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Opioid Misuse Among Students Pursuing Higher Education

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ABSTRACT

OPIOID MISUSE AMONG STUDENTS PURSUING HIGHER EDUCATION

By

HEATHER ANNE ZESIGER

APRIL 26, 2018

Background: Despite national attention on opioid abuse, little is known about opioid misuse
(OM; defined as heroin use or non-medical use of opioid prescription drugs) among students
pursuing higher education in the United States. A better understanding of student OM is
necessary to inform a public health process to develop campus-specific prevention strategies and
interventions. This dissertation examined three main questions: 1) what individual, social and
institutional characteristics are associated with OM, 2) Is OM elevated among student service
members/veterans, and 3) whether OM is associated with comorbidities including mental and
physical diagnoses, sleep, and suicidality, as well as whether the effect of OM on suicidality is
mediated by its effects on sleep quality?

Methods: Data were from full-time students (N = 91,322) enrolled at 103 institutions that
participated in the spring 2015 American College Health Association–National College Health
Assessment survey. Multilevel modeling and binary logistic regression were used to examine
associations between individual, social, and school-level predictors and OM.

Results: The prevalence of opioid misuse was 7% (N = 6,376). OM was associated with several
individual, social and institutional characteristics, such as being an undergraduate versus
graduate student (OR = 1.26, 95% CI = [1.179, 1.348]). Analyses showed that being a student

service member/veteran (SSM/V) who had served in hazardous duty increased the odds of OM by roughly 31% (OR = 1.309, 95% CI = 1.113, 1.539). Likewise, students who reported misusing opioids were twice as likely to report having suicidal ideation or a past suicide attempt (OR = 2.317, 95% CI = [2.193, 2.448]), and a number of other health outcomes, such as chronic illness, anxiety, and depression. Mediation analyses in MPlus showed that sleeping difficulties partially mediated the relationship between OM and suicidality.

Conclusion: OM has devastating economic, social and medical consequences for individuals and communities. Significant associations between individual characteristics, comorbid conditions, and social environmental structures and OM among students in higher education highlight the need to illuminate other risk and protective factors as well as to identify effective clinical and environmental interventions to reduce harm and save lives on campus.

OPIOID MISUSE AMONG STUDENTS PURSUING HIGHER EDUCATION

by

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B.A., AMHERST COLLEGE

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APPROVAL PAGE

OPIOID MISUSE AMONG STUDENTS PURSUING HIGHER EDUCATION

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Abbreviations and Acronyms

ACHA	American College Health Association
IHE	Institution of Higher Education
NCHA	National College Health Assessment
NMPDU	Non-medical prescription drug use
NMUOPD	Non-medical use of opioid prescription drugs
OM	Opioid misuse
SSM/V	Student service members/veterans

Acknowledgements

April 26, 2018

Author's Statement Page

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Heather Anne Zesiger

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Chapter One: Introduction

Opioid abuse is an epidemic in the United States and has been declared a Public Health Emergency. In 2015, over 90 people in the U.S. died each day due to opioid overdose (Rudd, 2016). Opioids are a class of drugs derived from opium, including heroin, oxycodone, morphine, and codeine, as well as synthetic versions, such as fentanyl. Opioids bind with receptors in the brain to diminish the sensation of pain. At larger doses, opioids produce a feeling of euphoria. The term opioid misuse encompasses misuse of prescription opioid medications as well as use of heroin, which is an illicit substance. Misuse of prescription opioids can be referred to as non-medical use of opioid prescription drugs (NMUOPD), which is a subset of the larger prescription drug abuse concern, referred to as non-medical use of prescription drugs (NMUPD). Nonmedical use occurs when a person is using more of the medication than prescribed, for a longer period than prescribed, for reasons other than as prescribed, or is using the medication without the supervision of a medical provider, including using medication not prescribed to them.

Opioid misuse is associated with serious harm, including substance abuse disorder, concurrent infection with HIV and HCV, and risk of overdose. Overdose deaths are the leading cause of preventable deaths from injury in the U.S. (The Trust for America's Health, 2015). Beyond these individual consequences, there are societal costs including lost productivity, treatment expenses, use of emergency medical services to respond to overdose, and related economic burdens. The annual economic burden of the opioid crisis in the U.S. is $80 billion (Florence, Zhou, Luo, & Xu, 2016).

Despite national attention to opioid abuse, little is known about opioid misuse among students pursuing higher education in the U.S. As potential civic leaders, parents, and economic drivers, current college and university graduates can wield their economic, political and social

influence to shape the future of environmental and individual components of substance abuse, treatment, and prevention. A better understanding of their opioid misuse is necessary to inform a public health process for developing interventions and policies to ameliorate harm on campuses.

Literature Review

Prevalence and Individual, Social and Environmental Correlates of Opioid Misuse

Opioid misuse in the United States. There are currently 4.3 million non-medical users of opioid analgesics and 435,000 heroin users in the United States (Center for Behavioral Health Statistics and Quality, 2015). According to the National Vital Statistics System, opioid pain relievers were involved in more overdose deaths than any other prescription drug (n = 14,800; 73.8%) (Centers for Disease Control and Prevention, 2011). Fatal opioid overdose was most common among males, non-Hispanic Whites, Native American/Alaska Natives, and persons aged 35-54. The Centers for Disease Control and Prevention reports that heroin use is increasing in most demographic groups and more than doubled among persons aged 18-25 in the past ten years; almost half of people who use heroin are also addicted to prescription opioids (Centers for Disease Control and Prevention, 2015). There is geographic variation in trends of opioid misuse in the U.S. and rates of misuse are highest in the Northeast, Midwest and South (Levine & Coupey, 2009; Unick & Ciccarone, 2017).

Opioids are particularly dangerous because of their iatrogenic effect; their potential harm is induced inadvertently as a result of medical treatment, and users may become addicted even when using prescribed pain medication appropriately (Beauchamp, Winstanley, Ryan, & Lyons, 2014). Beyond addiction, there are complex associations between opioid misuse, pain, and suicide. Olfson and colleagues found associations between opioid related fatalities, chronic pain, healthcare service utilization, and opioid misuse among Medicare decedents and concluded that

provider-patient interactions could have been better leveraged for intervention (Olfson, Wall, Wang, Crystal, & Blanco, 2017). Another study found that most (83%) people who later died by suicide had at least one health-care interaction in the year prior to death, even though fewer than half had a mental health diagnosis at the time of death (Ahmedani et al., 2014). In another study of physical health concerns, sleep disorders were associated with a more than twofold increase in risk of suicide (Ahmedani et al., 2017).

Although illegal, in some markets heroin is more affordable and accessible than prescription opioid medication (National Institute on Drug Abuse, 2014). According to results from the 2014 National Survey on Drug Use and Health report, 12.7% of new heroin users began with prescription pain relievers (Center for Behavioral Health Statistics and Quality, 2015). Because prescription opioid abuse is spreading so rapidly, and because dependent prescription opioid users may transition to heroin to maintain their addiction, both opioid types are the subject of the current research (Berman & Wartofsky, 2016; Compton, Jones, & Baldwin, 2016).

Opioid misuse and youth. While there are a limited number of studies with samples solely comprised of college students, there are lessons to be learned from research with youth. The primary developmental risk period for prescription opioid misuse, as with other substance abuse, is adolescence (Jones, Spradlin, Robinson, & Tragesser, 2014). Non-medical prescription opioid use may begin early. Wu and colleagues found that one in ten adolescents ages 12-17 reported non-medical use of prescription opioids, with a mean age of onset of just 13 years, which is similar to the age of onset for alcohol and marijuana (Wu, Pilowsky, & Patkar, 2008). In 2014, the rate of past year nonmedical opioid pain reliever use among youth aged 12 to 17 was 6.2% (Substance Abuse and Mental Health Services Administration, 2014).

As noted, a common catalyst for people to abuse or misuse opioids may be a legal prescription from a healthcare provider. This is true even for young people. McCabe and colleagues estimated that, in 2015, 3% of all U.S. high school seniors used opioids for medical reasons before using them nonmedically; this rate is higher than nonmedical use before medical use or nonmedical use only (McCabe et al., 2017). The authors reported that one third of high school seniors who reported nonmedical use started by using their own leftover prescription medication (McCabe et al., 2017). In addition, students who used opioids medically before high school graduation are 33% more likely to misuse opioids after high school (Miech, Johnston, O'Malley, Keyes, & Heard, 2015). This association is concentrated among individuals who have little to no history of drug use and strong disapproval of illegal drug use at baseline (Miech et al., 2015).

Opioid misuse in college samples. The most comprehensive look at opioid misuse among the college and college-age population is a 2015 national study commissioned by the Hazelden Betty Ford Foundation and the Christie Foundation (Q Market Research, 2015). A third of respondents reported easy access to opioids, and a third knew someone who had overdosed from either prescription opioids or heroin. Seventeen percent of graduate students and 16% of fraternity and sorority members reported taking prescription opioid medication and one-fifth of these respondents reported taking more than prescribed. Overall, 16% of the respondents reported non-medical use of prescription opioid medications, consistent with other studies (Brandt, Taverna, & Hallock, 2014; McCabe, Teter, Boyd, Knight, & Wechsler, 2005; Wu et al., 2008). In the Hazelden study, the rate of NMUOPD by intercollegiate athletes was as high as 22%. Most athletes (55.7%) had been prescribed pain medication for injury or surgery. Overall, in the Hazelden study, males seem to be most at risk.

Another comprehensive survey, the annual Monitoring the Future (MTF) study from the University of Michigan, found lower reported rates of opioid use among students (Schulenberg et al., 2017). However, the exact wording of the survey items differed between the instruments. For example, the MTF measures include a list of examples by brand name and queried about use in their lifetime, in the past 12 months as well as past 30 days. NMUOPD on this survey was measured by the item *On how many occasions (if any) have you taken narcotics other than heroin on your own, that is, without a doctor telling you to take them?* On the Hazelden study, respondents were asked if they had ever been prescribed opioids, measured from an even lengthier list, and then *Have you used prescription pain pills that were not prescribed to you?* and *Have you used prescription pain pills that were prescribed to you in excess of the dose prescribed to you?* In addition, researchers have found discordant self-report responses on the MTF study in the past (Palamar, Shearston, & Cleland, 2016). Nonetheless, on the MTF study, almost 4% (n=1,380) of college respondents reported past year use of narcotics other than heroin without medical supervision. Regarding OxyContin use specifically, the rate was 1.9%. While males reported non-medical use of narcotics more often, for Vicodin and OxyContin specifically, females were more likely to report past year use.

Higher education settings are host to the dynamic interplay between individual, social and environmental/institutional risk factors for opioid misuse. In previous studies, misuse was highest among white students, students with lower GPAs, and sorority and fraternity members (Dart, Bartelson, & Adams, 2014; McCabe, 2008; McCabe, Teter, Boyd, et al., 2005). Prior research has been mixed as to whether or not athletes and males are at greater risk (Ford, 2008; Veliz et al., 2014). There are no previous studies about specific associations between institutional and geographic characteristics of IHE and student opioid misuse specifically. However, Oswalt

and colleagues did find associations between alcohol, tobacco, and marijuana use and school type, geographic region, and student enrollment (Oswalt, Lederer, & Schrader, 2015). Student respondents at public institutions were less likely to report alcohol and marijuana use in the past 30 days than their private school peers, but there was no difference in cigarette use. Students in the Northeast had the highest reported rates for all three substances as did students at small schools (<2500). There has not been a comprehensive analysis of the American College Health Association- National College Health Assessment (ACHA-NCHA IIb) national dataset regarding student opioid misuse. The goal of the current research is to fill that gap.

Veteran status is another important risk factor with implications at individual, social and environmental levels. In 2015, the *Journal of American College Health* (JACH) devoted an entire special issue to the health concerns and academic adjustment of student service members and veterans (SSM/V) (Barry, 2015). Generally, SSM/V are more likely to experience significant psychiatric symptoms and mental illness including depression, anxiety, and post-traumatic stress disorder (PTSD) than civilian students. However, findings are mixed as to whether SSM/V who have served in hazardous duty are more at risk than their peers who did not serve in combat or those who are civilian. Findings also vary as to if SSM/V experience more suicidal behavior than non-SSM/V peers (Bryan & Bryan, 2015). Although previous studies have found SSM/V at greater risk for self-harm, violence and substance abuse (Barry, Whiteman, & Wadsworth, 2014), no studies have specifically explored opioid misuse in this population.

Finally, comorbidity with pain and other physical and mental health conditions is a risk factor at the individual student level. Among students, there is an association between self-reported opioid misuse and self-reported mental health symptoms and suicidality, (Lord, Brevard, & Budman, 2011; Wong et al., 2013; Zullig & Divin, 2012) as well as an association

between pain-related diagnoses and opioid misuse (Kenne et al., 2017; Novak, Herman-Stahl, Flannery, & Zimmerman, 2009). If indeed these comorbidities can be shown to correspond to healthcare service utilization among students who misuse opioids, these clinical and therapeutic interactions may provide valuable opportunities to intervene to reduce harm and save lives. The current research was the first to explore comorbidity of suicidal ideation or previous suicide attempt; anxiety; depression; back pain; broken bone; any chronic illness; mobility disability; or sleep difficulties with opioid misuse among college and university students.

Theoretical Foundations of the Aims of the Current Research

The Public Health Model

The public health model for addressing substance misuse in the *Surgeon General's Report on Alcohol, Drugs, and Health*, provides guidance in addressing the opioid epidemic (Substance Abuse and Mental Health Services Administration & Office of the Surgeon General (US), 2016). The steps in the public health model are to (a) define the problem through data collection; (b) identify risk and protective factors and possible interventions; (c) test interventions; (d) support broad implementation; and (e) monitor outcomes. The first two steps are evident in the purpose of the current research. The first study aimed to illuminate the scope of the problem, as well as risk and protective factors, reported by student respondents attending U.S. colleges and universities that participated in the (NCHA IIb). The aim of the second study was to examine whether student service members/veterans (SSM/V) were at greater risk than civilian students. The third study explored NMUOPD and associations with comorbidities, including mental and physical diagnoses, sleep, and suicidality.

