2021

Misuse of Prescription Pain Relievers Among Pregnant Women in The United States

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2021

Abstract

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by

Winnie C. Rono

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

Walden University

July 2021

Abstract

The non-medical use of prescription pain relievers has increased remarkably, posing social and public health concerns particularly in developed countries such as the United States. The management of pain experienced by pregnant women poses a challenge to clinicians considering the effects of the regimen on unborn babies. Guided by the health belief model, which aims to predict health-related behavior in terms of certain health beliefs and explain change and behavior maintenance as well as to guide health behavior interventions, this cross-sectional study aimed to understand the associations between misusing pain relievers and social determinants of health such as education level and race in pregnant women done using secondary analysis of data from a countrywide survey, National Survey on Drug Use and Health of 2016. These variables were dichotomized before running the binary logistic regression. A final study sample of 732 pregnant women were included, and 11.5% misused prescription pain relievers. Over 85% were non-African-American with most aged between 18 and 44, and over 82% had a high school diploma and above. Hydrocodone was the most misused prescription pain reliever. The regression showed that African-American women have a lower probability of misusing prescription pain relievers (Exp.(B) 0.06). Targeted interventions will use this data to address this public health concern among pregnant women therefore aiming to achieve Healthy People 2030 resulting in positive social change.

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June 2021

Dedication

To my family. You all stood by me during this doctoral journey. You are my inspiration.

Acknowledgments

It is indeed with a great sense of fulfillment and humility that I acknowledge Dr. Jennifer Edwards for her commitment and constant dialogue. As the chair of my doctoral committee, her enormous support in achieving my objectives deserves credit and gratitude.

Sincere gratitude is given to the other members of my doctoral committee for their tireless efforts to take me through the whole process of premise development to the write-up of this final study throughout the academic years. I am indebted to Dr. Cornelia White, who offered detailed and insightful feedback that guided me in my study. Dr. Patrick Dunn deserves gratitude for his expertise and for connecting me to useful resources. Dr. Bill Davis was a member whose invaluable input especially in the scholarly writing skills is greatly appreciated.

Special mention is made to the various authors whose writings inspired me to do this study and have been a constant reference point in my work.

Last but not least, I would like to thank my family for their constant support technically, financially, and emotionally. Their role in the production of this study will forever be cherished.

It is your support, co-operation, and constant dialogue that led to my success. I hope and trust that you all share with me the joy of the success of my doctorate.

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Section 1: Foundation of the Study and Literature Review

Foundation of the Study

Misuse of Prescription Pain Relievers

The magnitude of the burden of pain especially noncancer pain is poorly measured as stated by Bonnie et al. (2019). With the emerging attention of pain and its undertreatment, pain relievers have been prescribed to alleviate this, leading to an increase in the prescriptions (Maxwell, 2011). Marijuana is the leading illicit drug used in the United States, followed by the misuse of prescription pain relievers such as Vicodin, OxyContin, and methadone, as stated by Lipari and Hughes (2017). Lipari and Hughes also stated that despite the decline in the rate of opioid misuse, the number of deaths following overdoses and admissions due to substance use has increased. Bonnie et al. (2019) stated that the opioid epidemic lies at an intersection between two public health challenges: reducing the suffering from the burden of pain and containing the consequences of opioid use.

The non-medical use of prescription pain relievers has increased remarkably, posing both social and public health concerns, particularly in developed countries such as the United States. Most people are unaware they have this problem hence may not seek treatment. An estimated 22 million Americans in 2005 struggled with drug or alcohol problems, and the consequences of this have affected the quality of life for millions of individuals, families, and communities across the world (Sung et al., 2005). According to Substance Abuse and Mental Health Services Administration ([SAMHSA], 2019), alcohol is the third leading cause of preventable deaths among Americans with 88,000

approximate deaths annually. The SAMHSA reported an estimated 2.1 million people aged 12 and above having an opioid use disorder. Injury or death from accidents, poor school performance, and poor judgment and decision making are some consequences of underage drinking and substance abuse (SAMHSA, 2019). Teen pregnancy, sexually transmitted diseases such as human immunodeficiency virus (HIV), child abuse, and domestic violence are among other consequences of these habits as listed by the Office of Disease Prevention and Health Promotion (n.d.).

