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Opioid Types and Adolescent Prescription Opioid Misuse

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Abstract

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by

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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Abstract

Adolescent prescription opioid misuse (POM) in the United States is a significant public health issue, and there is a lack of studies investigating the association between opioid types and adolescent POM. The purpose of this quantitative cross-sectional study was to explore possible associations between a set of independent variables: opioid types, gender, religiosity, and education, and the outcome variable, POM among adolescents ages 12 to 17 in the United States. The socio-ecological model was the theoretical framework that guided the study. A sample size of 13,722 from the 2017 Substance Abuse & Mental Health Data Archive was analyzed using descriptive statistics, simple and multiple logistic regression, and stratification analysis. Simple logistic regression analysis showed that religiosity was statistically significant (*OR*= 1.978, 95%CI: 1.633-2.395, *p*= .000), while the multiple regression analysis revealed that gender was statistically significant (*OR* = 1.817, 95%CI: 1.129- 2.923, *p* = .014). Therefore, confirming the confounding effect of religiosity in the association between gender and adolescent POM. In the end, there was an association between gender and adolescent POM only. The use of stratification analysis highlighted that the responses within the subgroups were underrepresented based on the United States adolescent population size. The results provided useful information for policymakers and parents that can lead to positive social change, such as; information on the opioid types most misused by adolescents, possibly leading to the development of targeted policies to lower adolescent misuse, adverse effects, and deaths.

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Dedication

I dedicate my dissertation work to my family, friends, and colleagues that have supported me throughout the process. To my uncles and aunts for the opportunities created. A special thanks to my husband, Dr. Kelvin Michael George, for his unwavering support, cheerleading, and encouragement throughout the entire process.

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Chapter 1: Introduction to the Study

The use of many types of prescription opioids to treat pain is encouraged by some scholars and discouraged by others attributable to possible misuse, addiction, overdose, and death (Basco et al., 2015; Manworren & Gilson, 2015; Slater et al., 2010). The addictive characteristic of opioids is a significant contributor to misuse that may vary based on the type of opioid because physical dependency on or addiction to opioids can develop within seven days of use (the State of Utah, 2014). These types of drugs activate analgesic and reward pathways (Fields & Margolis, 2015; U.S. Department of Health and Human Services, 2018a) and reduce the perception of pain (Centers for Disease Control and Prevention [CDC], 2019; Colorado Chapter of the American College of Emergency Physicians [COACEP], 2017; National Institute of Health [NIH], 2019). Generally, the different types of opioids used to reduce pain are semisynthetic, synthetic, or natural (COACEP, 2017; Fields & Margolis, 2015; Rose, 2018; U.S. Department of Health and Human Services, 2018a). Two examples of semisynthetic opioids are hydrocodone and oxycodone; synthetic opioids are fentanyl and tramadol, and natural opioids are codeine and morphine (CDC, 2019; Coit & Shannon, 2019; NIH, 2020; Rose, 2018). The Illinois Department of Public Health (2019), Paxton (2019), and North Carolina Department of Health and Human Services (2019) confirmed that opioids are natural or synthetic chemicals that work in the brain to reduce pain. The NIH (2017) and State of Utah (2014) posited that opioids might alter brain chemistry due to the drug tolerance effect, which occurs when an individual requires higher doses of opioids to attain the same feelings over time, such as euphoric feelings or pain relief. Outcomes associated with adolescent

POM include but are not limited to (a) severe medical outcome, (b) risk of continued use (Dash et al., 2018); (c) opioid dependence,(d) increased opioid responsiveness (Blanco et al., 2016; Groenewald et al., 2019), (e) abuse, and (f) suicide (Allen et al., 2017; Chhabra & Aks, 2017). Furthermore, adolescent POM is associated with mood instability, irregular cognizance, dependence, and impaired common sense (NIH, 2019). Of particular relevance, prescription opioids are now the most commonly misused drugs among adolescents 12-13 years old in the United States (the State of Utah, 2014). Additionally, Allen et al. (2017) and Chhabra and Aks (2017) explained that adolescents 13-18 are three times more at risk of severe medical outcomes from POM than children 0-12 years old, notwithstanding the type of opioids used. Based on prescribing practices to children, adolescents aged 12 to 17 have the highest likelihood to receive a prescription opioid (Banerjee et al., 2016) and at significantly higher doses (Lobst et al., 2018). Although prescription opioid use, misuse, and death are decreasing (McCabe et al., 2017), the United States ranked number 1 compared to other nations in the consumption of prescription opioids (Allen et al., 2017; Rose, 2018). This ranking justified the need to conduct this study. Freedman-Weiss et al. (2019) and Jamasbi et al. (2018) clarified a connection between adolescents using and misusing opioids because the first prescription opioids use increases the risk for future misuse of illicit and prescription drugs. POM is associated with numerous adolescents' accidental death in the United States (COACEP, 2017; Hudgins et al., 2019). For instance, the CDC reported that approximately 0.2% of Americans died from an opioid overdose between 2000 and 2014 (COACEP, 2017), and in 2017, the absolute number of opioids overdose deaths was

approximately 72,000 (Hudgins et al., 2019; National Institute on Drug Abuse [NIDA], 2018; Rudd, Seth, et al., 2016). Some frequently prescribed opioid types misused by adolescents are hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine (COACEP, 2017; NIH, 2019; Substance Abuse & Mental Health Data Archive [SAMHDA], 2018). According to Ahn et al. (2019), Garren et al. (2019), and Van Cleve and Grigg (2017), there can be excessive and nonstandardized prescribing of opioids to children after urologic procedures. Cairo et al. (2018), Horton et al. (2018), and Monitto et al. (2017) reported that pediatric and adolescent patients who undergo surgical procedures consumed only 50% of the prescribed opioids, confirming overprescribing practices. For instance, Abou-Karam et al. (2015) and Piper et al. (2019) explained that parents of children undergoing surgery administered 9.2% of prescribed opioids; therefore, 90.8% are excess opioids. Further, 37% of the opioids were obtained from left-over prescriptions when 12th graders who misused prescription opioids were studied (McCabe et al., 2013; Piper et al., 2019). Therefore, these excess opioids that are available for future use by the patient may not be securely stored and may be accessible for adolescents' misuse (Bartels et al., 2016; Piper et al., 2019). Meyer et al. (2014) explained that POM by adolescents contributes significantly to overdose, hospitalization, lost school time, adverse physical and mental effects, increased societal cost, and death. Therefore, it is crucial to research POM in adolescents 12 to 17 by opioid type, which may lead to positive social change, such as increased awareness to reduce adolescent POM and reform current prescribing practices. According to Boyd et al. (2007), McCabe and Boyd (2005), and Monnat and Rigg (2015), preventative strategies or actions to

lower adolescent POM in the United States include awareness, parent monitoring, proper medication disposal, and education. Pruitt et al. (2019) found that modifying current prescribing practices, providing caregivers and patient guidance before surgery, and advancing the use of alternative pain medicine may also contribute to lowering adolescent POM. Other initiatives to reduce adolescent POM include but are not limited to (a) clinician-patient transparency,(b) candid discussion of opioid side effects,(c) informed decisions by patients based on clinicians' recommendations. and (d) regular clinician follow-up (CDC, 2019; Coit & Shannon, 2019). Chapter 1 contains the following sections: (a) background with an overview of adolescent POM trends, statistics, and current efforts for intervention; (b) the problem statement, including identification of the gap in the literature; (c) the study purpose; (d) research questions along with the study hypotheses; (e) the theoretical framework; (f) the nature and design of the study; (g) terms in the study and definitions; (h) the study assumptions; (i) the study scope and delimitation; (j) the study limitation; (k) the study significance; and (l) the study summary.

Background

POM and overdose were announced a public health crisis in 2017 by United States government officials to lower abuse, hospitalizations, incidence rates, and death (Ahn et al., 2019; CDC, 2018). The CDC (2018), Ford & Rigg (2015), and Monnat & Rigg (2016) reported that the declaration was timely, ideal, and contributed to improved policy, increased funding, improved intervention programs, and decreased mortality. The public health crisis declaration led to strategies to lower negative impacts with adolescent

POM, overdose, and related death. Further, Monnat and Rigg (2016) explained that declaring the opioid crisis a public health national emergency is a prudent macro intervention strategy. However, despite the declaration, POM by U.S. adolescents continues to be a public health issue (Ford & Rigg, 2015; Johnston et al., 2018; Monnat & Rigg, 2016) due to the introduction and availability of new opioid types. Before the 1980s, opioids, a significant pain medicine, were prescribed for severe pain that was cancer-related (Mohan & Bhattacharyya, 2018). Unfortunately, there has been a shift in opioid prescribing practices in which adolescents with noncancer pain received many types of opioids from 2005 to 2014 (Dash et al., 2018), and it continues today (Coit & Shannon, 2019). Due to the limited research on opioid use in children, the phenomenon has resulted in continued misuse of different types of opioids (Wynia & Schrock, 2019). Further, in the United States, a surge in prescribing opioids has led to several opioid types available for misuse by adolescents (Allen et al., 2017; Creswell et al., 2019; Ford & Rigg, 2015). From 1999 to 2009, POM treatment admissions increased more than fourfold (Ford & Rigg, 2015). The approximate number of adolescents 12 to 17 years old who misused prescription opioids in 2016 was 153,000 (NIDA. 2018). McCabe et al. (2011) and McCabe et al. (2013) explained that from 2007 to 2010, approximately 20% of United States adolescents surveyed reported prior year POM. This trend continued and was consistent in Hudgins et al.'s (2019) report that from 2015 to 2016, 21% of adolescents surveyed had prior year POM. Some prescription opioid types misused by adolescents include hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine (SAMHDA, 2018).

Problem Statement

Generally, adolescent use of opioids is associated with misuse, overdose, and untimely death (Jamasbi et al., 2018; Meyer et al., 2014). Although research conducted focused on prescription fentanyl misuse in adults 18 and older (Schepis et al., 2019), to my knowledge, there is no study by opioid types or opioid class that included the following for this study: hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine and adolescent 12 to 17 POM. Opioid types and adolescents POM in the United States require special attention (Monnat & Rigg, 2016) because the adolescent's POM rate ranges from 5% to 20% (Ford & Rigg, 2015; Johnston et al. 2018; Monnat & Rigg, 2016) of a total adolescent population of 42 million in 2016 (U.S. Department of Health and Human Services, 2019). Approximately 40% of high school seniors reported easy access to opioids, such as oxycontin, in 2015 (Nebraska Department of Health and Human Services, 2016). Additionally, experts agreed that Americans consume nearly 81% of the global supply of oxycodone (COACEP, 2017; Jordon et al., 2017), 99% of hydrocodone (COACEP, 2017; Jordon et al., 2017; Lobst et al., 2018), and 80% of the global supply of opioids (Allen et al., 2017; Rose, 2018).

Purpose of the Study

The purpose of this study was to quantitatively analyze the United States 2017 National Survey on Drug Use and Health (NSDUH) secondary dataset to determine whether an association exists between opioid types and POM among adolescents (SAMHDA, 2018). The independent variables included were as follows: (a) opioid types, (b) gender, (c) religiosity, and (d) education, and the dependent variable was POM among

adolescents 12 to 17 years of age in the United States. This research can fill the gap identified in the literature regarding types of prescription opioids misused among adolescents and may lead to improvements in prescribing these opioids to adolescents. The findings can benefit public health leaders and advance further research on opioid types and POM among adolescents, affecting positive social change.

Research Questions and Hypotheses

The overarching research question examined the association between opioid types, gender, religiosity, and education and adolescent POM. The following research questions answered the general question:

RQ1: What is the association between opioid types and POM among adolescents ages 12 to 17 in the United States?

$H_0$1: There is no association between opioid types and POM among adolescents ages 12 to 17 in the United States.

$H_1$1: There is an association between opioid types and POM among adolescents ages 12 to 17 in the United States.

RQ2: What is the association between gender and POM among adolescents ages 12 to 17 in the United States?

$H_0$2: There is no association between gender and POM among adolescents ages 12 to 17 in the United States.

$H_1$2: There is an association between gender and POM among adolescents ages 12 to 17 in the United States.

RQ3: What is the association between religiosity and POM among adolescents ages 12 to 17 in the United States?

$H_0$3: There is no association between religiosity and POM among adolescents ages 12 to 17 in the United States.

$H_1$3: There is an association between religiosity and POM among adolescents ages 12 to 17 in the United States.

RQ4: What is the association between education and POM among adolescents ages 12 to 17 in the United States?

$H_0$4: There is no association between education and POM among adolescents ages 12 to 17 in the United States.

$H_1$4: There is an association between education and POM among adolescents ages 12 to 17 in the United States.

RQ5: What is the association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education?

$H_0$5: There is no association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education.

$H_1$5: There is an association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education.

Theoretical Framework for the Study

Glanz and Rimer (2005) explained that theories provide systematic ways of understanding behaviors and phenomena and undergird scholarly research. The socioecological model (SEM) was the theoretical framework by Bronfenbrenner utilized

in the study (Rogers et al., 2018). The SEM presents four primary contextual constructs: microsystem, mesosystem, exosystem, and macrosystem, which incorporate five tenets, individual, interpersonal, community, organizational, and policy/enabling environment. I utilized these constructs to explore personal, social, and environmental factors that may influence knowledge, attitude, and behaviors related to prescription opioid misuse. The SEM model microsystem includes an individual interaction with friends, family, neighbors, social networks, and teachers. The mesosystem include interactions between individual and institutions, home, school, workplace, neighborhood, place of worship, and clinicians; The exosystem refers to the individuals' geographic location or community, and the macrosystem includes the direct or indirect influence on the individual by societal laws, values, policies, norms, and media (Conn & Marks, 2017; Rogers et al., 2018). However, since all the priority variables of the research area were at the individual level, only the microsystem was explored. The SEM is widely accepted and frequently used to create the platform to analyze individuals' health behaviors by investigating the association between opioid types and POM among adolescents (Conn & Marks, 2017; Rogers et al., 2018). The theoretical framework's microsystems construct guided my exploration of individual behaviors and interactions involved in adolescent POM (Conn & Marks, 2017; Connell et al., 2010; Rogers et al., 2018). The constructs provided the basis to analyze the following confounders that may influence adolescent POM: gender, religiosity, and education(CDC, 2019). The SEM was used as the ideal methodology or blueprint to determine a possible association between opioid type,

gender, religiosity, education, and adolescent POM. Table 1 below depicts the microsystem SEM construct and the study's independent variables and outcome.

Table 1

The Socioecological Model Constructs and Their Relationships to Study Variables

SEM Constructs	Description	Independent Variables	Justification	Outcome
Microsystem	Adolescent Interaction With family, peers, Religious belief, education/grade Completed and Opioid Use	Opioid types, gender, Religiosity And Education	Class of opioids, gender, Religious adherence and education/critical Thinking skills influence on adolescents Decisions To Misuse Opioids	POM Among Adolescents 12 to 17 in the United States

Note. Construct exclusion justification: Only the microsystem construct of the socioecological theoretical framework is utilized in the research because the variables used in the study are measured on the individual level.

Nature of the Study

This study was quantitative, descriptive, and cross-sectional in design. The research used the SAMHDA 2017 database to investigate the observable phenomenon of opioid types (the independent variables) and POM among adolescents (the dependent variable) utilizing hypothesis testing through in-depth analysis of distinct variables (Frankfort-Nachmias & Leon-Guerrero, 2015). The study used measurable data, central tendency measurement, variance, frequency distributions tables, and graphic charts. Further, in the research, I uncovered patterns that would facilitate interpreting and determining a possible association between opioid types and POM among adolescents

(see Salazar et al., 2015; Trochim, 2006), thereby answering the research questions regarding the association between opioid types and POM among adolescents controlled for gender, religiosity, and education. Further, the numerical data presentation answered the research hypothesis and facilitated discussion and interpretation (Creswell, 2014). I used descriptive statistics, simple logistic regression, and multiple logistic regression models to analyze the possible association between opioid types and adolescent POM. I used descriptive statistics to detail the variables and simplify the data improving interpretation through distribution, maneuvering, and organizing (see Frankfort-Nachmias & Leon-Guerrero, 2015). Logistic regression use was suitable since the outcome variable adolescent POM is dichotomous (see Wagner, 2016). Simple logistic regression estimated the odds ratio and predicted that opioid types, gender, religiosity, and education would predict POM by adolescents. Multiple logistic regression analysis uses derived an efficient model to determine the outcome. Multiple logistic regression analysis determined an association between the studies' four independent variables and one dependent variable and supported rejection or acceptance of the null hypothesis (see Wagner, 2016). Additionally, multiple logistic regression analysis is a predictive test appropriate for explaining the association between one or more nominal variables (Allison, 1999). Multiple logistic regression analysis was an ideal inferential statistical test because the test coincides with the SEM microsystem multilevel tenets (family, community, and society) interactions (Conn & Marks, 2017; Rogers et al., 2018).

Definitions

Adolescence: The period of physical and psychological development during the life of a young person age 10 to 19 in which the individual transits from childhood to adulthood.

Adolescent: Individuals currently in the period, development, or transition from a child to an adult or age 10 to 19.

Education: The critical thinking skills attained for decision-making as students progress through the grade levels.

Education/grade completed: Grade level that an individual attains throughout the school cycle. For example, 6th grade completed or 7th grade completed.

Gender: Socially constructed characteristics that have traditionally distinguished male and female.

Misuse: The inappropriate use of something or using a thing for the wrong reason, for example, taking an opioid that has been prescribed for someone else, taking a prescribed opioid differently than prescribed, taking an opioid to get high (NIH, 2020; U.S. Department of Health and Human Services, 2019).

Misuse of opioids: The inappropriate use of opium derivative drugs.

Opioid: A natural, synthetic, or semisynthetic opium derivative drug with addictive properties to alleviate pain (NIH, 2020; U.S. Department of Health and Human Services, 2018b).

Opioid class: Classification of powerful prescription pain-relieving drugs, such as hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine.

Opioid type: Classes of prescription pain-relieving drugs such as hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine (NIH, 2020; North Carolina Dept of Health and Human Services, 2019), which is a single categorical variable in the study.

POM among adolescents ages 12 to 17 in the United States: Adolescents ages 12 to 17 in the United States use more opium derivative drugs than the prescribed dosage or consume someone else prescribed opioids.

Prescription opioids: Opium derivative drugs given to patients by a clinician to help alleviate a pain that is chronic, excessive, or reoccurring (CDC, 2018; NIH, 2020).

Prescription opioid misuse: Using opioid/opium derivative drugs other than the prescribed dosage or consuming someone else's prescribed opioid (Austin & Shanahan, 2018; Baiden et al., 2019; NIDA, 2018).

Religiosity: Religion, a religious adherence, religious beliefs, activities, devotions, encounters, and experiences that involve spiritual, divine, or supernatural entities.

Religious beliefs influence life decisions: Attitude and behavior change are affected by religious adherence or affiliation that affects an individual action.

Assumptions

The following assumptions guided the study:

- I assumed the NSDUH secondary data were accurate (SAMHDA, 2018). NSDUH data has been collected since 1971 and has involved computer-assisted interviewing surveys with a state-based design to encourage honesty in responses (SAMHDA, 2018). This trustworthiness of the data was necessary for its selection and determined the integrity of the data.

- I assumed that religious belief influences life decisions had varying meanings to the study participant, resulting in different responses to the religious belief question due to interpretation.
- I assumed that adolescents' POM is affected by social, behavioral, and environmental factors, as presented by the microsystems within the SEM. Therefore, the mesosystem, exosystem, and macrosystem levels were not used in the research because the operationalization of the measurement for opioid type, gender, religiosity, and education at the microsystems level was adequate.
- I assumed that the number of adolescents who reported POM in 2017 was substantial. This assumption was justified by the extent of the prescription opioid epidemic as declared by the United States government. However, the study findings revealed that a low number of adolescents admitted POM.

Scope and Delimitations

The data used in the study came from the 2017 NSDUH series for 50 states obtained for noninstitutionalized adolescents 12 and over. This exclusion of institutionalized adolescents confined the research to adolescents 12 to 17 because these adolescents were within the established parameters. The Substance Abuse and Mental Health Data use determined adolescent POM trends for 2017. The study's purpose was to show a possible association between opioid types, gender, religiosity, education, and POM among adolescents ages 12 to 17 in the United States. Several delimitations were present through the study, such as variable selection, theoretical background, and

research questions. Opioid class, male/female, religious belief influence life decisions, education/grade completed, and misuse of opioids were SAMHDA operationalization of the variables. The selection of these variables provided insights on adolescent POM and meaningful information to answer the research questions. In addition, the usage of the SEM theoretical framework guided the study that only included one construct, the microsystem construct. My use of the microsystem captured the variables that may most likely influence the adolescent's decision to misuse prescription opioids. All the priority variables associated with an adolescent's decision to misuse prescription opioids are within the microsystem, justifying the adequacy of the construct. The final boundary of the study was in the creation of the research questions. These research questions aligned with my predetermined worldview and created the premise to investigate the contextual issues associated with adolescent POM in the United States. Although the study has these delimitations, the study sample, variable selection, theoretical background, and research questions, the study provided information on adolescent POM for stakeholders.

Limitations

I assumed there were inherent challenges associated with a secondary data source, in this case, the Substance Abuse and Mental Health Data Archive (2018), used from a public domain. Therefore, the information used was limited to what was available on the SAMHDA website for the study design. For example, the SAMHDA survey excluded adolescents on active military duty, institutionalized, with no internet and computer access, unable to speak English, experiencing homelessness, younger than 10-11 years, and older than 18 in the United States, and only included participants 12 to 17 years old

(SAMHDA, 2018). Additionally, I adopted the interpretative assumption and the worldview of the researchers in the primary data collection in the current paper, which may have tainted the results (see Ham-Baloyi & Jordan, 2017). Further, the researcher paid the participants to partake in the survey by SAMHDA, which resulted in improved response rate, the trustworthiness of the responses was questionable (SAMHDA, 2018). Nardi (2014) and Patton (2015) reiterated that surveys might be incomplete, deceitful, or inaccurate, resulting from recall biases and social desirability, strategies to minimize these biases would have been in the development of the survey by government agencies. The predicted number of adolescents who misused prescription opioids was not actualized. More specifically, during the development of the research methodology, the codebook was previewed and not the dataset itself. In other words, the actual number of adolescents who misused prescription opioids in 2017 in the United States was unknown. There was the possibility that many of the adolescents in the United States who may have misused prescription opioids may have been non-English speaking, involved in sex-trafficking, sick, injured, pregnant, hospitalized, institutionalized, or had no internet and computer access and were not in the survey. Therefore, many adolescents who may have misused prescription opioids in 2017 were not in the data collection. This exclusion resulted in low adolescents responding “yes” to misusing prescription opioids. In the study, religiosity was the conceptual definition, and the phrase “religious belief influences life decision” was the operational definition. Adolescents surveyed may use the terms interchangeably, thereby reducing the accuracy of the survey responses. For instance, education definition was education/grade completed, and adolescent acquired

knowledge or literacy as conceptually defined was possibly not measured. These definition differences also may have affected the accuracy of the survey responses. Gender operational definition was male and females only. Therefore, adolescents who may have felt excluded in this categorization may not have responded to that question. Gender refers to socially constructed characteristics that traditionally distinguish men and women. Sex refers to genetic, physiological, and biological traits that traditionally distinguish men and women. These terms are used interchangeably and may have resulted in survey response inaccuracy. One limitation of the SEM use in the study was the mesosystem, exosystem, and macrosystem exclusion. In the research, the measurement for the independent variables (opioid types, gender, religiosity, and education) was at the individual level only, justifying the use of the microsystem construct. Some of the study variables may influence other SEM levels or be relevant for another construct. For example, the exosystem encompasses larger social systems such as religious institutions and schools that directly affect adolescents in the United States and may be associated with POM. However, the exosystem construct was not in the study because the focus was on factors that influence individual behavior, attitudes, interactions, and decisions, as required in answering the research questions, thereby justifying the use of only the microsystem construct. Other variables were excluded, such as race, employment, and family income which may influence the behavior of adolescent POM from this research because these variables were outside the research priority area and were irrelevant to answering the research question; however, these variables present an opportunity for future research. The cross-sectional design data collection limited

temporal order or transitions creating limitations in the study (see Ford & Rigg, 2015). Finally, the misuse of opioids as the independent variable may have been in the different classes of opioids misused in the SAMHDA database. For example, the primary data collectors may have ignored separating POM purposes, such as recreational use from self-medicating.

Significance

POM was declared an epidemic and a public health emergency by the United States government in 2017 due to the sharp increase in prescription opioid-related overdoses, hospitalizations, and deaths (CDC, 2018). In this study, I investigated the association of opioid types and POM among adolescents to determine the significance of this public health concern. The study illuminated the opioid types most misused by adolescents. The study may increase the awareness of the community, parents, policymakers, clinicians, schools, and other stakeholders to facilitate effective intervention and to affect positive social change in American communities. Further, the research provided data on the opioid types most misused by adolescents controlled for gender, religiosity, and education. These data may create the premise for improved risk/benefit decisions on prescription opioid use and prescribing practices. The study findings may potentially further positive social change by providing information to reduce adolescent POM.

Summary

Research involving prescription opioids use in adolescents has mixed outcomes because some researchers supported opioid use in adolescents to relieve chronic pain and

others discouraged opioid use due to misuse risk (Basco et al., 2015; Manworren & Gilson, 2015; Slater et al., 2010). The SEM was the theoretical framework used in the study because the variables were within the Microsystem construct. This study may have revealed the opioid types most misused by adolescents and may reveal possible associations between opioid types and adolescent POM. Finding the association between opioid types and POM among adolescents may assist in positive social change and support policies to modify, improve, and adjust opioid prescription practices for adolescents. In chapter 2, there is an introduction, the literature search strategy, and a literature review. The literature review includes adolescent use and misuse of prescription opioids information, adolescent POM of hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine, adolescent POM by gender, religiosity, and education. Additionally, included in chapter 2 are the theoretical framework, statistical analysis plan, summary, and conclusion.

Chapter 2: Literature Review

United States residents use and misuse the highest number of prescription opioids globally (Allen et al., 2017; COACEP, 2017; Jordon et al., 2017). Banerjee et al. (2016) suggested that more opioids were prescribed to adolescents 12 to 17 years when compared to children in other age groups. Further, Yang et al. (2016) clarified that adolescents are more likely to misuse opioids when compared to adults. Additionally, Groenewald et al. (2019) reported that prescription opioid use for four weeks leads to misuse. Chhabra and Aks (2017) confirmed that the longer the period of initial prescription, 10 or 30 days, the higher the risk of misuse. These prescribing patterns illustrate the natural progression of prescription opioid use to misuse, addiction to overdose, and abuse to death among adolescents in the United States. POM is a behavioral public health crisis according to Baiden et al. (2019), Bohnert and Ilgen (2019), and the CDC (2011), with a misuse rate from 5% to 20% among adolescents (Ford and Rigg, 2015; Johnston et al., 2018; Monnat & Rigg, 2016). According to Ahn et al. (2019), Basco et al. (2015), and Garren et al. (2019), POM by adolescents is a multifaceted problem associated with overprescribing to treat pain, lack of awareness of opioid dangers, inadequate disposal of unused medicine, easy access, and new opioid types. For instance, Yang et al. (2016) advanced that adolescents underestimate the dangers of misusing prescription opioids. One in every two adolescents misusing varying prescription opioid types received the drug from an individual prescribed the opioid (Yang et al., 2016). From the extensive scholarly literature review, a research gap led to

investigate a possible association between opioid types and adolescent POM. As a result, the study determined a possible association between opioid types and POM among adolescents ages 12 to 17 in the United States. In this chapter, I review recently published literature from the last five years related to the purpose and nature of the study. The use of published literature before 2014 provided historical context and theoretical substance to confirm the purpose of the study. I discussed the SEM theoretical framework and examined the multiple independent variables (opioid types, gender, religiosity, and education). This discussion improved the understanding of how the variables were associated with adolescent POM. Additionally, I considered the role of gender, religiosity, and education independently in the association between opioid types and POM among adolescents aged 12 to 17 in the United States.

