increased risk for suicidal ideations and attempts among African American adolescents (Hooper et al., 2015; Joe, Baser, Neighbors, Caldwell, & Jackson, 2009). While findings from nationally representative data indicated that although African American and Hispanic adolescents had lower rates of suicidal ideations, they reported higher rates of having a suicide plan and making suicide attempts (Kann et al., 2018). Trend analysis from 1991 to 2017 indicated that African American teens reported an increase in suicide attempts despite decreases in suicidal ideation and plans across all race groups (Lindsey, Sheftall, Xiao, & Joe, 2019).

Past research has highlighted that Hispanic adolescents have unique vulnerabilities for suicide, compared to their non-Hispanic White counterparts. Similar to African Americans, Hispanic adolescents have higher prevalence in making a plan for suicide, having a suicide attempt in the past year, and attempting suicide requiring medical attention, with higher risks for Hispanic adolescent females (Garcia, Skay, Sieving, Naughton, Bearinger, 2008; Kann et al., 2018). Recent scholarship has found that depression and substance use (Castellanos, Kosoy, Ayllon, & Acuna, 2016; Pena, Kuerbis, Lee, & Herman, 2018; Price & Khubchandani, 2017), along with psychosocial factors such as problem behaviors and difficulty with peers (Price & Khubchandani, 2017) were linked to suicide among Hispanic adolescents. Closeness with one's family was protective, especially for Hispanic adolescent females (Pena et al., 2011) who experienced increased benefits from caring, supportive relationships with parents and other family members (Garcia et al., 2008).

There is a growing body of research on suicide among Asian American youth. A systematic review of literature has found that mental health issues such as depression and conflicts with peers and family can be risk factors for suicide, while school involvement and supportive peer and family relationships can be protective for Asian adolescents (Wyatt, Ung, Park, Kwon, & Trinh-Shevrin, 2015). Likewise, population health findings indicated closeness in family, school and peer relationships are important predictors for suicide attempts among Asian adolescents, although they can vary as both risk and protective factors (Wong & Maffini, 2011). Findings from large scale, cross-sectional data from three metropolitan cities in Asia (Hanoi, Shanghai & Taipei) suggested that female gender, lack of parental support, family history of suicide and substance use were associated with higher risk for suicidal ideation and suicide attempts among Asian youth from these countries (Blum, Sudhinaraset, & Emerson, 2012). It is unclear to what extent these risk and protective factors are associated with suicide for Asian adolescents in the U.S., who currently have the highest rates of deaths from suicide compared to their non-Hispanic White, African American and Hispanic counterparts (CDC, 2020).

Conceptual Framework and Hypotheses

Stress and Coping & Social Determinants of Health Framework

Lazarus and Folkman's stress and coping framework (1984) was used as a theoretical model to understand the association of NMPOU and suicide in the present study. Coping is conceptualized as a causal factor for emotional and psychological outcomes and can be either adaptive or maladaptive (Lazarus, 1993). Adolescents may use prescription opioids to manage short-term pain as a problem-focused coping strategy. However, evidence suggests that long-term use of prescription opioids can lead to misuse and poor psychological outcomes (Chung et al., 2018; Sheridan et al., 2016), which can be maladaptive for adolescents who may be particularly vulnerable.

The social determinants of health framework was used as a lens to examine stressors for minority adolescents. When considering race, non-White adolescents were less likely to be prescribed opioids when compared to non-Hispanic Whites (Groenewald et al., 2018), yet have similar rates of NMPOU. Past research suggested that non-White adolescents have been underserved in substance use and mental health treatment, which may lead

to deleterious outcomes without appropriate interventions. Although minority adolescents have similar risk and protective factors for suicide, they may be impacted differently by stressors which can result in maladaptive coping with opioid misuse. Left untreated, minority adolescents may experience poorer mental health outcomes, potentially resulting in higher rates of suicide. The current study applies the stress and coping framework with a social determinants of health lens to examine race differences in the association of NMPOU and suicide for non-Hispanic White, African American, Asian and non-White Hispanic adolescents.

Hypotheses

This study aims to examine race/ethnic differences in NMPOU and suicidality among adolescents. It was hypothesized that (H1) NMPOU will be associated with higher risk of suicidality as measured by (H1a) serious thoughts of suicide, (H1b) making a suicide plan and (H1c) making a suicide attempt in the past year, even when controlling for socio-demographic, mental health and other substance use variables. Through the lens of the stress and coping framework, we hypothesized that (H2) race/ethnic differences will be found in the association of NMPOU and suicide, as measured by (H2a) thoughts, (H2b) plans, and (H2c) attempts, and that race will have a moderating effect in this relationship. Specifically, the association of past-year NMPOU with (H2a) serious thoughts of suicide, (H2b) having a plan for suicide and (H2c) making a suicide attempt will be stronger for minority adolescents compared to their non-Hispanic White counterparts.