Maxwell (2011) associated this increasing trend to factors such as aggressive marketing strategies by pharmaceutical companies, an increase in the prescriptions for such drugs, availability of the pain relievers both legally and illegally, and inappropriate or incorrect prescriptions by untrained physicians. Centers for Disease Control and Prevention [CDC] (2014b) lists Vicodin (hydrocodone + acetaminophen), OxyContin (oxycodone), and methadone as prescription opioids that can be used for pain management. According to the CDC (2018), over 191 million opioid prescriptions were dispensed to Americans across the nation in 2017 with more than 11.5 million people reporting misusing them in the past 1 year in 2016. Although men are more likely to die from misusing pain relievers than women, the CDC (2013) reported that about 18 women die every day from prescription pain reliever overdose with 6,600 deaths in 2010. Apart from death, consequences affect unborn children when pregnant women misuse pain relievers. Neonatal abstinence syndrome (NAS) is on the rise due to the increasing use of pain relievers by pregnant women (Krans & Patrick, 2016). NAS is a withdrawal syndrome that affects infants exposed to pain relievers during pregnancy and symptoms

such as seizures, respiratory complications, feeding difficulties, and low birth weights are seen shortly after delivery (Krans & Patrick, 2016). According to Krans and Patrick (2016), most NAS admissions of infants are likely to be Caucasians.

Population and Demographics

The United States is one of the more developed countries in the world with an estimated population of over 320,000,000. China and India are the only countries with higher populations. According to the World Health Organization ([WHO] 2019), the population in 2016 was 322,180,000 with a life expectancy at birth of 76 years for men and 81 years for women. In 2019 the population was estimated to be 328,239,523 with 22.4% being those under the age of 18. Those above 65 years of age were 16% of the total population and the total female population was 50.8% ("U.S. Census Bureau QuickFacts: United States," [USCB QuickFacts], 2019).

Although the United States is cosmopolitan, the Caucasian population forms the highest percentage compared to other races. According to USCB QuickFacts, (n.d.-a), 76.5% of the population in 2019 was made up of Caucasians while African Americans were 13.4%. Out of the Caucasian population, the Hispanic or Latino were 18.3% and White alone, not Hispanic or Latino was 60.4%. Based on education, according to USCB QuickFacts, 87.7% of the population aged above 25 years and above had a high school diploma or higher in 2019 in the United States, which was slightly higher than what was reported in 2018. USCB QuickFacts reported that 87.3% of the population aged 25 years and above had a high school diploma or higher in 2018. The Demographic Statistical

Atlas of the United States - Statistical Atlas (2018) also reported that 48.5% of the population aged 25 years and older had a high school diploma.

Statement of the Problem

Pregnant women are considered as a vulnerable population in terms of taking a relatively higher share of the disease burden, especially during disasters and emergencies (WHO, 2012). Children, the elderly, and immunosuppressed people are also considered vulnerable (WHO, 2012). Joszt (2018) stated that health and healthcare issues for vulnerable populations may be worsened by social factors that lead to worse access to care, increasing their morbidity and mortality compared to the general population. They also experience greater risk factors due to their vulnerability (Joszt, 2018).

Pain can be experienced by anyone, and pregnant women are no exception. Pregnancy, which is considered a normal part of life, comes with different experiences by the expecting mothers, and these can include pain requiring interventions. According to Coluzzi et al. (2014), pre-existing conditions such as low back pain, rheumatoid arthritis, and fibromyalgia can cause chronic pain. Postural and hormonal changes during pregnancy can also lead to pain and discomfort (Coluzzi et al., 2014; Jankiewicz et al., 2015). Coluzzi et al. (2014) stated that pain management in pregnancy is a challenge.

The management of pain experienced by pregnant women poses a challenge to clinicians especially considering the effects of the regimen on unborn babies. With many clinicians fearing to prescribe pain relievers to pregnant women, some pregnant women, therefore, may decide to self-medicate to relieve pain leading to misuse of the pain relievers. U. S. Department of Health and Human Services ([HHS], 2019) and Volk

(2019) stated that the misuse of prescription drugs is the fastest-growing problem in the United States.

This introduces the issue of health literacy. As stated earlier, a high percentage of American residents aged above 25 years had a high school diploma or higher in 2019 (USCB QuickFacts, 2019). Erik Schmidt (2018) reported in the US Census Bureau that this is high, since in 1940 only 24% of the population aged 25 years and above completed 4 years of high school or more. Education and other factors affect health literacy which helps individuals obtain, process, and understand basic health information and make appropriate health decisions (Brooks, 2019; Healthy People.gov, 2020). With a high population having attained a high school diploma or more, the link between education and misusing prescription pain relievers is important to study.

There is a need to develop guidelines on pain management by obstetricians as stated by Ray-Griffith et al.(2018). According to Ray-Griffith et al., many chronic pain programs exclude pregnant women as they have pregnancy as an exclusion criterion, and this means all pain issues are left solely to the obstetricians. Findings from this study will provide information especially on education and race as variables that can guide the development of guidelines targeted at the specific populations.