Literature Search Strategy

Through searches conducted on current peer-reviewed literature, I obtained articles published after 2015 relevant to opioid types such as hydrocodone, oxycodone, fentanyl, tramadol, codeine, morphine, and adolescent POM. The databases utilized for the literature review were CINAHL plus, Science Citation Index, Science Direct, Pubmed and Expanded Academic ASAP, Walden University online library multi-database search, and Google scholar. Further, I conducted searches in the Center for Behavioral Health Statistics and Quality, the CDC, the U.S. Department of Health and Human Services, NIDA, NIH, and the COACEP websites. Key terms searched for relevant articles were the following: hydrocodone misuse, oxycodone misuse, fentanyl misuse, tramadol misuse, codeine misuse, morphine misuse, opioid misuse, adolescent prescription opioid

misuse, adolescents prescription opioid misuse and gender, adolescents prescription opioid misuse and religiosity, adolescents prescription opioid misuse and education, and adolescents opioid use.

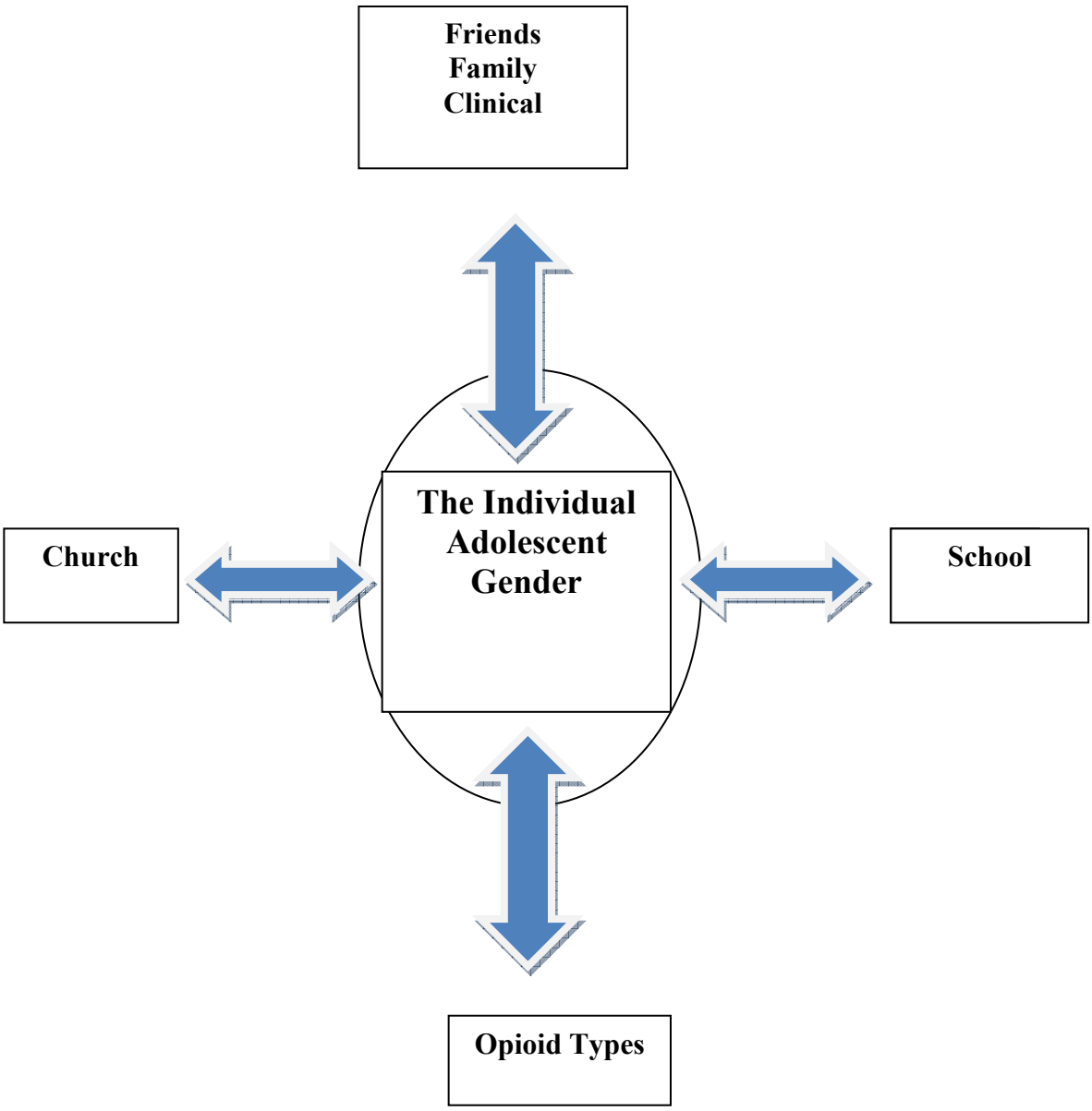
Theoretical Foundation

The theoretical framework used to conduct the study was the SEM. I selected this theory after a thorough examination of the independent variables (opioid types, gender, religiosity, and education), research questions, and hypothesis because the variables for the study required a multidimensional approach to understanding POM association with individuals and community health factors. Further, these factors included opioid types, opioid class, gender, religiosity, religious beliefs, a religious adherence, critical thinking skills, educational attainment, grade completed, and social and environmental association with adolescent POM, which formed the basis of the research. The SEM model is grounded in four constructs: (a) microsystem; (b) mesosystem; (c) exosystem; (d) macrosystem. However, the microsystem applies to the dynamics of adolescent misuse of a prescription opioid's possible association with the priority variables. The SEM was established in 1979 by Bronfenbrenner's foundational work titled *The Ecology of Human Development* (Gonca, 2019). Bronfenbrenner drew upon Lewins' (1935) psychological theory that illustrated the ecology of individual development depicted by nested circular structures, one inside the other (Gonca, 2019). The Bronfenbrenner theory presented interrelated systems and reciprocal interactions between the individual and environment (see Figure 1). Conn and Mark (2017) used the microsystem, exosystem, and macrosystem constructs of the SEM model to explore an ecological approach to

understand adolescent POM. Few researchers mentioned using the SEM theoretical framework to study adolescent POM. However, a researcher can deduce the theoretical framework utilized by another researcher. For instance, Edlund et al. (2015) used the microsystem construct to investigate the relationship between depression and opioid abuse in adolescents in the United States. This construct looked at religious coping and prescription stimulant misuse in undergraduate college students (Gallucci et al., 2018). Baiden et al. (2019) also used the microsystem of the SEM to examine the association between adolescent POM and suicidal behaviors among high school students in the United States. However, Dash et al. (2018) used the mesosystem construct to investigate peer and family influence on adolescent POM. Donaldson et al. (2015) used the mesosystem to show variations in parental monitoring and predictions of adolescent POM. Also, Dart et al. (2015) used the exosystem and highlighted trends in college students' POM.

Figure 1

Depiction of the Socioecological Model Microsystem Priority Variables Interconnectivity



The justification for using the microsystem was the need to determine the association between opioid types, gender, religiosity, and education and POM by adolescents 12 to 17 years of age in the United States. Further, the microsystem encompassed the research priorities that influence the interaction of the adolescent surroundings. Monnat and Rigg (2016) posited that adolescent POM is a complex mixture of individual risk factors. Therefore, adolescent POM is a multifaceted issue that encompassing the individuals' interaction, exposure, knowledge, gender, religion, and education. The SEM is a theoretical framework that focuses on factors that influence health behavior, attitudes, and practices, such as drug misuse (Conn & Marks, 2017; Rogers et al., 2018). Bronfenbrenner (1979) reinforced that personal and environmental factors influence behavior. An adolescent's ability to assess and make the risk/benefit decision when using prescription opioids may yield misuse or non-misuse. According to Conn and Marks (2017), the socioecological frame was the ideal methodology to understand drug risk behavior among adolescents in the United States. This methodology substantiated the use of the ecological model in the Conn and Marks (2017) research, which investigated adolescents' opioid use from opioids prescribed to another due to access and exposure. Embracing the conclusion by Conn and Marks (2017) was based on two factors: (a) the media and its influence on prescription drug behavior; and (b) the interplay between parents and peers, intrapersonal factors, and socialization agents. Conn and Marks (2017) noted that the ecological model addressed health risk, prevention, and other factors within these contexts, such as accessibility to POM treatment, social

structures, media-based messages, and educational messages. Conn and Marks (2017) confirmed that the SEM was well suited to improve understanding of POM among adolescents 12 to 17 years of age in the United States. Compton and Volkow (2006), Ford and Rigg (2015), and Rigg and Murphy (2013) suggested that adolescents' gender, religious belief, education/grade completed, attitudes, and misconceptions on opioid use legality make experimenting with the medicine attractive. For example, adolescents perceived that using peers' opioids is undoubtedly safe and not illegal because they are clinically prescribed (Wu et al., 2011). For instance, it was revealed in a survey that 1 in 4 adolescents perceived POM as a risky behavior (Groenewald et al., 2019). The availability of prescription opioids from family members and the perception that legal "prescription" opioids are safer than "illicit" drugs may negate motivation to seek POM treatment (Wu et al., 2011). Many adolescents with POM issues did not receive treatment and reported no perceived need for treatment (Wu et al., 2011). The latter suggested that adolescents misusing prescription opioids will not use treatments even when treatment is available (Wu et al., 2011). Failure to seek treatment might be from fears of stigma and lack of knowledge about the dangers of opioid use and misuse (Wu et al., 2011). Further, Groenewald et al. (2019) and Monnat and Rigg (2015) clarified that adolescents with parents and friends who approve substance use and have unrestricted access to opioid medications at home are more likely to misuse the drugs.

Literature Review Related to Research Design and Variable Selection

Other researchers had similar research designs and variables. For instance, Donaldson et al. (2015) used the NSDUH secondary dataset from SAMHDA to

investigate factors such as parental monitoring and warmth association with adolescent drug use. The researchers identified vicodin and oxycontin as two prescription opioids misused by adolescents in the United States. This research indicated that the SAMHDA dataset was adequate because the research priority prescription opioid type (hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine) was present in the SAMHDA dataset. Edlund et al. (2015) also used the NSDUH secondary dataset to investigate adolescent opioid abuse and depression. The researchers studied opioid abuse/dependence and nonmedical prescription opioid use among adolescents and not POM in adolescents, as is the case in this study. According to Edlund et al. (2015), nonmedical prescription opioid use was determined in these adolescents 12-17 years by answering yes to the following question; Have you ever, even once, taken (names of prescription opioids) not prescribed for you or that you took only for the experience or feeling it caused? This research question facilitated the development of the researchers' general and sub-research questions. Further, Ford & Rigg (2015) used the NSDUH secondary dataset from SAMHDA to determine racial differences in risk factors associated with adolescents' POM. The researchers analyzed past-year adolescent misuse of prescription pain relievers, percocet, vicodin, oxycontin, and darvocet. Although Ford & Rigg (2015) also studied adolescent drug misuse, the focus was on different classes of opioids from this study which reinforced the need to utilize the SAMHDA dataset. Monnat & Rigg (2016) used the NSDUH secondary dataset to examine rural and urban differences in adolescent POM. The researchers studied adolescent POM and usage of these drugs without a prescription from a doctor or use for euphoria (Monnat & Rigg,

2016). The study failed to identify the specific class of opioids misused by the adolescent creating the opportunity for this research that focuses on prescription opioids (hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine) misuse by the adolescent. Additionally, Nicholson et al. (2016) also selected the NSDUH secondary dataset from SAMHDA to determine the nonmedical use of pain relievers among African-Americans. The researchers studied African-Americans adolescents 12 to 17 drugs use (darvocet, percocet, vicodin, codeine, or demoral) in the past year. The age group utilized in this research created the premise for the research age group parameters for the independent variable. Lastly, Stabler et al. (2015) used the NSDUH secondary dataset from SAMHDA to investigate the association between childhood residential mobility and adolescents. There was a failure to identify the specific class of opioids misused by the adolescent creating the gap for this research that focused on prescription opioids (hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine) misused by the adolescent in the study. Overall, the prescription opioid class studied and the research questions selected by the researchers were different from this research. Conn & Mark's (2017) research methodology used data collected through semi-structured interviews like SAMHDA to understand adolescent POM. Donaldson et al. (2015) used a quantitative, descriptive, cross-sectional study design to study adolescent opioid misuse. Further, Donaldson et al. (2015), Edlund et al. (2015), Ford & Rigg (2015), Monnat & Rigg (2016), Nicholson et al. (2016), and Stabler et al. (2015) studied adolescents 12 to 17 POM in the United States. Edlund et al. (2015) used logistic regression to analyze opioid abuse among adolescents with a nonmedical opioid prescription. A review of these

studies facilitated the development of the research questions, research design, and methodology because no researcher studied the association between opioid types, gender, religiosity, and education and adolescent POM, thereby, creating the gap for this study.

Literature Review Related to Key Variables and/or Concepts

This study sought to quantifiably determine whether an association exists between opioid types and POM among adolescents 12 to17 years of age in the United States. The literature review revealed no studies on the association between opioid types, gender, religiosity, education, and POM among adolescents 12 to 17 years of age in the United States. However, from 1976 to 2015, the study McCabe et al. (2017) focused on prescription opioid use trends by adolescents in the United States. Further, Monnat and Rigg (2016) reviewed adolescent POM based on rural and urban differences in the United States. Notwithstanding similar constructs usage and the SEM theoretical framework uses, the selected demographics for this study were different from the Monnat and Rigg (2016) research. These researchers omitted opioid types, religiosity, and education, as factors associated with adolescent POM. Even when researchers determined socio-demographics age, race, sex, and family income for rural and urban differences in adolescent POM, there is a gap creating the need to investigate a possible association between opioid type, gender, religiosity, education, and POM among adolescents. Based on the literature gap, the identified independent variables for this research are opioid type, gender, religiosity, education, and the dependent variable is POM among adolescents 12 to17 years of age. It was imperative to rigorously review, discuss, analyze, and synthesize the literature on these variables individually.

Opioid Types

Literature Review Related to the Variable Opioid Type

Researchers have not studied the association between opioid class or opioid type (hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine) and adolescent POM (Monnat & Rigg, 2016). However, Gallucci et al. (2018) investigated misuse of prescription stimulants by students (adderall and ritalin). Baiden et al. (2019) studied adolescent POM (codeine, vicodin, oxycontin, hydrocodone, percocet) and suicidal behaviors. Ford & Rigg (2015) analyzed adolescents' POM (percocet, vicodin, oxycontin, darvocetin) by race. Also, Ransome et al. (2019) studied adolescent POM (demerol, vicodin, buprenex, hydrocodone, and oxycodone) and religious involvement and racial disparities. Finally, Dart et al. (2015) investigated trends in college students' POM (oxycodone, hydrocodone, hydromorphone, fentanyl, morphine, tramadol).

Prescription Opioid Benefits

From the 1990s, the FDA endorsed pharmaceutical company's clinical studies to acquire knowledge on prescription opioid safety and efficacy in children to treat pain (FDA, 2015; Yang et al., 2016). According to Balyan et al. (2017), the absolute number of children in the United States who experienced painful surgeries that require prescription opioids to manage pain annually is 6 million. Harbaugh et al. (2017) explained that prescription opioids are effective for acute pain and Zura et al. (2018) confirmed that opioids are generally widely prescribed to children for orthopedic and fracture pain. Of particular relevance, Brady et al. (2015) advanced that properties associated with prescription opioids include pain relief and euphoria. Further,

Friedrichsdorf et al. (2016) clarified that opioids used in long-lasting pain conditions, such as in children with junctional epidermolysis bullosa, osteogenesis imperfecta, or advanced metastasized bone tumors, suggested that opioids are critical.

Purpose of Prescription Opioids

Chung et al. (2016) advanced that most opioid prescriptions were for acute, self-limited conditions such as dental procedures (31%), outpatient procedure/surgery (24%), trauma (18%), and minor infections (17%). Further, the most frequently prescribed opioids for headaches in the emergency department were hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine (Meckler et al., 2019). Walco et al. (2017) posited that the most prescribed opioids for common oral medication were oxycodone followed by morphine. Similarly, in the emergency department, Wynia and Schrock (2019) asserted that morphine and oxycodone were the most common opioids prescribed for fractures care, represented by 14.6% and 13.7%, respectively. Lobst et al. (2018) dissented, positing hydrocodone accounted for 95% of the opioids prescribed for fractures, followed by oxycodone 3%. Nagar et al. (2018) reported that the most common opioids prescribed for asthma from 2011 to 2015 were hydrocodone, oxycodone, tramadol, and codeine, despite reports of the negative efficacy of codeine contribution to the well-being of youths. Ahn et al. (2019) advocated that more frequently prescribed were hydrocodone and oxycodone followed by codeine for pediatric urology. Further, Cartmill et al. (2019) posited that hydrocodone was the most commonly prescribed opioid for umbilical hernia repair (51%), followed by codeine (30%). Of particular relevance, Chua et al. (2017) advanced that codeine has been one of the most commonly

prescribed analgesics to children after tonsillectomy and adenoidectomy because of its perceived favorable safety profile compared with higher-potency opioids, such as hydrocodone and oxycodone.

Opioid Prescribing Trends

In 2009, the prescription opioids dispensed were 201.9 million of this amount, 84.9% were hydrocodone and oxycodone (Volkow et al., 2011). Walco et al. (2017) reported that in pediatrics, opioids for non-severe conditions prescribed in descending order of frequency were; morphine, oxycodone, fentanyl, and tramadol. Conversely, Allen et al. (2017) and Chhabra and Aks (2017) clarified that the most prescribed opioid to children with non-severe conditions was hydrocodone. Chung et al. (2018) and Meckler et al. (2019) advanced that hydrocodone, codeine, and oxycodone were the opioids most generally prescribed to children in descending order. Further, Van Cleve and Grigg (2017) concurred that the most commonly prescribed opioid to children was hydrocodone followed by codeine. Othman et al. (2016) posited that the opioid medications most implicated in exposure in descending order were hydrocodone, oxycodone, and codeine. However, older adolescents 12 to 17 years of age were more frequently prescribed oxycodone and tramadol, according to Chung et al. (2018), and older children were most likely to fill an opioid prescription (Van Cleve & Grigg, 2017). Further, Slater et al. (2010) advanced that the most frequently administrated opioids by clinicians or parents to youths were fentanyl and morphine.

Main Opioid Prescribers

McCabe et al. (2013) and Volkow et al. (2011) clarified that for patients aged 10 to 19 years, dentists, primary care, and emergency medicine physicians were the leading prescribers of opioids. Both Chung et al. (2018) and Ahn et al. (2019) supported that children undergoing dental procedures were most likely to receive a prescription opioid. There were variations in prescription prescribing practices based on medical condition and prescriber. For instance, the opioid prescribing frequency was; 31.3% for nurse practitioners, 29.3% for physicians, 27.8% for residents, and 15.9% for physician assistants (Jamasbi et al., 2018). However, for opioids prescribed for pain from pediatric fractures, nurse practitioners wrote 57.0% of the discharged opioid, followed by residents 23.0%, physician assistants 14.5%, and attending surgeons 5.5% (Lobst et al., 2018).

Short Acting Opioids

According to Argoff and Silvershein (2009), short-acting opioids refer to opioids that offer quick relief within 15 to 30 minutes and a short duration of analgesic activity lasting 3 to 4 hours. These opioids are appropriate for managing acute pain that other modalities cannot treat; however, the drug is an immediate release (COACEP, 2017). The immediate-release opioids included hydrocodone (vicodin, lorcet, lortab, norco), oxycodone (percocet, percodan), fentanyl, tramadol (Banerjee et al., 2016), codeine, and morphine (Banerjee et al., 2016; COACEP, 2017). However, Banerjee et al. (2016) advanced that the three most prevalent short-acting opioids were hydrocodone, oxycodone, and codeine, and their combinations. Volkow et al. (2011) concurred that hydrocodone and oxycodone are among the opioids most prescribed for short treatment

courses. According to Banerjee et al. (2016), short-acting opioids were more frequently used in children.

Long Acting Opioids

Conversely, long-acting or extended-release opioids are prescribed for chronic pain and absorb slowly after administration, for example, 12 to 24 hours, depending on the agent (Banerjee et al., 2016). Long-acting or extended-release formulations included: sustained released oxycodone (oxycontin), fentanyl transdermal (duragesic) tramadol (Banerjee et al., 2016), and morphine (MS contin, avinza, kadian, oramorph SR) (Banerjee et al., 2016; COACEP, 2017). Banerjee et al. (2016) reported that among long-acting opioid users, oxycodone and combinations were most prevalent. However, Walco et al. (2017) dissented and suggested that fentanyl was the most administered long-acting opioid.

Dosage Categorization

Generally, higher doses of opioids increase the risk of toxicity (Chung et al., 2016). According to Van Cleve and Grigg (2017), the general practice in prescribed doses of opioids to children is customizations and formulations based on the child's body size, composition, and ability to ingest oral medications. Prescription opioids formulations to children included tablets, syrups/suspensions, films, transdermal patches, powders, and sprays (Meckler et al., 2019). Lobst et al. (2018) clarified that heavier pediatric patients with fractures received a significantly greater average number of opioid doses than lighter counterparts. According to Chhabra and Aks (2017), fentanyl administered dosage is in microgram units, and morphine is in milligrams. Generally, the

administration of opioids can be oral, parenteral (including bolus infusions, continuous infusions, patient-administered analgesia, and intramuscular injection), sublingual, intranasal, and nebulized inhalation routes (Walco et al. 2017). Lobst et al. (2018) advocated that the average dose of opioids prescribed was 28.4mg per patient, where the prescriptions followed recommended guidelines for each medication. Sun et al. (2019) explained that the median oral morphine equivalent dose prescribed was 1.0 mg/kg/day. However, the mean total daily dosage of the most prevalent short-acting opioids hydrocodone, oxycodone, codeine, and its combinations, respectively, taken during a persistence period was 53.3mg, 79.2 mg, and 37.0 mg (Banerjee et al., 2016). In the case of the long-acting opioids, estimates of total daily dosage are 54.1mg for oxycodone (Banerjee et al., 2016).

Opioid Types Justification and Introduction

No scholarly research compares and analyzes hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine misuse among United States adolescents. However, some studies assessed the opioid type most used or prescribed in children, which created the gap for my research that explored the possible association between the opioid types and POM among adolescents 12 to 17 in the United States systematically. Opioid types discussed attributes are the following: (a) nature, street names, and brand names; (b) use, trends, historical facts, access, exposure, and prescribing practices; (c) purpose, policies, and demographics; (d) Onset of action, short-acting, and long-acting; (e) effects and outcome; (f) side effects and overdose symptoms; and lastly, (g) dosage.

Hydrocodone

Nature, Street Names, and Brand Names

According to the Centers for Disease and Control (2019) and North Carolina Department of Health and Human Services (2019), hydrocodone is a weak semi-synthetic licit prescription opioid. According to Coit and Shannon (2019), adolescents can receive hydrocodone; however, the oral form is about twice as strong as oxycodone and six to 10 times more potent than oral morphine. Chua et al. (2017) posited that hydrocodone has a higher potency than codeine. Additionally, hydrocodone has multiple actions, qualitatively similar to those of codeine (Sloan et al., 2019). Hydrocodone brands included vicodin according to the American Academy of Pediatrics (2017), Krashin et al. (2013), and NIH (2020), and SAMHDA (2018); zohydro and hysingla according to the American Academy of Pediatrics (2017) and NIH (2019) and SAMHDA (2018); lorcet and zydone, according to the American Academy of Pediatrics (2017), Banerjee et al. (2016), and Krashin et al. (2013); liquicet, dolacet, anexsia, and xodol according to the American Academy of Pediatrics, (2017) norco according to Banerjee et al. (2016) and Krashin et al. (2013) and SAMHDA (2018), and the University of North Carolina Hospital (2009) vicoprophen and lortab (Banerjee et al., 2016; Krashin et al., 2013); liquicet, dolacet, anexsia, and xodol according to the American Academy of Pediatrics, (2017) norco according to Banerjee et al. (2016) and Krashin et al. (2013) and SAMHDA (2018), and the University of North Carolina Hospital (2009) vicoprophen and lortab (Banerjee et al., 2016; Krashin et al., 2013; SAMHDA, 2018; Volkow et al., 2011). The

street name for the hydrocodone pill version was vic, and for hydrocodone formulations in cough syrup was robo or tuss (American Academy of Pediatrics, 2017).

Use, Trends, Historical Facts, Access, Exposure, and Prescribing Practices

This study researched hydrocodone because this opioid is most prescribed and used by adolescents (Krashin et al., 2013), thereby justifying the need to further research hydrocodone misuse among adolescents 12 to 17 years in the United States. According to Lobst et al. (2018) and COACEP (2017), Americans consumed approximately 99% of the global supply of hydrocodone. This trend is evident between 1997 and 2007 since hydrocodone prescriptions recorded an increasing trend of 280% in the United States (Manchikanti et al., 2010; Sloan et al., 2019). Hydrocodone was the most prescribed opioid in children with non-severe conditions and the most prescribed oral opioid medication in the United States with a good safety profile (Allen et al., 2017; Chhabra & Aks, 2017; Chumpitazi et al., 2017).

Purpose, Policies, and Demographics

Despite the positive review, the FDA decided to limit the use of medications containing hydrocodone to patients 18 years and under, update the safety labeling, and discontinue the drug as a cough treatment in the pediatric population (Food and Drug Administration [FDA], 2017; Medication Update, 2018; Sloan et al., 2019). According to experts, the risks of using hydrocodone for cough relief were more than any benefits in children under 18 years old (Medication Update, 2018). Sloan et al. (2019) reiterated that given the lack of evidence supporting the efficacy of hydrocodone as a cough suppressant in patients under 18 years of age, together with evidence from a review of the

manufacturer's safety database and existing safety concerns within the medical community the benefit-risk profile is not favorable.

For example, Sloan et al. (2019) confirmed the death of ten children after taking a cough medicine containing hydrocodone, with nine of these deaths due to overdose. As a result of these risks, the requirements were that manufacturers of cough and cold medications containing hydrocodone update labeling with a boxed warning explaining the risks, such as misuse, abuse, addiction, breathing difficulties, overdose, and death (Sloan et al., 2019). Hydrocodone should be used in small doses and administered to adolescents with extreme pain after surgery or those for which oxycodone is ineffective (Coit & Shannon, 2019; NIH, 2019). Further recommendations include paper prescriptions for opioids since the changing of hydrocodone from a schedule III to schedule II controlled substance in 2014 (Ahn et al., 2019). This schedule change limited the provider's ability to prescribe opioids over the phone and electronically (Ahn et al., 2019). This change established a profound national strategy to reduce hydrocodone overprescribing and misuse in the United States. Notwithstanding several reduction efforts, overprescribing of hydrocodone continued to plague the United States following surgical procedures; appendectomy, cholecystectomy, hernia repair, tonsillectomy, sinus surgery, septoplasty, knee arthroscopy, open reduction and internal fixation [ORIF] of the hand and wrist, and ORIF of the foot and ankle (Pruitt et al., 2019). As a result, there was a significant increase in opioid accessibility and exposure to children from overprescribing (Pruitt et al., 2019).

Onset of Action, Short Acting, and Long Acting

Hydrocodone is a short-acting immediate-release analgesic prescribed for short treatment courses according to Banerjee et al. (2016), COACEP (2017), Krashin et al. (2013), and Volkow et al. (2011), and many brands have a dosing interval of 3 to 4 hours (Argoff & Silvershein, 2009).

Effects and Outcomes

Sloan et al. (2019) explained that pediatric fatality from prescription opioids such as hydrocodone resulted from; acute combined sedative toxicity, overdose, respiratory depression, and irregular heartbeat associated with inflammation of the pericardium. For example, Khetani et al. (2012) and Sloan et al. (2019) reported that post-operative hydrocodone in 6 to 17-year-old patients with obstructive sleep apnea syndrome increased oxygen de-saturation, compromising the respiratory drive. Adverse events associated with hydrocodone use in pediatric patients under 18 years, from 1900 through August 2017 were cardiac disorders, arrhythmia, cardiac arrest, cyanosis, paralysis, tachycardia, congenital, familial, genetic disorders, tourette's disorder, ear disorder, labyrinth disorders, hyperacusis, eye disorder, mydriasis, oculogyric crisis, visual impairment, gastrointestinal disorders, abdominal pain, general disorders, administration site conditions, nausea, gait disturbance, chest pain, drug ineffective, malaise, feeling abnormal, immune system disorder, injury, procedural complications, hypersensitivity, medication error, somnolence oxygen saturation decrease, lethargy, nervous system disorders, movement disorder, ataxia, cerebrovascular accident, brain aedema, clumsiness, coma, memory impairment, mental impairment, psychomotor hyperactivity,

speech disorders, sedation, stupor, pericarditis, psychiatric disorders, flat effect, hallucination, insomnia, agitation, nightmare, disorientation, irritability, emotional distress, logorrhoea, tic, personality change, renal disorders, urinary disorders, respiratory disorders, thoracic disorders, mediastinal disorders, bladder spasm, dyspnoea, respiratory depression, hypopnoea, respiratory arrest, skin disorders, subcutaneous tissue disorders, rash, surgical procedures, medical procedures, oxygen therapy, drug prescribing error, incorrect dose administered, intentional product misuse, toxicity to various agents, off-label use investigations, drug level increased, poisoning, overdose, accidental overdose, and death (Sloan et al., 2019).