Social Cognitive Theory

The Social Cognitive Theory (SCT) (Bandura, 1986) posits that there is *reciprocal determinism* between people and their environments: therefore, behavior is the outcome of interaction between personal, environmental and behavioral influences. The focus of the current research on individual, social and environmental-institutional risk factors for student opioid misuse builds on the foundation of reciprocal determinism between individuals and their setting. For example, the current research was not only concerned with how individuals reported opioid misuse within a national sample of college students, but also with how social and campus environments may have shaped that behavior. Individual characteristics such as demographics, year in school and GPA were included in the analysis, as were group affiliations such as student military status; athletes; fraternity and sorority members. In addition, this study looked at social group indicators, such as type of residential living, as well as school- or cluster-based characteristics including campus enrollment, urbanicity, and if the school is public or private.

The SCT has been used in previous addiction research, including studies of process addiction (pornography, social media) as well as substance abuse including alcohol, tobacco and cannabis (Connor, Gullo, Feeney, Kavanagh, & Young, 2014; Haug, Schaub, & Schmid, 2014; Prochaska, 2006; Sirianni & Vishwanath, 2016; Takamatsu et al., 2016; Webb, Sniehotta, & Michie, 2010; Yu, Wu, & Pesigan, 2016). No studies were identified that applied the social cognitive theory to the study of opioid misuse specifically. While many scholars focus on self-efficacy as the primary construct of interest in the SCT, it has additional value when taking a settings-based approach to public health as in the current research that focuses on higher education settings.

Other constructs in the SCT are outcome expectations, self-efficacy, collective efficacy, self-regulation, facilitation/behavioral capability, observational learning, incentive motivation, and moral disengagement (Glanz, Rimer, & Viswanath, 2008). These constructs will be discussed further in Chapter Five as they inform how the findings of the current research are applied.

<div align="center">**Statement of Purpose**</div>

Advancing Research about Opioid Misuse among Post-Secondary Students

This research was novel in numerous ways. The purpose was to advance scientific understanding of opioid misuse among students in colleges and universities, which is an understudied segment of the U.S. population. Further, examining patterns of risk and protective factors of opioid misuse within the context of higher education settings has not been a priority in previous studies and therefore, this research examined how characteristics of this unique educational environment may reinforce or enable opioid misuse. Furthermore, this research uniquely examined opioid misuse risk among students enrolled in higher educational settings that also have military status. Finally, the significance of sleep disorders is an emerging area of health research linked to both suicide and depression. The current research examined the association between mental health symptoms, pain diagnoses, chronic illness, sleep difficulties, mobility disability and opioid misuse and analyzed whether or not sleep mediates the relationship between opioid misuse and suicidality, while controlling for depression. Analyses of mental health indicators, along with other comorbidities among students in college settings who misuse opioids, have the potential to reveal important opportunities to intervene, as has been found with other populations (Ahmedani et al., 2014). The current research examined opioid misuse patterns and prevention opportunities in higher education from the epidemiology of opioid misuse among

college and university students to better understanding potentially high-risk groups, such as SSM/V and associations with other physical and mental diagnoses.

Study One - Opioid Misuse among Students Pursuing Higher Education: Findings from a National Sample

This study aimed to define the problem and the underlying epidemiology of undergraduate and graduate student self-reported opioid misuse (prescription opioid misuse or heroin use or the combination of the two) based on analyses of the spring 2015 ACHA-NCHA IIb dataset (N=91,322). The study examined the prevalence of opioid misuse among a national sample and explored whether rates varied by individual and social characteristics of students as well as institutional characteristics. Based on previous research described in the literature review, it was hypothesized that misuse would be greater among white students and students with lower GPAs, as well as greater among sorority and fraternity members. It was hypothesized that students at private schools would have greater rates of opioid misuse, as would those at small schools. Finally, it was hypothesized that higher self-reported opioid misuse would be reported by students at institutions in geographic areas of the United States that have been most affected by the opioid epidemic: the Northeast, Midwest and South. Opioid misuse and overdose has spread quickly in recent years. A college health association guidance on opioid prescribing, (American College Health Association, 2016) and recent conference presentations, (Oyola-Santiago & Shey, 2017; Steiker, Hill, Castedo, & Barnes, 2017) suggest that some campuses are preparing for opioid abuse to surface among students in higher education. Further studies, such as this one, are necessary to identify risk and protective factors at the individual and institutional levels.

Study Two – Opioid Misuse among Student Service Members/Veterans

This study examined opioid misuse among SSM/V. Student service members/veterans are more at risk for a range of behavioral concerns than their civilian peers, but their risk for opioid misuse is currently unknown. Multilevel modeling was conducted with the spring 2015 ACHA-NCHA IIb dataset (N=91,322) to explore opioid use among SSM/V. Based on previous findings with SSM/V for other substances of abuse, it was hypothesized that SSM/V would report greater opioid misuse than their civilian counterparts and that those SSM/V who served in hazardous duty would report higher misuse than SSM/V who did not serve in hazardous duty. Colleges and universities strive to create inclusive climates for student service members and veterans to promote their integration on campus and academic success (Barry et al., 2014). A better understanding of their risk profile as it relates to the current opioid epidemic is vital to providing adequate services and treatment on-campus or in surrounding communities.

Study Three – Suicidality, Sleep, Pain, and Chronic Illness among Students Who Misuse Opioids

The American College Health Association's recent guidelines for opioid prescribing by campus healthcare providers acknowledged that NMUOPD is a looming public health crisis for post-secondary institutions in the United States (American College Health Association, 2016). As reported in the spring 2015 ACHA-NCHA IIb dataset, analyses of students' mental and physical diagnosis comorbidities with opioid misuse and the role of sleep in mediating the effect of opioid misuse on suicidality may illuminate additional opportunities for intervention to reduce drug-related harm and save lives.

Based on prior research, it was hypothesized that there would be an association between self-reported opioid misuse and self-reported mental health symptoms and suicidality as well as

an association between pain-related diagnoses and opioid misuse. Substance use is often correlated with mental health challenges, and suicide continues to be a concern, as well as a leading cause of death, among college students (American College Health Association, 2015). Studies are needed to inform evidence-based treatment and prevention approaches specific to the unique needs of higher education settings.

The three studies in this line of research filled gaps in the literature about the profile of students who misuse opioids and opportunities to intervene in higher education settings. These interrelated studies followed the steps in the public health model and the tenets of SCT, in order to better define the problem, identify risk and protective factors at individual and environmental levels, and make recommendations to campus personnel to reduce opioid related harm.

Data

American College Health Association - National College Health Assessment

The data included in this analysis were collected during the spring 2015 ACHA-NCHA IIb survey administration. Colleges and universities conduct the ACHA-NCHA IIb in accordance with their own needs, resources, and policies. Eligibility criteria for cases included U.S.-based institutions that administered the survey to all students or utilized a random sampling technique. One hundred and eight institutions self-selected to participate in spring 2015, with a total of 93,034 respondents, and an overall response proportion of 22.4% (American College Health Association, 2015). To focus on degree-seeking students, respondents who were not seeking a degree as well as those aged 41 years or older were omitted; the revised total sample is 91,322. The median age of respondents at the time of the survey was 21 (M = 22.58, SD = 5.86); 18% were graduate students at the time of the survey; and the majority (67.6%) described themselves as White. Of the 108 participating institutions, 72 were public, 36 were private, 5 were 2-year

institutions, and 103 were 4-year or above. Nineteen were in the Northeast, 35 in the Midwest, 29 in the South, and 25 in the West.

Statistical analyses including binary logistic regression and multilevel modeling were used to examine individual characteristics of college students who reported misusing opioids; institutional and social characteristics of college students who reported misusing opioids; self-reported opioid misuse by SSM/V; and concurrent mental health concerns and select medical diagnoses (pain, injury) among college students who reported misusing opioids. The Georgia State University Institutional Review Board reviewed the protocol and declared it exempt.

Chapter Two: Opioid Misuse among Students Pursuing Higher Education

Abstract

Background: Despite national attention to opioid abuse, little is known about opioid misuse (OM) among students pursuing higher education. An understanding of their OM is necessary to inform a public health process to ameliorate individual and community level drug-related harm on campuses.

Methods: This study examined associations between OM and characteristics of students and institutions. Full-time students (N = 91,322) enrolled at 103 four-year institutions in the spring 2015 American College Health Association–National College Health Assessment IIb (ACHA-NCHA IIb) survey were studied. Multilevel modeling (MLM) and binary logistic regression were used to examine associations between OM and individual, social, and institutional-level attributes. Results: The overall prevalence of student opioid misuse was almost 7% (6,376). Elevated odds for OM were associated with being, male (odds ratio [OR] = 1.395, 95% confidence interval [CI] = [1.328, 1.464]), an undergraduate (OR=1.26, 95% CI [1.184, 1.341]), and having a lower GPA (OR= 2.06, 95% CI [1.551, 2.723]), as well as participating in sorority and fraternity life (OR = 1.293, 95% CI = [1.199, 1.394]) or club sports (OR = 1.2, 95% CI [1.077, 1.273]). Being younger (OR = 0.084, 95% CI = [0.077, 0.091]), or living in a more supervised residential setting were protective (OR=0.78, 95% CI [0.725, 0.828]). Among institutional predictors, going to school in the Western region of the U.S. (AOR=1.3, 95% CI [1.188, 1.422]), was associated with OM whereas the odds of opioid misuse for students in private institutions (AOR=0.837, 95% CI [0.940, 1.161]) were approximately 16% less than for those in public schools.

Conclusion: Screening for OM is recommended, particularly in higher risk populations. Further research is needed to target prevention and intervention appropriately.

Background

Opioid misuse is an epidemic in the United States (Centers for Disease Control and Prevention, 2011). Yet, little is known about the rate of opioid abuse, nor protective and risk factors, in college populations. For this study, opioid misuse was defined as use of heroin, or non-medical use of prescription opioids (NMUOPD), such as OxyContin, Percocet, or Vicodin, or concurrent use of heroin and NMUOPD. This study sought to develop a profile of students who misuse opioids by exploring the following research question using a large, national dataset: What individual, social, and institutional characteristics predict student opioid misuse? Potential predictor variables were identified in individual, social, and institutional domains. The current study provided an epidemiological foundation to inform evidence-based prevention and intervention approaches specific to the unique needs of higher education settings. Based on limited previous research, it was hypothesized that misuse would be greater among white students, students with lower GPAs, and sorority and fraternity members (Dart et al., 2014; McCabe, 2008; McCabe, Teter, Boyd, et al., 2005). Prior research has been mixed regarding whether or not athletes and males are at greater risk (Ford, 2008; Veliz et al., 2014).

Methods

The data for this study came from the 2015 spring ACHA-NCHA IIb, a survey of undergraduate and graduate students that examines health and health-related behaviors and includes information about individual, social and environmental determinants (American College Health Association, 2015). Colleges and universities conduct the ACHA-NCHA IIb in accordance with their own needs, resources and policies. One hundred and eight institutions self-selected to participate in spring 2015, with a total of 93,034 respondents. There was an overall response proportion of 22.4% (American College Health Association, 2015). Eligibility criteria

for inclusion in this study included U.S.-based institutions that administered the survey to all students or utilized a random sampling technique. The Georgia State University Institutional Review Board reviewed the protocol and declared it exempt.

Multilevel models (MLM) were based on an analytic sample of 91,322 students nested in 103 schools. The analytic sample was derived after omitting students from two-year schools (only five of the participating institutions were two-year schools which did not allow for meaningful analysis), respondents who were not seeking degrees and respondents aged 41 years or older.

Description of Key Study Variables

The ACHA-NCHA IIb consisted of 66 items related to student health behaviors and outcomes. For this study, 15 relevant items were examined.

Outcome. The outcome measure *misuse* encompassed affirmative responses to items about heroin use, NMUOPD, or concurrent use of both drug types. The first component item asked participants on how many days within the last 30 did they use *opiates (heroin, smack)*, with response options of *never used*; *have used but not in the last 30 days*; and day intervals up to *used daily*. These response choices were dichotomized into *never used* and all other values. The second component item asked participants if in the last 12 months, they have taken any of the following prescription drugs that were not prescribed to them: *pain killers (e.g., OxyContin, Vicodin, Codeine)*, with response options of *no* and *yes*.

Individual level predictors. Five items were included as predictors in the individual category: age; year in school; ethnicity; gender; and GPA. For age, respondents were asked *how old are you?* with an open-ended response field. For year in school, participants were asked *what*

is your year in school? with response values of 1st year undergraduate through 5th year or more undergraduate; and graduate or professional. For ethnicity, students were asked to select all that apply in response to the question *how do you usually describe yourself?* with response values for multiple descriptors, dichotomized for this study as white and non-white. For gender, participants were asked to select among female, male, or transgender. For grade point average, participants were asked *what is your approximate cumulative grade average?* with response options A – D/F. These items were all dichotomized to facilitate multilevel modeling, discussed later. The continuous age variable was recoded as ages 18-22=1 and 23-40=0. Adjusted models controlled for the covariates of age, gender and ethnicity.

Social level predictors. Three items were included in the social predictor category: residence, membership in a fraternity or sorority; and participation in varsity, club or intramural athletics. Participants were asked where they currently lived, with response options campus residence hall; fraternity or sorority house; other college/university housing; parent/guardian's home; other off-campus housing; and other. These values are recoded as greater supervision and less supervision. Residences with greater supervision include responses of residence hall or parent/guardian's home. All other response options were coded as less supervised. Affiliation with Greek life was assessed by asking participants if they were a member of a social fraternity or sorority, with response options no and yes. For athletic involvement, respondents were asked if within the last 12 months, they had participated in organized college athletics at any of the following levels: varsity; club sports; intramurals, with response options no and yes.