Method

Sample

Analysis was conducted using the 2016 National Survey of Drug Use and Health (NSDUH) Public Use File (Center for Behavioral Health Statistics and Quality, 2016b). Data were obtained from a non-institutionalized, community-based sample using an independent, multi-stage area probability design within each state and the District of Columbia. The NSDUH survey was collected by the Substance Abuse and Mental Health Services Administration (SAMHSA) with participants aged 12 years and older. Applying a coordinated design, each state was used as a first-level stratification and were further stratified into state sampling regions (SSRs). Area segments were selected based on census tracts and census block groups, and dwelling units (DU) were randomly selected within each area segment. To obtain the necessary sample sizes for population age groupings (25% for 12 to 17, 25% for 18 to 25, 15% for 26 to 34, 20% for 35 to 49, 15% for 50 and older), up to two residents were selected from each DU. The present study examined adolescents aged 12 to 17 years old.

The NSDUH captured the use of tobacco products, alcohol, illicit drugs (including non-medical use of prescription drugs) and mental health. Federal, state and local government agencies have used analysis from this data to examine substance use trends, assess the need for treatment services, and determine strategies for funding and other prevention efforts. Data were collected using computer assisted personal interviewing (CAPI) and audio computer-assisted self-interviewing (ACASI). CAPI was used during the field interview

for screening and to collect and record socio-demographic information. The ACASI portion of the interview was used for more sensitive questions regarding substance use and mental health. During this portion, respondents read questions on a computer screen or listened to questions on headphones, recording their answers without the interviewer knowing their responses. Missing values were imputed in the dataset using predictive mean neighborhoods (PMN). Sampling design weights were created and calibrated based on the 2010 decennial census to account for non-response, demographics of the state of residence and poststratification steps. Quality control procedures such as data editing, statistical adjustments for nonresponse, close monitoring and periodic retraining of interviewers, and other improvements were used to increase the accuracy of survey estimates. The full sample in the Public Use File included 56,897 persons, of whom 14,272 were 12 to 17 years old. In the present study, the final analysis sample included 11,489 respondents aged 12 to 17 years old.

Dependent Variable

Suicidality was measured with three variables: serious thoughts of suicide, making any suicide plans, and attempting suicide in the past year. Individuals were asked, “At any time in the past 12 months, that is from [date of one year ago from interview] up to and including today, did you seriously think about trying to kill yourself?” Responses of “yes” were coded ‘1,’ and responses of “no” were coded ‘0.’ Respondents who indicated “yes” to the previous question were then asked, “During the past 12 months, did you make any plans to kill yourself?” Responses of “yes” were coded ‘1,’ and responses of “no” were coded ‘0.’ Respondents who indicated “yes” to having a suicide plan were then asked, “During the past 12 months, did you try to kill yourself?” Responses of “yes” were coded ‘1,’ and responses of “no” were coded ‘0.’

Independent Variables

Non-Medical Prescription Opioid Use (NMPOU)—NMPOU was defined as any past year use of prescription pain relievers which was not directed by a doctor. Respondents were first told, “When you answer these questions, please think only about your drug use in any way a doctor did not direct you to use it, including: (1) using it without a prescription of your own, (2) using it in greater amounts, more often, or longer than you were told to take it, and (3) using it in any other way a doctor did not direct you to use it.” They were then asked, “Have you ever, even once, used prescription pain relievers in any way a doctor did not direct you to use it?” A follow-up question was asked for those who responded yes, “How long has it been since you last used prescription pain relievers?” A value of ‘1’ was coded for respondents who reported any prescription pain reliever use in the past year which was not directed by a doctor, and ‘0’ for use more than a year ago or never used.

Race—Non-Hispanic White was used as the reference group and coded ‘0’ for each race group variable. Separate categorical variables for race were created, for Non-Hispanic Black / African American, Non-Hispanic Asian, and non-White Hispanic. Each race group variable was coded ‘1’ for the race category and ‘0’ for all others.

Other Substance Use

Binge Drinking—Binge drinking alcohol was included in the analysis because it is a known risk factor for serious mental health problems (Bellos et al., 2013; Powers, Duffy, Burns & Loxton, 2016), particularly for adolescent populations (Foley et al., 2006; Pirkola et al., 1999). Binge drinking is defined as having four or more alcoholic drinks on the same occasion at least once in the last 30 days. Respondents were asked, "During the past 30 days, that is since [date of interview], on how many days did you have [4 or more for women]/[5 or more for men] drinks on the same occasion? By 'occasion,' we mean at the same time or within a couple hours of each other." Affirmative responses of 1 to 30 were coded as '1' to capture binge drinking in the past month, and a value of '0' was coded for no binge drinking in the past month.

Marijuana and Hashish Use—Marijuana and hashish use was defined as use at least once within the past 12 months. Past research has examined short- and long-term harms and benefits on use of marijuana and its derivatives (National Academies of Sciences, Engineering, and Medicine, 2017). Medical and adult use is legal in many states, though as of this writing it is defined as an illicit substance under federal laws. Respondents were asked the question, "How long has it been since you last used marijuana or hashish?" A value of '1' was coded to capture use of marijuana or hashish within the past 12 months, and '0' for use more than 12 months ago or never used.