Side Effects and Overdose Symptoms

Hydrocodone side effects are; dry mouth, ringing in the ears, frequent urination, painful urination, tiredness, agitation, fever, sweating, shivering, uncontrollable shaking, muscle tightening, severe muscle stiffness, severe muscle twitching, loss of coordination, headache, back pain, stomach pain, chest pain, difficulty falling asleep, difficulty staying asleep, confusion, hallucinations, foot swelling, leg swelling, ankle swelling, fast heartbeat, nausea, vomiting, diarrhea, loss of appetite, weakness, dizziness, inability to get an erection, inability to keep an erection, irregular menstruation, decreased sexual desire, swelling of eyes, swelling of face, swelling of lips, swelling of the tongue, swelling of the throat, hoarseness, hives, itching, difficulty swallowing, changes in heartbeat, and difficulty breathing (NIH, 2019). Hydrocodone overdose symptoms included; cold skin, clammy skin, narrowed pupils, widened pupils, muscle weakness, slowed breathing, sleepiness, slowed heartbeat, coma, and death (NIH, 2019).

Dosage

According to Barnes et al. (2016), hydrocodone pediatric dose was 0.05 to 0.2 mg/kg/dose at 3 to 4-hour intervals. However, daily limits for children ages 0 to 17 years with moderate to severe fracture pain was 24 MME/day to 72 MME/0-3days (Vermont Department of Health, 2019), and daily pill count of 4 hydrocodone of 5mg (Barnes et al., 2016; Vermont Department of Health, 2019). Generally, the starting hydrocodone dosage was 5 mg hydrocodone/325 mg APAP, and oral dose in children more than 50 kg body weight was 5 to 10 mg every 4 hours (University of North Carolina Hospital, 2009).

Oxycodone

Nature, Street Names, and Brand Names

Oxycodone is a highly potent licit semi-synthetic narcotic opioid for pain relief (North Carolina Department of Health and Human Services, 2019; NIH, 2019). Balyan et al. (2017), the CDC (2019), Chua et al. (2017), the DEA (2017), and NIH (2019) recognized the drug as the most misused opioid by the drug-abusing population (CDC, 2019; DEA, 2017). Further, drugs that caused similar oxycodone effects are hydrocodone, fentanyl, codeine, and morphine (DEA, 2017). Oxycodone brands included oxycontin and percocet, according to the American Academy of Pediatrics (2017) and the NIH (2020) and SAMHDA, (2018); oxycet, roxicet, xtampza, and xartemis (NIH, 2019; SAMHDA, 2018). The street names for oxycodone are k*icker,* American Academy of Pediatrics (2017) and DEA (2017), hillbilly heroin, oc, ox, roxy, perc, and oxy (DEA, 2017).

Use, Trends, Historical Facts, Access, Exposure, and Prescribing Practices

Oxycodone is the most commonly documented implicated opioid in the United States (Finkelstein et al., 2017). Therefore oxycodone was selected for this study because the drug ranked the number one prescribed opioid for children and adolescents 12 to 17 years old (Chung et al., 2018). Oxycodone use varied based on administration purpose, separately or combined, which increased the risk of toxicity (Chung et al., 2016). In some instances, oxycodone was combined with another non-opioid analgesia for pain during fracture management (Coit & Shannon, 2019). Oxycodone was for oral pain management (Coit & Shannon, 2019) and acute and chronic pain in children (Balyan et al., 2017). For example, Allen et al. (2017) posited that exposure to oxycodone was 22.9% of children in the United States. Further, justify the need to research oxycodone misuse among adolescents 12 to 17 years in the United States. Monnat and Rigg (2016) reported the POM epidemic origins was rural America, where reports of oxycontin abuse first surfaced. The pharmaceutical use of opioids skyrocketed between 1990 and 1996, and oxycodone prescriptions increased by 15% (COACEP, 2017). Further, the number of prescription opioids sold in the United States quadrupled since 1999, with Americans consuming nearly 81% of the global supply of oxycodone (COACEP, 2017). However, by 2007, the opioid oxycontin revenue nationally exceeded 30 billion (Strayer et al., 2017). One reason for the prescription opioid use and misuse increase may be easy access. For instance, in 2015, easy access to oxycontin by seniors in high school was 40 % (Nebraska Department of Health & Human Services, 2016). Another critical factor that may have impacted use and misuse may be the extensiveness and consequences of

chronic pain and the need to reduce pain (Walco et al., 2017). For instance, in 2015, the FDA approved the use of extended-release oxycodone in children 11-16 years old with severe pain requiring daily long-term treatment (FDA, 2015; Yang et al., 2016).

Purpose, Policies, and Demographics

Generally, oxycodone was used to treat adolescents with moderate to severe pain according to the National Institute of Health (2019) and is ideal for opiate-like high and morphine withdrawal symptoms (Ciulla-Bohling, 2019). The FDA approval was two-fold; policy to curb the current off-label prescribing practice to children and standardization of clinical trials guidelines designed for children (NIH, 2017; Yang et al., 2016). These guidelines stipulated clinicians' specific dosing for pediatric patients. For example, patients already responding to and tolerating oxycodone should be prescribed doses up to 20 mg per day, including an equivalent dose of extended-release oxycodone (FDA, 2015; Yang et al., 2016). Within two years of the FDA oxycodone dosing guidelines implementation for clinicians, extended-release oxycodone abuse declined, and generic oxycodone abuse increased (FDA, 2015; Yang et al., 2016).

Onset of Action, Short Acting, and Long Acting

Oxycodone onset of action can be short-acting immediate-release opioid prescribed for short treatment courses (percocet and percodan) Banerjee et al., (2016), COACEP, (2017), and Volkow et al. (2011) or long-acting extended-release prescribed for long treatment courses (oxycontin) (Banerjee et al., 2016; COACEP, 2017). Some short-acting oxycodone brands have a dosing interval of 3 to 4 hours (Argoff & Silvershein, 2009). However, extended-release oxycodone dosing was allowed every 12

hours and not every 4 to 6 hours (FDA, 2015; Yang et al., 2016). Generally, oxycodone is extended-release tablets, extended-release capsules, and a concentrated solution (NIH, 2019). Patients considered as opioid naive or who were not administered these medications for at least one week due to the effects of the drug should not receive these oxycodone forms (NIH, 2019).

Effects and Outcomes

Some of the physiological effects of oxycodone included pain relief, sedation, constipation, papillary constriction, cough suppression, and respiratory depression (DEA, 2017). Usually, the need for euphoria and relaxation are the most common effects of oxycodone on the brain, which explains the propensity for misuse (DEA, 2017). Other effects of extended or chronic use of oxycodone containing acetaminophen were severe liver damage (DEA, 2017).

Side Effects and Overdose Symptoms

Side effects of oxycodone are dry mouth, stomach pain, drowsiness, flushing, headache, mood changes, changes in heartbeat, agitation, hallucinations, fever, sweating, confusion, fast heartbeat, shivering, severe muscle stiffness or twitching, loss of coordination, nausea, vomiting, diarrhea, nausea, loss of appetite, weakness, dizziness, inability to get or keep an erection, irregular menstruation, decreased sexual desire, chest pain, hives, itching, rash, swelling of the face, throat, tongue, lips, eyes, hands, feet, ankles, or lower legs, hoarseness, difficulty breathing, difficulty swallowing, seizures, extreme drowsiness, life-threatening breathing problems, and lightheadedness when changing positions (NIH, 2019). Generally, the overdose symptoms include; drowsiness,

muscle weakness, confusion, cold and clammy skin, pinpoint pupils, shallow breathing, slow heart rate, fainting, coma, and possible death (DEA, 2017).

Dosage

The following are the dosage guidelines when prescribing oxycodone to children six months or older for mild to moderate pain at dosing intervals of 4 to 6 hours utilizing the PO/SL route, an initial dose of 0.1 to 0.2 mg/kg (Children's Minnesota, 2017; NIH, 2015). Pain Assessment and Management Initiative [PAMI] (2016) recommended similar dosage guidelines for prescribing oxycodone to children six months or older with dosing intervals of 4 to 6 hours utilizing the oral route, an initial dose of 0.05 to 0.15 mg/kg. Barnes et al. (2016) confirmed a similar oxycodone pediatric dose of 0.05 to 0.2 mg/kg/dose at 4 to 6-hour intervals. Coit and Shannon (2019) further recommended that oral dosing recommendation for children weighing more than 50kg was 5 to 10 mg per dose every 4 to 6 hours. The FDA (2015), Shenoi (2016), and Yang et al. (2016) advanced the minimum daily oxycodone dose to manage pain as 20 mg. However, recommended starting Percocet pill is 5 mg oxycodone/325 mg APAP oral dose in children more than 50 kg body weight every 4 to 6-hour intervals (Barnes et al., 2016; NIH, 2015; University of North Carolina Hospital, 2009). According to Barnes et al. (2016), when administering oxycodone, the pediatric dose at 4 to 6-hour intervals of Percocet liquid is 1 mg/ml oxycodone and 65 mg acetaminophen/ml. Oxycodone limits for children ages 0 to 17 years with moderate to severe fracture pain daily dosage is24 MME/day, 72 MME/0-3days, and daily pill count of 3 oxycodone 5mg (Vermont

Department of Health, 2019). Lobst et al.(2018) clarified that oxycodone had the highest average doses of opioid prescriptions per patient for orthopedic fractures.

Fentanyl

Nature, Street Names, and Brand Names

Fentanyl is a synthetic opioid with approximately 100 times more potency than morphine (Chhabra &Aks, 2017; DEA, 2017; NIH, 2019). Drugs that cause similar fentanyl effects include hydrocodone, oxycodone, and morphine (DEA, 2017). However, fentanyl is more potent than opioids like morphine (NIDA, 2019). Fentanyl brands include actiq, duragesic, and sublimaze according to the American Academy of Pediatrics (2017), the NIDA (2016), the National Institute of Health (2019), and SAMHDA (2018), and fentora (American Academy of Pediatrics, 2017; NIH, 2019; SAMHDA, 2018). The street names for fentanyl are apache, china white, dance fever, friend, goodfella, jackpot, murder 8, tnt, tango, and cash, American Academy of Pediatrics (2017), DEA (2017), and National Institute of Health (2019) china girl, china town, great bear, he-man, king ivory, and tango & cash (DEA, 2017; NIDA, 2016).

Use, Trends, Historical Facts, Access, Exposure, and Prescribing Practices

Fentanyl was selected for this study because of the possible association with opioid-related overdose and death (CDC, 2019), thereby justifying the need to further research fentanyl misuse among adolescents 12 to 17 years in the United States. In the 1950s, fentanyl was a potent synthetic opioid agonist developed to satisfy powerful and rapid analgesia and was approved by the FDA for analgesic and anesthetic uses (DEA, 2017; NIH, 2020). The CDC (2019), Chhabra and Aks (2017), and the NIH (2019)

confirm fentanyl as a powerful synthetic opioid used for surgical and other painful procedures. Other fentanyl use includes but is not limited to 1) treating patients with severe pain; 2) managing pain after surgery (Coit & Shannon, 2019); 3) treating patients with chronic pain who are physically tolerant to other opioids (NIDA, 2016); 4) treat chronic cancer pain; 5) as an anesthetic, and finally 6) manage pain intravenously (NIH, 2020) in children. Further, fentanyl prescribed as transdermal patches or lozenges forms can be misused. Recent fentanyl-related misuse, harm, overdose, and death result from illegally made fentanyl in the United States (CDC, 2019).

Purpose, Policies, and Demographics

Coit and Shannon (2019) posited that fentanyl is an ideal option for quick procedures in the operating room requiring conscious sedation and immediate postoperative periods. Fentanyl administered when prescribed by a clinician can be in the form of an injection, a patch placed on the skin, or as lozenges sucked like cough drops (NIDA, 2019).

Onset of Action, Short Acting, and Long Acting

Fentanyl onset of action can be short-acting immediate release prescribed for short treatment courses (Banerjee et al., 2016) or long-acting extended-release administered for long treatment courses as fentanyl transdermal, or, and patches (Banerjee et al., 2016; COACEP, 2017). Fentanyl is a fast-acting opioid narcotic pain reliever that can be given more quickly through the nose/intranasally (Children Hospital of Philadelphia, 2018). Coit and Shannon (2019) asserted that fentanyl has a faster onset of 30 seconds than morphine onset of 30 to 60 minutes.

Effects and Outcomes

According to Chhabra and Aks (2017), central nervous system impairment, respiratory depression, and death occurred in children after the dermal application or ingestion of fentanyl. The associated fentanyl effects include extreme happiness, drowsiness, nausea, confusion, constipation, sedation, problems breathing, and unconsciousness (NIDA, 2019). This drug is considered highly addictive because of its potency. Therefore a person using prescription fentanyl as instructed by a clinician may experience dependency characterized by withdrawal symptoms with discontinued use (NIDA, 2019). Further, fentanyl binds to the body's opioid receptors found in areas of the brain that control pain and emotions, reducing cravings and withdrawal symptoms (NIDA, 2019).

Side Effects and Overdose Symptoms

Othman et al. (2016) clarified that transdermal fentanyl had no significant side effects when used for chronic pain in children aged 2-14. However, some non-significant side effects were; constipation, nausea, vomiting, erythema, itching, and respiratory depression (Othman et al., 2016). Further, fentanyl produces relaxation, euphoria, pain relief, sedation, confusion, drowsiness, dizziness, nausea, vomiting, urinary retention, pupil constriction, and respiratory depression (DEA, 2017). Fentanyl overdose symptoms include; low blood pressure, drowsiness, dizziness, nausea, vomiting, limp body, changes in pupil size, cold skin, clammy skin, blue colored lips, blue-colored fingernails, slowed breathing, stopped breathing, decreased heart rate, reduced consciousness, loss of consciousness, and coma (Americanaddictioncenters, 2019).

Dosage

Chhabra and Aks (2017) explained that fentanyl dosage is in microgram units. Barnes et al. (2016) clarified that fentanyl pediatric dose in individuals older than 12 years was 0.5 to 1mcg/kg/dose in1 to 2-hour intervals. The following are dosage guidelines when prescribing fentanyl to children six months or older for mild to moderate pain, including orthopedic fractures with dosing interval 10 min to 1 hr (bolus) utilizing the IV route; an initial dose of bolus 1mcg/kg and continuous infusion 1mcg/kg/hr (Children's Minnesota, 2017). Further, utilizing the IV route, an initial dose was 1-2 mcg/kg (PAMI, 2016) and maximum dosage of 50 mcg (PAMI, 2016; University of North Carolina Hospital, 2009) every 2 hours in children with more than 50 kg body weight (University of North Carolina Hospital, 2009). However, the dosage guidelines for prescribing fentanyl to children six months or older with dosing intervals of 72 hours utilizing the oral route are an initial dose of 12-25 mcg/h with a dosing interval every 1-2 hours (PAMI, 2016).

However, Coit and Shannon (2019) recommended bolus dosing fentanyl in children weighing over 50kg through intravenous dosing as 25 to 50 μg every 1 to 2 hours. In Pediatric Intensive Care Units [PICU], pediatric patients received 0.001 to 0.003 mg/kg doses of fentanyl for 1 to 1.5 hours using a low oral/parenteral potency ratio (Anand et al., 2010). Gehdoo (2004) clarified that although fentanyl has current doses of 1to 2 mg/kg, this dosage is not a popular systemic analgesic for conventional postoperative analgesia in children. Further, Othman et al. (2016) explained that the

transdermal therapeutic system fentanyl with a drug release rate of 12 mg/h is of value in pediatric cancer pain control.

Tramadol

Nature, Street Names, and Brand Names

According to (Makunts et al., 2019) and (Wren et al., 2019), tramadol is a weak synthetic opioid with an acceptable safety profile (Buck, 2015). Makunts et al. (2019) reiterated that the United States Drug Enforcement Agency classified tramadol as possessing a low abuse potential because of the drug pain-relieving action mechanism. However, misuse of the drug increases the risk of toxicity (Chung et al., 2016). Tramadol brands include ultram, according to Buck (2015) and DEA (2018) and SAMHDA (2018), ultram er, zytram, tramal, larapam sr, rybix odt, and conzip, according to Buck (2015) and SAMHDA (2018), and ultracet (DEA, 2018; SAMHDA, 2018). The street names for tramadol are chill pills, trammies, and ultras (Addiction Center, 2020).

Use, Trends, Historical Facts, Access, Exposure, and Prescribing Practices

According to Jin (2017), tramadol is most commonly prescribed compared to hydrocodone or oxycodone and ranks as one of the top five prescribed opioids in the United States (Makunts et al., 2019). This rank justifies the selection of tramadol for the research, which explores misuse of the drug among adolescents 12 to 17 years in the United States. In 1995, tramadol was approved for use in the United States as a non-controlled pain-relieving drug, according to the DEA(2018) and Makunts et al.(2019), and globally for acute and chronic pain management because of the drug's low respiratory depression risk (Makunts et al., 2019). Jin (2017) explained that repeated use

of tramadol and other opioid types increases the risk of becoming addicted. As a result, tramadol is abused mainly by narcotic addicts, chronic pain patients, and health professionals (DEA, 2018).

According to the Drug Enforcement Administration (2018), tramadol was approved for moderate to severe pain treatment in adults and more commonly prescribed to hydrocodone or oxycodone, thereby influencing patients risk perception of tramadol as a less risky drug compared to other prescription opioids (Jin, 2017). Tramadol was considered one of the top sixty prescribed medications in the United States (Makunts et al., 2019). However, tramadol exposures declined from 2000 to 2003 but increased steadily before plateauing after 2012 (Allen et al., 2017). This trend was evident since, in 2005, tramadol adverse reaction-related hospital visits increased two-fold, with females accounting for most cases (Makunts et al., 2019). In 2014, misuse of tramadol recorded increased, the absolute number of patients who visited the emergency departments for adverse effects in the United States was 20,000 (Buck, 2015). In 2015, the number of individuals in the United States aged 12 or older who misused tramadol products confirmed by the NSDUH was 1.6 million (DEA, 2018). The number of tramadol prescriptions dispensed in the United States in 2016 was 43.6 million, and 41.0 million in 2017(DEA, 2018). In light of the addictiveness of tramadol, in 2017, the FDA established revised clinician opioid prescribing practices guidelines by announcing a contraindication against the use of tramadol in children after surgeries such as a tonsillectomy or adenoidectomy (Chua et al., 2017).

Purpose, Policies, and Demographics

Since tramadol-contained products are recommended only for adult use, there are instances where the drug was prescribed and used for conditions, outside the age group, in an off-label dosage, or outside of FDA-approved guidelines to treat children (Aschenbrenner, 2017). Buck (2015) confirmed that although not approved for use in children 17 years of age or less, tramadol has been used off-label in the United States for postoperative pain following tonsillectomy. To date, tramadol is contra-indicatory for pain treatment in children younger than 12 (Aschenbrenner, 2017; Jin, 2017). Further, Buck (2015) advanced tramadol should not be given to patients with a history of hypersensitivity to the drug and central nervous system or respiratory depressants unless a clinician is present and can monitor the patient for adverse effects.

Onset of Action, Short Acting, and Long Acting

Tramadol onset of action is short-acting immediate releases, prescribed for short treatment courses, or long-acting extended-release administered for long treatment courses (Banerjee et al., 2016). This drug is rapidly absorbed in individuals after oral administration (Buck, 2015).

Effects and Outcomes

Adverse drug reactions of tramadol include constipation, according to the DEA (2018) and Makunts et al. (2019), dizziness, nausea, somnolence, according to Buck (2015), DEA (2018), and Makunts et al. (2019), headache, vomiting, and pruritus (Buck, 2015). Tramadol use leads to the risk of tolerance, dependence, addiction, and respiratory depression (Aschenbrenner, 2017; Buck, 2015; DEA, 2018) and sedation

(Aschenbrenner, 2017). Tramadol should not be prescribed to adolescents ages 12 to 18 with co-morbidities, obesity, sleep apnea, severe lung disease due to the risk of respiratory adverse effects, and breastfeeding adolescent women, which may cause an overdose in their infants (Jin, 2017). Additionally, tramadol should not be used by; breastfeeding women, children, and adolescents after surgery to remove tonsils or adenoids (Jin, 2017).

Side Effects and Overdose Symptoms

Creswell et al. (2019) clarified that supra-therapeutic doses of tramadol have the potential for abuse, dependence, serious side effects, death, and an atypical withdrawal syndrome due to the serotonin and norepinephrine effects. However, Chung et al. (2016) refuted that tramadol increased the risk of toxicity. Some of the side effects of tramadol include serotonin syndrome and hypoglycemia, according to Makunts et al. (2019), and increased seizure risk (Buck, 2015). Further, Jin (2017) reported tramadols' main side effects as mild or extreme sleepiness. Tramadol overdose symptoms include extreme fatigue, falling in and out of consciousness, slowed heartbeat, weak muscles, decreased pupil size, pinpoint pupil, pinned out pupils, cold skin, clammy skin, gray tint to the skin, bluish tint to the skin, and coma (Addiction Campuses, 2019).

Dosage

According to Buck (2015), there are no standardized dose recommendations for tramadol use in children. However, tramadol's recommended dose in adults is 25 mg per day administered as a single dose in the morning, then titration in 25 mg increments every three days to reach 25 mg four times daily (Buck, 2015). Buck (2015) clarified that

the dose titrated may be up to a maximum of 400 mg per day afterward. Additionally, tramadol can be administered in 50 to 100 mg tablets as needed for pain relief every 4 to 6 hours at a maximum limit of 400 mg/day (DEA, 2018). However, in the perioperative setting, the off-label administrative dose recommendation for pediatric is usually 1to 2 mg/kg intravenously or orally (Buck, 2015).

Codeine

Nature, Street Names, and Brand Names

Codeine derived from the poppy seed is a weak to mid-range opioid (Balyan et al., 2017; CDC, 2019; Goldschneider, 2017; Tremlett et al., 2010; Van Hout et al., 2017). Jamasbi et al. (2018) confirmed codeine as a weak opioid that works by metabolic conversion to an active drug. This nature means that codeine transforms into the active metabolite, morphine (Balyan et al., 2017). Codeine brands include tuzistra, brontex, guiatuss, nalex, phenergan, robitussin, and vanacof (NIH, 2019).The street names for codeine include syrup, schoolboy, and cody *(*American Academy of Pediatrics, 2017).

Use, Trends, Historical Facts, Access, Exposure, and Prescribing Practices

In the study, codeine use was due to its history, since the drug introduction nearly 200 years ago is a familiar drug among clinicians (Goldschneider, 2017). However, codeine is not the preferred prescription opioid for pediatric patients (Jamasbi et al., 2018). Goldschneider (2017) dissented and suggested that codeine ranks as the most commonly prescribed opioid in pediatric care. Further, Goldschneider (2017) identified that codeine was administered more to older children than children younger than six years old. Additionally, codeine use in pediatric emergency departments accounted for

nearly one-third of the overall codeine prescriptions (Chumpitazi et al., 2017). This trend justified the need to further research codeine misuse among adolescents 12 to 17 years in the United States.

In 1832, French chemist Pierre-Jean Robiquet isolated codeine from opium. In the 19th century, codeine use relieved pain and controlled diabetes (Schwartz, 2019). However, near the end of the nineteenth century, codeine use replaced morphine and was subsequently used in withdrawal from morphine treatment (Schwartz, 2019). Further, codeine use is for the symptomatic relief of cough or mild to moderate pain (Derry et al., 2013; NIH, 2019). Codeine is most common for oral pain management (Coit & Shannon, 2019), and prescribing is more prevalent in codeine than hydrocodone and oxycodone in children. Therefore, some patients believe that codeine does not carry the same misuse risks as other prescription opioids (Jin, 2017).

Van Hout et al. (2017) explained that prescribed codeine misuse is an increasing public health concern. Approved for use in adults only, according to Aschenbrenner (2017), based on codeine safety and efficacy concerns associated with pediatric use of the drug (Aschenbrenner, 2017). However, sometimes the drug was used off-label to treat children in the United States, according to Aschenbrenner (2017). Notwithstanding, concerns remain on whether or not prescribing codeine to children is appropriate (Basco et al., 2015). Frei et al. (2010) clarified that codeine variable genetic metabolic response contributes to misuse risk. According to Goldschneider (2017), numerous North American children's hospitals removed codeine or limited its use leading to statistically significant prescription reduction by prescribers. This removal resulted from the

knowledge that codeine has no unique benefits over other opioids but had several established risks (Goldschneider, 2017). Although clinicians vary in codeine prescribing practices, codeine was prescribed most by dentists and emergency room physicians (Goldschneider, 2017).

Purpose, Policies, and Demographics

Over the last 20 years, there were recordings of codeine use, labeling, and prescribing guidelines revisions. For instance, in 2006, the American Academy of Pediatrics issued guidelines concerning the potential danger and lack of documented efficacy of codeine-contained products for children with a cough or upper respiratory infections (Aschenbrenner, 2017; Chumpitazi et al., 2017). In 2011, codeine was no longer on the World Health Organization list of essential medications for children due to a lack of efficacy and safety evidence (Goldschneider, 2017: Van Cleve & Grigg, 2017). In 2012, the World Health Organization removed codeine-containing products from its analgesic ladder (Chumpitazi et al., 2017). Further, a black box warning was issued in 2012 by the FDA based on the life-threatening adverse events and death of children after tonsillectomy or adenoidectomy from codeine use (FDA, 2013). Additional requirements for manufacturers of cough and cold medications containing codeine were to update the labeling with a boxed warning explaining risks of misuse, abuse, addiction, breathing difficulties, overdose, and death (Sloan et al., 2019). This guideline was an innovative step in the right direction which established the critical criteria to assist clinicians in opioid prescribing practices (Aschenbrenner, 2017; Chua et al., 2017). In 2016, the American Academy of Pediatrics proposed the disuse of codeine in children because of

possible breathing complications (Allen et al., 2017). Also, in 2017, there were recommended restrictions and extensive education training for clinicians and awareness campaigns for parents on codeine use (Goldschneider, 2017). Further, the FDA decided to limit medications containing codeine to patients 18 years and under by recommending the medication discontinuation to treat cough in the pediatric population (Aschenbrenner, 2017; NIH, 2020).

Between 1969 and 2012, the FDA received 13 reports of youths who died or overdosed after taking codeine of this sum 8 had a recent tonsillectomy or adenoidectomy (Chua et al., 2017). Codeine is considered one of the most commonly prescribed analgesics to children after tonsillectomy or adenoidectomy because of its perceived favorable safety compared to higher-potency alternative opioids such as oxycodone and hydrocodone (Chua et al., 2017). According to Chua et al. (2017), there was a significant decline in prescribed codeine to youths after tonsillectomy or adenoidectomy, as revealed by the 2012 to 2013 FDA codeine safety investigation. However, in 2015, codeine prescribing continued with 5.1% of all youths and 3.0% of adolescents with obstructive sleep apnea receiving codeine after tonsillectomy or adenoidectomy (Chua et al., 2017). According to Sloan et al. (2019), post-operative use of codeine in 6 to 17-year-old patients with obstructive sleep apnea syndrome increased oxygen de-saturation, compromising the respiratory drive.

Notwithstanding the risk, genetic variability in metabolism, and safety concerns related to codeine use in children, codeine remain widely administered in the United States according to Chumpitazi et al. (2017) and Jin (2017), justifying the research. In

conclusion, codeine use should not be in adolescents with sleep apnea, severe lung disease, breastfeeding babies, obesity, and surgery to remove tonsils or adenoids (Jin, 2017).