Environmental level predictors. These characteristics are measured by four items answered by the survey contact at each institution (not by individual student respondents). Institution designation is either public or private. Urbanicity was dichotomized into surrounding

community populations of 49,999 or fewer and 50,000 or more. Response options for student

enrollment were dichotomized into 9,999 or fewer and 10,000 or more students. Geographic

region is entered into the dataset by ACHA research personnel in the following categories:

Northeast, Midwest, South, and West and a list of component states can be found online

(American College Health Association, 2015).

Analysis

The analysis proceeded in 3 steps. SPSS version 24 was used, including GENLINMIXED

for (MLM). MPlus version 8 was used subsequently for binary logistic regression. Initially, one

null or random-intercept-only MLM was estimated: an IHE-only MLM in which students were

clustered in schools. This null model estimated an intraclass correlation coefficient (ICC; i.e. the

proportion of variation in the outcome that was due to differences across schools rather than

differences across students).

Second, a model including individual, social, and environmental characteristics was used

to examine the effect of each of these measures at Level 1 as well as variability at the

institutional level. In addition to demographic variables, other individual and social predictors

were added to the model. These included GPA, undergraduate or graduate level study, whether

one's residence was more- or less-supervised, participation in fraternity or sorority life, and

participation in varsity, club, or intramural athletics. Institutional covariates in the model

included region and whether the IHE was public or private. Given the nested format of the data

the researchers originally planned to model variability within- (Level 1) and between- (Level 2)

schools. However, as shown in Table 3, the results from the second model above showed limited

variability in Level 1 predictor effects at Level 2.

Due to this limited variability, the final step was to use Mplus with the clustered observations option (i.e. sandwich estimator) to fit models 1, 3, and 3 (Table 4) that included both student- and IHE-level covariates, which allowed examination of opioid misuse predictors after considering the covariates.

Results

Descriptive analyses showed the median age of respondents at the time of the survey was 21 (M = 22.58, SD = 5.86); 18% were graduate students; the majority (67.6%) described themselves as white. Of the 108 participating institutions, 72 were public and 36 were private. Nineteen were in the Northeast, 35 in the Midwest, 29 in the South, and 25 in the Western U.S. Other demographic characteristics are presented in Table 1 and Table 2 highlights institutional characteristics. The overall prevalence of student opioid misuse was 6.89%. The ICC = 2.20, suggesting that about 2% of the variability in opioid misuse existed between schools. While 2% variability was small, with a large sample size of 91,322 a MLM was constructed in the event IHE level variance could be detected for Level 1 predictors.

Table 3 presents the results of the regression model examining individual- and social-level variables. The results of this model suggest that the odds of opioid misuse were higher for men (odds ratio [OR]=1.395, 95% confidence interval [CI] = [1.328, 1.464]), for students with lower GPAs (OR= 2.06, 95% CI [1.551, 2.723]), for undergraduates (OR=1.26, 95% CI [1.184, 1.341]), for members of fraternities and sororities (OR = 1.293, 95% CI = [1.199, 1.394]), and for club sports participants (OR = 1.2, 95% CI [1.077, 1.273]). Being 18-22 years old (OR = 0.084, 95% CI = [0.077, 0.091]) and living in a more supervised residence (OR=0.78, 95% CI [0.725, 0.828]) were protective. Opioid misuse did not vary by ethnicity. Among athletes, there was no difference in risk for varsity or intramural participants.

Multivariate Prediction of Opioid Misuse from the NCHA

As presented in Table 4, even after controlling for age, ethnicity, and gender, students were significantly more likely to report any opioid misuse if they were getting lower grades (adjusted odds ratio [AOR]=1.882, 95% CI [1.505, 2.354]); affiliated with a fraternity or sorority (AOR=1.319, 95% CI [1.222, 1.425]); were undergraduate (AOR=1.654, 95% CI [1.542, 1.774]); or a club sport athlete (AOR=1.098, 95% CI [1.024, 1.177]). Residing in a more supervised setting (AOR=0.812, 95% CI [0.768, 0.890]) was protective. The odds of opioid misuse for students in the Western region were 30% higher than for those in other parts of the U.S. (AOR=1.3, 95% CI [1.188, 1.422]). The odds of opioid misuse for students in private institutions were approximately 16% less than for those in public schools (AOR=0.837, 95% CI [0.940, 1.161]). School enrollment and urbanicity were not significant predictors of opioid misuse. In model 3, after adding significant institutional characteristics to the covariates that were held constant, predictors of risk continued to include low GPA (AOR=1.829, 95% CI [1.449, 2.309]); undergraduate status (AOR=1.539, 95% CI [1.421, 1.667]); Greek Life affiliation (AOR=1.336, 95% CI [1.242, 1.437]); and club sports participation (AOR=1.119, 95% CI [1.042, 1.202]).

Modeling the Interaction of Sex as a Biological Variable

Given the importance of gender differences in all phases of addiction, (Becker & Hu, 2008) a post-hoc analysis was conducted to examine the effect of gender on other significant predictors of risk in the individual and social domains. After controlling for all covariates, including institutional characteristics, the overall odds for Greek members were relatively unchanged (AOR= 1.33, 95% CI [1.242, 1.437]). However, an examination of whether the odds of opioid misuse were the same between genders revealed that the odds of opioid misuse were

greater amongst males i.e., the odds of opioid misuse were 2.2 points higher (3.54; interaction effect = 2.213, 95% CI [1.939, 2.525]). After controlling for all covariates, including institutional characteristics, the overall risk for club sports participants increased slightly (AOR = 1.119, 95% CI [1.042, 1.202]). However, amongst club sports participants, the odds of opioid misuse amongst males were 1.5 points higher (2.617; interaction effect = 1.498, 95% CI [1.333, 1.683]). Amongst residents in less supervised settings, the odds of opioid misuse were 1.3 points higher for males (2.45; interaction effect = 1.277, 95% CI [1.175, 1.389]). Amongst undergraduates, the odds for males were 1.4 points higher (2.94; interaction effect =1.396, 95% CI [1.324, 1.472]).

Discussion

This study examined the overall prevalence and identified risk and protective factors for opioid misuse by students enrolled as undergraduate and graduate students in a sample of U.S. institutions of higher education. The overall past-year prevalence for any opioid misuse (heroin and/or prescription opioid abuse) was almost 7%. This is the same past-year rate that McCabe and colleagues found over ten years ago, although their analysis did not include heroin (McCabe, Teter, Boyd, et al., 2005). A more recent study found an overall lifetime rate of misuse of 16%, including heroin and prescription opioids, among a sample of college and same-age non-college peers (Q Market Research, 2015). For past year use, the 2016 Monitoring the Future study found opioid misuse rates half as high as those found on the NCHA (Schulenberg et al., 2017). Further research is necessary to understand why reported rates by college students differ on national surveys. Variation in the item construction is one concern (Palamar et al., 2016).

Regarding individual characteristics identified in previous studies, misuse was expected to be greater among white students, (Dart et al., 2014; McCabe, Teter, & Boyd, 2005) but the current study did not find any significant variation in reported use by ethnicity. As in the current

study, prior researchers also found elevated risk for students with lower GPAs (Dart et al., 2014; McCabe, Teter, & Boyd, 2005; McCabe, Teter, Boyd, et al., 2005). The current study found males more at risk for opioid use, whereas, in prior studies males were more likely to use heroin but females were more likely to use certain types of prescription opioids (Schulenberg et al., 2017). Differences by age and year in school were not assessed in most of the previous national studies. The Hazelden and Christie Foundations' study did find higher use among graduate students, (Q Market Research, 2015) which contradicts the finding in the current study that graduate status was protective.

In terms of social predictors, multiple studies corroborate the finding in the current study that sorority and fraternity members were at elevated risk for opioid misuse (Dart et al., 2014; McCabe, 2008; McCabe, Teter, Boyd, et al., 2005). Further research is needed to examine why sorority and fraternity members are more at risk although it is possible that individual characteristics such as sensation-seeking and risk tolerance are factors as well as social influences including group-think and riskier social norms within the Greek Life community, although this may vary by gender and campus. Prior research has been mixed as to whether or not athletes are at greater risk, (Ford, 2008; Veliz et al., 2014) and in the current study only club sports participants were at elevated risk over non-athletes. Further study is needed to examine risk factors within club sports more deeply. Aspects of club sports that could increase student risks for opioid misuse include their association on many campuses with Greek Life; inconsistent access to team physicians or athletic trainers; inclusion of high-injury sports such as rugby and lacrosse; and potentially fewer players per team which might prompt students to play even while injured. Type of residential setting as a predictor of student opioid misuse has not been studied but prior studies exploring residence while in college and alcohol use found living with one's

parents was protective against alcohol use, but only for Hispanic students (Cacciola & Nevid, 2014) and living on-campus was associated with high-risk alcohol use (Simons-Morton et al., 2016). Thus, the findings in this study about the protective effects of more supervised residential settings are novel.

There are no previous studies regarding associations between institutional characteristics of IHE and student opioid misuse specifically. Oswalt and colleagues found associations between alcohol, tobacco and marijuana use, and school type, geographic region, and student enrollment (Oswalt et al., 2015). Student respondents at public institutions were less likely to report alcohol and marijuana use in the past 30 days than their private school peers, but there was no difference in cigarette use. However, in the current study, private school attendance was protective for opioid misuse. Further study is needed to explore why private institutions may be protective. It could be that students at public institutions are more likely to be in-state with their home of origin and thus more connected to networks from high school. For those students who initiated opioid misuse during high school, maintaining those local connections could sustain their risk. In the Oswalt study, students in the Northeast had the highest reported rates for all three substances, as did students at small schools (<2500). However, in the current study, participants at schools in the Western region of the U.S. had the highest opioid misuse, and there was no difference in reported misuse by school enrollment. Based on research of non-college populations, the regional finding in the current study of opioid misuse was surprising as rates were expected to be highest in the Northeast, Midwest and South (Centers for Disease Control and Prevention Injury Center, 2018; Levine & Coupey, 2009; Unick & Ciccarone, 2017). This finding from the NCHA should be further explored in future research. Perhaps there is an effect due to students attending school outside of their home state, as normative behaviors and types of

substances abused appear to be associated with geographical settings. To illustrate, the Western U.S. had an increase in opioid prescribing rates (Centers for Disease Control and Prevention Injury Center, 2017) yet none of the states with the greatest increase in opioid overdose deaths in 2015-2016 were in the Western U.S. region as it is defined by ACHA (Centers for Disease Control and Prevention Injury Center, 2018).

Another important future area of study includes an examination of opioid misuse among community college and other 2-year institutions. Only five of the 108 participating institutions in 2015were two-year institutions so those participants were omitted from analysis. Because they are generally more deeply embedded in their communities, two-year schools may be sentinel settings for the spread of opioid misuse into higher education and warrant study in the future.

Limitations

This study relied on student self-report regarding opioid use and group affiliation on campus. Recall bias and other limitations of survey research may exist. Nonetheless, student self-report is a commonly accepted method in substance use studies with higher education samples, and the NCHA is noted for producing population-level data that are generally both valid and reliable (American College Health Association, 2000). Due to the small number of students who identified their gender as transgender in this sample, these participants were omitted from multilevel analysis. This is concerning because examining solely associations, transgender student respondents indicated a much higher rate of NMUOPD (11%) than male (6%) or female (5%) students. More recent NCHA surveys have included more descriptive categories related to gender identity. When those national datasets become available to researchers, there is a research opportunity in repeating this study to include students who identify outside of a gender binary. Furthermore, respondents were from 103 colleges and universities, and results might not be

generalizable to the larger student population. The number of participants reporting opioid misuse was small, and this might have impacted the ability to identify statistically significant relationships with other measures. Finally, the characteristics of NCHA participants might not be similar to those who refused, were not selected, or were not eligible to participate.

Conclusion

Opioid misuse has devastating economic, social and medical consequences for individuals and communities, up to and including death. In this study, almost 7% of student respondents reported opioid misuse. Although understanding and appreciating every student's individual story is an aim of caring higher education professionals, a better snapshot of the risk profile for opioid misuse can help IHEs target appropriate surveillance, prevention and intervention measures.

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Table 1

Sample Characteristics

		Students		Report Opioid Misuse	
		<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>
Gender	Male	33%	29,541	9%	2,796
	Female	67%	61,154	7%	3,991
Ethnicity	White	61%	55,653	8%	4,183
	Non-White	39%	35,669	8%	2,720
Age	≥23	30%	27,399	7%	2,054
	18-22	70%	63,923	7%	4,288
GPA	A	43%	39,457	6%	2,387
	B	44%	40,474	8%	3,224
	C	10%	8,992	11%	1,034
	D/F	1%	581	14%	82
Class	Undergraduate	82%	74,438	8%	5,839
	Graduate	18%	16,884	6%	1,064
Residence	More supervised	48%	43,695	7%	2,914
	Less supervised	52%	47,627	8%	3,989
Sorority/Fraternity	Yes	11%	9,540	9%	876
	No	89%	81,482	7%	5,979
Athletics	Intramural	16%	14,796	8%	1,128
	Club	9%	7,853	8%	666
	Varsity	6%	5,509	7%	412

Table 2

Institutional Characteristics

		Students		Report Opioid Misuse	
		<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>
Region	Northeast	25%	22,706	7%	1,511
	Midwest	23%	20,829	7%	1,421
	South	22%	19,972	8%	1,505
	West	31%	27,815	9%	2,466
Enrollment	<2,500	8%	7,053	8%	556
	2,500-4,999	6%	5,775	6%	362
	5,000-9,999	14%	12,383	8%	963
	10,000-19,999	22%	19,822	7%	1,458
	≥20,000	51%	45,962	8%	3,564
Type	Public	65%	59,226	8%	4,738
	Private	35%	32,096	7%	2,165
Urbanicity	≥500,000	34%	30,556	8%	2,311
	250,000-499,999	8%	7,611	8%	588
	50,000-249,999	33%	29,891	8%	2,344
	10,000-49,999	22%	19,777	7%	1,413
	2,500-9,999	3%	2,705	8%	217
	<2500	1%	455	7%	30

Note. Percentages may not equal 100% due to rounding.