Specific Purpose of the Study

One important public health goal in the United States is to improve the health, safety, and well-being of mothers, infants, and children. In achieving this, the health of their families is also improved, as stated by HHS (2014). Factors such as age, poverty, and perinatal health care affect pregnancy and childbirth. Determinants that influence

maternal health also influence the health of the children, and HHS (2014) stated that racial and ethnic disparities exist in the mortality of infants. The development of infants and children is influenced by factors such as health, nutrition, and behaviors during pregnancy and early childhood (HHS, 2014). Objective 11 of the maternal-infant and child health (MICH 11) aims to increase abstinence from alcohol, cigarettes, and illicit drugs with 11.4 focusing on illicit drugs (HHS, 2014). Misusing pain relievers during this period is one such factor.

Goal 3 of the sustainable development goals (SDGs) which aims to ensure healthy lives for all has Target 3.5 addressing the prevention and treatment of substance abuse. Strengthening the prevention of substance abuse and treating those who abuse substances including narcotics and alcohol can be addressed by discussing pain reliever misuse. Findings from this study may include statistically significant associations between factors such as education and race and misusing pain relievers can aid in substance abuse prevention strategies. Stigma is the main concern with people who misuse drugs, and Health Poverty Action ([HPA] 2015) stated that people who use drugs are denied health care due to their drug use. HPA (2015) further elaborated this, stating that pregnant women face strong social stigma and get denied perinatal care including that of opioid substitution therapy and this affects their health and that of their unborn babies. The expenditure by states on narcotic services is also affected by this stigma (HPA, 2015). The goal is to strengthen the prevention and treatment of substance abuse especially with people with substance use disorders who receive treatment services. This study investigated the misuse of pain relievers by pregnant women in the United States.

Research Questions and Hypotheses

The following research questions guided this study:

RQ1: Is there an association between race and pain reliever misuse among pregnant women in the USA?

$H_0$1: There is not an association between race and pain reliever misuse among pregnant women in the USA.

H_a1: There is an association between race and pain reliever misuse among pregnant women in the USA.

RQ2: Is there an association between education level and pain reliever misuse among pregnant women in the USA?

$H_0$2: There is not an association between education level and pain reliever misuse among pregnant women in the USA.

H_a2: There is an association between education level and pain reliever misuse among pregnant women in the USA.

Operational Definition of Terms

Pain reliever – A drug that is used to relieve, reduce or eliminate pain is referred to as a pain reliever, and this could be opioid, narcotic, or non-opioid (Stempniak, 2016).

Pain reliever misuse – Pain reliver misuse refers to consumption of pain relievers in a way other than as prescribed by the doctor or using the pain relievers from non-medical sources. The use of these pain relievers for non-medical reasons or recreational reasons can also describe pain reliever misuse (LeClair et al., 2015; McCabe et al., 2013). Three specific ways of misusing a pain reliever are described in NSDUH: using it without

a prescription of your own; using it in greater amounts, more often, or longer than one was told to take it; and using it in any other way a doctor did not direct you to use it.

Pregnant women – The term pregnant women comes from the word pregnancy, which according to NIH (2017) describes the period when the fetus develops in a woman's uterus and lasts for about 40 weeks when measured from the last menstrual period to delivery and is divided into three trimesters. Women in this condition are considered pregnant women. NSDUH relied on self-report on pregnancy questions. This study focused on all the women who were pregnant during the NSDUH of 2016.

Nature of the Study

Understanding the association between misusing pain relievers and social determinants of health such as education level, social-economic status, and race in pregnant women was done using secondary analysis of data from a countrywide survey. This is a cross-sectional study where two research questions will guide the research identifying variables that will answer them hence have an analysis plan; check the strengths and weaknesses of the dataset including describing the study population, sampling scheme and strategy, time when data was collected, assessment tools, response levels, and quality control measures; generate operational definitions of the variables including the confounders; and run the analysis starting with frequency tables and cross-tabulation (Cheng & Phillips, 2014).

Literature Review

Literature Search Strategy

Extensive scholarly search for journals, articles, and books done through the Walden Library was the main strategy used to find the relevant information for this study. I primarily used the Health Sciences databases including CINAHL & MEDLINE Combined Search, CINAHL Plus with Full Text, MEDLINE with Full Text, ProQuest Health & Medical Collection, Elsevier Publishing Company, and PubMed. Media from Walden Library such as those in statistics were also used. Other databases searched included Google Scholar, CDC, WHO, and dissertations from former Walden Students from the same program of DrPH.

Key Search Terms

Key search terms used during literature review include prescription pain reliever/painkiller misuse and pregnancy, pain, opioid misuse, substance abuse, drug abuse, Health Belief Model, medication-assisted treatment/MAT, cross-sectional study, secondary analysis, dichotomization and variables, multiple logistic binary regression, and regression coefficient. Other terms used are pain management or pain relief or pain control or pain reduction. Determinants of health, race, and pregnancy, education and pregnancy, and SDGs are other key terms used.