Onset of Action, Short Acting, and Long Acting

Codeine onset of action is short-acting immediate release prescribed for short treatment courses according to Banerjee et al. (2016) and COACEP (2017). Codeine is administered as a tablet, a capsule, and a liquid and taken orally every 4 to 6 hours as needed (NIH, 2019).

Effects and Outcomes

Codeine use in children can lead to breathing difficulty, slow breathing, breathing problems, life-threatening breathing problems, and death (Allen et al., 2017; NIH, 2019). Further, according to Voepel-Lewis (2015), some evidential effects and risks of codeine use in children are obstructive sleep apnea, neurologic injury, and deaths from genetic susceptibility. Chumpitazi et al. (2017) posited that codeine, when converted to morphine variable activity, can lead to therapeutic failure and toxicity. Additionally, effects of codeine include; altered perceptions, emotional responses to pain, euphoria, sedation, and the development of tolerance within relatively short timeframes (Babalonis et al., 2013). McAvoy et al. (2011) and Van Hout et al. (2017) confirmed that the use or misuse of codeine stimulates neuro-adaptation, dependence and increases mortality. Additional, adverse health consequences of codeine misuse include hypokalaemia, gastrointestinal hemorrhage, acute pancreatitis, and inflammatory bowel conditions (Frei et al., 2010; Pilgrim et al., 2013).

The general codeine withdrawal symptoms include codeine seeking and taking preoccupation, cravings, overuse, according to Romach et al. (1999), and mild or extreme sleepiness (Jin, 2017). Frei et al. (2010) reported psychiatric co-morbidity such as anxiety, depression, and dysphoria. In light of the above effects, the American Academy of Pediatrics advocated discontinuing the use of codeine in young children because of documented respiratory depression and fatalities (Aschenbrenner, 2017). As a result, the FDA recommended reducing codeine administration and possible discontinuation because the drug is associated with life-threatening respiratory problems (Coit & Shannon, 2019).

Side Effects and Overdose Symptoms

Codeine side effect includes headache, stomach pain, difficulty urinating, agitation, hallucinations, fever, sweating, rash, itching, hives, changes in vision, confusion, fast heartbeat, shivering, severe muscle stiffness or twitching, loss of coordination, nausea, vomiting, diarrhea, loss of appetite, weakness, dizziness, inability to get an erection, inability to keep an erection, irregular menstruation, decreased sexual desire, noisy breathing, shallow breathing, difficulty breathing, difficulty swallowing, changes in heartbeat, and seizures (NIH, 2019). Codeine overdose symptoms include bluish lips, bluish skin, chest pain, chest discomfort, constricted pupils, pinpoint pupils, small pupils, decreased awareness, decreased responsiveness, extreme sleepiness, unusual drowsiness, slow heartbeat, and irregular heartbeat (Mayoclinic, 2020).

Dosage

According to Anand et al. (2010), codeine's pediatric dosage is 0.5 to 1.0 mg/kg every 3 to 4 hours. Morris et al. (2010) agreed that the recommended codeine dosage for arm fractures in children was 1 mg/kg. Gehdoo (2004) supported that a single oral codeine dose of 1 mg/kg is appropriate as antitussive and analgesic because no respiratory depression occurs after a single dose. Further, Michael and Sztajnkrycer (2004) explained that children exposed to more than 1 mg/kg of codeine developed evidence of toxicity within 1 hour of ingestion. However, the recommended starting dosage of codeine is 30 mg codeine/300 mg APAP, and the oral dose in children with more than 50 kg body weight is 30 to 60 mg every 4 hours (University of North Carolina Hospital, 2009).

Morphine

Nature, Street Names, and Brand Names

Morphine is a natural nonsynthetic opioid, according to the CDC (2019), extracted from the opium poppy and used for pain treatment (DEA, 2017). Drugs with similar morphine effects are hydrocodone, oxycodone, fentanyl, and codeine (DEA, 2017). Morphine brands include avinza and kadian according to the American Academy of Pediatrics (2017) and SAMHDA (2018), ms-contin, oramorph sr, msir, roxanol, and rms (DEA, 2017; SAMHDA, 2018). The street names for morphine are mister blue, dreamer American Academy of Pediatrics (2017) and DEA (2017), emsel, first line, God's drug, hows, m.s., morf, morpho, and unkie (DEA, 2017).

Use, Trends, Historical Facts, Access, Exposure, and Prescribing Practices

Morphine was selected for this study because the drug remains the standard opioid for pain relief in children of all age groups (Gehdoo, 2004). Morphine is ranked in the top 10 prescribed opioids in an inpatient setting, according to (Hsu & Brazelton, 2009). This rank justified the need to further research morphine misuse among adolescents. With a sharp increase in the pharmaceutical use of opioids between 1990 and 1996, prescriptions for morphine increased by 49% (COACEP, 2017). Morphine is the standard choice opioid and is widely used, according to Garimella and Cellini (2013), in relief from physical pain, hunger, and cough reflex inhibition (DEA, 2017). In children, morphine use included intravenous pain management and severe acute musculoskeletal pain, according to Coit and Shannon (2019), pain from fracture, burns, and sickle cell disease, according to Jacob and Mueller (2008) and Lasky et al. (2012), and appendicitis.

Purpose, Policies, and Demographics

According to Shenoi (2016), morphine safety and efficacy have not been established in patients less than 18 years. Although morphine for pediatric use is not approved, the drug is used off-label by clinicians (Hsu & Brazelton., 2009; Lasky et al., 2012). For example, Lasky et al. (2012) reported that 54,613 adolescents aged 12 to 17 years received morphine while hospitalized. Further, in 2008, despite the non-existence of pediatric labeling, 476,205 children in the United States received morphine (Lasky et al., 2012).

Onset of Action, Short Acting, and Long Acting

Morphine onset of action categorization includes short-acting and long-acting immediate-release opioids prescribed for short and long treatment courses (Banerjee et al., 2016; COACEP, 2017). Some examples of long-acting morphine are ms contin, avinza, kadian, and oramorph sr, whereas short-acting include (msir). Morphine onset of action peak effect occurs in 1 to 2 hours (Garimella & Cellini, 2013), but intravenous morphine provides excellent analgesia with a longer duration of action of 3 to 4 hours (Coit & Shannon, 2019).

Effects and Outcomes

Morphine's effects include euphoria and relief of pain, but the outcomes are tolerance, physical dependency, and psychological dependency (DEA, 2017).

Side Effects and Overdose Symptoms

According to Karl et al. (2012), children and adolescents with postoperative pain inhibit similar side effects when administered morphine. Additional side effect associated with morphine use includes nausea, vomiting, itching, urinary retention, and respiratory depression (Karl et al., 2012; Le May et al., 2016). Morphine overdose symptoms include; cold skin, clammy skin, lowered blood pressure, sleepiness, slowed breathing, slow pulse rate, coma, and death (DEA, 2017).

Dosage

Morphine is considered safest in a dose of 0.1 mg/kg-1 with the following dosage guidelines to children six months or older for moderate to chronic pain every 2 to 4 hours (Gehdoo, 2004; Children's Minnesota, 2017). When utilizing the PO/SL & PR route the

initial dose is 0.15 to 0.3 mg/kg whereas the IV & SC route initial dose is 0.05 to 0.1 mg/kg. Barnes et al. (2016) advanced morphine pediatric IV recommended dose is 0.05 - 0.2 mg/kg/dose, with a maximum of 2 to 4 mg at 2 to 4 hour intervals and (PO) 0.2 to 0.5 mg/kg/dose at 4 to 6 intervals. The dosage guidelines for prescribing morphine to children six months or older with dosing interval 4 hours utilizing the oral route commenced with an initial dose of 0.3 mg/kg with 2 to 4 hours dosing interval, whereas utilizing the IV route had an initial dose of 0.1 mg/kg (PAMI, 2016). However, Anand et al. (2010) recommended morphine dosage as 0.05 to 0.1mg/kg every 4 to 5 hours for children. Whereas Coit and Shannon (2019) advanced for bolus dosing of morphine in children weighing more than 50kg intravenous dosing recommendations are 2 to 5mg every 2 to 4 hours, continuous intravenous dosing is 1.5 mg/hour, and oral dosing recommendation as 10 to 20mg per dose every 3 to 4 hours. The initial oral dosage of morphine for children 6-months to 17 years old is 0.2 to 0.3 mg/kg/dose PO every 3 to 6 hours as needed, not exceeding an initial dose of 5mg/dose PO for children and 10mg/dose PO for older adolescents (Prescribers Digital References [PDR], 2019). Additionally, morphine recommended starting oral dose in children with more than 50kg body weight is 10 to 20mg every 4 hours, whereas, recommended starting morphine parenteral dose in children with more than 50kg body weight is 3 to 5mg every 4 hours (University of North Carolina Hospital, 2009).

Gender and Adolescent Prescription Opioid Misuse

In reviewing POM in adolescents and the socio-demographic risk factors, gender played a critical role in understanding the association between opioid types and POM

among adolescents 12 to 17 years of age in the United States. Sung et al. (2005) and SAMHDA (2018) indicated a higher risk for opioid misuse among female adolescents. The findings of Edlund et al. (2015), Vaughn et al. (2015), and Simoni-Wastila and Strickler (2004) concurred that females are at higher risk for POM. Monnat and Rigg (2015) further stated that being female is significantly and positively associated with adolescent POM. The findings by researchers on gender and POM among adolescents highlighted that females were at higher risk for POM.

Numerous researchers (Chen & VanderWeele, 2018; Donaldson et al., 2015) have analyzed the association between gender and adolescent POM. Male and female was the operationalized definition for gender (Chen & VanderWeele, 2018; Ford & Rigg, 2015; Donaldson et al., 2015; Edlund et al., 2015; Gallucci et al., 2018; Grim & Grim, 2019; Monnat & Rigg, 2016). Further, the findings of other secondary analyses of NSDUH data were that adolescent females are more likely to have POM disorders (Edlund et al., 2015; Sung et al., 2005, Wu et al., 2008a), whereas other analyses have found no statistical differences (Ford, 2008; Ford and Lacerenza, 2011).

Notwithstanding the above findings, one of the profound risks associated with reporting in research is recall biases which may have been evident in the above studies and may have impacted the overall validity of the studies. For instance, females are less likely to report POM (Groenewald et al., 2019). Agreeably, Austin and Shanahan (2018) stated that in 2018, 54.7% of the respondents reporting adolescent POM was male compared to 45.3% female within the United States. Conversely, according to McCabe et al. (2013), females were almost twice as likely as males to report past-year medical

misuse of prescription opioids. These disparities can influence research findings causing interpretative error and inconclusiveness that can impact awareness programs and policies.

Taking an opioid as prescribed by a clinician can effectively reduce pain; however, the literature revealed a positive association between being prescribed an opioid and misuse (NIH, 2020). According to Anandarajan et al. (2019), with regional-level gender variations in pediatric opioid prescription rates, males were the most common demographics representing 51.56%. For instance, after an appendectomy, 61.5% of boys received a prescription opioid at the time of discharge (Cairo et al., 2018). However, Meckler et al. (2019) indicated that ambulatory care visits for headaches had a female predominance of 63.2% for opioid receipt. Jamasbi et al. (2018) asserted that males predominated the receipt of prescribed opioids for pain in children under 15 years. However, in adolescents 16 years or older, females were at 57.1%. Conversely, Meckler et al. (2019) posited no significant difference in the likelihood of receiving an opioid for female children compared to males.

Religiosity and Adolescent Prescription Opioid Misuse

Several researchers have analyzed the association between religiosity and adolescent POM in the United States (Lee et al., 2019; Chen & VanderWeele, 2018). Some of the religiosity definitions and interpretations are listed below. The issue of religiosity is very complex and encompasses a multiplicity of interpretations. Spiritual and religious influences were the operationalized definition of religiosity and religious beliefs (Lee et al., 2019); religious services attendance (Edlund, 2015); religious

affiliation (Grim & Grim, 2019), religious coping, and religious attendance (Gallucci et al., 2018); religiosity importance and attendance at services (Vaughn et al., 2016); religious involvement measured by service attendance, social interaction, and subjective religiosity/spirituality (Ransome et al., 2019); and as religious service attendance and prayer or meditation (Chen & VanderWeele, 2018).

Gallucci et al. (2018) used the microsystem of the SEM construct to show the association between religious coping and prescription stimulant misuse among a sample of undergraduate students. Chen & VanderWeele (2018) used the microsystem of the SEM construct to show the association between religious service attendance and prayer or meditation and prescription drug misuse. Further, Lee et al. (2019) used the mesosystem of the SEM construct to show a possible association between spiritual and religious influences and adolescent POM. Ford & Rigg (2015) used the mesosystem of the SEM to show racial differences in factors such as religiosity that may lead to risk for adolescent POM. Ransome et al. (2019) used the exosystem SEM construct to show religious involvement and racial disparities in opioid use disorder between 2004–2005 and 2012–2013. Additionally, Grim & Grim (2019) used the exosystem SEM construct to show belief, behavior, and belonging and how faith is indispensable in preventing and recovering from substance abuse.

Previous research highlighted religiosity as highly associated with many outcomes in adolescence, such as improved physical health, mental health, and overall lifestyles (Ford & Rigg, 2015). Several studies suggested that religious involvement is associated with lower prescription drug use and misuse (Burdette et al., 2018; Ford &

Hill, 2012). Ford and Rigg (2015) and Monnat and Rigg (2015) confirmed that religiosity also protects against adolescent POM, in that more religious adolescents were 47 % less likely to misuse medication (Ford & McCutcheon, 2012).

Individuals may reflect on religious worldviews when faced with opportunities to misuse opioids (Burdette et al., 2018; Ford & Hill 2012). Generally, actively religious adolescents may fear divine retribution and guilt from nonadherence to moral codes, regulations, laws, and standards (Burdette et al., 2018; Welch et al., 2006). Further, religious adolescents may more likely obey laws prohibiting POM because these individuals may be more likely to adhere to authority (Burdette et al., 2018). Additionally, adolescents who believe the body is a manifestation of God, the temple of God, a gift from God, an instrument of God or perceive that the body is sacred, spiritual, blessed, holy, and divine are more likely to disapprove of and exhibit lower levels of opioid use, experimentation, and misuse (Burdette et al., 2018).

In light of the foregone discussion, the impact of religiosity on adolescent worldview created the premise to include religiosity as a priority variable because the worldview of an individual influences attitudes and proclivity to misuse or not misuse prescription opioids. This adolescent belief justified the need to explore the identified gap in the research and determine the possible role of religiosity in adolescent POM.

Education and Adolescent Prescription Opioid Misuse

A literature review showed that researchers analyzed the association between education/education attainment and adolescent POM. Adolescents with lower academic scores such as D's and F's (Bonar et al., 2020; Vaughn et al., 2016) and who were at a

higher grade level such as 11th or 12th grade (Veliz et al., 2013; Vaughn et al., 2016; Donaldson et al., 2015) had a greater risk of POM. Although education was the conceptual definition of this study, a review of the literature showed other definitions include; school performance (Edlund, 2015), school engagement or academic achievement (Donaldson et al., 2015), and school or university attended (Gallucci et al., 2018). Ransome et al. (2019) used a similar conceptual definition for educational attainment as this research. However, the researchers' variables had fewer educational attainment options than this study, such as 0=less than high school, 1=completed high school, 3=college degree, and 4=graduate education or higher (Ransome et al., 2019). Additionally, Gallucci et al. (2018) used the Microsystem of the SEM construct to show a possible association between university attended and prescription stimulants misused.

The varying grades of adolescents can provide a forum for discussion as to whether there is an association between the student grade level and POM among adolescents 12 to 17 years old in the United States. Education is a critical variable because the educational level and critical thinking attained by adolescents 12 to 17 influence their worldview on opioid misuse. In this light, adolescents with higher educational attainment and higher critical thinking should be more informed on POM. This worldview justified the need to investigate possible associations between education and adolescent POM. According to Miech et al. (2015), youth with a legitimate prescription for opioids by 12th grade are three times more likely to misuse opioids subsequently than youth without a prescription. Further, the use of prescribed opioids

before the 12th grade is related to future opioid misuse among patients with minimal drug experience and knowledge (Miech et al., 2015).

According to Monnat and Rigg (2015), education variation can facilitate effective mitigation of adolescent POM. Developing intervention strategies is prudent and should include educational and awareness programs to educate about misuse risks. Although, Miech et al. (2015) explained that clinic-based education and prevention efforts have substantial potential to reduce future opioid misuse among adolescents who began opioid use with strong attitudes against illegal drug use. There is still the need for additional studies on the association between educational levels, critical thinking skills, and adolescent POM outcomes. However, one of the challenges that affect adolescents 12 to 17 is the influence of peers, notwithstanding their common sense understanding of the risk/benefits of opioid use (Hudgins et al., 2019). This influence may shroud prescription opioid risk and benefits and may lead to a continuation of opioid misuse despite known risks by 12 to 17-year-old adolescents.

Dependent Variable

Prescription Opioid Misuse by Adolescents 12 to 17 Years of Age in the United States

Adolescent Prescription Opioid Misuse Rates and Sources

According to the Center for Behavioral Health Statistics and Quality (2017) and Groenewald et al. (2019), new drug introduction led to POM by 2.1 million Americans in 2016. Garren et al. (2019) and Harbaugh et al. (2018) explained strong evidence that opioid-related misuse is present among adolescents. Further, POM occurs among adolescents at a high rate (Ford & Rigg, 2015). According to Ford and Rigg (2015),

Johnston et al. (2018), and Monnat & Rigg (2016), the POM rate by adolescents in the United States is approximately 20%. This problem is multifaceted (Ahn et al., 2019) and a behavioral public health crisis (Ahn et al., 2019; Bohnert & Ilgen, 2019; CDC, 2011). Additionally, Bohnert & Ilgen (2019) and the CDC (2019) advanced that adolescent POM is a behavioral public health epidemic guided by socialization and interactions with but not limited to: relatives, parents, caregivers, friends, clinicians, religious institutions, and teachers.

Dash et al. (2015) explained that 80 % of high school students reported medical use of opioids before misuse and sourced the drugs from a previous prescription. Stewart & Reed (2015) supported advancing the number of 12 to 17-year-olds, reporting POM almost doubled by the absolute number of 1,653,000 to 2,952,000 between 1999 and 2006. Dash et al. (2015) explained that from 2015, 3.9% of adolescents aged 12 to 17 misused prescriptions opioid in the past year. However, in 2017, approximately 769,000 or 4.2% of adolescents misused prescription opioids in the past year (SAMHDA, 2018; Winstanley & Stover, 2019). Further, the sources of prescription opioids for misuse by adolescents are most often from a friend, relative, or clinician (Hudgins et al., 2019). For example, Piper et al. (2019) reported that 37% of high school seniors misusing prescription opioids acquired the drugs from previously unused prescriptions. Further, Miech et al. (2015) advanced that among 12th-grade students, an association exists between legitimate opioid use and misuse despite no history of illicit drug use.

Adolescent Prescription Opioids Misuse Trends

The types of prescription opioids most commonly misused by United States adolescents include but are not limited to hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine (COACEP, 2017; NIH 2019; SAMHDA, 2018). Duran et al. (2017) and Ossiander (2014) confirmed that hydrocodone, oxycodone, and morphine were the most commonly misused prescription opioids by children. Of particular relevance, Miech et al. (2015) clarified that seniors having a history of drug use or having firm beliefs against the use of illicit drugs is 33% likely by age 23 to misuse opioids after high school due to use of prescription opioids while in high school as compared to seniors. Woodcock et al. (2015) confirmed that opioids for youth postoperative pain predispose them to a greater risk of future misuse. Further, Rabbitts et al. (2015) reported chronic postoperative pain as a high-risk factor for POM where the pain intensifies or persists.

Adolescent Prescription Opioid Misuse Adverse Effects

Serious adverse effects from adolescent POM continue to be evident despite decreased self-reported medical and nonmedical opioid use (Allen, 2017; Harbaugh, 2018). Fortunately, the use of prescription opioids in children has been reducing since 2010 (Banerjee, 2016). Of particular relevance, misuse of opioids for any reason can result in overdose and death (Manworren & Gilson, 2015). Additionally, Jamasbi et al. (2018) asserted that opioid use is not benign and leads to misuse, abuse, addiction, and overdoses. Freedman-Weiss et al. (2019) agreed that adolescents who use prescription opioids have an increased risk for future drug abuse and overdose and further

classified adolescents as a high-risk population. Therefore, it is prudent to acknowledge that early identification of opioid use is crucial to prevent misuse, addiction, and opioid-related morbidity among adolescents (Winstanley & Stover, 2019).

Causes of Adolescent POM

Jamasbi et al. (2018) explained that the risk of POM by adolescents increases with initial use of the drug, confirming a direct association between prescription opioid use and adolescent POM (Meyer et al., 2014). Further, Groenewald et al. (2019) clarified that the odds ratio results suggested that adolescents who legitimately used opioids over a minimum of four weeks are associated with increased opioid misuse. Additionally, Miech et al. (2015) advanced legitimate initial opioid use by 12th grade as a significant misuse predictor after high school. The short-term use of opioids to treat pain carried a negligible risk for precipitating future misuse (Porter & Jick, 1980). The State of Utah (2014) and Miech et al. (2015) supported and clarified that physical dependency on opioids develops within seven days of use, and adolescent short-term opioid prescriptions are associated with misuse, especially with opioid naïve youth.

Reasons for POM by Adolescents

Though it is difficult to determine the source of prescription opioids misused by the adolescent population, over-prescribing by clinicians to treat pain is a contributor (Ahn et al., 2019). Further, according to Ford and Rigg (2015) and Fortuna et al. (2010), the almost doubling of prescription opioids written for adolescents since 1994 contributed to opioid access, exposure, and misuse. There was significant variability in prescribing patterns in hospital and state-level data analysis following general surgery procedures

(Cairo et al., 2018). This variability raises further concerns as to how physicians may be contributing to the epidemic and whether or not patients for postoperative pain expectations and treatment are prepared (Cairo et al., 2018). For instance, Miech et al. (2015) utilized 6220 individuals' national surveys of high school seniors who were followed up at age 23 to assess an association between adolescents' POM and future POM. Miech et al. (2015) clarified that 69% of adolescents reported misusing prescription opioids to feel good, get high, relax, or relieve tension instead of relief from physical pain. Generally, future opioid misuse is highly associated with attained positive feelings, pleasure, and high, derived from the initial drug experience (Brady et al., 2015). Chhabra and Aks (2017) confirmed that adolescents use opioids to get high or experiment. Dash et al. (2015) added that adolescent perceived benefits of opioid use were mood-enhancer, stress-reducer, and anxiety-reducer.

Risk Factors for Prescription Opioid Misuse in Adolescents

Meckler et al. (2019) reiterated that adolescents are a high-risk population for opioid misuse because approximately 18% of United States high school seniors endorsed medical use of opioids, and 13% reported at least one episode of nonmedical use (Garren et al., 2019). In addition, Ahn et al. (2019) confirmed post-surgical adolescents are at higher risk than medical patients for opioid misuse and dependence because 3 to 10% of opioid-naïve patients misuse opioids after surgery. Caouette and Feldstein (2017) and Dash et al. (2015) highlighted a direct relation between adolescents' decision to engage in substance use and friends who engage in substance use. Austin and Shanahan (2018) advanced that childhood abuse and neglect, negative emotional states, mood swings,

anxiety disorders, depression, and sadness are other risk factors directly associated with POM. Freedman-Weiss et al. (2019) posited the number of opioids prescribed as another substantial and modifiable contributor to POM. Also, the limited standardization in opioid-prescribing practices for pediatric ambulatory surgery may result in larger quantities of opioids receipt by patients, increasing POM likelihood (Denning et al., 2019). Blanco et al.(2016) confirmed that continued prescription opioid use to treat chronic pain is associated with increased sensitivity to pain, physiological tolerance to opioids, and opioid use disorder, perpetuating POM. Pruitt et al. (2019) suggested that in some instances, families may not have received appropriate disposal instructions for unused opioids from clinicians that further contribute to POM risk. Also, Log et al.(2013) clarified maternal use of opioids as associated with the repeated use of prescription opioids among offspring, increasing the likelihood of POM. According to Knopf (2016), in adolescent athletes, POM risk increases by diverting opioid medications from team-members prescribed medications. Of particular relevance, studies have found that youth involved in competitive sports rank higher in receipt of a prescribed opioid and misuse of opioid medications (Knopf, 2016). However, one risk of prescription opioid use is playing football and wrestling because of high injury rates (Knopf, 2016).

Innovations to Curb Adolescent Prescription Opioid Misuse

Miech et al. (2015) explained that parents should be aware of prescription opioid use as a risk factor for POM, allowing informed decisions to choose non-opioid options to treat minor pain. Donaldson et al. (2015) explained that parent monitoring and parents following the recommended safekeeping of opioids at home reduce opioid use and

adolescent POM. Garren et al. (2019) recommendations for curbing adolescent POM includes, but is not limited to instructional handouts to assist parents with monitoring postoperative pain in their children after discharge, clarifying proper opioid storage, explaining disposal recommendations, and emphasizing the return of unused opioids to hospital drop-off locations or community take-back programs. Voepel-Lewis (2015) agreed that reminding parents to ensure the safe storage and safe disposal of left-over opioids prevents children from accessing and using them. The forgone risk of opioid use increase is mainly associated with nationwide accessibility and availability of opioids prescribed to adults (Bailey et al., 2009). Therefore, Voepel-Lewis's (2015) recommendation is that parents restrict children's availability to prescription opioids and control by counting pills as applicable.

Finkelstein et al. (2017) posited that mothers prescribed opioids should be; prescribed smaller quantities, taught the importance of storing medication securely, and taught to promptly dispose of unused opioids to avoid intentionally and unintentionally use by children and adolescents. Further, Creswell et al. (2019) confirmed the need for parental education related to safe use, storage, and disposal of prescription opioids, thus avoiding potential adolescent POM. Garren et al. (2019) recommended education for parents on evaluating pain in children, and Van Cleve and Grigg (2017) recommended teaching parents and caregivers to administer prescription opioids appropriately. Basco et al. (2015) explained the need for concrete, visual instructions that clarify dosage administration and frequency to reduce parent administration error. Ahn et al. (2019) reported the need for improved education regarding the risks of receiving prescription

opioids after an operation and proper disposal throughout the medical community. Of particular relevance, Voepel-Lewis (2015) advanced the dire need for parents and caregivers to understand that children and adolescents exhibition of difficulty to awaken, snoring, and inability to stay awake during the day after opioid administration indicates a possible medical emergency, excessive sedation, or opioid toxicity that may require immediate medical intervention.

According to Piper et al. (2019), unused prescription opioids are often not adequately discarded and thus available for diversion and misuse. For instance, Garren et al. (2019) advanced that in the United States, nearly 80% of patients did not dispose of their excess opioid medications, and 75% of patients had opioids stored in unsecured locations, making the drugs easily accessible. Additionally, after operation follow-up, a novel drug-deactivation bag may allow patients the option to throw away unused prescription opioids more conveniently and safely (Deterra System, 2018). Pruitt et al. (2019) encouraged disposing of opioids in drug collection drop boxes. Garren et al. (2019) explained that the FDA recommendations for proper disposal of opioids included but are not limited to; disposing via authorized DEA collectors/receptacles and following specified steps of mixing opioids with unpalatable substances such as dirt/cat litter and placing them in a sealed plastic bag in the trash.

Gaither et al. (2018) posited that legislators, public health officials, clinicians, and parents take a more in-depth look at the opioid crisis and implement protective measures that are pediatric-specific and family-centered that may lower POM and death. Harbaugh et al. (2017*)* supported best practices that promote safe prescribing after an operation to

children as a top priority that improves surgical quality and prevents opioid-associated morbidity and mortality. Additionally, Slater et al. (2010) advocated that when prescribing opioid clinicians should carefully select patients, have improving as the goal and not only symptoms reduction, patients and their parents should document their use of medications, side effects, and other therapies the clinician use to control pain that the patients should follow. Luk et al. (2016) posited the use of Electronic Health Records [EHRs] as an ideal tool to help standardize pain treatment protocols in multiuser environments. Further, Allen et al. (2017) recommended restricting access to opioids, and Dash et al. (2015), recommended using electronic or social-media peer platforms. Mathew et al. (2014) advanced clinicians should screen and monitor patients for opioid side effects, diversion, misuse, and abuse. Fisher (2019) encouraged further educating clinicians not assigned to a pediatric center to avoid prescribing opioids to treat headaches.