Table 3

Univariate Effects on the Likelihood of Opioid Misuse

	Step 1				Step 2		
	Does misuse vary across any level 1 predictors?				*Do any significant level 1 predictors vary across school?*		
		95% CI					95% CI	
Variable	OR	Lower	Upper	Estimated variance	S. E. of the Estimate	Lower	Upper
Age (younger)	0.084	0.077	0.091*	0.010	0.009	0.002	0.057
Gender (male)	1.393	1.325	1.463*		*Unable to fit model*		
Ethnicity (white)	0.946	0.870	1.028	0.040	0.015	0.019	0.082
GPA (D&F)	2.055	1.551	2.723*		*Unable to fit model*		
Undergrad	1.260	1.184	1.341*		*Unable to fit model*		
Residence (more supervised)	0.775	0.725	0.828*	0.012	0.008	0.004	0.042
Greek	1.294	1.189	1.408*	0.007	0.009	0.001	0.075
Varsity	1.017	0.915	1.131		*Unable to fit model*		
Club	1.171	1.077	1.273*		*Unable to fit model*		
Intramural	1.069	0.994	1.149		*Unable to fit model*		
CI=confidence interval, *p<0.05; OR= Odds Ratio; AOR=Adjusted Odds Ratio							

Table 4

Predictors of Opioid Misuse NCHA Spring 2015

Predictors	Model 1		Model 2[a]		Model 3[b]	
	OR	CI	AOR	CI	AOR	CI
Age	0.866	.819, 0.959*				
Gender	1.395	1.328, 1.464*				
Ethnicity	0.95	0.886, 1.019				
GPA	2.007	1.597, 2.522*	1.882	1.505, 2.354*	1.829	1.449, 2.309*
Undergrad	1.26	1.179, 1.348*	1.654	1.542, 1.774*	1.539	1.421, 1.667*
Residence	0.802	0.756, 0.850*	0.812	0.768, 0.89*	0.827	0.782, 0.874*
Greek	1.293	1.199, 1.394*	1.319	1.222, 1.425*	1.336	1.242, 1.437*
Varsity	1.006	0.921, 1.100				
Club	1.143	1.065, 1.227*	1.098	1.024, 1.177*	1.119	1.042, 1.202*
Intramurals	1.041	0.978, 1.107				
Region	1.305	1.196, 1.425*	1.3	1.188, 1.422*		
Public/Private	0.84	0.772, 0.913*	0.837	0.772, 0.907*		
Enrollment	1.049	0.937, 1.174				
Urbanicity	1.077	0.969, 1.197				

Note. CI=confidence interval, *p*<0.05; OR= Odds Ratio;
AOR=Adjusted Odds Ratio

[a]Model 2 includes age and gender as covariates.

[b]Model 3 adds school level variables as covariates.

Chapter Three: Opioid Misuse among Student Service Members/Veterans

Abstract

Background: This study examined the association of any opioid misuse (OM; heroin or prescription opioids used nonmedically or concurrent use of both) and student service member/veteran (SSM/V) status. Findings are based upon full-time students (N = 91, 322) enrolled at 103 institutions who participated in the spring 2015 American College Health Association–National College Health Assessment IIb (ACHA-NCHA IIb) survey.

Methods: Multilevel modeling (MLM) and binary logistic regression were used to examine associations between opioid misuse and (SSM/V) status.

Results: The odds of opioid misuse were less for civilian students (AOR=0.949, 95% CI [0.903, 0.996]) than among SSM/V; and students who had served in hazardous duty were particularly at risk (AOR=1.205, 95% CI [1.050, 1.384]).

Conclusion: The results of this study can inform targeted interventions at the post-secondary level for college health professionals and others seeking to address opioid misuse risk within SSM/V.

Background

In 2017, President Donald Trump declared the opioid crisis in the United States a public health emergency (The White House, 2017). In 2015, over 90 people in the U.S. died each day due to opioid overdose (Rudd, 2016). While opioid misuse, defined in the current research as nonmedical use of prescription opioids (NMUOPD), heroin use, or concurrent use of both, is recognized as a national emergency, little is known about how it manifests in higher education nor how it may affect student service members/veterans (SSM/V). As potential future civic leaders and economic drivers, students in higher education will shape the future of drug abuse policy, prevention and treatment. Furthermore, as microcosms of the larger society (Lederer & Oswalt, 2017), successful integration of SSM/V in higher education may spotlight strategies to replicate in other communities.

College Student Opioid Misuse

A recent study found that 16% of college students report misuse of prescription opioids (Q Market Research, 2015), similar to rates reported elsewhere (Brandt et al., 2014). Heroin use is rare among college students but it is increasing (Schulenberg et al., 2017). Among college students, males, older students, and white students are most likely to misuse opioids (Benotsch, Koester, Luckman, Martin, & Cejka, 2011; McCabe, Cranford, Boyd, & Teter, 2007).

Military Opioid Misuse

Among service members, illicit drug use is lower than among civilians, possibly due to strict zero-tolerance rules in the military (National Institute on Drug Abuse, 2013). However, prescription drug misuse, especially opioid misuse, is growing among service members for many reasons including injury, physical and psychological trauma, and the pain associated with

physical labor such as lifting heavy gear in daily operations (National Institute on Drug Abuse, 2013).

SSM/V and Opioid Misuse

SSM/V are an important campus population of interest because of the assets they bring to higher education and because they may have social and academic needs different from civilian students. Generally, SSM/V are more likely to experience significant psychiatric symptoms and mental illness including depression, anxiety and post-traumatic stress disorder (PTSD) than their civilian peers (Barry et al., 2014). Smith et al., found that *fitting in* was the only domain in which SSM/V functioned worse than civilian students and found this was predicted by having experienced trauma; there were no significant differences in the domains of health, emotional adjustment, productivity, social engagement or career development (Smith, Vilhauer, & Chafos, 2017). However, findings are mixed as to whether SSM/V who have served in hazardous duty are more at risk for emotional and social disparities than their peers who did not serve in combat, or those who are civilians. Findings are also mixed as to whether SSM/V experience more suicidal behavior than non-SSM/V peers (Bryan & Bryan, 2015; Bryan, Bryan, Ray-Sannerud, Etienne, & Morrow, 2014). Although previous studies have found SSM/V at greater risk for self-harm, violence and substance abuse, (Barry et al., 2014; Miller et al., 2016; Whiteman & Barry, 2011) no studies have specifically explored opioid misuse in this population.

Environmental Level Predictors

Higher education settings are host to the dynamic interplay between individual, social and environmental/institutional risk factors for opioid misuse. Individual predictors include age, gender and ethnicity as described above. SSM/V status is both an individual and social level predictor, related to personality and interest as well as peer influence and established norms of

conduct. There are no previous studies about specific associations between institutional and geographic characteristics of IHE and student opioid misuse. Oswalt and colleagues found associations between alcohol, tobacco, and marijuana use and school type, geographic region, and student enrollment (Oswalt et al., 2015). Student respondents at public institutions were less likely to report alcohol and marijuana use in the past 30 days than their private school peers, but there was no difference in cigarette use. Students in the Northeast had the highest reported rates for all three substances as did students at small schools (<2500).

SSM/V are more at-risk for a range of behavioral concerns than their civilian peers but their risk for opioid misuse is currently unknown. The purpose of this study was to examine opioid misuse among SSM/V using data from a national college health survey. Using the results of the 2015 spring ACHA-NCHA IIb, this brief report aimed to fill this gap.

Methods

The ACHA-NCHA is a survey of undergraduate and graduate students that examines health and health-related behaviors and includes information about individual, social and environmental determinants (American College Health Association, 2015). Colleges and universities conduct the ACHA-NCHA in accordance with their own needs, resources and policies. One hundred and eight institutions self-selected to participate in spring 2015, with a total of 93,034 respondents and there was an overall response proportion of 22.4% (American College Health Association, 2015). Eligibility criteria for cases included U.S.-based institutions that administered the survey to all students or utilized a random sampling technique. Multilevel models were based on an analytic sample was 91,322 students nested in 103 schools. The analytic sample was derived after omitting students from two-year schools (only five of the participating institutions were two-year schools, which did not allow for meaningful analysis),

respondents who were not seeking degrees, as well as those aged 41 years or older. The Georgia

State University Institutional Review Board reviewed the protocol and declared it exempt.

Description of Key Study Variables

The ACHA-NCHA IIb consisted of 66 items related to student health behaviors and

outcomes. For this study, 15 items relevant to the research questions were examined.

Outcome. The outcome measure *misuse* encompassed affirmative responses to items

about heroin use, NMUOPD, or concurrent use of both drug types. The first component item

asked participants on how many days within the last 30 did they use *opiates (heroin, smack)*,

with response options of *never used*; *have used but not in the last 30 days*; and day intervals all

the way up to *used daily*. These response choices were dichotomized into *never used* and all

other values. The second component item asked participants if in the last 12 months, they have

taken any of the following prescription drugs that were not prescribed to them: *pain killers (e.g.,*

OxyContin, Vicodin, Codeine), with response options of *no* and *yes*.

Individual level predictors. The independent variable assessed SSM/V status with the

item *are you currently or have you been a member of the United States Armed Services (Active*

Duty, Reserve, or National Guard)? Response options were no; yes and *I have* deployed to an

area of hazardous duty; and yes and *I have not* deployed to an area of hazardous duty. To explore

the research questions, this variable was computed into two predictors: whether a student is

civilian or SSM/V and if SSM/V, whether one served in hazardous duty or not. Adjusted models

controlled for the covariates of age, gender and ethnicity. For age, respondents were asked "how

old are you?", with an open-ended response field. Ethnicity was assessed by asking respondents

to select all that apply from a list of descriptors, dichotomized as white or non-white. For gender,

participants were asked to select among female, male, or transgender. Covariates were all dichotomized to facilitate multilevel modeling, discussed later. The continuous age variable was recoded as ages 18-22=1 and 23-40=0.

Environmental level predictors. These characteristics are measured by four items answered by the survey contact at each institution (not by individual student respondents). Institution designation is either public or private. Urbanicity is categorized based on the population of the area surrounding campus and was dichotomized into populations of 49,999 or fewer and 50,000 or more. Response options for student enrollment were dichotomized into 9,999 or fewer and 10,000 or more students. Geographic region is entered into the dataset by ACHA research personnel in the following categories: Northeast, Midwest, South, and West and a list of component states can be found online (American College Health Association, 2015).

Analysis

The analysis proceeded in 3 steps. SPSS version 24 was used, including GENLINMIXED for multilevel models (MLM). MPlus version 8 was used subsequently for binary logistic regression. Initially, one null or random-intercept-only MLM was estimated: an IHE-only MLM in which students were clustered in schools. This null model estimated an intraclass correlation coefficient (ICC; i.e. the proportion of variation in the outcome that was due to differences across schools rather than differences across students). Second, a model including civilian/SSM/V status and hazardous/non-hazardous duty predictors was used to examine the effect of each of these measures at Level 1 as well as variability at the IHE level. Given the nested format of the data the researchers originally planned to model variability within- (Level 1) and between- (Level 2) schools. However, as presented in Table 3, the results from the second model above showed limited variability in Level 1 predictor effects at Level 2. Due to this

limited variability, the final step was to use MPlus with the clustered observations option (i.e.

sandwich estimator) to fit models 1, 3, and 3 (Table 4) that included both student- and IHE-level

covariates, which allowed examination of opioid misuse predictors after taking into account the

covariates.

Results

Descriptive analyses showed the median age of respondents at the time of the survey was

21 (M = 22.58, SD = 5.86); 18% were graduate students; the majority (67.6%) described

themselves as white. Of the 108 participating institutions, 72 were public and 36 were private.

Nineteen were in the Northeast, 35 in the Midwest, 29 in the South, and 25 in the Western U.S.

Individual and institutional characteristics are summarized in Table 1 and Table 2, respectively.

Most civilian respondents were female (68%) and younger (71%) while the SSM/V population

was predominately male (71%) and older (74%). Among SSM/V, 47% served in hazardous duty.

The overall prevalence of student opioid misuse was 7% but among SSM/V, 14% reported

having ever misused opioids. The ICC = 2.20, suggesting that about 2% of the variability in

opioid misuse existed between schools. While 2% variability was small, with a large sample size

of 91,322 a MLM was constructed in the event IHE level variance could be detected for Level 1

predictors.

Table 3 shows the results of the regression model examining individual-level variables.

The odds of opioid misuse among men were 39% higher (odds ratio [OR] = 1.39, 95%

confidence interval [CI] = [1.325, 1.463]) than the odds for females. For students of typical

undergraduate ages, < 22, the odds of misusing any opioids were less than for those students 23

or older (OR = 0.084, 95% CI = [0.077, 0.091]). Opioid misuse did not vary significantly by

ethnicity. The odds of opioid misuse for civilians were approximately 8% lower compared to

SSM/V (OR = 0.917, 95% CI [0.064, 0.099]). The odds for SSM/V who had been deployed in hazardous duty to misuse opioids were almost 60% higher than for SSM/V who were not deployed in hazardous duty (OR=1.588, 95% CI [1.199, 2.104]).

Multivariate Prediction of Opioid Misuse among SSM/V from the NCHA

As shown in Table 4, even after controlling for age, ethnicity and gender, civilian students were significantly less likely to report any opioid misuse (AOR=0.949, 95% CI [0.903, 0.996]); and among SSM/V, those who served in hazardous duty were significantly more likely to report opioid misuse (AOR=1.205, 95% CI [1.050, 1.384]). Institutional covariates in the model included region and whether the IHE is public or private. The odds of opioid misuse for students in the Western region were 30% higher than for those in other parts of the U.S. (AOR=1.3, 95% CI [1.188, 1.422]). The odds of opioid misuse for students in private institutions were approximately 16% less than for those in public schools (AOR=0.837, 95% CI [0.940, 1.161]). School enrollment and urbanicity were not significant predictors of risk. In model 3, after adding significant institutional characteristics to the covariates that were held constant, predictors of risk continued to include hazardous duty (AOR=1.205, 95% CI [1.054, 1.378]); but there was no significant difference between civilians and SSM/V at this level.