Heroin, Cocaine, Crack Cocaine, Methamphetamine, Inhalant, and Hallucinogen Use—The use of heroin, cocaine, crack cocaine, methamphetamines, inhalants, and hallucinogens were captured as separate variables, and defined as the use of the substance within the past 12 months. Past research has documented the short- and long-term term harmful effects in use of heroin (Bewley, Ben-Arie, & James, 1968; Centers for Disease Control and Prevention, 2017; Grella & Lovinger, 2012), cocaine (Lévesque et al., 2016; Minnes et al., 2012), crack cocaine (Hoff et al., 1996; Smart, 1991), methamphetamines (Scott et al., 2007; Sommers, Baskin, & Baskin-Sommers, 2006) and inhalants (Cairney et al., 2013; Crossin, Cairney, Lawrence, & Duncan, 2017). To date, the long-term effects in use of hallucinogens are unclear (National Institute on Drug Abuse, 2015). All other substances included here are illegal with the exception of inhalants (i.e. household products such as gasoline, aerosol sprays, paint/solvents, cleaners, etc.).

Participants responded to the following: "These next questions are about [heroin, cocaine, crack cocaine, methamphetamine, inhalants, or hallucinogens]." Respondents who indicated they used the substances at least once in their lifetime were asked to respond to the following question: "How long has it been since you last used [heroin, cocaine, crack cocaine, methamphetamines, inhalants, or hallucinogens]?" Past use within the past 12 months were coded '1,' and no use within the past year was coded '0.' Separate variables for heroin, cocaine, crack cocaine, methamphetamines, inhalants, or hallucinogens were created for this analysis.

Non-Medical Prescription Stimulant, Tranquilizer, and Sedative Use—Non-medical use of prescription stimulants, tranquilizers, and sedatives were captured as separate

variables. Prescription drug misuse is associated with addiction, dependence, and negative long-term effects (Becker, Fiellin, & Desai, 2007; Coben et al., 2010; Weyandt et al., 2009). Respondents were first given the following prompt, “The next question asks about using prescription [stimulants, tranquilizers, or sedatives] in any way a doctor did not direct you to use them.” Respondents were instructed to consider the use of these substances without a prescription, using it in greater amounts, more often, or longer than instructed, and using it in any other way not directed by a doctor. They were asked the question, “Have you ever, even once, used any prescription [stimulants, tranquilizers, or sedatives] in any way a doctor did not direct you to use it?” Of those who answered yes, a follow-up question was asked, “How long has it been since you last used prescription [stimulants, tranquilizers, sedatives]?” Use of stimulants, tranquilizers, and sedatives were coded as separate variables with a value of ‘1’ coded for use within the past 12 months and ‘0’ for use more than 12 months ago or never used.

Mental Health Utilization

Youth Depression—Major depressive episode (MDE) was captured using questions from the Youth Depression Module which was based on the National Comorbidity Survey of Adolescents. According to the *Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV)*, major depressive episode is defined as meeting five of the nine criteria: depressed mood, diminished interest/pleasure in everyday activities, significant weight change, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness or excessive or inappropriate guilt, diminished ability to think or concentrate, and recurrent thoughts of death (American Psychiatric Association, 2000; Center for Behavioral Health Statistics and Quality, 2016b). Respondents were identified as having a major depressive episode if they reported depressed mood or loss of interest/pleasure in everyday activities and meet at least 5 or the 9 criteria. Two separate variables, having a past-year and lifetime depressive episode, were used to measure depression.

Inpatient & Outpatient Mental Health Utilization—In order to control for pre-existing mental health conditions, inpatient and outpatient mental health utilization were used as proxy variables. Respondents were asked if they received inpatient and/or outpatient services in the past year. Inpatient and outpatient mental health services in the past year were captured separately and coded with a value of ‘1’ for yes and ‘0’ for no.

Other Socio-Demographic Variables

Gender—Male gender was set as the reference group. Male gender was coded ‘0’ and female gender was coded ‘1.’

Age—Age ranged from 12 to 17 years old in this study and was included as two separate variables (age and age-squared). Adolescent development is nonlinear, and age-squared was used to examine non-linear patterns in mental health problems and substance use.

Poverty Status—Poverty status is captured as twice the federal poverty threshold. Being in poverty was coded as ‘1,’ and not in poverty was coded as ‘0.’

Mother in Household—Mother in household was defined as having a maternal guardian living in the home. A response of yes was coded as ‘1,’ and no was coded as ‘0.’

Father in Household—Father in household was defined as having a maternal guardian living in the home. A response of yes was coded as ‘1,’ and no was coded as ‘0.’

School Attendance—School attendance was measured by the question, “did you attend any type of school in the past 12 months?” Yes was coded as ‘1,’ and no was coded as ‘0.’