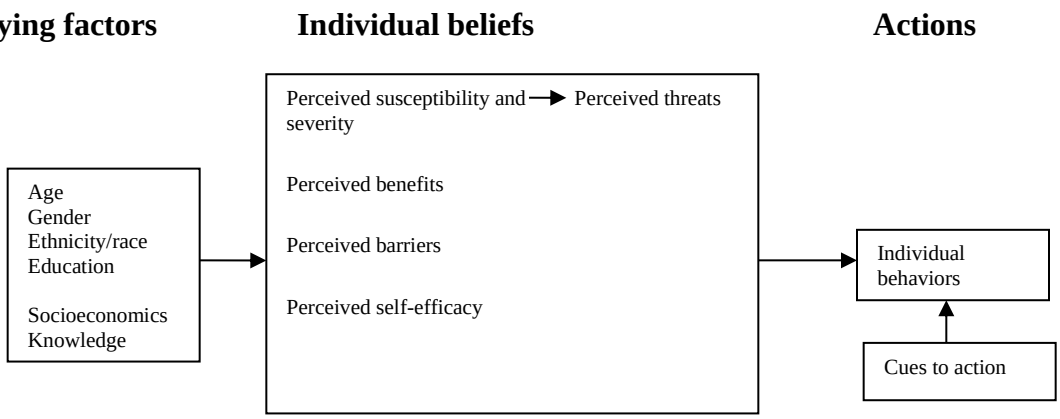
Theoretical Framework

The Health Belief Model (HBM), which aims to predict health-related behavior in terms of certain health beliefs, guided this study. The HBM as described by Boston University School of Public Health ([BUSPH] 2019) was developed in the 1950s by

social scientists Irwin M. Rosenstock, Godfrey M. Hochbaum, S. Stephen Kegeles, and Hoard Loventhal at the U.S. Public Health Service in order to understand why people failed to adopt disease prevention strategies and screening tests for early detection of disease. The HBM is used to explain change and behavior maintenance as well as to guide health behavior interventions as explained by Glanz et al. (2008). This model focuses on an individual's perceptions of the threats posed by a health problem, the benefits of avoiding those threats, and factors affecting or influencing the decisions to act. Key concepts of HBM include perceived susceptibility or an individual's likelihood of getting the health problem, perceived severity or the seriousness of contracting the health problem, perceived benefits or the potential benefits gained from changing behavior, perceived barriers or potential negative aspects of the particular health action, cues to action or what triggers them to act and self-efficacy or confidence in oneself to perform the required action (Glanz et al., 2008; National Cancer Institute et al., 2005).

Figure 1

Diagrammatic Presentation of HBM



Constructs of HBM and Misuse of Painkillers

Perceived susceptibility is further described as an individual's perception of the risk of acquiring a disease or condition. It is the belief about the likelihood of getting the condition or disease (BUSPH, 2019; Glanz et al., 2008). Glanz et al. (2008) explained this, stating that "...a woman must believe there is a possibility of getting breast cancer before she will be interested in getting a mammogram." (p. 47). As noted earlier, various factors affect our health, with the environment and individual factors being significant (Danawi, Bryant, & Hasbini, 2016). The key concepts of the HBM focus on the individual's perception and how they behave. Misusing pain relievers can be triggered by how these individuals perceive the pain.

Perceived susceptibility is also explained by Parker and Anthony (2019) in their study on underage use of alcohol and this being a predictor of misusing prescription pain relievers. According to Parker and Anthony, underage drinking of alcohol should be a factor considered by clinicians when prescribing pain relievers to people who start to misuse prescription pain relievers. Mental disorders are also predictors of misusing prescription pain relievers including opioids. Sanmartin et al. (2019) stated that major depressive episode (MDE) is a common medical condition among women of reproductive age, affecting about 10.4% compared to 5.5% of men. According to Sanmartin et al., the risk of misusing opioids or having opioid use disorder among women with MDE was almost double those without MDE. This further explains perceived susceptibility.

Perceived severity as explained by BUSPH (2019) is the individual's feelings on the seriousness of contracting the disease or condition. It also includes the feelings on the seriousness of leaving it untreated after evaluating the clinical and medical consequences such as pain and disability. Social consequences including the effects on their work and relationships in the family and the community are also included (BUSPH, 2019; Glanz et al., 2008). A combination of the individual's beliefs on the likelihood of acquiring the disease or condition and its seriousness as well as consequences if left untreated is the perceived threat (Glanz et al., 2008).

The outcomes or benefits of performing certain actions to reduce the threats posed by the disease or condition are the perceived benefits. According to Glanz et al. (2008), a personal belief in the benefits of an action will influence their decision to take action to reduce the threats. Glanz et al. further stated that an individual may not accept a recommended action unless they perceive the action to be beneficial in reducing the threat.