Mathew et al. (2014) recommended restricting prescription opioid prescribing to those experienced in managing chronic pain safely in children. For instance, Voepel-Lewis (2015) proposed that pediatric nurses can play a role in helping children learn about prescription opioid safety. Manworren and Gilson (2015) supported that nurses educated patients on; the risks of POM, proper controlled substance disposal, monitoring opioids pain diaries, counting pills, partaking in prescription drug monitoring programs, and conducting random drug screens. Further, according to Hahn et al. (2019), clinicians who prescribe opioids should improve screening, compliance, data, and assess substance use risk when prescribing opioids by better understanding the substance use screening

process from a nurse perspective. Additionally, Dash et al. (2015) posited that psychologists develop informed policies and preventative interventions for POM in healthcare settings. Of particular relevance, mental health outcomes such as anxiety and depression, Edlund et al. (2015) and childhood trauma, Dash et al. (2015) increase the risk for POM in adolescents.

According to Lim (2015) and Zura et al. (2018), clinical trial results showed ibuprofen is as effective as prescription opioids for post-fracture pain relief in pediatric patients, with fewer adverse effects. Ahn et al. (2019) supported growing evidence that opioids are not the best option for pain after an operation and that ibuprofen and acetaminophen provide adequate analgesia in children. Several trials have shown no advantage to opioids over Non-Steroidal Anti-Inflammatory Drugs [NSAIDs] in terms of postoperative pain reduction in children and adolescents, such as in tonsillectomy and minor orthopedic conditions (Dash et al., 2018).

These literature findings can influence prescription opioid use practices within the United States in adolescents and assist in possible solutions to the POM crisis. Anderson et al. (2018) proposed recommendations that examine providers prescribing practices. Voepel-Lewis (2015) advanced children as young as 11 or 12 years start self-managing their conditions. Of particular relevance, some parents have acknowledged allowing their children to decide when pain medication after surgery is required. These older children need to understand the health and safety risks of opioid medications, specifically when used without appropriate medical supervision or when shared with others who may be at higher risk for POM (Voepel-Lewis, 2015).

What Remains to Be Studied

According to Manworren and Gilson (2015), O'Donnell et al. (2017), Van Cleve and Grigg (2017), Walco et al. (2017), and Wynia and Schrock (2019), there is a need for research on opioid prescribing practices and prescription opioid use to treat moderate to severe pain in children. Within the pediatric postoperative population, the data have shown that a multimodal pain approach reduces inpatient opioid consumption: Therefore, additional patient consumption data to guide evidence-based prescribing practices are needed to reduce excess opioids available in the community while ensuring pain control for patients (Anderson et al., 2018; Manworren et al., 2016). Research is required to determine the appropriate number of prescription opioid doses per injury type in children (Lobst et al., 2018). This dosage determination is needed because the potential risk of harm or strategies to increase analgesic doses in children remains unknown (Voepel-Lewis, 2015).

Miech et al. (2015) explained that determining risk factors for adolescents who receive prescription opioids for chronic pain experiences are warranted. Research addressing peer influence on prescription opioid use in the context of pediatric pain has not been conducted (Dash et al., 2015). The directionality and causality of chronic opioid use and adverse outcomes are unclear due to a lack of long-term research over one year (Dash et al., 2015). Data are lacking regarding which adolescents are likely to obtain a refill, how refills impacted later opioid misuse, and which adolescents can terminate opioid use (Dash et al., 2015). Primary care practitioners appeared to be frequent prescribers of opioid medications, and future research into why office-based clinicians

prescribe opioids would be crucial in making the use of these medications safer for children (Basco et al., 2015). There is little knowledge about medical providers or health care factors associated with opioid prescribing, particularly regarding children and adolescents (Meckler et al., 2019).

The effects of opioid intoxication in children are poorly understood and described only in a handful of cases (Chung et al., 2016). Improvement in understanding clinical presentation, radiographic findings, and pathophysiological mechanisms of accidental prescription opioid intoxication in children are critical given the persistently elevated opioid prescription rates across the United States (Dart et al., 2015; Duran et al., 2017). The high opioid prescription rate among nurse practitioners needs further investigation (Jamasbi et al., 2018). The patterns of opioid prescribing behaviors of health care providers remain unclear (Lobst et al., 2018).

Summary and Conclusion

I reviewed the current literature on the possible association between opioid types, gender, religiosity, education, and adolescent POM. Also, I perused the literature within the identified gap context to determine social and environmental demographic factors that may influence adolescents' POM. The main sections of chapter 2 were: (a) introduction, (b) the literature search strategy, (c) theoretical foundation (d) literature review related to variables (opioid types, gender, religiosity, education, and POM among adolescents 12 to 17 years of age in the United States). In chapter 3, there were presentations of the research method in detail.

Chapter 3: Research Method

In the study, I utilized secondary data from SAMHDA 2017 dataset that focused on 12 to 17-year-old adolescents in the United States. Over the last decade, several studies revealed the extent of adolescent POM and associated economic, socioeconomic, biological, and physiological effects (Allen et al., 2017). No research examined the association between opioid types and adolescent POM (Monnat & Rigg, 2016). As a result, I sought to address the gap in the literature.

In chapter 3 are the details of the study design and rationale, the methodology inclusive of the location, population, sampling, sampling procedure, data analysis plan, the procedure for gaining access to the data, threats to the internal and external measurements, the statistical validity of the study, and ethical methods. I used a strategic approach to ensure data protection, privacy, ethics, credibility, reliability, appropriate dissemination framework, and adequate communication of the research findings. Finally, the chapter concludes with a culmination of the salient points for analysis.

Research Design and Rationale

I utilized the NSDUH 2017 dataset from SAMHDA. The predictor variables in the quantitative cross-sectional study were opioid types, gender, religiosity, and education, whereas the outcome variable was POM among adolescents in the United States ages 12 to 17. The quantitative, descriptive, observational, cross-sectional study design was appropriate for the study because the study design allowed analyzing the association of numerous variables at once, with no associated costs. Furthermore, the environment from which the adolescent sample population came did not require

manipulation. The purpose of the study was to examine a possible association between opioid types, gender, religiosity, education as independent variables, and the outcome variable of POM in the United States among adolescents 12 to 17. The SEM theoretical framework aligned well with the variables in the study and the investigation of the association between opioid types, gender, religiosity, education, and POM among adolescents aged 12 to 17. Table 2 shows the variable type, name, description, category, and measurement based on the study design narrative. In Table 2, there is a description of the study definition, variable description, categorization, operationalization, variable measurement level, and codes of the variables used in the study.

Table 2

Definition, Description, Categorization, Conceptualization, Measurement, and Codes of Study Variables

Variable type	Variable name/variable description	Category	Measurement	Coding
Independent Variable	Opioid type/			OT
	Hydrocodone	0 = "0 - No / Unknown	Nominal	OTHE
		1 = Yes	(dichotomous)	
	Oxycodone	0 = "0 - No / Unknown	Nominal	OTOE
		1 = Yes	(dichotomous)	
	Fentanyl	0 = "0 - No / Unknown	Nominal	OTFL
		1 = Yes	(dichotomous)	
	Tramadol	0 = "0 - No / Unknown	Nominal	OTTL
		1 = Yes	(dichotomous)	
	Codeine	0 = "0 - No / Unknown	Nominal	OTCE
		1 = Yes	(dichotomous)	
	Morphine	0 = "0 - No / Unknown	Nominal	OTME
		1 = Yes	(dichotomous)	
Independent Variable	Gender	1=male	Nominal	GD
		2=female	(dichotomous)	
Independent Variable	Religiosity	1= 1-agree/strongly agree	nominal	RN
		2= 2-strongly disagree/disagree	(dichotomous)	
Independent Variable	Education	1 = 1- fifth grade or less completed	Ordinal	ED
		2 = 2- sixth grade completed	Categorical	
		3 = 3- seventh grade completed		
		4 = 4- eight grade completed		
		5 = 5- ninth grade completed		
		6 = 6- tenth grade completed		
		7 = 7- eleventh or twelfth grade completed		
		9 = 9- some college credit but no degree		
		10 = 10-associate degree		
Dependent variable	POM among adolescents ages 12 to 17 in the United States/POM in 2017	0 = 0-no	Nominal	POM
		1 = 1-yes	(dichotomous)	

Note. OT-opioid type, OTHE –Hydrocodone, OTOE – Oxycodone, OTFL- Fentanyl, OTTL- Tramadol, OTCE- Codeine, OTME- Morphine, GD- Gender, RN- Religiosity, ED- Education, POM-prescription opioid misuse among adolescents ages 12 to 17 in the United States

In this research, the 2017 NSDUH series dataset obtained from SAMHDA that surveyed adolescents 12 to 17 in the United States who misused prescription opioids was within the research priority. Further, the process was most economical because there are no financial and time constraints associated with secondary data use. The SAMHDA 2017database contains reported adolescent misuse of prescription opioids specific to the type of opioid misused and in the age range of study, 12 to 17 across the United States. Additionally, the secondary data facilitated reviewing historic cross-sectional records that would have been absent from primary data.

Methodology

Population

The population selected for the study was in the United States because the nation is the major consumer of opioids, representing 80% of the world supply (Allen et al., 2017; Rose, 2018). In addition, POM in the United States was a national public health epidemic (Ahn et al., 2019; CDC, 2018). Evidence suggested that continued opioid use will worsen the public health epidemic before it improves (Meyer et al., 2014). Several researchers focused on POM, but there was no attempt to investigate the association between opioid types and POM among the target population of adolescents ages 12 to 17 in the United States. The 2017 NSDUH series included a sample size of 56,276 individuals of the noninstitutionalized population 12 years or older in 50 states in the United States(SAMHDA, 2018). Of the total surveyed population of 56,276, the analytic sample for the research on adolescents 12 to 17 years was 14,069, representing 25% of the sample size (SAMHDA, 2018).

Sampling and Sampling Procedures

The 56,276 sample size predetermined by the SAMHDA dataset sufficiently represented the adolescent population studied in the United States (SAMHDA, 2018). However, for the population parameter of 12 to 17 years old, there were 14,069, representing 25% of the sample size. The remaining 42, 207 or 75% of the participants in the SAMHDA survey were 18 and older. Further, the sample size satisfied the criteria for generalizability that would add credence to the study findings. Based on SAMHDA inclusion criteria, adolescents 12 years and older participated in the 2017 survey. Based on the exclusion criteria, adolescents aged 10, 11, 18, and 19 years and those serving active military duty were excluded (SAMHDA, 2018). The sampling strategy employed was geared to minimize error and ensure result accuracy.

Procedures for Recruitment, Participation, and Data Collection

The 2017 NSDUH is 37th in a series of SAMHDA datasets, which was the secondary dataset for the study. SAMHDA collected the data to measure the drug use prevalence of United States noninstitutionalized civilians 12 years or older (SAMHDA, 2018). This cross-sectional study was collected periodically over 37 years from 1971 through 2017. The collection system was redesigned, evolving from paper questionnaires to computer-assisted interviewing surveys.

An exploration of the SAMHDA codebook ascertained that the study variables were in the dataset. Upon verification, I downloaded the SAMHDA codebook for the research. Although I viewed the codebook, the dataset was not initially downloaded or viewed. After obtaining Walden University Institutional Review Board (IRB) permission,

I downloaded the dataset, adhering to the university research protocol. Based on the data use policy of SAMHDA, no written request for permission to use the SAMHDA dataset was required. However, consent sought online to gain access and use the data for research through electronic acknowledgment and agreements was granted. The 2017 SAMHDA sample allocated 25% of the sampled population to youths aged 12 to 17, resulting in a 14,069 analytic sample size. I sought IRB approval to reduce ethical issues and known limitations before using the data. After downloading the dataset, I transferred it to SPSS version 24 for analysis. According to the SAMHDA terms and use agreement, I will provide a research copy for posting on the SAMHDA website.

Some of the known limitations of the research and ways to ameliorate them were as follows: The viewpoint and explicative premise of the primary data collection researchers may be assumed and may corrupt the findings (Ham-Baloyi & Jordan, 2017). The accessible data for the design was the available data on the SAMHDA website (SAMHDA, 2018). Efforts to minimize these two biases were in the development of the survey by government agencies, double-checking that the data was from SAMHDA, and checking to ensure the data was not altered (see University of Florida, 2015). In addition, there was uncertainty in participants' responses because SAMHDA paid 30 dollars to boost the survey response rate to participants (SAMHDA, 2018). I acknowledged that payment to participants generally leads to respondent biases and inaccurate data (Patton, 2015). Two issues associated with paying participants are recall biases and social desirability, which lead to incomplete, insincere, or inaccurate research results (Nardi, 2014; Patton, 2015). Therefore, incomplete data elimination occurred during the analysis

of the data. The cross-sectional data collection study design limited the creation of the arrangement over time of POM (Ford & Rigg, 2015). SAMHDA collects a replica of these data, meaning further research on adolescent POM annually, showing consistency and continuous monitoring. In addition, SAMHDA combined the opioid types misused and adolescent POM as the independent variable. For example, the data may ignore separating the purpose of POM, such as to self-medicate or for recreation. To ameliorate this recall bias, the prescription drug questions in 2017 allowed respondents to report misuse of prescription drugs in the past 12 months of specifically related medications, including given active ingredients. In conclusion, to ameliorate the known biases of the SAMHDA secondary data, it was imperative to read and understand information on the data provided by the primary source and verify that the data was from the primary source and not altered (University of Florida, 2015).

Additional Information if Conducting a Pilot Study

The primary and secondary researchers did not conduct a pilot study. A pilot study is significant in research to capture critical information that can lead to questions and approach modifications (Ham-Baloyi & Jordan, 2017). However, an adjustment made to redesign the NSDUH questionnaire in 2015 to improve the dataset quality and address policymakers' and researchers' needs and expectations relating to drug use was conducted (SAMHDA, 2018). A documented change was the adaptation of audio computer-assisted self-interviewing [ACASI] as the administrator of the questions by NSDUH, which led to the redesign that provided a high private and confidential mode for

question responses to attain higher levels of honesty in reporting drug use (SAMHDA, 2018).

For Students Using Archival Data

Permission was granted online by SAMHDA via an electronic authorization (see appendix 1) to use the secondary data. According to permission authorization, a specified promissory statement agreed upon by selecting yes acknowledged the utilization of the data solely for research. The process was not timely or economical and allowed immediate and no-cost access to the codebook.

SAMHDA dataset is a populous dataset utilized for researching drug abuse and addiction. Therefore, the SAMHDA database was selected (SAMHDA, 2018). This database fairly represented adolescents in the United States, based on the extent of the surveyed population, thereby justifying the use of SAMHDA for the research. It is noteworthy that the use of secondary data may exclude a detailed sampling strategy; however, it includes the parameters utilized to gather the primary data for the research. Therefore of importance was ensuring the dataset encompassed the characteristics of the research inclusion criteria. The dataset included the priority independent and dependent variables. Despite the limitation, this dataset was ideal for the study.

Upon receipt of SAMHDA approval, there was the completion of downloading the codebook to a computer hard drive. Noteworthy, IRB approval was sought and obtained before downloading and utilizing the dataset in the study. Upon IRB approval, the dataset was downloaded and analyzed using SPSS version 24. To determine the

possible association between opioid types and POM by adolescents, and other independent variables, such as gender, religiosity, and education.

Instrumentation and Operationalization of Constructs

The study design will be descriptive cross-sectional with archived secondary data containing the SAMHDA dataset. This database had valid and reliable information on drug use and health across the United States for individuals 12 years and older, including adolescents' POM in 2017 (SAMHDA, 2018). The flow of the data originates from interviews conducted using computer-assisted interviewing methods. All the information collected is summarized annually and kept in the SAMHDA database. For example, 2015 data on drug use and health across the United States are also available at the SAMHDA database. SAMHDA has annual drug use and health data and developed the datasets. Permission to use the data was granted under the SAMHDA terms and use agreement.

Operationalization

Table 3

Operationalization of the Study Independent and Dependent Variables

Name	Level of Measurement	Determining Question	Value
Opioid Class	Nominal dichotomous	Have you ever misused in the past year opioid types: hydrocodone, oxycodone, fentanyl, tramadol, codeine, or morphine?	0 = no/unknown 1 = yes
Male Female	Nominal dichotomous	Are you male or female?	1 = male 2 = female
Religious Belief Influence Life	Nominal dichotomous	Does religious belief influence life decisions?	1 = agree/ strongly agree 2 = strongly disagree/

Decision			disagree
Education Attainment	Ordinal categorical	What was your most recent education/grade completed?	1 = fifth grade or less completed 2 = sixth grade completed 3 = seventh grade completed 4 = eight grade completed 5 = ninth grade completed 6 = tenth grade completed 7 = eleventh or twelfth grade completed 8 = some college credit but no degree 9 = associate degree
Misuse of Opioids	Nominal dichotomous	Have you misused opioids within the last year 2017?	0 = no/unknown 1 = yes

Noteworthy, the independent variable opioid type operational definition was opioid class, and gender was male and female. While the variable religiosity definition was religious belief influences life decisions, and education definition was most recent education attainment/grade completed. Further, the dependent variable POM among adolescents ages 12 to 17 in the United States operational definition was the misuse of opioids. Conceptual definitions were used throughout the study to facilitate consistency with the literature.

Data Analysis Plan

I used SPSS version 24 to analyze the data to answer the five research questions. A critical issue associated with secondary data use is missing data notwithstanding; research efforts to avoid incomplete datasets in many instances are present. Noteworthy, statistical authority, research conclusiveness, and the sample are affected by missing data above 5% (Pigott, 2001). Separate frequency analysis conducted for different variables determined the missing data's possible effects on the research (Graham, 2012). Some additional mitigating or management strategies to reduce the impact of missing data during analysis included; pairwise deletion or advance case analysis, mean and listwise deletion, for example, grand mean for all participants or group mean resulting from splitting the database into two groups. Generally, using a group means the basis is experiential relevance and prior knowledge. In this study, if the missing data is above 5%, complete analysis/listwise deletion was employed.

Research Questions

RQ1: What is the association between opioid types and POM among adolescents ages 12 to 17 in the United States?

RQ2: What is the association between gender and POM among adolescents ages 12 to 17 in the United States?

RQ3: What is the association between religiosity and POM among adolescents ages 12 to 17 in the United States?

RQ4: What is the association between education and POM among adolescents ages 12 to 17 in the United States?

RQ5:What is the association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education?

These research questions were answered by testing, analyzing, interpreting, and presenting the findings of the sub-questions utilizing the following: descriptive analysis, simple logistic regression, and multiple logistic regression analysis. The descriptive-analysis frequency tables' determined opioid types, gender, religiosity, and education association with the outcome variable adolescents POM. Simple logistic regression determined that the odds ratio for opioid types, gender, religiosity, and education would predict adolescent POM. Multiple logistic regression analysis determined whether there is an association between each independent variable (opioid types, gender, religiosity, and education) as a set and the outcome variable at a significant level of 0.05.

Assumptions

The following strategies safeguarded against possible violations in statistical assumptions: ensuring that the dependent variable was binary, the outcomes for all persons, persons 1, person 2, person 3, and all others were not related and are independent of each other, no two independent variables correlate too strongly with each other, the log odds of each independent variable are linearly related, and a large enough sample size. Based on the nature of the study, there were no statistical assumptions violations.

Statistical Analysis Plan

A data analysis plan is a blueprint, roadmap, or strategic tool used to guide the researcher. The plan increased the likelihood of answering the research hypothesis and

understanding the study findings (Henry Feldman Clinical Research Center, 2014). The data analysis plan is invaluable in that a detailed framework to conduct the research was established to facilitate alignment between the research question, the problem statement, the methodology, the findings, and the hypothesis. Some terms and concepts included in the data analysis plan are as follows; values, predictor variable, categorical variables, outcome variable, dependent variable, ordinal variable, nominal variable, independent variable, data analysis plan, odds ratio, Exp Beta value, level of significance, and descriptive statistics (Simpson, 2015). Conversely, some weaknesses of the analysis plan included but were not limited to a narrowly focused research approach because the plan provided a roadmap that may prevent or inhibit further analysis of the data. Further, the plan can be bureaucratic because symmetrical steps during the research should be adhered to, which may also be time-consuming.

Variables N**ames**

The variables names are opioid types (hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine), gender, religiosity, education, and POM among adolescents 12 to 17 years in the United States.

Types of V**ariables**: I**ndependent/**D**ependent**

The independent variables are opioid types, gender, religiosity, education, and the dependent variable is POM among adolescents 12 to 17 years of age in the United States. Potential confounders in the study are 1) race; 2) family income; 3) drug education in school; 4)health status; 5) substance use program participation; 6) interactions with

family, parents, caregivers, peers, teachers; 7) interactions with clinicians, pharmaceutical companies, and finally 8) interactions with politicians, and policymakers.

According to Austin and Shanahan (2018) and Creswell et al. (2019), most prescription opioid use and misuse nationally are done by White American adolescents. For instance, the White non-Hispanic rate of POM in the United States was 74.8% (Austin & Shanahan, 2018). Additionally, Gaither et al. (2018) reported that Non-Hispanic white children experienced a 79.9% annual opioid poisoning death rate placing White non-Hispanics as a risk factor. Creswell et al. (2019) further added that opioid exposure in white children was (67.7%), supporting the role race plays in opioid prescription misuse.

Socioeconomics is a determinant for a prescription opioid receipt by the pediatric patient (Dash et al., 2015). This risk is evident from the research findings that confirmed a higher socioeconomic status as a risk factor associated with adolescent POM (Groenewald et al., 2019; Stewart &Reed, 2015). Further, pediatric patients from low-socioeconomic and high-poverty neighborhoods were less likely to be prescribed opioids for pain (Dash et al., 2015). Based on the above, it is safe to conclude a direct relationship between income and adolescent POM related to the cost of opioids.

Knowledge of prescription opioid use, exposure, misuse, and mortality is paramount in misuse avoidance (Voepel-Lewis, 2015). Therefore institutions must disseminate relevant information to adolescents and the general public on these issues. Drug education should be structured to ensure common risks and opioid adverse effects deterrence to avoid POM (Voepel-Lewis, 2015). For instance, NOPE'S [Narcotics

Overdose Prevention and Education] uses education efforts in the United States to teach high and middle school students on the dangers associated with prescription drug use and misuse through the utilization of student and parent presentations (NOPE Task Force, 2012). Despite the efforts by NOPE, the crisis persisted, and the abuse of opioids continued increasing across the United States (NOPE Task Force, 2012). Therefore, justifying the need for improved education regarding the risks of post-operative opioid prescriptions and proper disposal throughout the medical community (Ahn et al., 2019).

Pediatric patient characteristics that predict receipt of a prescribed opioid include health status (Dash et al., 2015). Opioids are utilized as the acceptable treatment by clinicians for severe conditions such as; cancer (Chung et al., 2016; Dash et al., 2015; Othman et al., 2016), sickle cell pain (Chung et al., 2016; Friedrichsdorf et al., 2016), congenital anomalies (Chung et al., 2016), hospitalization for a total of more than 30 days in the preceding year (Chung et al., 2016), history of organ transplant (Chung et al., 2016), history of drug abuse (Chung et al., 2016), chronic musculoskeletal pain (Friedrichsdorf et al., 2016), pain after an operation (Dash et al., 2015), and advanced metastasized bone tumors (Friedrichsdorf et al., 2016). For instance, 85% of pediatric emergency physicians in North America prescribed oral opioids for pediatric musculoskeletal pain (Zura et al., 2018). Further, children aged12 to18 reported POM after consuming opioids for chest pain, muscle pain, joint pain, headaches, and stomachaches (Austin & Shanahan, 2018).

Adolescent substance use program participation is associated with adolescent POM in the United States (Syed et al., 2018). Research shows that preoperative narcotics

education is a positive factor in assisting the opioid epidemic and increasing the likelihood that the individual would discontinue POM. Roe & Banta-Green (2016) highlighted the strengths of web-based opioid education tools as ideal responses to POM. These programs influenced and redirected behaviors that led to different choices and ultimately reduced POM among adolescents and can be considered a confounder.

Interactions with family, parents, caregivers, peers, and teachers are associated with adolescent POM. Friends who engage in substance use are strong predictors of adolescents' decision to engage in substance use (Caouette & Feldstein-Ewing, 2017; Dash et al., 2015). Adolescent athletes could receive diverted prescription opioid medications from teammates or be prescribed them themselves (Knopf, 2016). Most of the opioid exposures to youth occur at the following places; at school and in the community (Gaither et al., 2018), at home (Bailey et al., 2009; Allen et al., 2017), and in pediatric medical settings (Dash et al., 2015).

Interactions with clinicians and pharmaceutical companies are associated with adolescent POM. Adolescents who underwent orthopedically or Nuss surgery consumed 25.42 more doses than those who underwent other types of surgery (Monitto et al., 2017). Wide variations and overprescribing exist in adolescents' surgery practices (Harbaugh et al., 2018; Van Cleve & Grigg, 2017). This variation is evident since more than half of all doses dispensed were left unconsumed by adolescents (Cairo et al., 2018). Further, despite discouragement in using opioids to treat headaches in children, the trend is a common practice among clinicians (Fisher, 2019). Additionally, dental and outpatient fracture procedures rank high in prescribing opioids, resulting in at least one opioid

prescription fulfillment per year in healthy adolescents (Ahn et al., 2019; Chung et al., 2016).

Interactions with politicians and policymakers are associated with adolescent POM. Prescription opioid rates vary at the hospital, county, and state-level (Anandarajan et al., 2019). The CDC policy recommendation is that opioids prescribed should use the lowest effective dose for the shortest period needed, no more than three days when treating pain (MayoClinic, 2019; the Missippi State Department of Health, 2016). In the case of children, there are no specific guidelines on prescribing opioids for chronic pain. Therefore, pediatricians should use their best judgment when prescribing opioids after appropriate use of non-opioid alternatives (Wren et al., 2019). Also, there may be opportunities to reduce opioid prescriptions by nurse practitioners by standardizing protocols for opioid prescriptions (Jamasbi et al., 2018). There is a need for increased collaboration efforts between the leaders of the justice system and other leaders to reduce opioid accessibility and lower misuse (Sacco et al., 2019). According to Webster (2013), the current opioid crisis causes include; health policy misguidance and unchecked regulation and educational neglect regarding appropriate prescribing, storage, and disposal practices (Garren et al., 2019; Baker, 2017). These causes can affect the association between the independent and the dependent variables. However, these factors were not priority variables based on the research topic, research questions, and hypothesis. In this light, these factors are mentioned but excluded from the analysis and interpretation.

Levels of M**easurement**

The variable opioid types hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine measurement is nominal dichotomous with values; 0 = no/unknown, and 1 = yes (SAMHDA, 2018). These values are to the following question prompts for each opioid class. Have you ever misused hydrocodone, oxycodone, fentanyl, tramadol, codeine, or morphine in the past year? The variable gender level of measurement is nominal, dichotomous, and has values 1 = male and 2 = female. The variable religiosity measurement is nominal, dichotomous, and has the value of 1= 1-Agree/strongly agree and 2= 2-Strongly disagree/disagree. These values are to the following questions: do religious beliefs influence life decisions?

The variable education, level of measurement is ordinal categorical and has the values of 1 = 1- fifth grade or less completed, 2 = 2- sixth grade completed, 3 = 3- seventh grade completed, 4 = 4- eight grade completed, 5 = 5- ninth grade completed, 6 = 6- tenth grade completed, 7 = 7- eleventh or twelfth grade completed, 9 = 9- some college credit but no degree, and 10 = 10-associate degree (SAMHDA, 2018). These values are in response to the following question prompts; what was your most recent education/grade completed? The variable POM among adolescents 12 to 17 years of age in the United States level of measurement is nominal dichotomous and has the value and value labels 0 = no/unknown and 1, = yes. Adolescents aged 12 to 17 in the United States answered whether or not they misused opioids within the last year, 2017.

Statistical Tests for the Study Outcome

SPSS software version 24 analyzed the 2017 NSDUH dataset utilizing descriptive statistical tests and logistic regression. The analysis sought to answer the five research questions, as stated above. Some strategies that can reduce the impact of missing data include; frequency analysis, pairwise deletion, advanced case analysis, grand mean, statistical weighting, and multiple imputations (Larsen et al., 2009). In the study, missing data above 5% leads to completion of analysis/listwise deletion. Based on the extent of the study, the statistical analysis will be in three stages. The first stage will include a descriptive analysis using 0.05 alpha to determine the frequency of opioid types across the predictor variable in the United States. Descriptive statistics summarized the data using representations such as histograms, statistics tables, frequency distribution tables, and central tendency measurement of mode, mean, and median (Trochim, 2006). Other descriptive statistics depicted skewness, variance, standard deviation, kurtosis, and range (Wagner, 2016).