Regionality—Regionality was defined as residence in large metro, small metro, or non-metro areas. Metro area status was determined for counties using Core Based Statistical Area (CBSA) classifications from the Office of Management and Budget (OMB; Center for Behavioral Health Statistics and Quality, 2016b). Separate variables were created for small metro and non-metro areas, both coded as ‘1,’ and residence in a large metro area was coded as ‘0’ for the reference group.

Social Factors

Parental and Teacher Support—Parental and teacher support was captured using three questions regarding support from parents and teachers. Parental support was measured with two questions: 1) “During the past 12 months, how often did your parents tell you they were proud of you for something you had done?” and 2) “During the past 12 months, how often did your parents let you know when you’d done a good job?” Teacher support was measured with “During the past 12 months, how often did your teachers at school let you know when you were doing a good job with your school work?” Responses were coded on a Likert scale from Never as ‘0’ to Always as ‘3.’ The three variables were summed to measure overall parental and teacher support, and ranged from 0 to 12.

Participation in Youth Activities—The variable for participation in youth activities was created based on affirmative responses on four youth activity questions: 1) School-based, 2) community-based, 3) church or faith-based, or 4) other activities. A response of yes in two or more activities was coded ‘1,’ while no participation or participation in one activity was coded ‘0.’

Youth Delinquency Behaviors—Six questions were used in the NSDUH to measure youth delinquent behaviors. The following questions were asked, during the past 12 months, 1) “how many times have you gotten into a serious fight at school or work?” 2) “how many times have you taken part in a fight where a group of your friends fought against another group?” 3) “how many times have you carried a handgun?” 4) “how many times have you sold illegal drugs?” 5) “how many times have you stolen or tried to steal anything worth more than $50?” 6) “how many times have you attacked someone with the intent to seriously hurt them?” Responses were coded as ‘0’ for 0 times, ‘1’ for 1 or 2 times, ‘2’ for 3 to 5 times, ‘3’ for 6 to 9 times, and ‘4’ for 10 or more times. To measure overall youth delinquent behaviors, responses to the six questions were summed to create an overall score which ranged from 0 to 24.

Data Analysis Plan

Multivariate logistic regression analyses were conducted to examine the odds of past year non-medical prescription opioid use (NMPOU) with 1) having serious thoughts of suicide, 2) made plans for suicide, and 3) attempted suicide, all within the past year. Analysis weights were used to compute unbiased, design-based estimates, to account for non-responders (Center for Behavioral Health Statistics and Quality, 2016a). The analysis was first conducted using the full sample, testing for the effect of NMPOU on past year suicidality while controlling for all other variables in the analysis. Race was examined as a moderating variable for the relationship of past year NMPOU with past-year occurrence of serious thoughts of suicide, made plans for suicide, and attempted suicide. Stata 15.0 was used for analysis in this study (StataCorp, 2016).

Results

The independent variables of interest in this study were adolescent non-medical prescription opioid use (NMPOU) and race (non-Hispanic White, African American, Asian and non-White Hispanic). The study sample included 392 adolescents who engaged in NMPOU and 11,097 who reported no use. Weighted results indicated that 3.3% of adolescents reported NMPOU in the past year. Overall, suicidality was more prevalent for adolescents who reported NMPOU compared to non-users. As shown in Table 1, over three times the percentage of users reported having serious thoughts of suicide compared to non-users (Users: 31.0%; Non-users: 9.8%, $p < 0.001$). There were five times the percentage of users who made a plan for suicide compared to non-users (Users: 22.1%; Non-users: 4.5%, $p < 0.001$). Almost six times the percentage of adolescent users reported at least one suicide attempt in the past year (Users: 17.9%; Non-users: 3.0%).

NMPO users and non-users were statistically similar in racial composition for non-Hispanic Whites, Blacks and Asians and Hispanics adolescents. In terms of suicidality, non-Hispanic Whites and Hispanics had statistically similar rates of suicidal thoughts (non-Hispanic White: 11.3%; Hispanic: 9.6%), plans (non-Hispanic White: 5.4%; Hispanic: 5.1%), and attempts (non-Hispanic White: 3.6%; Hispanic: 3.5%). African Americans had lowest rates of suicidal thoughts (8.1%), plans (3.8%), and attempts (2.7%). Asian adolescents had the highest percentages of serious thoughts of suicide (12.2%), having a suicide plan (6.2%), and making a suicide attempt (4.8%) compared to all other race groups. Rates of NMPOU were statistically similar for both males and females, and around half of adolescent users and non-users were female and male. Regarding age, almost three-quarters of users were 15 and older, indicating higher rates of NMPOU among older adolescents. Users and non-users had statistically similar rates of poverty (Users: 45.9%; Non-users: 42.2%) and patterns of residence in large metro (Users: 53.5%; Non-users: 56.9%), small metro (Users: 31.1%; Non-users: 29.6%) and non-metro (Users: 15.4%; Non-users: 13.5%) areas. Adolescent NMPO users utilized more inpatient (9.7%) and outpatient (28.0%) mental health services in the past year, compared to non-users (Inpatient: 2.4%; Outpatient: 12.5%).