<div align="center">**Discussion**</div>

This study examined the overall prevalence and identified risk and protective factors for opioid misuse by SSM/V enrolled as undergraduate and graduate students in a sample of U.S. institutions of higher education. The overall past-year prevalence for any opioid misuse (heroin and/or prescription opioid abuse) was almost 7% but among SSM/V it was 11% and among those who had served in hazardous duty it was 14%. Rates for student opioid misuse in the scientific literature vary, depending on the sample and the item construction. The overall rate of

misuse is the same past-year rate that McCabe and colleagues found over ten years ago, although their analysis did not include heroin (McCabe, Teter, Boyd, et al., 2005). A more recent study found an overall lifetime rate of misuse of 16%, including heroin and prescription opioids, among a sample of college and same-age non-college peers (Q Market Research, 2015). For past year use, the 2016 Monitoring the Future study found opioid misuse rates half as high as those found on the NCHA (Schulenberg et al., 2017). Further research is necessary to understand why reported rates by college students differ on national surveys. Variation in the item construction is one concern (Palamar et al., 2016). While the higher rates for SSM/V and those SSM/V who served in hazardous duty are within the range in the literature of 3%-16% for college samples overall, the fact that these rates are so high within the same survey, with the same sampling technique and same item construction, is of particular note.

Regarding individual characteristics identified in previous studies, misuse was expected to be greater among white students, (Dart et al., 2014; McCabe, Teter, & Boyd, 2005) but the current study did not find any significant variation in reported use by ethnicity. The current study found males more at risk for opioid use, whereas, in prior studies males were more likely to use heroin but females were more likely to use certain types of prescription opioids (Schulenberg et al., 2017). Demographically, SSM/V in the NCHA sample were disproportionately older and male (Table 1); and while the current research controlled for these covariates, they are exactly the individual level predictors most likely to signal risk for opioid misuse in prior studies. Civilian students were less likely to misuse opioids than SSM/V, and among SSM/V, those who were deployed in hazardous duty were at higher risk for opioid misuse. Combat exposure could yield more impact from trauma or injury that might coincide with the dangerous iatrogenic implications of prescription opioids. The results of this study are consistent with prior research

that found males and SSM/V more at risk for substance use broadly (Barry, Whiteman, Wadsworth, & Hitt, 2012; Schulenberg et al., 2017). However, this study is novel in studying opioid misuse among SSM/V.

There are no previous studies regarding specific associations between institutional characteristics of IHE and student opioid misuse. Oswalt and colleagues found associations between alcohol, tobacco and marijuana use, and school type, geographic region, and student enrollment (Oswalt et al., 2015). Student respondents at public institutions were less likely to report alcohol and marijuana use in the past 30 days than their private school peers, but there was no difference in cigarette use. However, in the current study, private school attendance was protective for opioid misuse. In the Oswalt study, students in the Northeast had the highest reported rates for all three substances, as did students at small schools (<2500). However, in the current study, participants at schools in the Western region of the U.S. had the highest opioid misuse, and there was no difference in reported misuse by school enrollment. Based on research of non-college populations, the regional finding in the current study of opioid misuse was surprising as rates were expected to be highest in the Northeast, Midwest and South (Centers for Disease Control and Prevention Injury Center, 2018; Levine & Coupey, 2009; Unick & Ciccarone, 2017). This finding from the NCHA should be further explored in future research. Perhaps there is an effect due to students attending school outside of their home state, as normative behaviors and types of substances abused appear to be associated with geographical settings. To illustrate, the Western U.S. had an increase in opioid prescribing rates (Centers for Disease Control and Prevention Injury Center, 2017) yet none of the states with the greatest increase in opioid overdose deaths in 2015-2016 were in the Western U.S. region as it is defined by ACHA (Centers for Disease Control and Prevention Injury Center, 2018).

As student affairs and campus health professionals aspire to integrate veterans and service members into the fabric of student life, they are becoming more attuned to the needs of this population. Ongoing efforts in reducing stigma and increasing social inclusion are important. In addition, SSM/V may benefit from intentional screening for mental health concerns including addiction. Discussion of alternative coping and pain management strategies may also be beneficial for SSM/V in clinical, counseling and advising interactions. Campus healthcare providers may wish to consult the ACHA Guidelines for Opioid Prescribing in College Health (American College Health Association, 2016). Skill-building in emotional regulation and social support is an important health promotion strategy for this group (Williston & Roemer, 2017). Other audiences for this research include public health investigators, law enforcement, and military personnel, their families, and their healthcare providers. Until further research is conducted, the root causes of differences in opioid misuse among SSM/V will remain unknown.

Limitations

This study relied on student self-report regarding opioid use and SSM/V status. Recall bias and other limitations of survey research may exist. Nonetheless, student self-report is a commonly accepted method in substance use studies with higher education samples, and the NCHA is noted for producing population-level data that are generally both valid and reliable (American College Health Association, 2000). Respondents were from 103 colleges and universities, and results might not be generalizable to the larger student population. The number of participants reporting opioid misuse was small, and this might have impacted the ability to identify statistically significant relationships with other measures. Finally, the characteristics of NCHA participants might not mirror those who refused, were not selected, or were not eligible to participate.

Conclusion

This study identified significant, elevated odds of opioid misuse in the SSM/V population, especially among those who served in hazardous duty. Further research is needed to explore risks and protective characteristics for SSM/V to enhance intervention and treatment and bolster post-secondary success.

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Table 1

Sample Characteristics

		Civilian (N=89,180)		SSM/V (N=1,729)		Hazardous (N=808)		Duty Non-Hazardous (N=921)	
		%	N	%	N	%	N	%	N
Age	23-40	29%	25,956	74%	1,274	93%	754	56%	520
	18-22	71%	63,224	26%	455	7%	54	44%	401
Ethnicity	White	61%	54,343	66%	1,135	67%	545	64%	590
	Non-White	39%	34,837	34%	594	33%	263	36%	331
Gender	Male	32%	28,170	71%	1,208	81%	643	62%	565
	Female	68%	60,429	29%	499	19%	152	38%	347
Misuse	Yes	7%	6,657	11%	189	14%	112	8%	77
	No	93%	82,523	89%	1,540	86%	696	92%	844

Note. Percentages may not equal 100% due to rounding.

Table 2

Institutional Characteristics

		Students		Report Opioid Misuse	
		%	N	%	N
Region	Northeast	25%	22,706	7%	1,511
	Midwest	23%	20,829	7%	1,421
	South	22%	19,972	8%	1,505
	West	31%	27,815	9%	2,466
Enrollment	<2,500	8%	7,053	8%	556
	2,500-4,999	6%	5,775	6%	362
	5,000-9,999	14%	12,383	8%	963
	10,000-19,999	22%	19,822	7%	1,458
	≥20,000	51%	45,962	8%	3,564
Type	Public	65%	59,226	8%	4,738
	Private	35%	32,096	7%	2,165
Urbanicity	≥500,000	34%	30,556	8%	2,311
	250,000-499,999	8%	7,611	8%	588
	50,000-249,999	33%	29,891	8%	2,344
	10,000-49,999	22%	19,777	7%	1,413
	2,500-9,999	3%	2,705	8%	217
	<2500	1%	455	7%	30

Note. Percentages may not equal 100% due to rounding.

Table 3

Univariate Effects on the Likelihood of Opioid Misuse

	Step 1			Step 2			
	Does misuse vary across any level 1 predictors?			*Do any significant level 1 predictors vary across school?*			
		95% CI					95% CI	
Variable	OR	Lower	Upper	Estimated variance	S. E.	Lower	Upper
Age (younger)	0.084	0.077	0.091*	0.010	0.009	0.002	0.057
Gender (male)	1.39	1.325	1.463*	*Unable to fit model*			
Ethnicity (white)	0.946	0.870	1.028	0.040	0.015	0.019	0.082
Civilian	0.917	0.064	0.099*	*Unable to fit model*			
Hazardous duty	1.588	1.199	2.104*	*Unable to fit model*			
CI=confidence interval, *p<0.05; OR= Odds Ratio; AOR=Adjusted Odds Ratio							

Table 4

Predictors of Opioid Misuse Among SSM/V

Predictors	Model 1		Model 2[a]		Model 3[b]	
	OR	CI	AOR	CI	AOR	CI
Civilian	0.889	0.851, 0.929*	0.949	0.903, 0.996*	0.956	0.913, 1.002
Hazardous duty	1.309	1.113, 1.539*	1.205	1.050, 1.384*	1.205	1.054, 1.378*
Age	0.866	.819, 0.959*				
Gender	1.395	1.328, 1.464*				
Ethnicity	0.95	0.886, 1.019				
Region	1.305	1.196, 1.425*	1.3	1.188, 1.422*		
Public/Private	0.84	0.772, 0.913*	0.837	0.772, 0.907*		
Enrollment	1.049	0.937, 1.174	1.001	0.888, 1.127		
Urbanicity	1.077	0.969, 1.197	1.045	0.940, 1.161		

CI=confidence interval, *$p<0.05$; OR= Odds Ratio; AOR=Adjusted Odds Ratio

[a]Model 2 includes age and gender as covariates.

[b]Model 3 adds school level variables as covariates.

Chapter Four: Suicidality, Sleep, Pain, and Chronic Illness among Students Who Misuse Opioids

Abstract

Background: Opioid misuse (OM) is correlated with mental health concerns, pain diagnoses, and individual and environmental characteristics in adult populations. However, little is known about how OM manifests at the post-secondary level. This study examined the association between select diagnoses, painful conditions and mental health concerns and OM and explored whether sleep difficulties mediated a relationship between suicidality and OM among a sample of full-time students (N = 91,322) enrolled at 103 institutions who participated in the spring 2015 American College Health Association–National College Health Assessment IIb (ACHA-NCHA IIb) survey.

Methods: Multilevel modeling (MLM) and binary logistic regression were used to examine associations between OM and comorbid conditions. A path analysis with a test for mediation was also conducted.

Results: Students who reported misusing opioids had double the odds of reporting suicidality (AOR = 2.317, 95% CI [2.193, 2.448]), and several other health outcomes such as chronic illness, anxiety and depression. Further, students with sleep difficulties had elevated odds for suicidality (AOR=1.876, 95% CI [1.810, 1.946]). Notably, sleeping difficulties partially mediated the relationship between OM and suicidality.

Conclusion: The results of this study may prompt college health professionals to screen for OM and target prevention and intervention appropriately. Further research is needed to enhance prevention.

Background

It is widely understood that opioid misuse in the United States has reached epidemic levels. Opioid misuse in the current study is defined as nonmedical prescription opioid misuse, heroin use, or any combination of the two. Opioid misuse is correlated with mental health concerns and pain diagnoses, as well as other individual and environmental characteristics in adult populations including personality traits, risk perceptions, gender, age, ethnicity, access to opioid medications, geographic region and community characteristics. There are currently 4.3 million nonmedical users of pain relievers and 435,000 heroin users in the United States (Center for Behavioral Health Statistics and Quality, 2015). Nonmedical prescription opioid use may begin early. Wu and colleagues found that one in ten adolescents ages 12-17 reported nonmedical use of prescription opioids, with a mean age of onset of just 13 years, similar to the age of onset for alcohol and marijuana (Wu, Woody, Yang, & Blazer, 2010). Studies have found a lifetime prevalence of adolescent opioid misuse between 12-16% (McCabe, Teter, & Boyd, 2005; Q Market Research, 2015). Opioids are particularly dangerous because of their iatrogenic effect; their potential harm is induced inadvertently as a result of medical treatment, and users may become addicted even when using prescribed pain medication appropriately (Beauchamp et al., 2014).

Adolescence and early adulthood are developmental periods when young people are at most risk for substance abuse as well as the onset of mental illness (Pedrelli, Nyer, Yeung, Zulauf, & Wilens, 2015). Several studies of adolescent samples have identified mental health symptoms, use of mental health services, and diagnoses (depression, ADHD, manic disorder) as predictors of opioid misuse (Schepis & Krishnan-Sarin, 2008; Subramaniam & Stitzer, 2009; Wu et al., 2008) as well as poly-substance use (Ford, 2008; Ford & Arrastia, 2008; Harrell &

Broman, 2009). There have been a limited number of studies of these associations with college samples yet higher education is associated with stress related to academics, managing finances and relationships, social isolation, and balancing work, studies and family responsibilities (Pedrelli et al., 2015). For over a decade, college counseling center directors have reported an increasing frequency and severity of student mental health concerns, with anxiety and depression being the most common presenting issues (Pedrelli et al., 2015). Furthermore, mental illness, physical health conditions and substance use are interrelated. Among students in higher education, there is an association between opioid prescription drug misuse and increases in self-reported symptoms of mental illness and suicidality, (Lord et al., 2011; Wong et al., 2013; Zullig & Divin, 2012) as well as an association among young adults between pain-related diagnoses and opioid misuse (Kenne et al., 2017; Novak et al., 2009). Back pain is one of the most frequently reported physical ailment among students. One study found that student back pain was most strongly predicted by psychosocial factors, including fatigue and emotional abuse (Gilkey, Keefe, Peel, Kassab, & Kennedy, 2010); another found associations between back pain, self-esteem and campus participation among students using wheelchairs (Rice, Wong, Salentine, & Rice, 2015); and another study found connections between physical disability and depression in students with lower back pain (Handrakis et al., 2012). These manifestations of physical and mental illness are not single-issue diagnoses and comorbidity is common.

The current study is the first to explore these comorbid associations as they relate to opioid misuse specifically among students in a national sample. The purpose of this study was to examine whether there was an association between opioid misuse and other mental health symptoms; opioid misuse and medical diagnoses of painful conditions; and opioid misuse, sleep difficulties and suicidality. If so, did sleep difficulties mediate the relationship between opioid

misuse and suicidality among students as it does in other populations? Based on prior research, it was hypothesized that there would be an association between opioid misuse and mental health symptoms and suicidality as well as an association between pain-related diagnoses and opioid misuse.