Impediments, obstacles, and anything that limits one to take the required actions form the perceived barriers. Despite over 100 million Americans suffering from chronic pain leading to disabilities, Ray-Griffith et al. (2018) stated that women are more impacted than their male counterparts, and the pain thresholds of healthy women increases throughout their pregnancies peaking just before delivery. Ray-Griffith et al. further added that with back pain being a common ailment during pregnancy, there is limited information or guidelines on how to manage this. The health care providers caring for obstetrical patients, therefore, have limited time or inadequate training to provide the

appropriate pain management to their clients (Ray-Griffith et al., 2018). This can be viewed as one factor that brings out the construct of perceived barriers. Willis (2018) stated that the construct of perceived barriers is the most significant of the HBM when predicting behavior.

Education attainment also portrays perceived barriers since education is a strong predictor of adult health as stated by Liu and Hummer (2008). According to Liu and Hummer, educational disparities exist in terms of age, period, race/ethnicity, and gender, and a higher level of education is associated with better health. These disparities have been in existence since the early years and changed in the 1970s as stated by Madigan (2009). According to Madigan, the passage of Title IX of the Education Amendment Act of 1972 protected students from being discriminated against based on their genders. Teenagers on the other hand have a weak understanding of the use of pain relievers as stated by Silva et al. (2011), who described the understanding as weak. Pregnant women include teenagers, and this is a significant barrier to their correct use of pain relievers.

The stimuli needed to trigger an individual to act form the cues to action (Boston University School of Public Health, 2019). According to BUSPH (2019) and Glanz et al. (2008), individuals may do a cost-benefit analysis of actions to be taken comparing the expected benefits of taking the action and the barriers. Hence, a combination of the perceived susceptibility and perceived benefits minus the perceived barriers leads to the path of action.

Self-efficacy or the level of confidence an individual has in their ability in performing a recommended action is important in behavior change (Glanz et al., 2008).

An individual will perform the recommended action based on the level of confidence they have in themselves, and this begins from the initiation of the recommended action to its maintenance (Glanz et al., 2008). Educational attainment is a variable that influences an individual's perceptions indirectly, hence influencing their level of confidence in performing actions. According to Glanz et al. (2008), education influences perceived susceptibility, perceived severity, perceived benefits, and perceived barriers.

Misuse of Painkillers

Misuse of prescription pain relievers is increasing, posing both social and public health concerns particularly in developed countries such as the United States. According to LeClair et al. (2015), this can occur with or without a prescription. LeClair et al. further stated that this habit is initiated during young adulthood with around 10.1% of those aged between 18- and 25-years reporting having misused pain relievers in the last year. Most people are unaware they have this problem and hence may not seek treatment. An estimated 22 million Americans in 2005 struggled with drug or alcohol problems, and the consequences of this have affected the quality of life for millions of individuals, families, and communities across the world (Sung et al., 2005). McLellan, 2017 reported that serious substance misuse including alcohol and prescription pain relievers, have significant financial consequences citing costs of over $420 billion annually and over $120 billion in healthcare.

Experimentation, normalization, and its use in combination with other substances such as alcohol are some of the motivators for this behavior. According to LeClair et al. (2015), young people may want to try new things. The acceptance by society that this is

normal in managing school, leisure, and boredom also is a motivator for the behavior. Other substances such as alcohol may require one to take pain relievers to moderate their effects (LeClair et al., 2015; McCabe et al., 2013). McCabe et al. (2013) added that some misuse pain relievers to get high, relieve tension, relax, or help sleep, and because these are safer than street drugs.

Chronic pain impacts millions of people and is a major cause of lasting disability in America (Ray-Griffith et al., 2018a). Women have a higher burden compared to men, and Ray-Griffith et al. (2018) further added that the pain threshold in pregnant women peaks just before delivery. As noted earlier, pain is common during pregnancy. Sinclair et al. (2014) reported that 60% of pregnant women typically experience low back pain with another 20% experiencing pelvic pain. Coluzzi et al. (2014) and Ray-Griffith et al. (2018) noted that the management of chronic pain in pregnancy is a challenge for healthcare providers and hence some pregnant women may misuse the prescribed pain relievers.

Coluzzi et al. (2014) argued that there is a risk of undertreatment of pain in pregnant women due to fear of using certain drugs during pregnancy. According to Elander et al. (2014), people with chronic pain can easily misuse pain relievers. Elander et al. (2014) explained that the incorrect use of pain relievers is on the increase especially because these pain relievers are also available over the counter (OTC). This is in alignment with Maxwell (2011), who attributed the increasing trend of prescription opioid misuse to factors such as inappropriate prescriptions and the wide availability both legally and illegally.

The effects of the misuse of these substances can be grouped into those affecting the mother and those affecting the child. According to Day and Sanju (2005), mothers may have self-neglect in various aspects and may even engage in prostitution and burglary to get their supplies due to dependence. The effects on the child trickle down from maternal infections, poor nutrition, and neglect leading to low birth weight and high incidence of preterm birth (Day & Sanju, 2005). Day and Sanju explained that exposure during the first trimester affects the development of the fetus while exposure in the second and third trimesters affects their growth and functioning.