Multivariate Logistic Regression Results for Users & Non-users

We hypothesized that (H1) NMPOU will be associated with suicidality, as measured by (H1a) serious thoughts of suicide, (H1b) making a suicide plan and (H1c) making a suicide attempt in the past year), even when controlling for socio-demographic, mental health and other substance use variables. As shown in Table 2, results indicated that Hypothesis H1b was supported, and that past-year NMPOU was associated with 68% higher odds for having a plan for suicide (OR = 1.68, SE = 0.37, 95% CI: [1.07, 2.64], $p < 0.05$), even when controlling for all other variables in the analysis. Hypothesis 2b and 2c were partially supported; Asian adolescents compared to non-Hispanic Whites had over 62% higher odds for having a plan for suicide (OR = 1.62, SE = 0.28, 95% CI: [1.14, 2.30], $p < 0.01$) and 94% higher odds for making a suicide attempt in the past year (OR = 1.94, SE = 0.56, 95% CI: [1.09, 3.44], $p < 0.05$) (see Table 2). However, Black and Hispanic adolescents were not statistically different compared to non-Hispanic Whites in suicidal thoughts, plans or attempts when controlling in this study.

In regard to socio-demographic variables, female gender was associated with 60% higher odds for having serious thoughts of suicide (OR = 1.60, SE = 0.19, 95% CI: [1.26, 2.04], $p < 0.001$), 53% higher odds of having a suicide plan (OR = 1.53, SE = 0.26, 95% CI: [1.09, 2.15], $p < 0.05$), and 69% higher odds of making a suicide attempt in the past year (OR = 1.69, SE = 0.37, 95% CI: [1.08, 2.62], $p < 0.05$). Older age was associated with higher odds for serious thoughts of suicide (OR = 1.52, SE = 0.30, 95% CI: [1.02, 2.24], $p < 0.05$) and having a plan for suicide (OR = 1.53, SE = 0.26, 95% CI: [1.09, 2.15], $p < 0.05$), but not suicide attempts. Age-squared was not statistically significant. Poverty was associated with 57% higher odds for making a suicide attempt (OR = 1.57, SE = 0.28, 95% CI: [1.09, 2.24], $p < 0.05$), but not with suicidal thoughts or having a plan for suicide. Having a mother in the household was associated with 38% lower odds for having a suicide plan (OR = 0.62, SE = 0.12, 95% CI: [0.41, 0.92], $p < 0.05$) and 36% lower odds for making a suicide attempt (OR = 0.64, SE = 0.12, 95% CI: [0.44, 0.94], $p < 0.05$), but was not significant for serious thoughts of suicide. Attending school, having a father in the household, and region of residence were not associated with the three measures of suicide for adolescents in this study.

We hypothesized that (H2) race/ethnic differences will be found in the association of NMPOU and suicidality measured as (H2a) thoughts, (H2b) plans, and (H2c) attempts, and that race will have a moderating effect in this relationship. Specifically, the association of past-year NMPOU with (H2a) serious thoughts of suicide, (H2b) having a plan for suicide and (H2c) making a suicide attempt will be stronger for minority adolescents compared to their non-Hispanic White counterparts. As shown in Table 3, analysis on the interaction of race and NMPOU indicated a statistically significant moderating effect for NMPOU and Asian ethnicity on past-year suicide plan (OR = 4.95, 95% CI: [1.09, 22.36], $p < 0.05$) and attempt (OR = 7.33, 95% CI: [1.22, 43.91], $p < 0.05$; see Table 3). The moderating effect of NMPOU was not statistically significant for Black and Hispanic adolescents when controlling for all other variables in the analysis. Although all race groups of adolescents had similar rates of NMPOU, Asian adolescents who engaged in opioid misuse had higher

odds for having a suicide plan and making a suicide attempt in the past year compared to non-Hispanic White, Black and Hispanic adolescent users.

Discussion

The present study sought to examine the differences in the relationship of opioid misuse with suicidality among non-Hispanic White, Black, Asian and Hispanic adolescents. Consistent with past research, findings from this study indicated that adolescent non-medical prescription opioid use was significantly associated with higher odds for having a plan for suicide in the past year for all race groups, even when controlling for sociodemographic variables, social factors, mental health and other substance use. The moderating effect of race on the relationship of opioid misuse with suicidality as measured by having a suicide plan in the past year was statistically significant. Although the prevalence of opioid misuse was similar across race groups, opioid misuse was associated with higher odds for having a plan for suicide, and this effect was stronger among Asian adolescents compared to non-Hispanic Whites, African Americans and non-White Hispanics. In addition, the findings align with Lazarus and Folkman's (1984) stress and coping framework in that NMPOU can be understood as a maladaptive coping mechanism, which can lead to adverse outcomes such increased odds for suicide.