Methods

The data for this study came from the 2015 spring ACHA-NCHA IIb, a survey of undergraduate and graduate students that examines health and health-related behaviors and includes information about individual, social and environmental determinants (American College Health Association, 2015). Colleges and universities conduct the ACHA-NCHA IIb in accordance with their own needs, resources and policies. One hundred and eight institutions self-selected to participate in spring 2015, with a total of 93,034 respondents and there was an overall response proportion of 22.4% (American College Health Association, 2015). Eligibility criteria for cases included U.S.-based institutions that administered the survey to all students or utilized a random sampling technique. Multilevel models were based on an analytic sample was 91,322 students nested in 103 schools. The analytic sample was derived after omitting students from two-year schools (only five of the participating institutions were two-year school which did not allow for meaningful analysis), respondents who were not seeking degrees, as well as those aged 41 years or older. The Georgia State University Institutional Review Board reviewed the protocol and declared it exempt.

Description of Key Study Variables

The ACHA-NCHA IIb consisted of 66 items related to student health behaviors and outcomes. For this study, 15 relevant items were examined. The outcome measure *misuse* encompassed affirmative responses to items about heroin use, NMUOPD, or concurrent use of

both drug types. Predictor variables included individual characteristics: age, gender, ethnicity, mental and physical health concerns, and institutional characteristics: region, type, enrollment and urbanicity. Table 1 presents the variables related to mental and physical health and how they were operationalized. Adjusted models controlled for the covariates of age, gender and ethnicity.

Analysis

The analysis proceeded in three steps. SPSS version 24 was used, including GENLINMIXED for multilevel models (MLM). MPlus version 8 was used subsequently for binary logistic regression. Initially, one null or random-intercept-only MLM was estimated: an IHE-only MLM in which students were clustered in schools. This null model estimated an intraclass correlation coefficient (ICC; i.e. the proportion of variation in the outcome that was due to differences across schools rather than differences across students). Second, a model including individual predictors was used to examine the effect of each of these measures at Level-1, as well as variability at the IHE level. In addition to demographic variables, mental- and physical illness predictors were added to the model. These included measures of suicidality, anxiety, depression, chronic illness, mobility disability, back pain and broken bone, fracture, or sprain (see Table 1). Given the nested format of the data the researchers originally planned to model variability within- (Level 1) and between- (Level 2) schools. However, as presented in Table 4, the results from the second model above showed limited variability in Level 1 predictor effects at Level 2. Due to this limited variability, the final step was to use MPlus with the clustered observations option (i.e. sandwich estimator) to fit models 1, 3, and 3 (Table 5) that included both student- and IHE-level covariates, which allowed examination of opioid misuse predictors after considering the covariates.

For the final research question exploring whether sleep difficulties mediate the relationship between opioid misuse and suicidality, MPlus was used to conduct a path analysis with a test for mediation. As shown in Figure 1, the conceptual premise of the model included paths from misuse to both sleep difficulties and suicidality, as well as from sleep difficulties to suicidality. Analyses controlled for co-occurrence of depression.

Results

Descriptive statistics revealed the median age of respondents at the time of the survey was 21 ($M = 22.58$, $SD = 5.86$); 18% were graduate students; the majority (67%) described themselves as white and female (61%). Of the 108 participating institutions, 72 were public and 36 were private. Nineteen were in the Northeast, 35 in the Midwest, 29 in the South, and 25 in the Western U.S. Additional demographic and institutional characteristics are presented in Tables 2 and 3, respectively. Respondent symptoms and diagnoses ranged from 1% endorsing a mobility disability to 88% endorsing back pain. Nearly a quarter (23%) of students reported symptoms of suicidality.

The overall prevalence of student opioid misuse was 7%. The ICC = 2.20, suggesting that about 2% of the variability in opioid misuse existed between schools. While 2% variability was small, with a large sample size of 91,322 a MLM was constructed in the event IHE level variance could be detected for Level 1 predictors. Table 4 presents the results of the model examining individual level variables. The odds of opioid misuse among men were 39% higher (odds ratio [OR] = 1.39, 95% confidence interval [CI] = [1.325, 1.463]) than the odds for females. For students of typical undergraduate ages, < 22, the odds of misusing any opioids were 13% lower than for those students 23 or older (OR = 0.084, 95% CI = [0.077, 0.091]). Opioid misuse did not vary significantly by ethnicity. The odds of opioid misuse were higher for

students reporting any of the health conditions examined in the current study. For students

reporting suicidality, the odds of opioid misuse were 132% higher compared to those students

who did not report symptoms of suicidality (OR=2.317, 95% CI [2.193, 2.448]). The odds of

opioid misuse for students diagnosed with anxiety were 89% higher than if not (OR=1.888, 95%

CI [1.792, 1.989]). The odds of opioid misuse for students diagnosed with depression were 118%

higher than if not (OR=2.179, 95% CI [2.066, 2.299]). Students with any chronic illness were

65% more likely to misuse opioids (OR=1.65, 95% CI [1.503, 1.812]). The odds of misusing

opioids were 190% higher for students with mobility disabilities (OR=2.909, 95% CI [2.414,

3.504]) than students who did not indicate this condition. The odds of opioid misuse for students

diagnosed with back pain were 87% higher than students who had not been diagnosed with back

pain (OR=1.877, 95% CI [1.747, 2.017]). The odds of opioid misuse for students diagnosed with

a broken bone or sprain in the past year were 100% higher than for students without these

diagnoses (OR=2.042, 95% CI [1.895, 2.202]).

Multivariate Prediction of Opioid Misuse from the NCHA with Co-Morbid Diagnoses

As shown in Table 5, even after controlling for age, ethnicity and gender, students were

significantly more likely to report any opioid misuse if they reported suicidal symptoms

(adjusted odds ratio [AOR]=2.347, 95% CI [2.226, 2.476]); were diagnosed with anxiety

(AOR=2.017, 95% CI [1.912, 2.128]; were diagnosed with depression (AOR=2.289, 95% CI

[2.167, 2.417]) indicated they had a chronic illness (AOR=1.706, 95% CI [1.559,1.867] or

mobility disability (AOR=2.650, 95% CI [2.196, 3.198]); or were diagnosed with back pain

(AOR=1.911, 95% CI [1.782, 2.050]) or broken bone (AOR=2.025, 95% CI [1.880, 2.182]).

Environmental covariates in the model included region and whether the IHE is public or private.

The odds of opioid misuse for students in the Western region were 30% higher than for those in

other parts of the U.S. (AOR=1.3, 95% CI [1.188, 1.422]). The odds of opioid misuse for students in private institutions were approximately 16% less than for those in public schools (AOR=0.837, 95% CI [0.940, 1.161]). School enrollment and urbanicity were not significant predictors of risk. In model 3, after adding significant institutional characteristics to the covariates that were held constant, predictors of risk continued to include all of the comorbid diagnoses and self-reported conditions: suicidality (AOR=2.33, 95% CI [2.209, 2.458]); diagnosis of anxiety (AOR=2.029, 95% CI [1.923, 2.141]); diagnosis of depression (AOR=2.292, 95% CI [2.170, 2.420]); chronic illness (AOR=1.704, 95% CI [1.552, 1.870]); mobility disability (AOR=2.601, 95% CI [2.162, 3.129]); diagnosis of back pain (AOR=1.892, 95% CI [1.765, 2.028]) or diagnosis of fracture or sprain (AOR=2.017, 95% CI [1.870, 2.174]).

Logistic Regression and Path Analysis of Sleep, Opioid Misuse and Suicidality

Students who reported opioid misuse were almost twice as likely to report suicidality (AOR = 1.990, 95% CI [1.894, 2.091]). Students with sleeping difficulties had much higher odds for suicidality as well (AOR=1.876, 95% CI [1.810, 1.946]). Due to these higher odds, a path analysis was conducted to test if sleeping difficulties mediated the relationship between opioid misuse and suicidality (see Figure 1 for structure of path model). Overall, opioid misuse explained 9% of the variance of suicidality (i.e., total effect of opioid misuse). Partitioning of the total opioid misuse effect (i.e., direct from opioid misuse and indirect via sleeping difficulties) indicated that approximately one percent of the total effect on suicidality was explained by the effect of opioid misuse on sleep and subsequent effects of sleeping difficulties on suicidality (see Figure 2 where 0.044 x 0.156 = 0.00684). The direct effect of opioid misuse on suicidality was 8%, that is, opioid misuse effectively accounted for 8% of individual differences in suicidality. Overall, this mediation analysis indicated that sleep partially mediated the effect of opioid

misuse on suicidality in students after controlling for other covariates, including depression diagnosis (see Table 6 for path analysis results; see Figure 2 for path model with standardized path loadings).

Modeling the Interaction of Sex as a Biological Variable

Given the importance of gender differences in all phases of addiction, (Becker & Hu, 2008) a post-hoc analysis was conducted to examine the effect of gender on other predictors among students reporting diagnoses and conditions. After controlling for all covariates, including institutional characteristics, among students reporting suicidal symptoms, an examination of whether the odds of opioid misuse were the same between genders revealed that the odds of opioid misuse were greater amongst males i.e., the odds of opioid misuse were 1.3 points higher (3.71; interaction effect=1.375, 95% CI [1.278, 1.479]). Elevated odds for males persisted across the other diagnoses and self-reported conditions: anxiety (3.92; AOR=1.885, 95% CI [1.717, 2.070]); depression (3.89; AOR=1.600, 95% CI [1.453, 1.761]); chronic illness (3.27; AOR = 1.566, 95% CI [1.272, 1.927]); back pain (3.45; AOR=1.553, 95% CI [1.380, 1.746]); and broken bone/sprain (3.64; AOR=1.620, 95% CI [1.392, 1.885]). Only mobility disability did not have a significant gender effect.

Discussion

Emerging research with adult populations has explored associations between sleep, pain, physical conditions, opioid misuse and suicidality (Ahmedani et al., 2014, 2017; Owen-Smith et al., 2017). However, little is known about how these symptoms manifest in post-secondary student populations.

This study examined associations between comorbid diagnoses and opioid misuse by students enrolled as undergraduate and graduate students in a sample of U.S. institutions of

higher education. The overall past-year prevalence for any opioid misuse (heroin and/or prescription opioid abuse) was almost 7%. This is the same past-year rate that McCabe and colleagues found over ten years ago, although their analysis did not include heroin (McCabe, Teter, Boyd, et al., 2005). A more recent study found an overall lifetime rate of misuse of 16%, including heroin and prescription opioids, among a sample of college and same-age non-college peers (Q Market Research, 2015). For past year use, the 2016 Monitoring the Future study found opioid misuse rates half as high as those found on the NCHA (Schulenberg et al., 2017). Further research is necessary to understand why reported rates by college students differ on national surveys. Variation in the item construction is one concern (Palamar et al., 2016). Among students with comorbid health conditions, the odds of opioid misuse were elevated dramatically, for example, the adjusted odds ratios were over 2.0 for suicidality, anxiety, depression, mobility disability and broken bones/sprains.

Regarding individual characteristics identified in previous studies, misuse was expected to be greater among white students, (Dart et al., 2014; McCabe, Teter, & Boyd, 2005) but the current study did not find any significant variation in reported use by ethnicity. The current study found males more at risk for opioid use, whereas, in prior studies males were more likely to use heroin but females were more likely to use certain types of prescription opioids (Schulenberg et al., 2017).

There are no previous studies regarding associations between institutional characteristics of IHE and student opioid misuse specifically. However, Oswalt and colleagues found associations between alcohol, tobacco and marijuana use, and school type, geographic region, and student enrollment (Oswalt et al., 2015). Student respondents at public institutions were less likely to report alcohol and marijuana use in the past 30 days than their private school peers, but

there was no difference in cigarette use. However, in the current study, private school attendance was protective for opioid misuse. In the Oswalt study, students in the Northeast had the highest reported rates for all three substances, as did students at small schools (<2500). However, in the current study, participants at schools in the Western region of the U.S. had the highest opioid misuse, and there was no difference in reported misuse by school enrollment. Based on research of non-college populations, the regional finding in the current study of opioid misuse was surprising as rates were expected to be highest in the Northeast, Midwest and South (Centers for Disease Control and Prevention Injury Center, 2018; Levine & Coupey, 2009; Unick & Ciccarone, 2017).

The current research provides support for healthcare providers on and near campuses to screen their student patients for substance abuse, including opioid misuse. If universal screening is not feasible, then the results of this study suggest that targeted screening could occur whenever there is a history or diagnosis of sleep difficulties; anxiety; depression; suicidality; chronic illness; impaired mobility; back pain; or broken bone or sprain. In addition, healthcare providers caring for student patients may wish to consult recent guidelines for managing pain while reducing the risk for iatrogenic opioid misuse (American College Health Association, 2016). Finally, campus personnel and student advocates may pursue preventive action outside the realm of treatment by putting into place safety and injury prevention coalitions including partners in athletics and environmental, health and safety compliance, among others, as well as by enhancing mental wellbeing through universal and selected public health strategies. Future research is needed to examine the findings of this study in association with student healthcare utilization on- and off-campus, as well as qualitative and quantitative explorations of barriers to help-seeking for students with mental health concerns, painful conditions, and addiction. In

addition, while the construct of *suicidality* in this study was comprised of students who responded affirmatively to having ever considered suicide *and* to having ever attempted suicide, those populations of students may diverge considerably as many more people consider suicide than attempt suicide. Further study should dis-aggregate these groups and explore associations with opioid misuse and sleep difficulties with each group separately. While the findings in this study for these relationships between suicidality, sleep difficulties and opioid misuse were significant, the associations are potentially even stronger if examining just those students who reported attempting suicide.

Limitations

This study relied on student self-report, so recall bias and other limitations of survey research may exist. Nonetheless, student self-report is a commonly accepted method in substance use studies with higher education samples, and the NCHA produces population-level data that are generally both valid and reliable (American College Health Association, 2000). Data on dates of diagnoses, opioid misuse and suicidality were not available. Therefore, the order of these events could not be established. The prevalence of diagnoses estimated using NCHA data might not be consistent with estimates derived from clinical records or symptom assessment. Respondents were from 103 colleges and universities, and results might not be generalizable to the larger student population. The number of participants reporting opioid misuse was small, and this might have impacted the ability to identify statistically significant relationships with other measures. Finally, the characteristics of NCHA participants might not mirror those who refused, were not selected, or were not eligible to participate.