Misuse of drugs begins during the early parts of life, and Chakravarthy et al. (2013) stated that adolescent abuse is correlated to using drugs during adulthood and this being problematic. Volk (2019) noted that the fastest-growing drug problem in the United States is the use of prescription drugs affecting the lives of many. Stimulants that have effects common with cocaine, pain relievers that have effects common with heroin, and depressants are the ones mostly misused (Volk, 2019). Volk also stated that prescription drug misuse affects judgment leading to an increase in risky behaviors. These may, in turn, lead to pregnancy and the acquisition of sexually transmitted infections.

Anxiety and depression are some factors that lead to the misuse of prescription pain relievers. Kozhimannil et al. (2017) in their retrospective study sampled pregnant women aged 12 to 44 from the NSDUH 2005-2014 and reported a rate of 5.1% of non-medical use of pain relievers and anxiety and depression were strong risk factors. Sung et al. (2005) report that the African-American individuals, women, those of low socioeconomic status, and those who view the use of pain relievers as favorable are at a

higher risk of misusing prescription pain relievers among the youth. Using univariate and multivariate models, variables such as age, gender, education, family income, and race, among others, were analyzed and from their findings, Sung et al. recommend targeting prevention measures to the at-risk groups.

A study by Okewole and Fadebi (2017) concluded that drug abuse affects the performance of students in their academics. The analysis revealed that peer pressure was a significant reason for getting involved in drug misuse. Okewole and Fadebi listed getting over problems, deriving pleasure, and curiosity as some reasons for indulging in drug misuse, which is in alignment with LeClair et al. (2015) and McCabe et al. (2013). Counseling combined with other approaches was the most favorable strategy to be used to reduce this menace (Okewole & Fadebi, 2017). According to Kozhimannil et al. (2017) and Krans and Patrick (2016), medications such as methadone when used on pregnant women are most effective when used in combination with counseling.

Policies and Programs

With the increasing use of pain relievers during pregnancy and the consequential increase in NAS for the exposed infants, initiatives to improve access to treatment of substance abuse by pregnant women are now in place (Krans & Patrick, 2016). Krans and Patrick (2016) further added that criminalizing pregnant women with addiction is being embraced by most states with substance abuse during pregnancy now classified as criminal child abuse in 18 states and this could lead to the termination of parental rights. This, however, may prevent mothers from seeking prenatal care, hence clinicians should routinely screen all pregnant women for drugs and alcohol following the Health

Insurance Portability and Accountability Act of 1996 (HIPPA) regulations (Krans & Patrick, 2016).

Medication-assisted treatment (MAT) using methadone or buprenorphine is recommended among pregnant women, and the benefits include reduced risk-taking behavior decreasing the transmission of infectious diseases such as HIV and minimized opioid withdrawal. MAT is most effective when used together with counseling or behavioral therapy, hence health personnel should work together (Kozhimannil et al., 2017; Krans & Patrick, 2016). For NAS, adherence to a single treatment regimen through the standardization of care as given by the American Academy of Pediatrics resulted in improved outcomes (Krans & Patrick, 2016).

To control the prescription of pain relievers, legislative initiatives addressing four main pillars, namely, educating everyone including the public, tracking, and monitoring of prescribers, proper disposal of medication, and the enforcement targeting pill mills and doctor shopping, lead to better protection of mothers and infants (Krans & Patrick, 2016).

Social Change

The prevalence of misuse of prescription pain relievers including opioids continues to rise and this poses a burden to the healthcare system. As earlier documented, MAT is most effective when combined with behavioral therapy through counseling and a standardized regimen works best for NAS (Krans & Patrick, 2016). Sehgal et al. (2012) stated that there is no single instrument that can be used to screen patients who can benefit from opioid therapy (MAT), and hence multiple tools and tests have to be used together. These include risk assessments as well as urine tests. Sehgal et al. suggested

that if there was one instrument for this task, iatrogenic addiction would be eliminated and this would lead to better outcomes. Spada et al. (2019) also recommended studies focusing on opioid agonist treatment in pregnant women to be carried out as this had better outcomes compared to outpatient substance use treatment alone. The findings from this study showed associations between race and the misuse of pain relievers among pregnant women and thereby will guide the targeting of treatment regimens.

Victimization of those who seek help leads to shying away from health-seeking. As such, Krans and Patrick (2016) reported that following HIPAA regulations is essential. According to Sehgal et al. (2012), medical providers should be well-equipped with legal and regulatory issues surrounding the use of prescription pain relievers and pain relievers to manage chronic pain effectively while minimizing addiction at the same time.