Race, Non-medical Prescription Opioid Use and Adolescent Suicide

Results from the present study further explicate the link of opioid misuse and adverse mental health outcomes (Edlund et al., 2015; Fischer et al., 2012; Mojtabai et al., 2016; Salas et al., 2017; Scherrer et al., 2016; Sheridan et al., 2016; Yarborough et al., 2016), in particular suicide among adolescents (Chan et al., 2019; Chan & Marsack-Topolewski; Baiden et al., 2019; Clayton et al., 2019; Kuramoto, Chilcoat, Ko, & Martins, 2012). We hypothesized that the relationship between NMPOU and suicide would be stronger for minority youth. Our findings indicated that this was partially supported. African American, Asian and Hispanic adolescents had similar rates of opioid misuse compared to non-Hispanic Whites. Among adolescents who misused prescription opioids, non-Hispanic White adolescents had the highest percentage of suicidal ideation (38.3%), compared to Asian (29.8%), Hispanic (23.6%) and African American adolescents (15.3%). However, Asian adolescents who engaged in opioid misuse had higher prevalence and odds for having a suicide plan and making a suicide attempt in the past year compared to all others. Our findings support that Asian ethnicity has a moderating effect on the relationship of opioid misuse and suicide, indicating increased risk of suicide for Asian adolescent populations.

Past research has highlighted vulnerabilities specific to minority adolescents regarding substance use and suicide (Goldston et al., 2008). African Americans and non-White Hispanics experience disparities in mental health outcomes which can result in higher risk for suicide (Castellanos et al., 2016; Garcia et al., 2019; Hooper et al., 2015; Joe et al., 2009; Kann et al., 2018; Lindsey et al., 2019; Pena et al., 2018; Price & Khubchandani, 2017). Findings from the present study suggest that Asian adolescents experience more harmful effects from prescription opioid misuse, and the link between opioid misuse and suicide is stronger for this population compared to non-Hispanic White, African American

and Hispanic adolescents. Past research has highlighted that Asian Americans are increasing in substance abuse treatment admissions, most notably in prescription opioids as a problem substance for the oldest and youngest populations (Sahker, Yeung, Garrison, Park, & Arndt, 2017).

Our findings are consistent with past research which identified family factors as correlates of substance use and suicide for Asian adolescents. Adolescent females are at higher risk for opioid misuse and depression (Chan & Marsack-Topolewski, 2020), and for Asian adolescent females, substance use is associated with lower levels of family involvement and higher depressive symptoms (Fang, Barnes-Ceeney, & Schinke, 2011) and risk for suicide (Guo et al., 2019). There is a need for prevention programs that are culturally-specific and can effectively engage with this underserved population (Fang, Barnes-Ceeney, Lee, & Tao, 2011).

Although adolescent females misused opioids at the same rate as males, findings from our study indicated that they were at greater risk for serious thoughts of suicide, having a suicide plan, and making a suicide attempt. This is consistent with past research which highlighted risks for opioid misuse and depression for adolescent females (Chan & Marsack-Topolewski, 2020). Minority female adolescents may be particularly vulnerable to adverse mental health outcomes such as suicide (Blum et al., 2012; Joe et al., 2009; Pena et al., 2018).

Recommendations

Suicide is the second leading cause of death among adolescents (CDC, 2020), and findings from this study contribute to the body of research indicating a link between prescription opioids and heightened risks for suicide among adolescents. Adolescents who misuse presscription opioids have higher prevalence of serious thoughts of suicide, having a plan for suicide, and making any suicide attempts. It is recommended that social work clinicians and other health care professionals who work with adolescents be cognizant of the risks of suicide for those with a history of prescription opioid misuse.

The percentages of those who reported serious thoughts of suicide, having a suicide plan, and making any suicide attempts were higher for non-Hispanic Whites compared to African Americans and non-White Hispanic adolescents. However, findings from this study suggest that African American and non-White Hispanic adolescents experience similar risks for suicidality. There is a need for focused and effective mental health services to address the impact of the opioid epidemic for all adolescent race groups.

Findings from this study suggest that the deleterious effects of prescription opioids on suicide were more adverse for Asian adolescents compared to other race groups in this study. Asians have been underidentified and underserved in substance use and mental health services despite evidence of need (Kim et al., 2018). Social workers can serve as a nexus point in connecting with other systems of care (e.g., juvenile justice, schools, child welfare, hospitals, community health care settings) to engage adolescents and their families in obtaining appropriate preventive services and supports. Cultural humility is a mechanism embraced by social workers to engage with diverse populations, and a part of the *Standards*

and Indicators for Cultural Competence in our profession (National Association of Social Workers, 2015). Adolescents have age-specific risk factors for mental health problems that can lead to suicide, and social workers who work with adolescents from different race and ethnic groups can use cultural humility as a tool for increasing mental health and suicide awareness.