Conclusion

This study explored associations between opioid misuse by students and comorbid conditions related to pain, injury, disability and mental health. Logistic regression analyses found significant associations between opioid misuse and diagnoses of depression, anxiety, back pain and fractures, as well as self-reported conditions of chronic illness, mobility disability and suicidality. Students reporting any of these conditions had elevated odds for opioid misuse and males with any studied condition except mobility disability had elevated odds for opioid misuse over their female counterparts. Sleep difficulties, suicidality and opioid misuse were also associated with each other. Students reporting opioid misuse displayed greater odds for both sleep difficulties and suicidality. Sleep difficulties partially mediated the relationship between opioid misuse and suicidality. Screening for substance abuse in campus health and counseling centers is recommended, especially for students presenting with the mental or physical symptoms or conditions explored in this study. In addition, further study is necessary to more deeply explore these associations.

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Figure 1. Conceptual Path Model
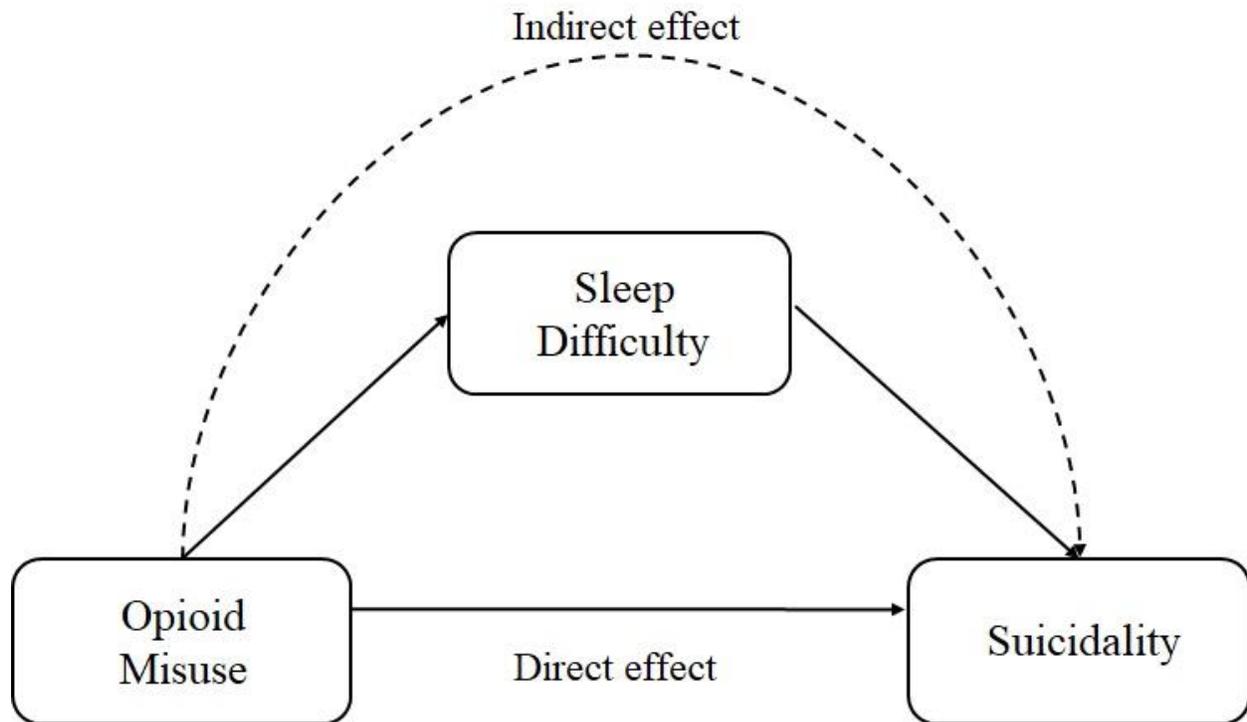
Diagram showing conceptual path model examining the direct and indirect effects of opioid misuse on suicidality via sleeping difficulties.

Figure 2. Path Analysis Results
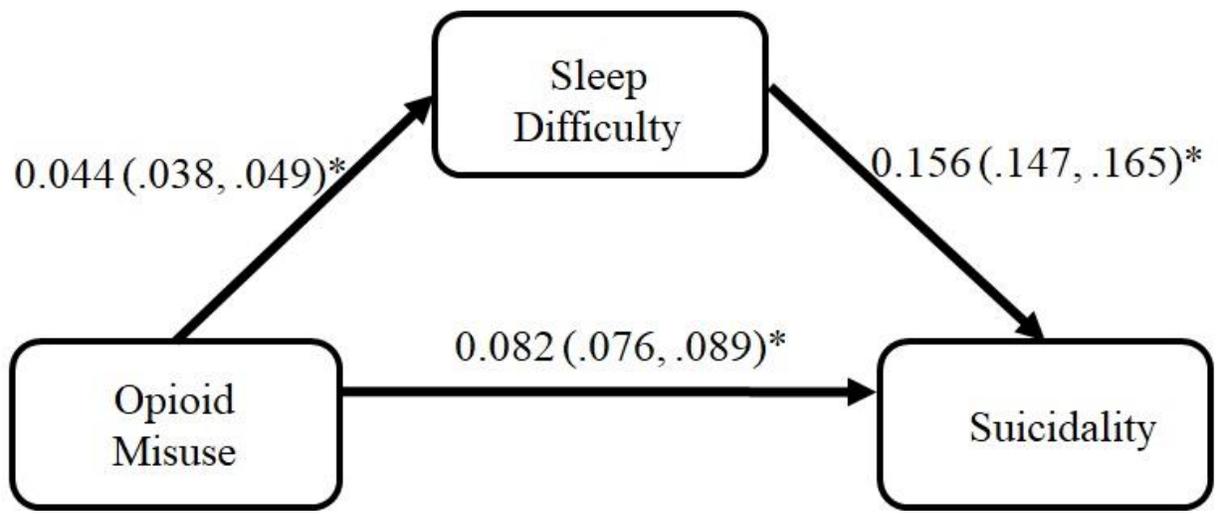
Diagram showing standardized path loadings of path model examining the direct and indirect effects of opioid misuse on suicidality via sleeping difficulties. Notation: * indicates a parameter with a p-value < 0.05.

Table 1			
Key Variables			
Name	**Item**	**Response Options**	**New variable created**
Suicidality	Have you ever: felt things were hopeless; felt very lonely; felt very sad; felt so depressed that it was difficult to function; seriously considered suicide; attempted suicide?	No, never; no, not in the last 12 months; yes, in the last 2 weeks; yes, in the last 30 days; yes, in the last 12 months	Composite variable "suicidal" created from any response except "no, never."
Anxiety	Within the last 12 months, have you been diagnosed or treated by a professional for any of the following? anxiety	No; yes, diagnosed but not treated; yes, treated with medication; yes, treated with psychotherapy; yes, treated with medication and psychotherapy; yes, other treatment; <u>Recoding:</u> 0 = no; 1= yes	
Depression	Within the last 12 months, have you been diagnosed or treated by a professional for any of the following? depression	No; yes, diagnosed but not treated; yes, treated with medication; yes, treated with psychotherapy; yes, treated with medication and psychotherapy; yes, other treatment; <u>Recoding:</u> 0 = no; 1= yes	
Back pain	Within the last 12 months, have you been diagnosed or treated by a professional for any of the following? back pain	Yes, No	
Broken bone/Fracture/ Sprain	Within the last 12 months, have you been diagnosed or treated by a professional for any of the following? broken bone/fracture/sprain	Yes, No	
Chronic illness	Do you have any of the following? Chronic illness (e.g., cancer, diabetes, auto-immune disorders)	Yes, No	
Mobility disability	Do you have any of the following? Mobility disability	Yes, No	
Sleep difficulty	In the past 7 days, how much of a problem have you had with sleepiness (feeling sleepy, struggling to stay awake) during your daytime activities?	Response options were a) no problem at all; b) a little problem; c) more than a little problem; a big problem; and e) a very big problem. <u>Recoding:</u> Responses were dichotomized with a and b as the referent and c, d, and e combined as the variable of interest.	
Suicidality (2)	Have you ever: seriously considered suicide; attempted suicide?	No, never; no, not in the last 12 months; yes, in the last 2 weeks; yes, in the last 30 days; yes, in the last 12 months	Composite variable "suicidality" created from any response except "no, never." Other symptoms were omitted from this item in order to help control for depression.

Table 2

Sample Characteristics

		Students		Report Opioid Misuse	
		<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>
Gender	Male	33%	29,541	9%	2,796
	Female	67%	61,154	7%	3,991
Ethnicity	White	61%	55,653	8%	4,183
	Non-White	39%	35,669	8%	2,720
Age	≥23	30%	27,399	7%	2,054
	18-22	70%	63,923	7%	4,288
Suicidality	Yes	23%	21,043	13%	2,759
	No	77%	69,514	6%	3,998
Anxiety	Yes	16%	14,245	12%	1,768
	No	84%	76,233	7%	4,983
Depression	Yes	13%	11,780	14%	1,642
	No	87%	78,735	6%	5,101
Chronic Illness	Yes	5%	4,420	12%	528
	No	95%	86,136	7%	6,240
Mobility disability	Yes	1%	816	20%	166
	No	99%	89,570	7%	6,577
Back pain	Yes	88%	10,820	12%	1,314
	No	12%	79,424	7%	5,419
Broken bone	Yes	6%	5,520	14%	751
	No	94%	84,718	7%	5,985

Note. Percentages may not equal 100% due to rounding.

Table 3

Institutional Characteristics

		Students		Report Opioid Misuse	
		%	N	%	N
Region	Northeast	25%	22,706	7%	1,511
	Midwest	23%	20,829	7%	1,421
	South	22%	19,972	8%	1,505
	West	31%	27,815	9%	2,466
Enrollment	<2,500	8%	7,053	8%	556
	2,500-4,999	6%	5,775	6%	362
	5,000-9,999	14%	12,383	8%	963
	10,000-19,999	22%	19,822	7%	1,458
	≥20,000	51%	45,962	8%	3,564
Type	Public	65%	59,226	8%	4,738
	Private	35%	32,096	7%	2,165
Urbanicity	≥500,000	34%	30,556	8%	2,311
	250,000-499,999	8%	7,611	8%	588
	50,000-249,999	33%	29,891	8%	2,344
	10,000-49,999	22%	19,777	7%	1,413
	2,500-9,999	3%	2,705	8%	217
	<2500	1%	455	7%	30

Note. Percentages may not equal 100% due to rounding.

Table 4

Univariate Effects on the Likelihood of Opioid Misuse

Predictors	Step 1			Step 2	
	OR	95% CI	Estimated variance	S.E.	95% CI
Age	0.866	.819, 0.959*	0.01	0.009	0.002, 0.057
Gender	1.395	1.328, 1.464*	Unable to fit model		
Ethnicity	0.95	0.886, 1.019	0.04	0.015	0.019, 0.082
Suicidality	2.317	2.193, 2.448*	0.005	0.005	0.001, 0.031
Anxiety	1.888	1.792, 1.989*	Unable to fit model		
Depression	2.179	2.066, 2.299*	0.001	0.004	0.000, 12.773
Chronic Ill.	1.65	1.503, 1.812*	0.02	0.016	0.004, 0.096
Mobility disability	2.909	2.414, 3.504*	0.036	0.03	0.007, 0.184
Back pain	1.877	1.747, 2.017*	0.01	0.008	0.002, 0.044
Broken bone	2.042	1.895, 2.202*	0.005	0.008	0.000, 0.163
CI=confidence interval, *p<0.05; OR= Odds Ratio					

Table 5

Comorbidity of Opioid Misuse with Select Diagnoses

Predictors	Model 1		Model 2[a]		Model 3[b]	
	OR	95% CI	AOR	95% CI	AOR	95% CI
Suicidality	2.317	2.193, 2.448*	2.347	2.226, 2.476*	2.33	2.209, 2.458*
Anxiety	1.888	1.792, 1.989*	2.017	1.912, 2.128*	2.029	1.923, 2.141*
Depression	2.179	2.066, 2.299*	2.289	2.167,2.417*	2.292	2.170, 2.420*
Chronic Ill.	1.65	1.503, 1.812*	1.706	1.559, 1.867*	1.704	1.552, 1.870*
Mobility dis.	2.909	2.414, 3.504*	2.65	2.196, 3.198*	2.601	2.162, 3.129*
Back pain	1.877	1.747, 2.017*	1.911	1.782, 2.050*	1.892	1.765, 2.028*
Broken bone	2.042	1.895, 2.202*	2.025	1.880, 2.182*	2.017	1.870, 2.174*

CI=confidence interval, *p<0.05; OR= Odds Ratio; AOR=Adjusted Odds Ratio

[a]Model 2 includes age and gender as covariates.

[b]Model 3 adds school level variables as covariates.

Table 6

Path Analysis Results of Sleep Difficulties, Opioid Misuse and Suicidality

Dependent Variable	Independent Variable	OR	95% CI	p
Suicidality	Opioid Misuse	1.99	1.894, 2.091	p<.001
	Sleep Difficulties	1.876	1.810, 1.876	p<.001
	Depression	5.665	5.450, 5.889	p<.001
	Age	1.077	1.022, 1.136	p<.05
	Gender	1.018	.970, 1.068	0.549
	Year	1.342	1.250, 1.442	p<.001
OR = Odds Ratio, CI = Confidence Interval				

Chapter Five: Dissertation Summary and Recommendations

Opioid misuse, in the form of prescription opioid drug abuse or heroin use or both, is a growing concern in higher education. Although alcohol, tobacco, and marijuana use are more common among students, opioid misuse is reported by almost 7% of the college sample in the spring 2015 ACHA-NCHA IIb. One university president recently declared that the national opioid crisis "should have been OUR problem from the start,"(Sterk, 2018) and it must be addressed as a system-level public health challenge. While any substance abuse carries personal and community-level consequences, opioid misuse speaks to the society-level failings of a lack of effective, non-addictive pain management; a discriminatory war on drugs; entire regions left behind in the wake of technological and economic advances elsewhere; and pharmaceutical corporation excess (Quinones, 2015). College campuses are communities, (American College Health Association, 2012) and are coming to more closely resemble the demographics of the nation (Lederer & Oswalt, 2017). Could campuses be incubators of a way forward in mobilizing communities to prevent and respond to opioid misuse?