Secondly, simple logistic regression was an ideal tool to inform of an event happening or not happening. The third stage sought to determine whether there is an association between the predictors or independent variables in aggregate or as a set and POM as the outcome among adolescents ages 12 to 17 in the United States, using multiple logistic regression modeling. The statistical plan proposed and performed in this study fulfilled the goal of the multiple logistic regression analyses and predicted the best model in terms of the associated independent variables with POM among adolescents

ages 12 to 17 in the United States. The model provided an odds ratio to interpret the likelihood of POM occurrence.

According to Wagner (2016), logistic regression is the most appropriate statistical tool to analyze an association between multiple independent variables and one dependent variable. The logistic regression tool is relevant for the study because four independent variables with one dependent variable answered the research questions. Conversely, the linear regression is ideal for one independent variable, thereby justifying the use of multiple logistic regression analysis for the study. Although there are similarities between logistic regression and simple linear regression, critical distinctions are; the integration of One-Way ANOVA analysis and the Coefficient analysis, multiple logistic regression analysis dependent variables are binary/ dichotomous. However, with linear regression, the dependent variables are continuous with an infinite number of possible values (Frankfort-Nachmias & Leon-Guerrero, 2015). Further, multiple logistic regression analyses are considered a predictive test appropriate for explaining the association between one or more nominal variables and an ideal inferential statistical test because the test can determine the degree of associations between the multiple variables in the study (Wagner, 2016). Additionally, multiple logistic regression analysis was used in this research to examine a possible association between more than one independent variable, support acceptance or rejection of the null hypothesis, and predict binary/ dichotomous outcome (Frankfort-Nachmias & Leon-Guerrero, 2015).

Data Dictionary and Data Table

The 2017 NSDUH data codebook used a computer-assisted interviewing method to collect data used to determine the possible association between opioid type and POM among adolescents ages 12 to 17 in the United States. The overall collected data represented the 50 states, plus the District of Columbia, with a sample size of 68,032 (SAMHDA, 2018). This dataset encompasses the priority variables of the study: thereby, justifying the research that investigates the possible association between opioid type and adolescent POM.

Threats to Validity

Validity

I used secondary data from the 2017 NSDUH series. A critical component of research findings is validity because the degree can influence finding interpretations (Creswell, 2014). For example, in chapter 1, is the threat to validity variables operational and conceptual definition used. For instance, religious beliefs influence life decisions conceptualization was religiosity, religious beliefs, activities, devotions, encounters, and experiences concerning spiritual, divine, or supernatural entities. The misinterpretation of these operational and conceptual definitions threatened the study's validity. Below are the considered threats to validity internal, external, measurement, and statistical.

Threats to Internal Validity

This study has no experimental protocol. Therefore threats to internal validity not anticipated were testing, attrition, instrumentation, and experiment mortality. However,

internal threats identified for this study included history, maturation, and selection. These threats are discussed below, with possible implications for the study findings.

Historical threats that influenced reports of prescription opioids by adolescents include national media attention. In 2017, the United States government declared POM an epidemic. The declaration led to headline news and lived stories on POM creating more awareness of the crisis issues to residents and citizens, including adolescents. The trend may have possibly affected adolescents' responses to POM, limiting the generalizability of the study findings.

Maturation is naturally occurring changes over time (Schreiber-Gregory et al., 2018). Some adolescents interviewed for the study were 17-years-old when SAMHDA collected the survey. The participant had a birthday and turned 18 upon survey completion. As a result, excluded were these participants from the sample of adolescents aged 12 to 17. This exclusion affected the sample size and overall results of the study. Additionally, maturation in the study influenced the sample size and findings and impeded the generalizability of the study findings.

Selection bias resulted when the included study participants led to findings that may have been different if the sample from the entire population was used (Schreiber-Gregory et al., 2018). For instance, SAMHDA excluded many adolescents who may have misused prescription opioids in 2017 when collecting the data. SAMHDA excluded adolescents with no internet and computer access to complete the survey, adolescents who were non-English speaking, involved in sex trafficking, and those who were sick,

injured, pregnant, hospitalized, mentally ill, homeless, or high on drugs. Therefore, the study results cannot be generalized.

Threats to External Validity

Due to the nature of the study, there were no anticipated threats to external validity. However, threats to external validity in the study were population validity. As discussed previously, the sample population was restricted based on exclusions made by Government agencies when developing the SAMHDA survey, which did not capture all adolescents that misused prescription opioids. This exclusion is just one example suggesting that the sample should not be generalized to the entire population.

Threats to Measurement Validity and Measurement Reliability

Threats to measurement validity and reliability were evident in this study. For instance, the priority prescription opioids types for the study excluded misused opioids such as methadone, hydromorphone, oxymorphone, and buprenorphine. Although these prescription opioids were in the codebook, they were not in the study. The variable opioid types cannot be generalized to all the prescription opioids that adolescents misuse.

Additionally, excluded from the study were some of the known conceptual religious beliefs definitions such as religious affiliation, religion, religious devotion, faith, religious doctrine, and religious participation. Also included in the study was religiosity association with POM, but excluded were the variables; adolescents' IQ, maturity, performance in school, general intelligence, ability to make responsible decisions, ability to read/comprehend, critical thinking skills, or school attended. However, included in the study were grade level completed or attained knowledge association with POM. These

differences in the measurement of the study variables indicated that the selected variables in the study should not be generalized to the overall population.

Threats to Statistical Validity

The research aimed to provide reliable and valid conclusions regarding the association between opioid types, gender, religiosity, education, and POM in adolescents aged 12 to 17 in the United States. Furthermore, appropriate statistical tests to analyze the data, such as simple logistic regression and multiple logistic regression, may lower the study's threats to statistical validity because regression analysis is a well-known technique for checking violations in statistical assumptions (Hoekstra et al., 2012). At the research proposal stage, the assumption was that the statistical logistic regression test would meet all five primary assumptions.

The five primary assumptions that apply to logistic regression are assumption of appropriate outcome structure, observation independence, the absence of multicollinearity, linearity of independent variables and log odds, and large sample size (Schreiber-Gregory et al., 2018). The following are methods to overcome these statistical validity assumptions: Firstly, the assumption of an appropriate outcome structure, overcome by ensuring that the dependent variable is binary. Secondly, observation independence required ensuring that the outcomes for all persons, persons 1, person 2, person 3, and all others are not related and are independent of each other. Thirdly, the absence of multicollinearity requires ensuring that no two independent variables correlate strongly with each other. Fourthly, the linearity of independent variables and log odds requires looking at the log odds of each independent variable and that the independent

variables are linearly related to the log odds. Lastly, overcoming a large sample size regression assumption requires selecting a large enough sample size.

Ethical Procedures

There was limited personal information on the adolescents who participated in the SAMHDA 2017 NSDUH series survey. There was no need for informed consent to conduct this study because the information on the adolescent was confidential. During the authorization process, the terms of use were read and agreed to, for the dataset, designated use only 'for research' by clicking the "I accept" icon provided by the SAMHDA website. A detail of the process embodied the application for IRB approval at Walden University. A pledge to use the data on adolescent POM and the other variables associated with the purpose of the study anonymously and confidentially was the agreement and storage of the information was on a personal password-protected computer. Only I had access to the data, keeping with the ethical practices. I intend to erase and destroy the data three years after completing the research. The data dissemination would be through mediums, such as conferences, workshops, presentations, and social media blogs. Further, SAMHDA will receive citations of the study, per the terms of use agreement, upon completion of the research.

Summary

I reflected on the investigation of a possible association between opioid type and adolescent POM in chapter 3. I utilized a quantitative method, descriptive analysis based on a cross-sectional study approach. Archived data from the United States 2017 NSDUH secondary dataset was analyzed using descriptive statistics, simple logistic regression,

and multiple logistic regression analysis. There were descriptions of the study methodology, the design, population, sampling, and analysis tool. The study result analysis was by SPSS, version 24, a statistical software package presented in chapter 4.

I cover the research questions, hypotheses, and a summary of the research results in chapter 4. Further, presented in chapter 4 were details on the data collection, the sample representativeness, and the study sample demographic composition. Following the research questions, descriptive statistics, simple logistic regression, multiple logistic regression analysis, and stratification analysis were used to present the statistical findings and summary of the data.

Chapter 4: Results

The purpose of the study was to investigate an association between opioid types, gender, religiosity, education, and POM among adolescents 12 to 17 years in the United States. I used the 2017 NSDUH dataset from SAMHDA analysis to explore the association between four priority variables and adolescent POM in three stages. Descriptive statistics determined the frequency distributions of the variables. Simple logistic regression analysis determined that the odds ratio for the variables opioid types, gender, religiosity, and education would predict POM by adolescents. Multiple logistic regression analysis detected an association between opioid types and POM among adolescents ages 12 to 17 in the United States, controlled for gender, religiosity, and education.

The following were the research questions and hypotheses:

RQ1: What is the association between opioid types and POM among adolescents ages 12 to 17 in the United States?

$H_0$1: There is no association between opioid types and POM among adolescents ages 12 to 17 in the United States.

$H_1$1: There is an association between opioid types and POM among adolescents ages 12 to 17 in the United States.

RQ2: What is the association between gender and POM among adolescents ages 12 to 17 in the United States?

$H_0$2: There is no association between gender and POM among adolescents ages 12 to 17 in the United States.

$H_1$2: There is an association between gender and POM among adolescents ages 12 to 17 in the United States.

RQ3: What is the association between religiosity and POM among adolescents ages 12 to 17 in the United States?

$H_0$3: There is no association between religiosity and POM among adolescents ages 12 to 17in the United States.

$H_1$3: There is an association between religiosity and POM among adolescents ages 12 to 17 in the United States.

RQ4: What is the association between education and POM among adolescents ages 12 to 17 in the United States?

$H_0$4: There is no association between education and POM among adolescents ages 12 to 17 in the United States.

$H_1$4: There is an association between education and POM among adolescents ages 12 to 17 in the United States.

RQ5:What is the association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education?

$H_0$5: There is no association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education.

$H_1$5: There is an association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education.

This chapter includes a description of the sample, descriptive statistics, the results, simple logistic regression, multiple logistic regression analyses, and stratification analysis conducted using SPSS.

Data Collection

I received IRB approval from Walden University (approval number08-06-20-0661558) on August 6th, 2020. The receipt of the approval occurred before downloading the dataset, which was from the SAMHDA 2017 NSDUH. Notably, the system of data collection used by SAMHDA (2018) was computer-assisted interviewing surveys with a state-based design. The purpose of the SAMHDA data was to measure drug use and misuse prevalence by noninstitutionalized civilians 12 years or older in the United States in 2017. The database was a well-recognized and acceptable source for adolescent drug misuse in the United States (Ford & Rigg, 2015). No differentiation occurred between religious affiliations, sexual orientation, and educational abilities in the research. The analysis purpose was to determine the possible association between opioid types, gender, religiosity, education, and POM among adolescents aged 12 to 17 in the United States. There was a check on the data for duplication and missing data. Descriptive tests preceded simple logistic regression, multiple logistic regression analysis, and stratification analysis. Upon SPSS analyses completion, I transferred data to Microsoft excel for summarization and presentation.

Threats to external validity may be evident due to possible exclusion of U.S. adolescents based on the following; no internet and computer access, inability to speak English, victims of sex trafficking, sickness, injury, pregnancy, hospitalization, mental

illness, homelessness, or high on drugs. Although the analytic sample was 14,069, only 13,722 were analyzed, representing a difference of 347 adolescents, as shown in Tables 4 through 13 (SAMHDA, 2018). This sample resulted from data cleaning associated with age recategorization that involved reassignment of these individuals to the age category 18-25 after SAMHDA determined the participant was already 18 years old because the data was collected over one year (SAMHDA, 2018).

Determining Opioid Misuse

I used SPSS version 24 to determine the possible association between opioid types, gender, religiosity, education, and POM among adolescents aged 12 to 17 in the United States. The analysis was in the following three steps: (a) descriptive statistics determined the opioid types associated with opioid misuse, as shown in Tables 4 through 13: (b) simple logistic regression analysis use determined whether the variables opioid types, gender, religiosity, and education would predict POM among adolescents age 12 to 17 in the United States, as shown in Tables 14 through 17: and (c) multiple logistic regression analysis uses detected an association between opioid types and POM among adolescents ages 12 to 17 in the United States, controlled for gender, religiosity, and education, as shown in Table 18. I used additional stratified analysis steps to investigate the findings and highlight that the responses within the subgroups were underrepresented based on the U.S. adolescent population size, as shown in Tables 20 through 24. Frequency distributions for gender, religiosity, and education are presented in Tables 11 to 13 and Figures 2 to 5.

Results

Descriptive Statistics

Baseline demographic variables of the sample included gender, religiosity, and education. Each of these variables' characteristics is presented and reported in Tables 11 through 13 and Figures 2 through 5. Indicated in the tables were the numbers of participants for the demographic variables included in the study. Frequency distributions for opioid types are in Tables 4 through 10 and in figure 2.

The majority of participants in the study did not misuse prescription opioids within the last year. For many prescription opioids less than 1% of adolescents reported misusing these opioids (oxycodone 1.2%, codeine 1.2%, hydrocodone 1.1%, tramadol 0.4%, morphine 0.2%, and fentanyl 0.1%). Additionally, more males (51.4%) were in the study than females 48.6%. Most adolescent participants (59.9%) agreed and strongly agreed that religious belief influenced their life decisions. Further, most participants in the study were 18% eighth, 17% ninth, and 17.1% tenth graders.

Table 4

Frequency Distribution for Opioids Past Year Misuse

		Frequency	Percent	Valid Percent
Valid	No	13264	96.7	96.7
	Yes	458	3.3	3.3
	Total	13722	100	100

Table 5

Frequency Distribution for Hydrocodone Products Past Year Misuse

		Frequency	Percent	Valid Percent
Valid	No/Unknown	13570	98.9	98.9
	Yes	152	1.1	1.1
	Total	13722	100	100

Table 6

Frequency Distribution for Oxycodone Products Past Year Misuse

		Frequency	Percent	Valid Percent
Valid	No/Unknown	13554	98.8	98.8
	Yes	168	1.2	1.2
	Total	13722	100	100

Table 7

Frequency Distribution for Fentanyl Products Past Year Misuse

		Frequency	Percent	Valid Percent
Valid	No/Unknown	13713	99.9	99.9
	Yes	9	0.1	0.1
	Total	13722	100	100

Table 8

Frequency Distribution for Tramadol Products Past Year Misuse

		Frequency	Percent	Valid Percent
Valid	No/Unknown	13672	99.6	99.6
	Yes	50	0.4	0.4
	Total	13722	100	100

Table 9

Frequency Distribution for Codeine Products Past Year Misuse

		Frequency	Percent	Valid Percent
Valid	No/Unknown	13557	98.8	98.8
	Yes	165	1.2	1.2
	Total	13722	100	100

Table 10

Frequency Distribution for Morphine Products Past Year Misuse

		Frequency	Percent	Valid Percent
Valid	No/Unknown	13695	99.8	99.8
	Yes	27	0.2	0.2
	Total	13722	100	100

Table 11

Frequency Distribution for Gender

	Frequency	Percent	Valid Percent
Male	7050	51.4	51.4
Female	6672	48.6	48.6
Total	13722	100	100

Table 12

Frequency Distribution for Religiosity

		Frequency	Percent	Valid Percent
	Agree/Strongly Agree	8226	59.9	62
	Strongly Disagree/Disagree	5046	36.8	38
	Total	13272	96.7	100
Missing	System	450	3.3	
Total		13722	100	

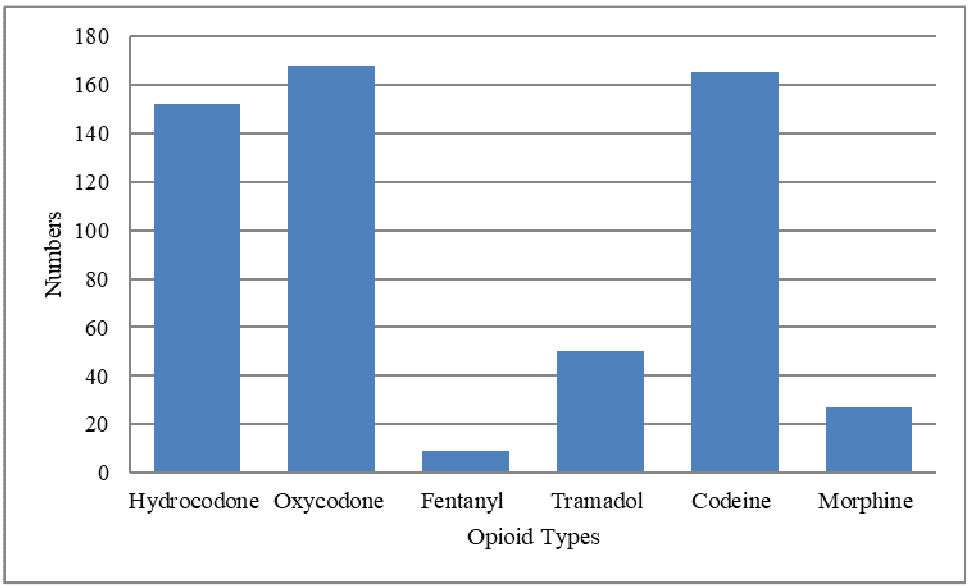
Table 13

Frequency Distribution for Education

	Frequency	Percent	Valid Percent
Fifth grade or less grade completed	735	5.4	5.4
Sixth grade completed	1959	14.3	14.3
Seventh grade completed	2174	15.8	15.8
Eighth grade completed	2465	18	18
Ninth grade completed	2333	17	17
Tenth grade completed	2341	17.1	17.1
Eleventh or Twelfth grade completed, no diploma	1560	11.4	11.4
High school diploma/GED	129	0.9	0.9
Some college credit, but no degree	22	0.2	0.2
Associate s degree	2	0	0
College graduate or higher	2	0	0
Total	13722	100	100

Figure 2

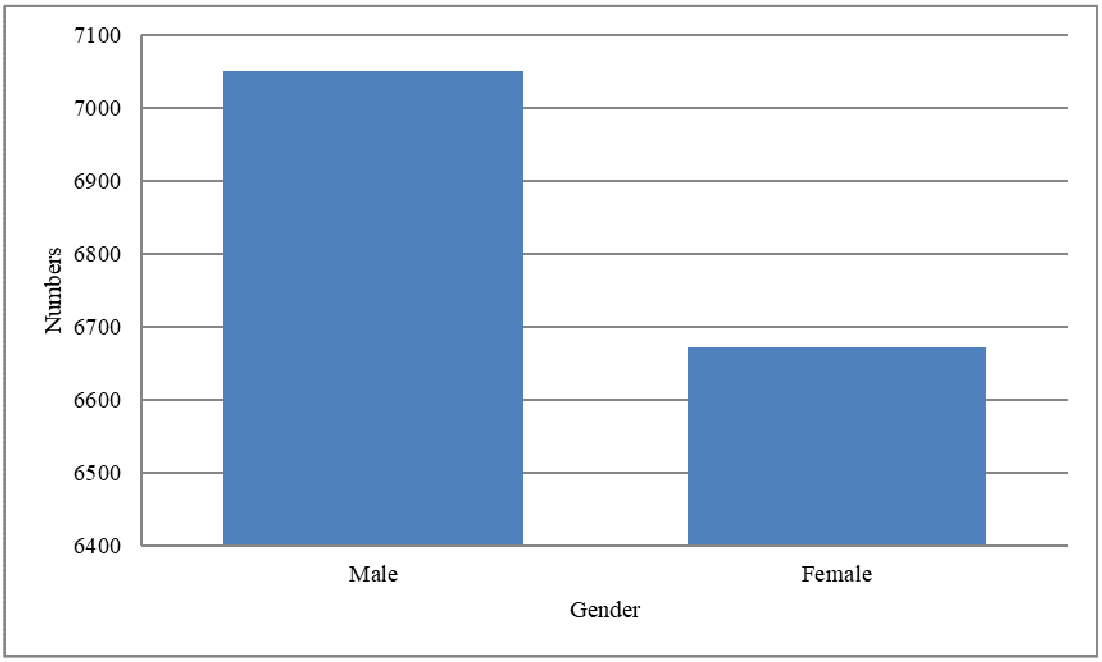
Histogram Displaying Frequencies for Opioid Types



Note. United States adolescents misuse of prescription opioids in 2017 by Opioid types

Figure 3

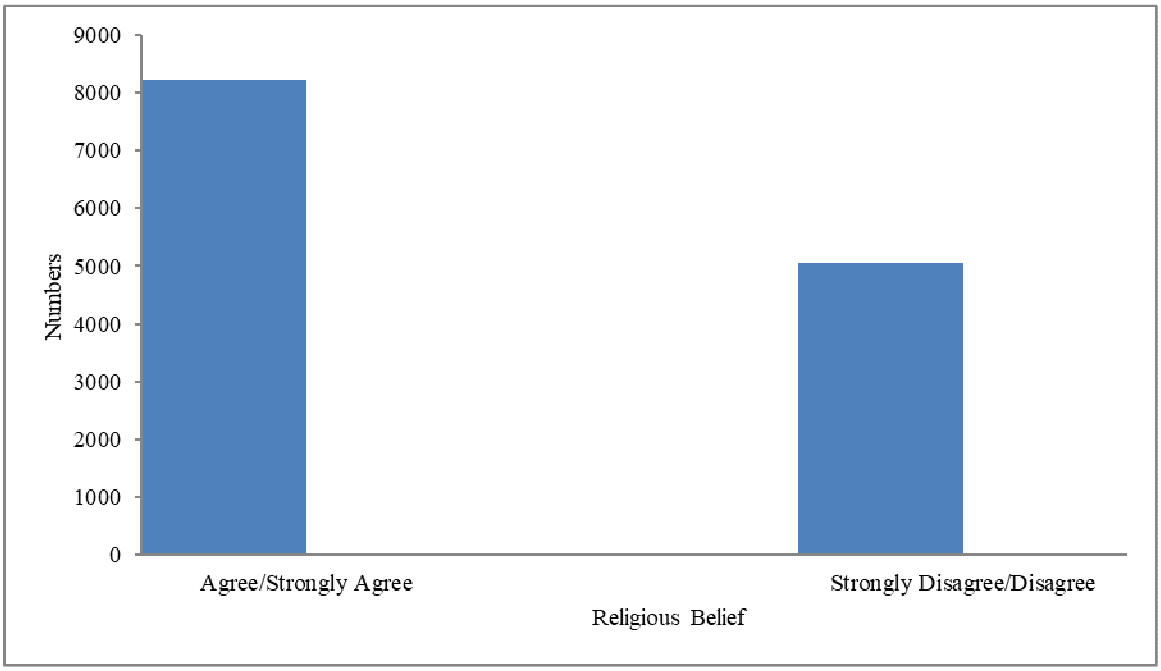
Histogram Displaying Frequencies for Gender



Note. United States adolescents misuse of prescription opioids in 2017 by gender.

Figure 4

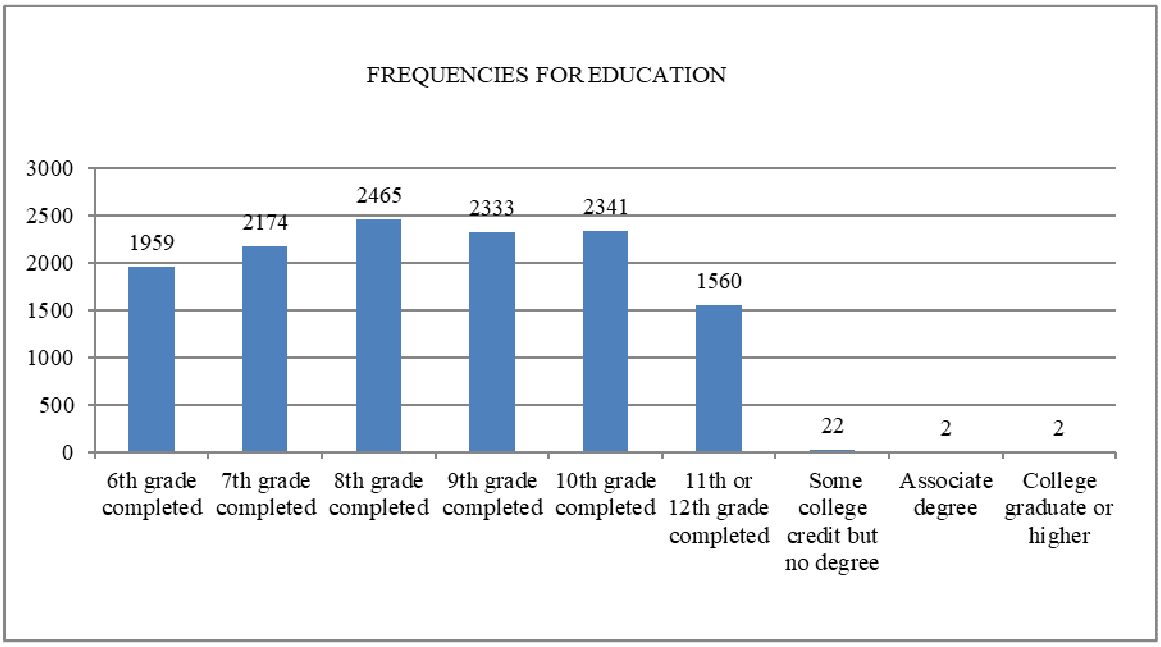
Histogram Displaying Frequencies for Religiosity



Note. United States adolescents misuse of prescription opioids in 2017 by religiosity

Figure *5*

Histogram Displaying Frequencies for Education



Note. United States adolescents misuse of prescription opioids in 2017 by educational level/attainment.

Hypotheses 1

RQ1: What is the association between opioid types and POM among adolescents 12 to 17 years of age in the United States?

The hypothesis was an association between opioid types and POM among adolescents 12 to 17 in the United States. Table 5 to 10 descriptive statistics and Figure 2 histogram depicted the numbers of adolescents ages 12 to 17 in the United States who misused hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine were 152,168, 9, 50, 165, and 27, respectively.

The findings of the simple logistic regression analysis illustrated in Table 16 depicted the independent variable opioid types (hydrocodone, oxycodone, fentanyl,

tramadol, codeine, and morphine) and POM among adolescents 12 to 17 years of age in the United States with the following statistical significance of 0.991, 0.991, 0.995, 0.991, 0.996, and 0.998, respectively. Based on the results of the simple logistic regression analysis, I failed to reject the null hypothesis.

The Nagelkerke R^2 and the Cox & Snell R^2 tool validated the appropriateness of the analytical model. The Nagelkerke $R,^2$ recorded a 0.773, is simpler to interpret than the Cox & Snell R^2 because the model has possible values from 0 to 1, whereas Cox & Snell R^2 has possible values from 0 to 0.75 (Warner, 2013). According to the Nagelkerke R^2 rule, the closer the result is to 1, the stronger the model predictive power. Therefore, Nagelkerke R^2 =0.773 suggests that the model explained roughly 77.3% of the variability of the outcome. Further, the Hosmer Lemeshow goodness of fit test produced a p = 0.000, indicating that the model was not a good fit for the data. Based on the results of the tests, the model was not correctly specified and not consistent with the data. According to Allison (2013), for results, when both models do not support a good fit and contradict the rules, either of the two models is adequate.

Simple Logistic Regression

Table 14

Simple Logistic Regression Analysis Opioid Types Predicting Opioid Misuse

	B	S.E.	*p* value
Hydrocodone products	24.581	2235.913	0.991
Oxycodone products	24.603	2092.774	0.991
Fentanyl products	23.587	10537.2	0.998
Tramadol products	24.278	3720.803	0.995
Codeine products	25.172	2339.321	0.991
Morphine products	24.265	5227.989	0.996

Hypotheses 2

RQ2: What is the association between gender and POM among adolescents ages 12 to 17 in the United States?