Strengths and Limitations

This study addresses the gap in literature on race differences in the relationship of opioid misuse with suicide among adolescents. Findings from this study were from analysis using the NSDUH data, a nationally-representative, population-based survey. Although this study has important strengths due to its generalizability, there are limitations due to its design. Data from the NSDUH are self-reported, and it is possible that respondents may be reluctant to report on sensitive information regarding their substance use and mental health issues for fear of being judged. Although there were procedures included in the data collection design to increase the honesty of participants, some underreporting may still take place. In addition, the data was cross-sectional and not longitudinal, with participants being interviewed at one point in time. It is beyond the limits of this study to definitively determine if opioid use was causally prior to suicide ideations, having a plan for suicide, or making a suicide attempt. However, past-year major depressive episodes and inpatient/outpatient mental health service utilization were used as proxies to control for the effect of pre-existing mental health diagnoses with suicide variables in the multivariate logistic regression analysis. This provides further evidence on the statistically significant association of NMPOU with suicide in this study for different race and ethnic groups of adolescents.

Results from this study indicate a significant moderating effect of Asian ethnicity with opioid misuse and suicide, which is an important novel finding in research on the opioid epidemic for this population. It is important to note, however, that Asians comprise of multiple ethnic groups with different cultural practices, languages, and different contexts of migration to the U.S. There is a need to further disaggregate different ethnic groups of Asian Americans (e.g., Chinese, South Asian, FilipinX, Korean, Vietnamese, Japanese, Laotian, Hmong, Burmese, etc.) to examine the effect of substance use on mental health for this population. Data from the NSDUH does not include separate categories for Asian ethnic groups, which can be used to further elucidate the risk and protective factors for different ethnic groups of Asian adolescents. In addition, past research has highlighted sexual minority status as an important risk factor for substance use and suicide among adolescents (Johns et al., 2018; Hottes, Bogaert, Rhodes, Brennan, & Gesink, 2016; Pinhet & Millman, 2004), which was unavailable from the data that was used in this study. Future research can benefit from the inclusion of sexual orientation, identity and expression as variables in conjunction with race and ethnicity to further tease out the effects of opioid misuse with suicide among adolescents.

Despite these limitations, this study provides important, novel insights into the relationship of NMPOU with suicide for different race and ethnic groups of adolescents using large-scale, population health data. Findings from this study can inform practice, policy and future

research on the effects of the opioid epidemic on adolescents from different race and ethnic groups who are underserved and at-risk for suicide.

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Table 1.

Descriptive Variables Characteristic of Prescription Opioid Users and Non-Users (n=11,489)

Variables	Non-Medical Prescription Opioid Users (n=392)	Non-Users (n=11,097)	Effect Size †
Suicidality			
Serious Thoughts of Suicide	31.0%	9.8%	0.12***
Suicide Plan	22.1%	4.5%	0.14***
Suicide Attempt	17.9%	3.0%	0.14***
Socio-demographics			
Race			
White	57.0%	56.5%	0.02
Black	14.5%	13.7%	
Asian	3.1%	5.8%	
Hispanic	25.4%	24.1%	
Gender			
Male	49.8%	50.7%	<0.01
Female	50.2%	49.3%	
Age			
12	3.6%	13.8%	0 09***
13	6.6%	16.3%	
14	16.2%	16.9%	
15	23.2%	18.2%	
16	19.8%	18.0%	
17	30.6%	16.8	
2x poverty	45.9%	42.2%	0.01
Mother in Household	88.0%	92.4%	0.03*
Father in Household	69.4%	74.9%	0.02*
Attended School	98.8%	99.5%	0.02
Large metro	53.5%	56.9%	0.01
Small metro	31.1%	29.6%	
Non-metro	15.4%	13.5%	
Past Year Mental Health Utilization			
Inpatient	9.7%	2.4%	0.08***
Outpatient	28.0%	12.5%	0.08***

* p-value <0.05

** p-value <0.01

*** p-value <0.001

† For effect sizes, Cohen's D was calculated for the t-test comparing the K6 score between users and non-users. Cramer's V was calculated for Chi-square tests of categorical variables with users and non-users.

Table 2.

Aggregate Multivariate Logistic Regression of Non-Medical Prescription Opioid Use with Suicidality (n=11,489)[†]