Understanding the association between misusing pain relievers and social determinants of health will guide in the interventions geared towards managing chronic pain among women of reproductive age hence addressing the public health concern. Krans and Patrick (2016) as cited by Kozhimannil et al. (2017) stated that for better prevention, screening, and treatment of nonmedical use of pain relievers, it is important to understand the factors that lead to this behavior. Romero et al. (2016) also reported that effective community interventions geared towards preventing teen pregnancies should consider the social needs of the groups at risk and data can help in identifying those with the greatest need.

The highest rate of teenage pregnancies among developed countries is in the United States, and young adults and teenagers make approximately 22% of the population. With this in mind, Jankiewicz et al. (2015) reported that teenagers are not well-represented in most studies and that pregnancy limits pain management options in women due to the potential adverse effects on both the mother and the unborn baby. This study focused on all pregnant women including teenagers. A focus on perinatal pain and its management using evidence from studies was also recommended by Jankiewicz et al. (2015) and Ray-Griffith et al. (2018), as the perinatal and postnatal periods are understudied. Understanding factors that are associated with misusing pain relievers early in life will, therefore, give the necessary scientific evidence in the management of pain in pregnancy, and hence findings from this study with pregnant women as the main subjects will play a significant role in this. As reported by Romero et al. (2016), addressing the social conditions using effective community-based interventions will reduce disparities especially when those with the greatest need are focused on.

Even as the United States has a high rate of teen pregnancies compared to other developed countries, there exists a disparity in the distribution. According to Romero et al. (2016), racial, ethnic, and geographical disparities should be considered in the prevention strategies. To achieve health equity, unemployment, access to education, and higher family income can be addressed by community-level interventions (Romero et al., 2016). The Robert Wood Johnson Foundation (RWJF), whose vision is to give everyone an equal opportunity to the healthiest life regardless of their different races, income, and living environments, requires collaboration by various sectors to deal with these

problems. Guided by 10 principles and the involvement of every individual in the society, a culture of health with healthy communities and lifestyles is built (Robert Wood Johnson Foundation, 2020). The collaboration will, therefore, achieve good health for the population (Plough, 2015). Creating a culture around health through health education and behavior change is a broad approach to achieving good health in the population, as stated by Mockenhaupt and Woodrum (2015). Addressing the issue of pain reliever misuse among pregnant women is a step towards achieving a culture of health in our society.

CDC (2018) reported that the rate of teen pregnancies among Hispanic teens and non-Hispanic African-American teens was more than double that of the non-Hispanic Caucasian teens in 2017. American Indian/Alaska Native teens had the highest rate among all the races/ethnicities (CDC, 2018). This is in alignment with King Bowes et al. (2018), who stated that American Indian and Alaska Native (AI/AN) adolescents are at a higher risk for adverse sexual and reproductive health outcomes due to the lack of culturally appropriate sexual education reporting the early onset of sexual activity as well as higher numbers of sexual partners compared to the general population. According to Romero et al. (2016), Sedgh et al. (2015), and Sung et al. (2005), there is a higher rate of teen pregnancy among the Black race. Studying race as a predictor to whether pregnant women misuse prescription pain relievers will yield results that can be used to gear prevention strategies to this behavior and in the long run, address issues affecting most pregnant women including teenagers.

About 50% of pregnancies in the United States have been reported to be unplanned (American Society of Addiction Medicine, [ASAM] 2017). This percentage

could be as high as 80% among women with substance use disorders ASAM, 2017). Policies on substance use, misuse, and use disorders during any stage of pregnancy and after delivery are important and hence screening women for their intention to get pregnant, prioritizing their treatment, educating them on issues regarding substance use and its effects on pregnancy, and regulatory and legal issues concerning these pregnant women are addressed in substance use programs (ASAM, 2017). This knowledge empowers them despite their substance use habits and depicts the construct of self-efficacy and leads to positive social change.

Summary

In this section, a foundation of the study was presented including discussions on the gaps in knowledge and the problem statement. The purpose of this study was also discussed. An introduction of the research questions, the related null and alternative hypotheses, and the theoretical framework guiding the study were also discussed. The nature of the study and the literature search strategy together with the literature review described ways that other research has been done, and the review guided the study in terms of the implications on positive social change it will have. Programs and policies in drug misuse were also discussed. The next section describes the methodology and study design used.

Section 2: Research Design and Data Collection

Introduction

Understanding the associations between misusing pain relievers and social determinants of health such as education level and race in pregnant women was done using secondary analysis of data from a countrywide survey. The National Survey on Drug Use and Health data set of 2016, labeled NSDUH-2016-DS0001. was used. A sample from the data was analyzed and findings reported and generalized to the population. This is a cross-sectional study where two research questions guided the research. El-Masri (2017) stated that researchers have the aim of concluding populations that have characteristics that interest them and since they may not be able to study the entire population due to time, cost, and logistical constraints, research participants with the characteristics are selected randomly or non-randomly from that target population. Findings from the selected sample, also known as the study sample, will then be generalizable to the entire population especially when it is representative of the population (El-Masri, 2017).