The hypothesis is an association between gender and POM among adolescents ages 12 to 17 in the United States. Figure 3 and Table 11 showed more male adolescent respondents than females, 7050 and 6672, respectively. The findings of this simple logistic regression analysis illustrated in Table 15 depicted the independent variable gender and the outcome variable with the following Odds Ratio [*OR*] = 1.180, 95% Confidence Interval [CI] = [.979, 1.422] and statistical significance, $p = 0.082$. The Exp (B) [exponentiation of the B coefficients] is the Odds Ratio [*OR*] in the study (Daniel& Cross, 2013). The Odds Ratio for gender was 1.180. This result suggested that adolescent

females were 1.2 times more likely to misuse prescription opioids when compared to males. At a 95% confidence level, there is a 95% confidence interval of .979 and 1.422 for gender and adolescent POM, as shown in Table 15. The rule is that the OR is statistically significant at the 95% CI when the 95% CI does not include 1.0. Based on this rule, the 95% CI in this study ranged from .979 to 1.422 and therefore was not statistically significant. Given all of the above, I failed to reject the null hypothesis. The NagelkerkeR^2 = 0.001 suggests that the model explained roughly 0.1% of the outcome variability. The Hosmer Lemeshow goodness of fit test produced a p = 0.000, indicating that the model was not a good fit for the data.

Table 15

Simple Logistic Regression Analysis Gender Predicting Opioid Misuse

					95% C.I. for OR	
	B	S.E.	*p* value	OR	Lower	Upper
Gender	0.166	0.095	0.082	1.180	0.979	1.422

Hypotheses 3

RQ3:What is the association between religiosity and POM among adolescents ages 12 to 17 in the United States?

I hypothesized an association between religiosity and POM among adolescents ages 12-17 in the United States. The findings of this simple logistic regression analysis illustrated in Table 16 depicted the independent variable religiosity and the outcome variable with the following *OR* = 1.978, 95% CI = [1.633, 2.395] and statistical significance p = 0.000. This result suggested that religious adolescents 12 to 17 in the United States would almost two times likely not misuse prescription opioids. Based on

the values of the *OR*, the 95% CI, and the *p*-value, I rejected the null hypothesis. The Nagelkerke R^2 result of 0.015 suggests that the model explained roughly 1.5% of the outcome variability. The Hosmer Lemeshow goodness of fit test produced a $p = 0.000$, indicating that the model was not a good fit.

Table 16

Simple Logistic Regression Analysis Religiosity Predicting Opioid Misuse

					95% C.I. for OR	
	B	S.E.	*p* value	OR	Lower	Upper
Religiosity	0.682	0.098	0.000	1.978	1.633	2.395

Note.p<.05.

Hypotheses 4

RQ4: What is the association between education and POM among adolescents ages 12 to 17 in the United States?

I hypothesized an association between education and POM among adolescents ages 12 to 17 in the United States. The findings in Table 17 depicted the independent variable education and the outcome variable with the following statistical significance, $p = 1.000$ or 0.999. Based on the results of the *p*-value alone, I failed to reject the null hypothesis. The NagelkerkeR^2 recorded a 0.015, suggesting that the model explained roughly 1.5% of the outcome variability. Further, the Hosmer Lemeshow goodness of fit test produced a $p = 0.000$, indicating that the model was not a good fit for the data.

Table 17

Simple Logistic Regression Analysis Education Predicting Opioid Misuse

	B	S.E.	*p* value
Education - 5th grade or less completed	17.102	28335.668	1
Education - 6th grade completed	17.037	28335.668	1
Education- 7th grade completed	17.321	28335.668	1
Education 8th grade completed	17.711	28335.668	1
Education - 9th grade completed	17.985	28335.668	0.999
Education - 10th grade completed	18.152	28335.668	0.999
Education - 11th or 12th grade completed	18.384	28335.668	0.999
Education - High school diploma/GED	19.095	28335.668	0.999
Education - Some college credit but no degree	18.156	28335.668	0.999
Education - Associate degree	-0.002	40132.873	1

Hypotheses 5: Predictors of POM among Adolescents Ages 12 to 17 in the United States

RQ5: What is the association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education?

To test the influence of each independent variable simultaneously while controlling for all other variables, I used a multiple regression model, with all variables predicting the outcome variable (see Table 18). I hypothesized an association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education. The findings illustrated in Table 18 depicted the independent variables opioid types, gender, religion, and education and the outcome variable with the following statistical significance, p = 0.990-0.998, 0.014, 0.193, and 1.000, respectively. When the independent variables were analyzed collectively, there was a statistically significant association between only gender and POM among adolescents ages 12 to 17 in the United States. Based on the results of the p values alone, I rejected the null hypothesis for only the variable gender.

Although religiosity was associated with less POM, as depicted in Table 16, the effect disappeared after controlling for gender, as shown in Table 18. The multiple logistic regression finding led to investigate confounding or mediation. With the results that the association between religiosity and adolescent POM effect disappears after controlling for gender, there was the need for stratified analysis.

Multiple Logistic Regression Analysis

Table 18

Multiple Logistic Regression Analysis Predicting Opioid Misuse

					95% C.I. for OR	
	B	S.E.	*p* value	OR	Lower	Upper
Gender	0.597	0.243	0.014	1.817	1.129	2.923
Religiosity	0.307	0.236	0.193	1.359	0.856	2.158
Education - 5th grade or less completed	15.165	28354.871	1.000			
Education - 6th grade completed	15.724	28354.871	1.000			
Education - 7th grade completed	14.901	28354.871	1.000			
Education - 8th grade completed	15.456	28354.871	1.000			
Education - 9th grade completed	15.858	28354.871	1.000			
Education - 10th grade completed	16.135	28354.871	1.000			
Education - 11th or 12th grade completed	16.143	28354.871	1.000			
Education - High school diploma/GED	16.144	28354.871	1.000			
Education - Some college credit but no degree	2.743	28420.853	1.000			
Education - Associate degree	-0.598	40122.102	1.000			
Hydrocodone products	24.465	2227.752	0.991			
Oxycodone products	24.662	2093.337	0.991			
Tramadol products	24.441	3686.759	0.995			
Codeine products	33.777	2749.869	0.990			
Morphine products	24.402	5374.092	0.996			
Fentanyl products	24.223	11049.393	0.998			

The stratified analysis further investigated the findings that religiosity is associated with POM when the effect disappeared after controlling for gender, as shown in Tables 20 through 24. The following stratified analysis further analyzed the extent of the association: 1) bivariate stratified analysis of gender and religiosity; 2) multivariate stratified analysis of gender, POM, and religiosity; and finally 3) multivariate stratified analysis of religiosity, opioid misuse, and gender.

Based on the potential impacts of statistical assumption violations on the simple logistic and multiple logistic regression analysis findings, the use of the stratified analysis test ascertained the possible degrees of statistical assumption violations that may have been present in the study. According to Schreiber-Gregory et al. (2018), the five degrees of logistic regression assumption violations are assumption of appropriate outcome structure, observation independence, absence of multicollinearity, linearity of independent variables, log odds, and large sample size. Based on the findings, there were no statistical assumptions violations in the study. The diagnostic tests performed to assess the assumptions of logistic regression were; assumption of linearity, sampling independence, normality, and homoscedasticity.

Assumption of Linearity

There was no violation in the assumption of linearity because there were no curves in the scatterplot diagram, and the plot followed a linear pattern.

Assumption of Sampling Independence

The multicollinearity diagnostic test assessed the assumption. There was no tolerance value less than 0.10 and no Variance Inflation Factor [VIF] value greater than 10, which would otherwise indicate high multicollinearity, as shown in Table 19 below. These values suggested no inter-relationship among the predictor variables present in the model. Therefore the assumption of sampling independence was not violated. Noteworthy, the VIF is the reciprocal of the tolerance or is 1/tolerance.

Table 19

Collinearity Coefficients

	Collinearity Statistics	
	Tolerance	VIF
Education	0.978	1.023
Religiosity	0.982	1.018
Gender	0.998	1.002
Hydrocodone	0.743	1.346
Oxycodone	0.736	1.359
Tramadol	0.864	1.158
Codeine	0.867	1.153
Morphine	0.893	1.119
Fentanyl	0.952	1.05

Dependent Variable: Adolescent POM

Assumption of Normality

There was no violation in the assumption of normality because the data were approximately normally distributed, and the residuals of the regression conformed to the diagonal normality line indicated by the P-P plot.

Assumption of Homoscedasticity

There was no assumption of homoscedasticity because the scatter plots did not show that the residual dots formed a distinguished pattern such as a triangular, funnel, or U shape.

The cross-tabulation analysis presented in Table 20 depicted that more adolescent females than males agree that religiosity influences their life decisions, 63.6% compared to 60.5%, respectively. Further, an average of 62% of adolescent females and males

agree/strongly agree to religiosity, whereas an average of 38% of adolescents disagreed/strongly disagreed with religiosity. The bivariate tests reflected in Table 21 revealed $p = .000$, and a statistically significant association exists between these two variables; gender and religiosity.

The cross-tabulation analysis presented in Table 22 confirmed that 3.3% of males and females indicated yes to POM when asked if religiosity influences their life decisions. Further, in the category strongly agree 97.6%, of both males and females, responded no to religiosity, whereas 2.4% answered yes. Similarly, in the category strongly disagree, 95.3% of both males and female respondents indicated no when asked; does religious belief influence life decision, whereas 4.7% stated yes. Additionally, more females agreed, and strongly agreed, to religiosity and misuse of prescription opioids, 114 and 86 respectively.

The stratified multivariate results depicted in Table 23 confirmed a statistically significant association between religiosity and adolescent POM when controlling for gender. However, the multivariate tests reflected in Table 24 did not reveal a statistically significant association between gender and adolescent POM when controlling for religiosity. However, the stratification analysis results confirmed the simple logistic regression results of an association between religiosity and adolescent POM.

Stratification Analysis

Table 20

*Cross-Tabulation of Gender * Religiosity*

	Agree/Strongly Agree	Strongly Disagree/Disagree	Total
Male	4106	2683	6789
	60.5%	39.5%	100.0%
Female	4120	2363	6483
	63.6%	36.4%	100.0%
Total	8226	5046	13272
	62.0%	38.0%	100.0%

Table 21

*Chi Square Test for Gender * Religiosity*

	Value	Df	*p* value
Pearson Chi-Square	13.269[a]	1	0.000
Continuity Correction[b]	13.139	1	0.000
Likelihood Ratio	13.275	1	0.000
Linear-by-Linear Association	13.268	1	0.000
N of Valid Cases	13272		

Table 22

*Cross-Tabulation of Religiosity*Opioid Misuse*Gender*

Gender			Opioid misuse		
			No	Yes	Total
Male	Religiosity	Agree/Strongly Agree	4020	86	4106
			97.9%	2.1%	100.0%
		Strongly Disagree/Disagree	2567	116	2683
			95.7%	4.3%	100.0%
	Total		6587	202	6789
			97.0%	3.0%	100.0%
Female	Religiosity	Agree/Strongly Agree	4006	114	4120
			97.2%	2.8%	100.0%
		Strongly Disagree/Disagree	2242	121	2363
			94.9%	5.1%	100.0%
	Total		6248	235	6483
			96.4%	3.6%	100.0%
Total	Religiosity	Agree/Strongly Agree	8026	200	8226
			97.6%	2.4%	100.0%
		Strongly Disagree/Disagree	4809	237	5046
			95.3%	4.7%	100.0%
	Total		12835	437	13272
			96.7%	3.3%	100.0%

Table 23

*Chi Square Test for Religiosity*Opioid Misuse*Gender*

Gender		Value	Df	*p* value
Male	Pearson Chi-Square	27.928[c]	1	0.000
	Continuity Correction[b]	27.161	1	0.000
	Likelihood Ratio	27.145	1	0.000
	Linear-by-Linear Association	27.924	1	0.000
	N of Valid Cases	6789		
Female	Pearson Chi-Square	23.812[d]	1	0.000
	Continuity Correction[b]	23.143	1	0.000
	Likelihood Ratio	22.893	1	0.000
	Linear-by-Linear Association	23.809	1	0.000
	N of Valid Cases	6483		
Total	Pearson Chi-Square	50.410[a]	1	0.000
	Continuity Correction[b]	49.701	1	0.000
	Likelihood Ratio	48.718	1	0.000
	Linear-by-Linear Association	50.406	1	0.000
	N of Valid Cases	13272		

Table 24

*Chi Square Test for Gender *Opioid Misuse* Religiosity*

Religiosity		Value	Df	*p* value
Agree/Strongly Agree	Pearson Chi-Square	3.921[c]	1	0.048
	Continuity Correction[b]	3.642	1	0.056
	Likelihood Ratio	3.934	1	0.047
	Linear-by-Linear Association	3.920	1	0.048
	N of Valid Cases	8226		
Strongly Disagree/Disagree	Pearson Chi-Square	1.783[d]	1	0.182
	Continuity Correction[b]	1.610	1	0.205
	Likelihood Ratio	1.779	1	0.182
	Linear-by-Linear Association	1.783	1	0.182
	N of Valid Cases	5046		
Total	Pearson Chi-Square	4.393[a]	1	0.036
	Continuity Correction[b]	4.191	1	0.041
	Likelihood Ratio	4.393	1	0.036
	Linear-by-Linear Association	4.393	1	0.036
	N of Valid Cases	13272		

Summary

The study examined the four independent variables, opioid types, gender, religiosity, and education, and the dependent variable, POM among adolescents 12 to 17 years of age in the United States. The statistical tests used for the analysis were simple logistic regression and multiple logistic regression, and stratification analysis. I failed to reject null hypothesis 1 because opioid types were not associated with POM among adolescents 12 to 17 years of age in the United States. Further, I failed to reject null hypothesis 2 because gender was not associated with POM among adolescents 12 to 17 years of age in the United States. However, I rejected null hypothesis 3 because religiosity was associated with POM among adolescents 12 to 17 years of age in the United States. I failed to reject null hypothesis 4 because education was not associated with POM among adolescents 12 to 17 years of age in the United States. Finally, I failed to reject null hypothesis 5 because there was no association between opioid type and adolescent POM controlled for gender, religiosity, and education among adolescents ages 12 to 17 in the United States. In the end, the overall result of the study was a rejection of the null hypothesis for only gender.

Further, the simple logistic regression analysis resulted in a statistically significant association between religiosity and adolescent POM. However, the multiple logistic regression analysis results indicated only a statistically significant association between gender and adolescent POM. As a result, the stratified analysis clarified the confounding effect findings and explained the association between religiosity and adolescent POM controlled for gender. The use of simple and multiple logistic regression

and stratified analysis was adequate for this investigation. The bivariate model showed a significant association between gender and religiosity. However, the multivariate model showed a statistically significant association between religiosity and adolescent POM controlled for gender. Notably, the second multivariate model showed no statistically significant association between gender and adolescent POM when controlling for religiosity, supporting the logistic regression findings. The overall results indicated a statistically significant association between gender and adolescent POM.

I presented the research overview that quantitatively determined an association between opioid types and POM among adolescents 12-17 in the United States in chapter 4. The results of chapter 4 are within the context of the SEM theoretical framework and current literature review within chapter 5. Interpretations of the statistical results are in chapter 5 interpretation of findings section. In addition, there are discussions on the limitations of the research, proposed suggestions for further study, and implications for professional practice and positive social change.

Chapter 5: Discussion, Conclusions, and Recommendations

POM poses a significant challenge to adolescents 12 to 17 in the United States. Austin and Shanahan (2018) and Rudd, Seth et al. (2016) found that prescription opioids and not illicit opioids such as heroin remain the cause of the opioid misuse epidemic. Compton and Volkow (2006), Ford and Rigg (2015), Rigg and Murphy (2013), and Voepel-Lewis (2015) reported that adolescents' risky attitudes and misconceptions regarding illegality and safety of prescription opioids increase the drug attractiveness. According to Dash et al. (2018), in 2015, 3.9% of adolescents aged 12 to 17 misused prescription opioids. This rate is expected to worsen before improving (Meyer et al., 2014). Although possible over-prescribing accounts for much of the adolescent POM in the United States (Ahn et al., 2019; Pruitt et al., 2019), ease of access to prescription opioid medicines in the home is a factor in opioid misuse in adolescents (Allen et al., 2017).

Substantial research revealed the extent of adolescent POM and associated economic, socioeconomic, biological, and physiological effects (Allen et al., 2017). Researchers, to my knowledge, have not evaluated the association between opioid types, gender, religiosity, education, and POM among adolescents 12 to 17 years of age in the United States. A factor that might prevent studies regarding opioid types and adolescent POM is the inability to recall the name of the prescription opioid that was misused (McCabe et al.,2013).

This quantitative cross-sectional study investigated four factors that may play a statistically significant association in POM among adolescents 12 to 17 years of age in

the United States: opioid types, gender, religiosity, and education. I used the SAMHDA 2017 NSDUH dataset to evaluate an association between opioid types, gender, religiosity, education, and adolescent POM. It is noteworthy that gender was associated with POM among adolescents ages 12-17 in the United States by multiple logistic regressions. The analysis was limited to the provided variables in the 2017 NSDUH dataset.

The results of this study provided insight into the role that opioid types, gender, religiosity, and education play in adolescent POM but did not include findings that could be generalized to all adolescents who misuse prescription opioids. Due to the sample selection employed in the study, the results may not represent all adolescents who misuse prescription opioids. Specific concerns related to the methodology and generalizability are in the limitation section. For example, institutionalized adolescents and those 11 and under were not surveyed and therefore not included in the study (SAMHDA, 2018). In chapter 5, there are an interpretation of the findings, SEM analysis and interpretation, and a limitation of the study section. I also provide recommendations for future research, implications for positive social change, and a conclusion.

Interpretation of the Findings

The focus of the study was on answering five research questions and hypotheses to determine a possible association between opioid type and adolescent POM. The study results led to four hypotheses rejection and the acceptance of one. Therefore, the study findings provided some unexpected yet beneficial information related to adolescent POM that is presented in more detail later in the chapter. Two items of particular interest were the results of the null findings for RQ1 and RQ5 and the confounding effect of religiosity

on gender and adolescent POM association by using the multiple logistic regression model.

The SEM was the supporting theoretical framework for evaluating the association between opioid types, gender, religiosity, education, and adolescent POM in the study. An adolescent decision to misuse prescription opioids is multifaceted. Notwithstanding the complexity of adolescent POM, the microsystem construct was ideal because the priority variables of the research were at the individual level. Further, the SEM model was the most appropriate theoretical framework to explain the research questions and depicted alignment between the research findings and the microsystem construct, as shown in Table 25.

Based on the research findings, the SEM was the most appropriate fit. Therefore, in redesigning another study to interpret and understand adolescent POM, the researcher should examine the association between opioid types, gender, religiosity, education, and adolescent POM, using the mesosystem, exosystem, and macrosystem constructs. For instance, within the mesosystem, the researcher determined the parents and friends of the adolescents attitudes and beliefs regarding adolescent POM (Conn & Marks, 2017). Using the exosystem, the researcher can look at the school environment, neighborhoods, religious institutions, or cultural influence on adolescent POM (Allison et al., 1999; Conn & Marks, 2017). Finally, using the macrosystem, the researcher can look at various media sources, health, economic, educational, and social policies and their influence on adolescent POM.

Further, the stratified analysis revealed a low sample size that resulted in some null study findings that can be considered a methodological study weakness. Therefore, one of the recommendations is using the NIDA secondary dataset that also captures adolescent POM trends in the United States. The recommended change to the NIDA dataset can allow researchers to use opioid types, gender, religiosity, and education to get a different perspective on the set variables. For instance, researchers can use variables such as education/education attainment to get trends of adolescent POM by grade, such as from eighth to 12^{th} grade and by year such as 2017 to 2020. The study should incorporate the contextual definitions of the variables to maintain consistency. For example, according to the literature, religiosity association with adolescent POM can be conceptualized as religious involvement (Ransome et al., 2019), faith (Grim & Grim, 2019), spiritual and religious influences (Lee et al., 2019), religious services attendance (Edlund, 2015), religious coping, religious affiliation, religious attendance (Gallucci et al., 2018), service attendance, social interaction, and subjective religiosity/spirituality (Ransome et al., 2019), religious service attendance, prayer, and meditation (Chen & VanderWeele, 2018).

The exclusion of institutionalized adolescents from this study reduced the number of U.S. adolescents involved in the survey that may have misused prescription opioids and affected the study sample size. A study redesign should include the United States institutionalized adolescents' responses because doing so may increase the yes response to misuse of prescription opioids. The survey responses from the institutionalized

adolescents may also lead to different results in the association between opioid types, gender, religiosity, education, and adolescent POM.

Table 25

Microsystem Constructs alignment

	My study findings	N/A for my study	N/A for my study	N/A for my study
Variable	Microsystem	Mesosystem	Exosystem	Macrosystem
Opioid Type	The type of opioid does not determine Adolescent Prescription opioid misused	High level of parental warmth and monitoring Predicted lower POM by opioid type (Donaldson et al., 2015)	Adolescents' social networks Influence the type of prescription opioid misused	Based on opioid type law enforcement intervention and decrease prescribing help lower Adolescent POM (Dart et al,. 2015)
Gender	Female adolescents have higher POM Behavior	Family and peers are more likely to influence Female adolescents to POM behavior	Community interaction of adolescent females is more likely to lead to POM	Societal factors such as health in the United States lead to high rates of POM in female adolescents
Religiosity	Adolescents religious beliefs do not determine POM behavior	An adolescent without spiritual and religious influence is vulnerable to POM behavior (Lee et al.,2019)	An adolescent interaction with faith can prevent POM (Grim & Grim, 2019)	An adolescent with less exposure to religious culture in the United States had a higher likelihood of POM (Edlund et al., 2015)
Education	An adolescent grade completed does not determine POM behavior	An adolescent peers in the school they attend influence POM behavior	Homeschooled adolescents had lower POM rates (Schepes et al., 2020)	An adolescent with lower grades had higher likelihood of POM (Edlund et al., 2015)

Note. N/A means not applicable

Study Results Interpretation and Comparison to the Literature

This study involved a cross-sectional analysis of the association between opioid types, gender, religiosity, and education and POM among adolescents ages 12 to 17 in the United States. The evaluation included an analysis of 13,722 United States adolescents who may have misused prescription opioids in 2017. State-based design computer-assisted interviewing surveys collected adolescents' reports of the prescription opioids they misused.

Descriptive Statistics

The research findings recorded the percentages of some misused prescription opioid types by adolescents 12 to 17 in the United States in 2017:oxycodone 1.2%, codeine 1.2%, hydrocodone 1.1%, tramadol 0.4%, morphine 0.2%, and fentanyl 0.1%. Duran et al. (2017) and Ossiander (2014) supported that oxycodone, morphine, and hydrocodone are among the most commonly misused prescription opioids by adolescents. Moreover, Johnston et al. (2018) reported that the estimation of POM among adolescents in the United States varied above 5%. However, my study results recorded lower POM among adolescents in the United States at 3.3%. This percentage was consistent with the literature review findings of 3.9% POM among adolescents aged 12 to 17 (Dash et al., 2018). Overall, the 458 adolescents in 2017 who admitted to misusing prescription opioids selected in my study were the relatively low number.

According to Jamasbi et al. (2018), receiving a prescription opioid is associated with the misuse of opioids. Off-label prescribing apply to the dispensing of prescription opioids to an unapproved age group, dosage, administration route, or as indicated by

clinicians (Goncalves & Heinneck, 2016). According to Aschenbrenner (2017) and Buck (2015), tramadol prescribing is off-label to adolescents 17 or younger. Similarly, morphine is used off-label in children (Hsu & Brazelton, 2009; Shenoi, 2016), supporting the study result of a low percentage of adolescent misuse of tramadol 0.4% and morphine 0.2%. Noteworthy, there is a positive relationship between off-labeled prescribing of morphine and tramadol and POM.

The descriptive analysis revealed that only 5 % more adolescent males than females participated in the 2017 NSDUH. Studies conducted in the United States showed that females were at higher risk for adolescent POM. For instance, Monnat and Rigg (2015), Sung et al. (2005), and SAMHDA (2018) indicated a higher risk for opioid misuse among female adolescents. The findings of Edlund et al. (2015)and Simoni-Wastila and Strickler (2004) concurred that females are at higher risk for POM. In this study, adolescent females were more likely to misuse prescription opioids when compared to males. The risk difference might be due to opioids being prescribed more to adolescents females than males (Chung et al., 2018). Some scholars suggested that prescription opioid use is associated with future misuse (Freedman-Weiss et al., 2019).

Research Questions

RQ1: What is the association between opioid types and POM among adolescents ages 12 to 17 in the United States?

Based on the simple logistic regression, there was no statistically significant association between opioid types and POM among adolescents ages 12 to 17 in the United States. The findings from the simple logistic regression were that opioid types

were not associated with POM among adolescents ages 12 to 17 in the United States. These results present an opportunity for inclusion in the current body of literature. The prescription opioid type used by an adolescent does not determine whether or not the adolescent will misuse or not misuse the drug. This result might be due to the low number of adolescents who reported misuse of opioids, hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine. These results may indicate that adolescents who misuse a prescription opioid are likely to report misuse despite the opioid type. Additionally, SAMHDA payment to boost the survey response rate may have led to respondent and recall biases and inaccurate data and parent/guardian influence, leading to incomplete and insincere POM reports.

Further, enabling factors and predisposing factors such as overprescribing, new types of opioids, parental use of opioids, health status, and initial intake of prescribed opioids from peers, family, and clinicians are determinants of adolescent POM, were not included in this analysis. Institutionalized adolescents were not in the 2017 survey. Many adolescents who may have misused prescription opioids were confined to group homes, rehabilitation centers, mental health institutions, in-prison, and were homeless. Other adolescents with no internet and computer access to complete the survey, non-English speaking, involved in sex-trafficking, sick, injured, pregnant, hospitalized, were also excluded. These exclusions may also explain why such a low number of surveyed adolescents reported POM. Another reason for the lack of statistical significance results might be adolescents' access to these opioids. For example, adolescents 12 to 17 who are non-institutionalized are usually administered prescription opioids by a parent/guardian,

teacher, or school nurse (Ramos et al., 2018). These opioids are in the guarded possession of these responsible adults, indicating a low chance that the adolescent had access to these opioids to misuse them. Research is needed on trends in adolescent POM when parents, teacher, or school nurse, administers prescription opioids. Since adolescents will report misusing an opioid despite the opioid misused with equal chances, future research needs to evaluate recorded opioids prescribed to adolescents by the clinician association with adolescent POM.

RQ2: What is the association between gender and POM among adolescents ages 12 to 17 in the United States?

The results of the simple logistic regression were that gender was not statistically significantly associated with POM among adolescents ages 12 to 17 in the United States. Therefore, the data fail to reject the null hypothesis. Based on the statistically significant values, gender did not predict POM among adolescents ages 12 to 17 in the United States. An adolescent gender does not determine whether or not the adolescent will misuse or not misuse prescription opioids. However, this study findings interpretation should be conservative because adolescents reported low misuse rates of prescription opioids.

However, the odds ratio was more than 1, confirming a positive association between gender and adolescent POM, despite no statistically significant. Females were 1.2 times more likely to misuse prescription opioids than males, but this association was not statistically significant (95% CI: 0.98- 1.42, $p = 0.082$). These researchers' findings

also support that adolescent female are at higher risk for POM (Edlund et al., 2015; Monnat and Rigg, 2015; Simoni-Wastila & Strickler, 2004; Vaughn et al., 2016).

RQ3. What is the association between religiosity and POM among adolescents ages 12 to 17 in the United States?

The results from the simple logistic regression indicated a statistically significant association between religiosity and POM among adolescents ages 12 to 17 in the United States (95% CI: 1.633- 2.395, $p = 0.000$). Therefore, based on the simple logistic regression results, I rejected the null hypothesis. Adolescents with religiosity were two times more likely to avoid POM when compared to adolescents with no religiosity. The odds ratio greater than 1 confirms a positive association between religiosity and adolescent POM. In other words, having religiosity is associated with less adolescent POM. Ford and Hill (2012), Ford and McCutcheon (2012), Ford and Rigg (2015), Krause et al. (2017), and Monnat and Rigg (2016) findings supported that religiosity/religious belief can protect against adolescent POM.

RQ4: What is the association between education and POM among adolescents ages 12 to 17 in the United States?