This research sought to fill gaps in the literature about the profile of students who misuse opioids and opportunities to intervene in higher education settings. These interrelated studies followed the steps in the public health model and the tenets of SCT to better define the problem, identify risk and protective factors, and make recommendations to campus personnel to reduce opioid related harm and to suggest future research. The first study illuminated the scope of the problem, as well as risk and protective factors, reported by participants in a national survey of students in higher education. The second study examined whether student service members/veterans (SSM/V) were at greater risk for opioid misuse than their civilian peers. The third study explored comorbidities with mental and physical diagnoses including whether there

were associations between opioid misuse, sleep and suicidality, to discern if healthcare service utilization for these health concerns might be better leveraged for intervention.

<div align="center">**Results**</div>

This research identified risk and protective factors with a national sample, and each campus may wish to repeat the process for their population. Findings from this research indicate opportunities for further study as well as intervention opportunities.

Individual Level Predictors

The overall prevalence of student opioid misuse was 6.89%. This finding was consistent with Kenne et al., (2017) but nearly half that reported by other researchers (McCabe, Teter, Boyd, et al., 2005; Q Market Research, 2015; Wu et al., 2008). The odds of opioid misuse among men were 39% higher ([OR] = 1.39, 95% CI = [1.325, 1.463]) than the odds for females. Previous findings have been mixed on how biological sex was associated with opioid misuse; men were more likely to abuse heroin, women were more likely to abuse specific prescription opioid formulations. For students of typical undergraduate ages, < 22, the odds of misusing any opioids were 13% lower than for those students age 23 or older (OR = 0.866, 95% CI = [0.819, 0.959]), however, undergraduate status was associated with a higher likelihood of opioid misuse (OR=1.260, 95% CI = [1,184, 1.341]. This is a provocative finding in that undergraduate status was found to be a risk factor but so was younger age; it also contradicts previous research that found graduate students at higher risk (Q Market Research, 2015). Opioid misuse did not vary significantly by ethnicity. This finding contradicts the hypothesis that white students would be more at-risk than their peers of other ethnicities. The odds of opioid misuse for students reporting a GPA of D or F were 106% higher compared to those students with GPAs in the A, B or C

range (OR=2.06, 95% CI [1.551, 2.723]), consistent with previous research of substance abuse among college students.

Student service members/veterans. The odds of opioid misuse for civilians were approximately 8% lower compared to SSM/V (OR=0.917, 95% CI [0.064, 0.099]). The odds for SSM/V who had been deployed in hazardous duty to misuse opioids were 58% higher than for SSM/V who were not deployed in hazardous duty (OR=1.588, 95% CI [1.199, 2.104]). These findings supported the hypothesis informed by prior research on SSM/V and substance abuse broadly, but there has not been prior research among this population regarding opioid misuse specifically.

Select medical diagnoses, physical conditions and mental health concerns. After holding age, gender and ethnicity constant, the odds of opioid misuse were significantly increased for students with diagnoses of anxiety (AOR=2.017, 95% CI [1.912, 2.128]); depression (AOR=2.289, 95% CI [2.167, 2.417]); or self-reported symptoms of suicidality (AOR=2.347, 95% CI [2.226, 2.476]), a finding similar to previous research (Zullig & Divin, 2012). After controlling for age, gender and ethnicity, the odds of opioid misuse were significantly increased for students with diagnoses of broken bone or sprain (AOR=2.025, 95% CI [1.880, 2.182]); back pain (AOR=1.911, 95% CI [1.782, 2.050]); a history of chronic illness (AOR=1.706, 95% CI [1.559,1.867]); or impaired mobility (AOR=2.650, 95% CI [2.196, 3.198]). These findings were consistent with Kenne et al., (2017) who explored opioid misuse among students or physical or emotional pain. Sleep difficulties, suicidality and opioid misuse are associated. Students reporting opioid misuse displayed greater odds for suicidality (AOR = 1.990, 95% CI [1.894, 2.091]), consistent with Zullig and Divin (2012). Students with sleep difficulties had higher odds for suicidality as well (AOR=1.876, 95% CI [1.810, 1.946]). Sleep

difficulties partially mediates the relationship between opioid misuse and suicidality. These findings were consistent with research with adult populations.

Social Level Predictors

Students living in a more supervised residential environment were 22% less likely to misuse opioids (OR=0.78, 95% CI [0.725, 0.828]), a finding consistent with previous research. The odds of misusing opioids were 30% higher for members of fraternities and sororities than non-affiliated students (OR = 1.293, 95% CI = [1.199, 1.394]), also consistent with the research literature. Among athletes, there was no difference odds for opioid misuse for varsity or intramural participants. However, among club sports athletes, the odds of misusing opioids were about 20% higher (OR = 1.2, 95% CI [1.077, 1.273]) compared to students who did not participate in club sports. This finding was consistent with previous research that found mixed results: Ford (2008) found athletic participation at the college level to be protective against NMUPD but Veliz et al. (2014) found adolescent athletes at higher risk for NMUOPD.

Environmental Level Predictors

The odds of opioid misuse for students in private institutions were approximately 16% less than for those in public schools (AOR=0.837, 95% CI [0.940, 1.161]). This finding did not support the hypothesis informed by Oswalt et al. (2015) that public school students would be less likely to engage in substance abuse. School enrollment and urbanicity were not significant predictors of risk. This also contradicted Oswalt et al. (2015) who found associations between alcohol, tobacco, and marijuana use and school type, geographic region, and student enrollment. The odds of opioid misuse for students in the Western region were 30% higher than for those in other parts of the U.S. (AOR=1.3, 95% CI [1.188, 1.422]). This finding challenges the

hypothesis that misuse would mirror national trends which show the rates of misuse were highest in the Northeast, Midwest and South (Levine & Coupey, 2009; Unick & Ciccarone, 2017).

Collectively, these findings depict the most comprehensive snapshot of student risk for opioid misuse to date.

Recommendations

Further Research

There is ample opportunity for continued research of college student drug use, especially as the opioid crisis continues nationally. As a start, public health and campus personnel could benefit from applied research into campus readiness and assessment tools for campus approaches at the environmental level, consistent with SCT. If student behavior is the outcome of a dynamic interplay between their individual, social and environmental influences, including observational learning, even more research is needed to explore whether effective community-based strategies (Albert et al., 2011) can be successfully adapted to campus settings.

Another area of research is to further explore the finding in the current research that both older students and undergraduates had higher odds of opioid misuse. What is the association between being a non-traditional aged undergraduate and opioid misuse? Are students in their fifth undergraduate year or more at greater risk for opioid misuse than students who graduate in four years? How might multiple responsibilities such as employment, family obligations or financial hardship, leading to taking a longer time to complete a degree, interact with age, class year and opioid misuse? Findings from further studies could highlight other vulnerable campus populations.

As noted in Study One, the NCHA survey has changed in the past year to offer more response options for gender identity. Using cross-tab statistical analysis, transgender students seemed at greater risk, but there were too few students in the 2015 sample who selected

transgender to allow for meaningful study in a multilevel model. It is important that future research include students who do not identify in a strictly binary gender.

Overdose risk for college students due to opioid misuse is not currently addressed in the literature (Paulozzi, 2012). This is a growing concern as stronger-than-morphine formulations, including fentanyl, are implicated in overdoses among street users in Canada and the Northwestern United States. In addition, it is imperative to study whether college students demonstrate a willingness to call for help for peers experiencing overdose symptoms. One paper examined office-based treatment options for college students who are seeking treatment for opioid dependence (DeMaria & Patkar, 2008) but no studies have examined college student attitudes about emergency use of naloxone, either by laypersons or first responders.

Further inquiry into co-occurring use of marijuana and prescription opioids is also needed. One in five young adults uses marijuana (Center for Behavioral Health Statistics and Quality, 2015). In one study, marijuana using youth were more likely to report nonmedical prescription drug use than nonusers (Levine & Coupey, 2009), although marijuana use was associated with lower likelihood of misuse in at least one other study (Harrell & Broman, 2009). This discrepancy, and correlates such as race/ethnicity and the specific class of prescription drug used, could be explored in further research.

An important area for study includes the reliability of measures used on surveys with contemporary college students. Of concern is the discordant reporting identified in the Monitoring the Future study which suggests current items and terminology may not resonate consistently with Millennial students (Palamar et al., 2016). In addition, economic analyses of the financial burden of opioid abuse need to be updated. A final area for further research is whether and how the current concern with opioid drug abuse fits with a "recurrent epidemic"

pattern identified by Sung and colleagues over a decade ago (Sung, Richter, Vaughan, Johnson, & Thom, 2005).

Next Steps for Campuses Based on Application of the Social Cognitive Theory

Recommendations for campus-based practitioners can be organized using the constructs in the SCT.

Reciprocal determinism. A primary tenet of the SCT is that health behavior results from reciprocal relationships between the individual and their environment. Campuses are communities, they constitute specific settings for health promotion and environments that can enhance or inhibit wellbeing (American College Health Association, 2012). Positive enhancements in the campus environment to mitigate stress, promote connection, destigmatize help-seeking and facilitate emergency response may decrease opioid misuse and improve response to overdose.

Outcome expectations. Outcome expectations are beliefs about the likelihood and value of the consequences of behavioral choices. Campuses will be well served to recognize that they are not immune from the opioid challenge, that they have responsibility to promote student safety and wellbeing (Lederer & Oswalt, 2017) and that they can be successful doing so. Campus leaders can set the tone through their policies and public statements regarding the importance of bystander intervention, recovery, and preparation at the community level to respond to overdose.

Self-efficacy. Self-efficacy is the belief in one's capacity for change and a common component of recovery maintenance, including twelve-step programs. Campuses are increasingly embracing collegiate recovery communities (CRC) to support student retention. Campuses with CRC and those seeking to establish them might want to consider how students who misuse

opioids are served and welcomed within these groups and to what extent self-efficacy for all substance- and process addictions is addressed.

      Collective efficacy. Coalition building, as well as assessing capacity and readiness, are appropriate next steps for campuses wishing to address opioid misuse by leveraging their collective efficacy. Collective efficacy refers to confidence or belief in a group's ability to perform actions to bring about desired change. Collective efficacy is also the willingness of community members to intervene in order to help others. In coalition building, champions and stakeholders would be identified to guide the process and leverage social capital as well as financial resources. Prevention and harm-reduction organizations in surrounding communities may be able to provide technical assistance or other resources. In a capacity and readiness assessment, the coalition could document needs and gaps in resources for prevention, intervention, and treatment. Campuses may wish to assess the prevalence of opioid misuse among their students, staff, and faculty, and gather as much information as possible regarding motivation for use; location of use; and risk and protective factors at the individual, interpersonal, and institutional levels. Campuses may identify what harm-reduction measures are in place. For example, they should know if campus emergency responders carry naloxone, an opioid overdose reversal medication, or if there are locations on campus for secure and discreet disposal of used needles and excess prescription medication. Campuses may also wish to examine whether stigma persists, and among which student populations, regarding seeking help for mental health concerns, including addiction. Are there mental health promotion strategies (Glass, 2016) in place on campus or only referrals to treatment? From this multi-faceted data collection, priorities for intervention can be identified and assets deployed commensurately.

Self-regulation. Self-regulation is defined as controlling oneself or enacting health promoting strategies through self-monitoring, goal-setting, feedback, self-reward, self-instruction, and enlistment of social support. On campuses, this construct can be applied to both those individuals seeking to begin or maintain recovery from opioid misuse as well as those seeking to be active, pro-social bystanders in reducing the risk of and responding to opioid overdose. For example, a key component of successful bystander intervention training is to engage participants in identifying potential barriers to taking action and developing strategies to overcome those barriers. Publicizing state medical amnesty laws might enable students to call for help for a friend experiencing overdose without fear of legal repercussions.

Facilitation/behavioral capability. This is a critical domain for campus leadership and personnel. This construct means providing tools, resources, or environmental changes that make new behaviors easier to perform. A campus inventory of assets and corresponding needs assessment can point the way forward in identifying what tools are needed, what barriers are perceived and how best to facilitate uptake of layperson naloxone trainings, participation in drug take-back days, and peers' willingness to call for help in drug-related medical emergencies.

Observational learning. This construct represents an important *how* of behavior change. People learn by watching others, especially role models, perform healthy behaviors. Thus, role-play can be a powerful educational tool in preparing students to reduce or avoid substance abuse, engage as active bystanders, seek help for themselves or a friend, and learn to administer naloxone. Engaging respected key opinion leaders among the student body as peer facilitators in workshops is one example of how to apply this construct in higher education settings.

Incentive motivation. A key to promoting recovery on campus is to celebrate substance-free events and pro-social behaviors. These are examples of incentivizing healthy behaviors

which is the definition of incentive motivation. Campus medical amnesty policies are another example in that they remove a disincentive to calling for help.

Moral disengagement. The construct of moral disengagement refers to the human tendency to stigmatize those with substance abuse issues or to conflate addiction with moral failing rather than as a chronic condition to treat and manage. Campus leaders can promote the humanity of those with addiction and role model healthy ways to offer social support and intervention beyond just those compliance measures required by law. Students may seize on addiction and recovery as social justice issues and demand policies and practices that support students in recovery and expand resources for safety, prevention, mental health and health promotion.

The constructs of the SCT can inform engagement, action and research at campus, state and national levels. No community or social strata is immune from the opioid epidemic in the U.S. This research established a foundation to better understand the risk profile for students and IHEs. There is a role to play for everyone invested in the success of our nation's students: parents, faculty, staff, professional associations, healthcare providers, law enforcement, lawmakers, public health experts, coalitions and students themselves.

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