	Serious Thoughts of Suicide		Have a Plan for Suicide		Suicide Attempts	
Variables	**OR (SE)**	**95% CI**	**OR (SE)**	**95% CI**	**OR (SE)**	**95% CI**
Non-Medical Prescription Opioid Use	1.25 (0.25)	0.84; 1.86	1.68 (0.37) *	1.07; 2.63	1.93 (0.68)	0.95; 3.92
Race						
White (Ref)	--		--		--	
Black	1.02 (0.19)	0.71; 1.48	1.25 (0.31)	0.77; 2.06	1.15 (0.35)	0.62; 2.13
Asian	1.26 (0.32)	0.76; 2.11	1.62 (0.28) **	1.14; 2.30	1.94 (0.56) *	1.09; 3.44
Hispanic	0.78 (0.14)	0.55; 1.12	1.13 (0.19)	0.80; 1.59	1.12 (0.22)	0.75; 1.68
Socio-demographics						
Gender						
Male (Ref)	--		--		--	
Female	1.60 (0.19) ***	1.26; 2.04	1.53 (0.26) *	1.09; 2.15	1.69 (0.37) *	1.08; 2.62
Age	1.52 (0.30) *	1.02; 2.24	1.60 (0.38) *	1.00; 2.57	1.24 (0.33)	0.72; 2.12
Age Squared	0.96 (0.02)	0.91; 1.01	0.95 (0.03)	0.89; 1.01	0.98 (0.03)	0.92; 1.05
2x poverty	1.03 (0.12)	0.81; 1.30	1.17 (0.17)	0.87; 1.57	1.57 (0.28) *	1.09; 2.24
Mother in Household	0.89 (0.16)	0.62; 1.29	0.62 (0.12) *	0.41; 0.92	0.64 (0.12) *	0.44; 0.94
Father in Household	0.99 (0.14)	0.75; 1.31	1.20 (0.20)	0.86; 1.69	1.01 (0.20)	0.67; 1.51
Attended School	1.80 (0.85)	0.70; 4.66	2.42 (1.58)	0.65; 9.01	0.70 (0.39)	0.23; 2.16
Large metro (Ref)	--		--		--	
Small metro	0.96 (0.13)	0.74; 1.26	1.25 (0.20)	0.91; 1.73	1.04 (0.17)	0.75; 1.45
Non-metro	0.96 (0.14)	0.71; 1.30	0.94 (0.18)	0.65; 1.37	0.98; (0.19)	0.66; 1.44
Pseudo R^2	0.49[a]		0.43[a]		0.40[a]	
Wald Statistic (30)	58.55 ***		39 11 ***		26.11 ***	

* p-value <0.05

** p-value <0.01

*** p-value <0.001

[†] All analyses controlled for socio-demographics, other substance use, social factors, and health (self-rated health) and mental health (past-year major depressive episode, lifetime major depressive episode) variables.

[a] Pseudo R2 was not estimated with survey design weights due to issues of heteroskedasticity. The Pseudo R2 value presented here is unweighted.

Table 3.

Interaction Effect of Non-Medical Prescription Opioid Use and Race on Suicidality (n=11,489)[†]

	Serious Thoughts of Suicide			Have a Plan for Suicide			Suicide Attempts		
	Users	**Non-Users**	**OR (95% CI)**	**Users**	**Non-Users**	**OR (95% CI)**	**Users**	**Non-Users**	**OR (95% CI)**
Non-Medical Prescription Opioid Use	31.0%	9.8%	1.54 (0.95; 2.49)	22.1%	4.5%	1.59$^{\wedge}$ (0.92; 2.75)	17.9%	3.0%	1.64 (0.64; 4.24)
Race Groups									
White (n = 6,819)	38.3%	10.4%	--	26.4%	4.6%	--	21.2%	3.0%	--
Black (n = 1,535)									
Black (Ref: White)	15.3%	7.8%	1.03 (0.70; 1.52)	13.5%	3.4%	1.17 (0.71; 1.94)	15.3%	2.2%	0.98 (0.53; 1.79)
Non-Medical Prescription Opioid Use x Black			0.99 (0.33; 2.90)			2.54 (0.71; 9.00)			5.00* (1.23; 20.38)
Asian (n = 478)									
Asian (Ref: White)	29.8%	11.9%	1.27 (0.75; 2.15)	29.8%	5.7%	1.53* (1.04; 2.23)	29.8%	4.4%	1.76A (0.97; 3.20)
Non-Medical Prescription Opioid Use x Asian			1.26 (0.28; 5.61)			4.95* (1.09; 22.36)			7.33* (1.22; 43.91)
Hispanic (n = 2,657)									
Hispanic (Ref: White)	23.6%	9.0%	0.83 (0.57; 1.19)	16.4%	4.7%	1.19 (0.84; 1.67)	10.8%	3.2%	1.22 (0.80; 1.85)
Non-Medical Prescription Opioid Use x Hispanic			0.43 (0.14; 1.33)			0.60 (0.24; 1.50)			0.51 (0.16; 1.61)
Pseudo R^2	0.49[a]			0.43[a]					0.40[a]
Wald Statistic F Statistic (df)	47.02*** (33, 18)			33.90*** (33, 18)			22.74*** (33, 18)		

* p-value <0.05

** p-value <0.01

*** p-value <0.001

$^{\wedge}$ p <0.10

[†] All analyses controlled for socio-demographics, other substance use, social factors, and health (self-rated health) and mental health (past-year major depressive episode, lifetime major depressive episode) variables.

[a.] Pseudo R2 was not estimated with survey design weights due to issues of heteroskedasticity. The Pseudo R2 value presented here is unweighted.