Based on the simple logistic regression, the analysis of the association between education and POM among adolescents ages 12 to 17 in the United States did not produce a statistically significant association, $p = 1.000$ or 0.999 in all categories of the variable education. Education was not statistically significantly associated with POM among adolescents ages 12 to 17 in the United States because the model results have failed to reject the null hypothesis. The results of the simple logistic regression were that

education does not predict POM among adolescents ages 12 to 17 in the United States. Ransome et al. (2019) used a similar conceptual definition for educational attainment as this research allowing a literature comparison. This study showed no association between education and adolescent POM, creating an opportunity for inclusion among the current body of literature.

Since education/grade completed is not associated with POM, the results indicated that completing school grade levels do not determine whether an adolescent would be less or more likely to misuse prescription opioids. This result was due to the following; lack of relevant inclusion of POM education, lack of teacher's training on POM, and inadequate policies to govern POM education throughout the United States education system. Therefore, it is fair to conclude that instituting POM education throughout the grades may lead to an association between the two variables. Future research needs to consider other possible educational factors that influence adolescent POM.

Further, due to the lack of POM education integration in schools, the amount of education an adolescent attain makes no difference on POM. For instance, education does not determine the likelihood that an adolescent 12 to 17 will misuse or not misuse prescription opioids. However, Miech et al. (2015) explained that clinic-based education reduces future opioid misuse among adolescents with a well-built attitude against illegal drug use before commencing prescription opioid use. Additionally, Monnat and Rigg (2015) advanced that education awareness programs can facilitate the effective mitigation of adolescent POM.

RQ5: What is the association between opioid types and POM among adolescents ages 12 to 17 in the United States controlled for gender, religiosity, and education among adolescents ages 12 to 17 in the United States?

Based on the multiple logistic regression analysis, the association between opioid types (hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine) and adolescent POM controlled for gender, religiosity, and education did not produce any statistically significant association. The multiple logistic regression analysis confirmed the simple logistic regression model results that showed no statistically significant association between opioid types and education and POM among adolescents 12 to 17 in the United States. The multiple logistic regression results were that gender was statistically associated with adolescent POM at $p = 0.014$. However, religiosity confounded this association between gender and adolescent POM. Therefore, the association in this study is between gender and adolescent POM, but not between religiosity and adolescent POM, as further clarified below.

Although the simple logistic regression result was no association with gender and adolescent POM, researchers found that females were at higher risk for POM (Edlund et al., 2015; Monnat and Rigg, 2015; Simoni-Wastila & Strickler, 2004; Sung et al., 2005; Vaughn et al., 2016). For instance, researchers Austin & Shanahan, (2018) study used secondary data from the National Longitudinal Study of Adolescent to Adult Health, which was longitudinal and focused on adolescent misuse of prescription opioids at age 12-18 in the 1994-1995 academic years and at age 24-32, in 2008. However, this study used secondary data from the 2017 NSDUH and is cross-sectional and focused on

adolescents aged 12 to 17 POM. Reasons the findings differed from other studies may include: 1) the differences in the methodological approach as shown in the above example: 2) the differences in the operational and conceptual definitions; 3) the low number of positive male and female adolescents' responses to POM in 2017; 4) a low number of adolescents agreed that religious belief influence life decisions. Despite low POM responses, definitions differences, and method differences from other studies, this study still provides valuable information and insights on opioid types, gender, religiosity, education, and adolescent POM and should be included in the body of scholarly literature.

This result may be due to the low number of adolescents who responded yes to religiosity and misusing opioids during 2017. The results may also be due to the adolescent interpretation of religious beliefs influencing life decisions. The simple logistic regression result indicated that religious belief is associated with adolescent POM and supported by other studies conducted in the United States that recorded an association between religious involvement/religiosity and lower rates of prescription drug use and misuse (Ford & Hill, 2012; Ford & McCutcheon, 2012; Monnat & Rigg, 2016). There are similarities between these studies, and the variables are distinct, creating the need for further study of Christianity, Hinduism, Buddhism, and other religions associated with adolescent POM.

Stratification analysis explained the findings of the multiple logistic regression model analysis, ensuring simple variable assessment interpretation. The results showed that the responses within the sub-groups were low; males (202) and females (235)

responded yes to POM, and 86 adolescents' males, 114 females responded yes to both prescription opioids misuse and religiosity. The analytic sample within the subgroups was therefore small and underrepresented. For instance, with a 13,722 sample size used for the analysis, 437 adolescents misused prescription opioids, and only 200 adolescents misused prescription opioids and agreed that religious belief influences their life decisions. According to Ialongo (2016), an increased sample size would increase the likelihood of a smaller *p*-value even when the effect is minor.

Also, a bivariate analysis was conducted with gender as the predictor and religiosity as the outcome variable. Based on the stratified analysis, the bivariate stratified analysis showed a statistically significant association between the predictor variable gender and religiosity as the dependent variable. Additionally, the multivariate model confirmed the association between gender and adolescent POM as not statistically significant. The model supported the simple logistic regression results that recorded a statistically significant association between religiosity and POM among adolescents ages 12 to 17 in the United States. In this study, females were at a higher risk for adolescent POM, and more females admitted that religiosity influenced their life decisions. It is reported in the literature that adolescent girls are more religious than adolescent boys in the United States (Hoffmann, 2019; Smith & Denton, 2005; Smith et al., 2002).

Therefore, the overall results showed that females or male adolescents with or without religiosity do not determine POM. In the study, more female than male adolescents who misused prescription opioids strongly agreed that religiosity influenced their life decisions. Also, females were at a higher risk for adolescent POM. Additionally,

the small analytic sample, which was evident in the descriptive statistics analysis and with the use of stratification and the analysis of four predictor variables collectively, reduced the power, increased the margin of error, and distorted the study results.

Additionally, some of the assumptions made in the study provided a source of methodological weakness. For instance, although The NSDUH computer-assisted interviewing surveys encouraged honesty in responses, it is unlikely that all the adolescents interviewed were truthful. Also, because the sampling procedure used by SAMHDA was random and more likely resulted in a cross-section of diverse religious beliefs in the United States, one can assert there were varying interpretations. Further, based on the prescription opioid epidemic declared by the government in the United States in 2017, the belief was that more adolescents would respond yes to misusing prescription opioids. However, the study showed that the adolescents responding 'No' exceeded the 'Yes' to misusing prescription opioids.

The study results, due to confounding, should also be cautiously interpreted. In this study, the association of gender and POM is confounded by religiosity, as shown in the multiple logistic regression analysis. The overall results may be due to the high number of adolescents who responded to the gender variable and the low number of adolescents yes responses to religious belief influences life decisions and misusing opioids during the last year.

Socioecological Model Analysis & Interpretation

The SEM theoretical framework undergirds the study used by scholars to predict adolescent POM (Conn & Marks, 2017; Connell et al., 2010). The framework suitability

is due to the acceptance and frequent use in analyzing individual health behaviors, attitudes, and interactions (Conn & Marks, 2017). Conn and Marks (2017) investigated adolescents' opioid use from opioids prescribed to another due to access and exposure, using factors such as social structures and educational messages. Conn and Marks (2017) confirmed that the SEM is well suited to improve the understanding of POM among adolescents. Although there are four constructs in the model (microsystem, mesosystem, exosystem, macrosystem), only the microsystem construct was used in this study because it captured all the priority variables at the individual level. This construct focused on the characteristics that affected adolescent behavior, including knowledge, attitudes, behavior, self-efficacy, developmental history, gender, age, religious beliefs, religious identity, racial/ethnic identity, sexual orientation, economic status, financial resources, values, goals, expectations, grade completed, literacy, stigma, and other (CDC, 2020). For the research, the relevant variables for the analysis are opioid types, gender, religious beliefs/religiosity, and grade completed/education.

The first research question determined whether an association existed between opioid types and POM among adolescents ages 12 to 17 in the United States. Research question one results were that opioid types were not associated with POM among adolescents 12 to 17 years of age in the United States. The use of the SEM microsystem in this study organized attitudes and beliefs of adolescents towards POM. Further, at this SEM level, an adolescent's personal experiences, belief system, and critical thinking skills may drive their understanding and actions towards engaging in POM. Notwithstanding the opioid type, adolescents would decide to engage in the behavior of

POM. This decision may be due to differences in adolescents' belief systems regarding risks and benefits associated with POM. For example, adolescent admits to using the internet to research and identify which prescription opioids can be misused (Conn & Marks, 2017). This admission suggested that an adolescent decision to misuse a prescription opioid may be due to complex factors such as; opioid availability, literacy, critical thinking skills, computer skills, socioeconomics, and intrapersonal characteristics. Although this study used the microsystem construct, the factors within the other constructs are crucial. Since factors such as; peers influence, school attendance, and prescribing policies may influence an adolescent decision to misuse prescription opioids confirming the complexity of adolescent POM.

The second research question sought to determine an association between gender and POM among adolescents ages 12 to 17 in the United States. The study findings showed gender was not associated with POM among adolescents 12 to 17 in the United States. However, this study and the literature stated that female adolescents are at a higher risk for POM (Edlund et al., 2015; Monnat and Rigg, 2015; Simoni-Wastila & Strickler, 2004; Vaughn et al., 2016). The study results may be due to the low number of males and females who responded yes to POM. POM is a major behavioral epidemic health problem (CDC 2011; Bohnert & Ilgen, 2019). This problem aligns with the Microsystem construct in which the adolescent males and females decide to engage in POM behavior. An adolescent gender, skills, attitude, health status, tolerance for pain, knowledge, behavior, and immediate surroundings may play a role in POM behavior.

Within the Microsystem construct, gender perceived meaning can be misinterpreted by adolescents, influencing the accuracy of the survey response. Male or female responsiveness to Microsystem factors differs. In other words, factors that may directly impact female behavior may not influence males and vice versa, such as depression, menstruation pain, and self-medicating (Meyer et al., 2014). The literature highlighted gender differences and found that females stole prescription opioid medication or obtained it for free. However, males were more likely to buy prescription opioid medication or get it from a physician (Schepis & Krishnan-Sarin, 2009). Further, adolescent females are more likely to self-medicate than adolescent males (Lee et al., 2017).

According to Kuhn (2015), gender neurobiological factors, intrinsic factors (personality), and extrinsic factors (environment mainly peers and family) differences mediate adolescents to misuse opioids and influence the progression from the initial use to misuse. Puberty occurs during adolescence and profoundly impacts physical and cognitive changes (Blakemore, Burnett, & Dahl, 2010; Romeo, 2003; Romeo, Richardson, & Sisk, 2002; Sisk & Foster, 2004). In females, puberty occurs between ages 11 to 14 and slightly later, between 13 to16 in males (Parent et al., 2003). However, it is only a component of the many changes in adolescents. For instance, one change in adolescent females is the start of menstruation which can be associated with pain and headaches. There is extensive substantiated evidence of opioids prescribed to children with non-severe conditions such as headaches (Chung et al., 2016; Fisher, 2019). The clinician prescribes based on knowledge of pain mechanisms (Mathew et al., 2014). The

receipt of an opioid by adolescent females to ease menstrual pain may help explain the study results that adolescent females misuse prescription opioids more than adolescent males. Allen et al. (2017) clarified that adolescents' receipt of an opioid leads to opioid misuse.

The third research question was to determine an association between religiosity and POM among adolescents ages 12 to 17 in the United States. Research question 3 results showed an association between religiosity and POM among adolescents 12 to 17 years of age in the United States with simple logistic regression analysis. The expectation was that religious adolescents would avoid POM compared to non-religious adolescents, and the results show they do. The Microsystem construct presents adolescents' characteristics, such as a religious identity, which may influence the behavior of POM (CDC, 2020). The interactions between the adolescent religious environments may impact POM (Ford & Hill, 2012). Therefore, the conclusion is that the Microsystem construct supported the results of research question 3, and the association between religiosity and POM among adolescents ages 12 to 17 in the United States.

The fourth research question aimed to determine an association between education and POM among adolescents ages 12 to 17 in the United States. Although an adolescent interaction with principals, teachers, school workers, and friends can influence their use or misuse of different prescription opioids: Emphasis was on the grade completed by the adolescent in this study. The Microsystem construct suggested critical thinking skills or education as an individual characteristic that can influence adolescents' use or misuse of prescription opioids. However, the results showed that education was

not associated with POM among adolescents 12 to 17 years of age in the United States. Education and adolescent POM were not significant due to the lack of POM education at school. Education or critical thinking skills as an individual characteristic in the Microsystem, as investigated in research question 4, does not confirm a statistically significant association with POM among adolescents. Generally, critical thinking skills should increase as an individual ascends from one grade level to another and, as such, should influence the decision to misuse or not misuse prescription opioids. However, grade attainment does not determine whether adolescents would misuse prescription opioids.

The fifth research question attempted to detect an association between the independent variables, opioid types, and the dependent variable, POM among adolescents ages 12 to 17 in the United States, controlled for gender, religiosity, and education. Since human behavior is very complex, it is difficult to analyze all factors such as; gender, IQ, personality, socioeconomic status, social class, sexuality, race/ethnicity, health status, and experiences that might influence the human behavior of POM. The reason for POM by adolescents includes but are not limited to; pain medication addiction, depression, euphoric effect, and easy access to opioid (Meyer et al., 2014) and using the medication to self treat (Nebraska Department of Health and Human Services, 2016). These factors align with the Microsystem construct in which the adolescent decides to engage in POM behavior. Cairo et al. (2018) explained that up to 40% of high school students reported that opioids are relatively easy to obtain due to the increasing frequency of opioids prescribed to adults and children.

Due to confounding, there should be cautiousness when interpreting the study results. In this study, religiosity was a confounder, and therefore the association between religiosity and POM as shown by the simple logistic regression and stratification analysis was considered. Therefore, religiosity was responsible for or explained the observed association between gender and adolescent POM, as shown in the multiple logistic regression results. The overall results of the study, gender was associated with adolescent POM.

Limitations of the Study

The study aimed to investigate the association between opioid types, gender, religiosity, education, and POM among adolescents ages 12 to 17 in the United States. The data source for this study was secondary data from the SAMHDA public domain (SAMHDA, 2018). These secondary data have many inherent and assumed challenges or biases. Efforts to minimize biases such as recall biases, inaccurate data, respondent biases, and parent/guardian influence were evident in the SAMHDA survey by government agencies. Noteworthy, the study design was the information available on the SAMHDA website. For example, the SAMHDA survey excluded adolescents without access to the internet and a computer, non-English speakers, homeless, institutionalized, and younger than 12 years. However did not exclude adolescent participants aged 12 to 17 years old (SAMHDA, 2018). SAMHDA exclusion of this group of adolescents from the study was a threat to the validity of the research findings. Further, SAMHDA's wide recognition in drug use research by (Edlund et al., 2015; Monnat & Rigg, 2016;

Nicholson et al., 2016; Stabler et al., 2015) provided the necessary credence to the data quality and study results.

In 2017, the adolescent population aged 12 to 17 in the United States was 23.5 million. The final sample size represented approximately 0.0006% of the total number of adolescents living in the United States in 2017. The sample size adequately represented the population due to the proportionate size compared to the United States population. Additionally, 13,722 adolescents were in the study analysis. This exclusion meant 367 fewer adolescents had a birthday and turned 18 upon survey completion and were not in the study. As a result, these participants from the sample of adolescents aged 12 to 17 were not in the study. The exclusion of institutionalized adolescents from the data collection by SAMHDA led to a low number of adolescents (458) who responded yes to misusing prescription opioids in 2017. The G power calculations determined that at least 385 participants (who admitted yes to POM) would be appropriate at a 95% CI at a 5% margin of error. Therefore, meeting the large enough sample size assumption applicable to logistic regression. However, some of the sub-group categories were low. For instance, with the variable gender, (202) males and (235) females responded yes to misusing prescription opioids. There was an adequate representation of the United States adolescent population, notwithstanding the low sub-groups categories, which was also a limitation in this study.

In the independent variable analysis, opioid products were used by SAMHDA rather than opioid types. Meaning SAMHDA used hydrocodone products, oxycodone products, fentanyl products, tramadol products, codeine products, and morphine products

rather than hydrocodone, oxycodone, fentanyl, tramadol, codeine, and morphine. The issue was resolved in the study using opioid type/opioid products interchangeably and discussed in the literature review section that referenced brand names and street names of the named prescription opioids.

Opioid type operationalization was opioid class, religiosity was religious belief influence life decision, education was education/grade completed, and POM among adolescents ages 12 to 17in the United States was the misuse of opioids. For example, I viewed religiosity or religious adherence as an influential POM behavior factor. This view was in the absence of access to the SAMHDA dataset. Upon viewing the dataset, I discovered that the variable opioid type definition was opioid class, religiosity definition was religious belief influence life decisions, education definition was educational attainment, and POM among adolescents ages 12 to 17 in the United States definition was adolescent POM. This definition difference created a gap between the author, SAMHDA, and the literature definition of the variable opioid types, religiosity, education, and POM among adolescents ages 12 to 17 in the United States.

With the use of the microsystem construct of the SEM, and the exclusion of the mesosystem, exosystem, and macrosystem: the microsystem was the most adequate and appropriate construct to analyze the independent variables (opioid types, gender, religiosity, and education) at the individual level. Using the microsystem construct was justified because the priority variables used were relevant for the study. Additionally, the construct focused on influential factors individual behavior, attitudes, interactions, decisions, and critical thinking skills. Unfortunately, there were other SEM constructs

used at the variable conceptual definition. For instance, the author and the literature used the exosystem construct, for the variable religiosity. This SEM construct usage distinctions are critical when interpreting the research information and must be clarified to reduce limitations. Noteworthy, this use of other SEM construct gap was also evident with opioid types, gender, education, and POM among adolescents ages 12 to 17 in the United States use.

In chapter 3, there was a discussion on the study's internal and external threats to validity. Threats to internal validity were confounding, information bias, and selection bias. Considering confounding threats is critical because this bias occurs when there is a change in the association between the independent variable and the dependent variable by 10% or more, with regression models (Lamorte & Sullivan, 2016). A confounding effect was evident in the study when the statistically significant association between religiosity and adolescent POM using a simple logistic regression analysis disappeared when gender was in the multiple logistic regressions analysis. The multiple logistic regression results showed that only gender was associated with adolescent POM. Religiosity was the confounding factor responsible for the observed association between gender and adolescent POM with multiple logistic regressions. The confounding effect led to the final results that only gender was associated with adolescent POM. The use of stratification analysis further explained the confounding effect. Minimizing the confounding effect include a larger sample for institutionalized adolescents who may admit to POM.

Information bias is a systemic error that results in an incorrect estimate of the association between the exposure and the outcome (Althubaiti, 2016). Reporting bias, misclassification, or recall bias are some forms of information bias present in the study. Notwithstanding SAMHDAs strategy to eliminate recall bias by presenting an image of the prescription opioid to the participant, it is prudent to visit the age group parameter for the study. At age 12 to 17, it may be difficult to recall and classify the prescription opioid that was misused when asked. What is clear is that the adolescent will state that an opioid was misused. A video presentation on the classification of prescription opioids before or during the survey may minimize reporting bias, misclassification, and recall bias.

Selection bias is evident in epidemiological studies when there is a systematic difference in the characteristics of the individuals included in or excluded from the study (Henderson & Page, 2007). Selection bias occurred because adolescents who most likely misused prescription opioids were excluded from the SAMHDA secondary dataset and were institutionalized. This exclusion limited the number of adolescents who partook in the survey, and low numbers admitted to POM. Selection bias can be minimized by including institutionalized adolescents or completing questionnaires in other languages.

The identified threat to external validity was population validity. As discussed above, the sample population restriction was due to possible exclusions made by Government agencies when developing SAMHDA survey of adolescents that may not capture all individuals that misused prescription opioids. For instance, adolescents aged 10, 11, 18, and 19 years, with no internet and computer access, unable to speak English, experiencing homelessness, and serving active military duty. This exclusion suggested

that the study conclusions could not be generalized to the entire United States adolescent population.

Table 26

Study Variables Operationalization/Conceptualization, Definition Limitation, Socioecological Model Level, Socioecological Model Level Explanation, Internal Validity Meaning, Results Meaning

Operationalization	Definition limitation	SEM level	Why SEM Level?	Meaning internal validity/reliability	Meaning of the results
Opioid Class	Adolescents may not remember the opioid class they Misused	Microsystem	Individual perceived benefits or safety of opioids can lead to POM	Information bias where recalling and classifying the prescription opioid misused is difficult for the adolescent	Adolescents who were unable to accurately identify the prescription opioid misused may lead to inaccurate results of the study
Gender	Gender meaning can be misunderstood by the adolescent	Microsystem	Males and female adolescents make POM decisions	Information bias where individual interpretation of gender lead to misclassification	Misunderstanding the meaning of gender could lead to inaccurate responses and study results
Religious belief influence life Decision	Adolescents have broad interpretions of religious beliefs for instance some believe smoking Marijuana is an experience of religious adherence	Microsystem	An individual adherence to religious beliefs can influence POM Behavior	Confounding effect where religious belief association with POM diminishes when controlling for Gender	Adolescents misunderstanding of religious beliefs meaning may lead to inaccurate results of the study
Education Attainment	Education attainment can be misunderstood	Microsystem	An individual grade completed influence	Information bias where adolescent in lower grades may be less likely to	Adolescent misunderstanding of education attainment meaning may

	by the adolescent		POM decisions	report POM under parental supervision	lead to inaccurate results of the study
Misuse of opioids	Adolescent may be	Microsystem	An individual	Information bias adolescent who	Adolescent misunderstanding of
	untruthful and unaware		decides to misuse	misunderstood the meaning of	what it means to misuse opioids
	of what		prescription opioids	misusing prescription opioids may	may lead to
	misusing opioids mean			have provided untruthful responses	inaccurate results of the study

Conceptualization	Definition limitation	SEM level	Why SEM Level ?	Meaning internal validity/reliability	Meaning of the results
Opioid Type	Adolescents may not	Macrosystem	Societal norms	Information bias caused by	The varying names given to opioids
	remember the		can influence opioid	the varying street and brand names	by makers of social policies
	opioid type		classification and	given to opioid types	may have posed an
	they misused		Misuse	by makers of social policies	interpretative challenge to
				can lead to error in response	adolescents survey response
Gender	Peers and family	Mesosystem	Peers and family can	Information bias the	Terminology gender may
	can influence an		influence	adolescent interpretation of	have posed an interpretative
	adolescent gender		adolescent POM	gender can lead to error	challenge to adolescents during the
				in response	survey response
Religiosity	Religiosity is broad	Exosystem	Adherence to religious	Information bias the	Religiosity meaning

	and leaves room for misinterpretation by the participant		norms may influence an adolescent POM behavior	adolescent interpretation of religiosity can lead to confusion in response	may have posed an interpretative challenge to adolescents
Education	Education is broad and can be misinterpreted by the adolescent	Exosystem	An adolescent interaction at school can influence POM	Information bias adolescents interpretation of education can lead to confusion in response	The term education is broad and may have posed an interpretative challenge to adolescents
POM among adolescent 12 to 17 in the United States	All adolescents in the United States was not represented or included	Mesosystem	An adolescent relationship with peers and family can influence POM	Selection bias, adolescents 9, 10, 11, 18 and 19 years old were excluded from the study	Excluded adolescents may have had higher rates of POM

Recommendations

POM and overdose were announced a public health crisis in 2017 by the United States government (Ahn et al., 2019; CDC, 2018). To my knowledge, no study assessed the association between opioid types and POM among adolescents ages 12 to 17 in the United States. Therefore, the recommendation is that the study findings be presented to the following stakeholders: adolescents, parents/caregivers, policymakers, religious leaders, congregations and public health regulators, community health workers, United States government. In the end, only gender had a statistically significant association with adolescent POM. There was a statistically significant association between religiosity and adolescent POM, based on the findings of the simple logistic regression models.

However, no statistical significance resulted when the variables religiosity and adolescent POM were analyzed using the multiple logistic regression model. These findings were due to the confounding effect and the low number of adolescents who responded “yes” to religiosity and “yes” to misuse of prescription opioids in 2017. The following recommendations are to create awareness and reduce POM nationally.

Government regulation; The United States government should prioritize gender intervention to lower POM and provide financial support to institutions for programs to influence adolescent belief, decisions, and critical thinking skills. Government regulations and policies should support these gender-specific programs for successful implementation and the desired outcomes.

Religious and other frequently visited institutions by adolescent intervention; these institutions should develop and implement gender-specific interventions that include but are not limited to; counseling adolescents battling POM to lower opioid overdose and misuse; designating a station within the institution facilities to assist adolescents battling POM. For instance, these institutions should establish POM outreach programs designed for gender differentiation, using leaders to offer POM educational programs and public awareness for adolescents to reduce POM. Such as adolescents’ all-female and all-male youth programs designed to strengthen critical thinking skills.

Future studies should investigate the possible role of prescription opioid dosage in adolescent POM based on the current recommended minimum number of opioid doses prescribed. Developing a database on adolescents’ POM in the United States that collects data on who obtained a refill and how refills frequently impact later opioid misuse and

adolescents who terminate misuse is needed. There is little knowledge about medical providers or health care setting factors and their association with opioids prescribed to adolescents. Future research into why office-based clinicians prescribe opioids would be a critical aspect in making the use of these medications safer for adolescents. Future studies should also determine the cost of POM treatment in the United States to understand the impact on adolescent POM interventions.

A look at risk factors for adolescents who receive prescription opioids for chronic pain experiences is warranted. Future studies should compare and contrast adolescent POM rates and trends by private and public schools. Future research should focus on education and POM within the school system/educational system. Understanding the role religiosity plays in adolescent POM and conducting research to understand the association between the variables. There is the need for a study that is more aligned with the SAMHDA operationalized variables (opioid class, gender, religious belief influence life decisions, and education attainment association with misuse of opioids). Lastly, future research should investigate the possible association of the variables (opioid types, gender, religiosity, education, and age) to determine confounders or effect modification variables.

Implications

I collected statistical data on the association between opioid types, gender, religiosity, education, and POM among adolescents 12 to 17 in the United States. The research goal was to equip stakeholders, policymakers, and the community with factual information regarding adolescent POM. Noteworthy, religiosity was associated with

POM among adolescents ages 12-17 in the United States with the simple logistic regression, and religiosity was responsible for the confounding effect in the association between gender and adolescent POM with the multiple logistic regression. However, the overall results indicated that gender is associated with POM among adolescents ages 12 to 17 in the United States. Therefore, policymakers should focus on more gender-specific interventions, such as adolescent girls' POM awareness programs. This focus may lead to enhanced critical thinking skills, and adherence to moral codes, laws, and standards, as drivers to lowering adolescent POM. Researchers also should focus on other factors such as age, socio-economic status, substance use, or history of abuse that may lead to adolescent POM. Clinicians, policymakers, and public health professionals should review opioid types most misused by adolescents, some of which are provided by this study, with the intent to lower adolescent morbidity and mortality.

Conclusion

The purpose of this quantitative, cross-sectional study was to investigate the association between opioid types, gender, religiosity, education, and POM among adolescents ages 12 to 17 in the United States in 2017. The SEM was the theoretical framework used in the study, and the Microsystem alone guided the study. The study used 2017 SAMHDA archived data collected by the NSDUH. The use of descriptive statistics, simple logistic regression, multiple logistic regression analysis, and stratified analysis determined the association between the independent and dependent variables. With the simple logistic regression, the findings were not statistically significant for the association between opioid types, gender, and education and POM among adolescents

ages 12 to 17 in the United States. However, religiosity showed a statistically significant association with adolescent POM. Religiosity was not statistically significant with the use of multiple logistic regression. In addition, religiosity confounded the association between gender and adolescent POM. The results regarding gender were consistent with findings in the reviewed literature, meaning females were more likely to misuse prescription opioids.

According to the final findings of this study, opioid types, religiosity, and education did not influence adolescents' decisions to misuse prescription opioids. The study provided a need for further research on opioid type and adolescent POM using the mesosystem, exosystem, and macrosystem constructs from the SEM and larger sample size. Also, there is a need for future research to focus on confounders in the association between religiosity and adolescent POM. The study will provide policymakers with evidence on the role of gender in adolescent POM. In the end, looking at the part played by other factors such as peers, customs, traditions, communities, institutions, organizations, local government, and state government play in adolescent POM may provide evidence-based information. Additionally, government and policymakers should adopt an evidence-based approach to review and update gender roles in lowering adolescent POM because this study describes gender influence on adolescents' decisions to misuse POM.

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