Quantitative, qualitative, and mixed methods are the approaches of conducting research, and Regoniel (2015) stated that those research methods that use numbers to generalize phenomena are quantitative. Measurable information and data such as age, educational status, and socio-economic status among others are collected using standardized and pre-tested instruments. A normal population distribution curve can be drawn, hence proper sampling from the target population should be done for proper generalization of the findings. This study is quantitative as it has two research questions

and measurable variables such as education, the number of women of a certain race, and the number of women who are pregnant and their ages.

Target Population

Pregnant women of all ages from the NSDUH of 2016 formed the study population. NSDUH measures the illegal use of prescription and non-prescription drugs as well as mental disorders. The illegal use of common substances such as alcohol and tobacco are also measured (HHS, n.d.). According to HHS (n.d.), respondents to the survey's face-to-face interviews are aged above 12 years, US civilians, and not institutionalized. This study focused on the misuse of pain relievers including Vicodin, OxyContin, Percocet, and others by pregnant women who were surveyed. Some other pain reliever (coded 37) was also included, and OTC pain relievers such as Tylenol, aspirin, Advil, and Aleve were excluded.

Pregnant women have been excluded in most researches, and van der Graaf et al.(2019) stated that this reluctance is mainly due to the fear of harming the fetus. The reasons are valid, but van der Graaf et al. explained that there is a need for evidence-based information from the pregnant women themselves. Pregnant women get sick or experience pain, and women who are sick or in pain get pregnant, so including them in research is important to achieve positive outcomes (van der Graaf et al., 2019). Targeting this group using data from a nation-wide survey gave findings that can be generalizable to the entire population of the United States.

Sampling Procedures and Sample Size Determination

The NSDUH uses multistage area probability sampling methods to select their respondents for participation in the survey. According to SAMHSA(2017), stratification and first-, second-, and third-stage sample selections were done. A more detailed description of the design and sampling used in the NSDUH is available in the report (SAMHSA, 2017). Salas-Wright et al. (2015) in their study restricted their analysis to female respondents within the target age group. This study focused on all pregnant women and analysis was restricted to them.

Inclusion and Exclusion Criteria

Ethical considerations must be followed when dealing with human subjects, and the NSDUH used respondents aged above 12 years who were US civilians and were not institutionalized. According to SAMHSA (2017), all civilian residents of the 50 states and the District of Columbia who were not institutionalized and were aged above 12 were included in the national survey. Lofquist et al. (2012) reported that during the 2010 census, 300.8 million people of the 308.7 million people were living in households in the United States. This was approximately 97%of the total population then. Hence respondents aged 12 and above who were non-institutionalized civilians would represent approximately 97% of the entire population.

According to SAMHSA (2017), those with no fixed household address such as the homeless and/or transient persons not in shelters, the active military personnel, and those residing in institutions such as hospitals and jails were excluded in the survey.

Power Analysis for Sample Size Determination

Identification of an appropriate sample size requires the level of statistical significance, alpha; the power desired to test the null hypothesis when it is false, beta; and the effect size which is the expected difference between the means (Creswell, 2014). Sawilowsky (2009) explained that Cohen in 1988 defined the effect size d = 0.2, 0.5, and 0.8 as small, medium, and large. Larger and smaller values of d have been reported in different research studies, hence Sawilowsky revised the values of d as d (0.01) = very small, d (0.2) = small, d (0.5) = medium, d (0.8) = large, d (1.2) = very large, and d (2.0) = huge.

Using G*Power 3.1.9.4 (Faul et al., 2009) to test whether the dichotomized independent variables were significant predictors of misusing prescription pain relievers, a minimum sample size of 333 was needed. Power analysis as explained by (Sawilowsky, 2009) and testing of the model whether the independent variables, race, and education, predict the dependent variable, misuse of prescription pain relievers was done using a level of significance, α, set at 0.05. To achieve a power of 0.8 or 80 % and a medium effect size, a minimum sample of 333 was required to detect a significant model. There was an 80% chance of correctly rejecting the null hypothesis that race and education level were not associated with misuse of prescription pain relievers with 333 participants.

Jenkins and Quintana-Ascencio (2020) explained that low sample sizes lead to challenges in reproducibility in research recommending a sample size $N \geq 8$ for data with very low variance and $N \geq 25$ for data with high variance. A minimum sample size of 333 would detect a significant model and is greater than 8 and 25.

Datasets and Variables

Based on my topic and research questions, the NSDUH-2016-DS0001 was used for the secondary analysis. The use of pain-relievers when not directed by doctor labeled PNRNMLIF was the dependent variable which was categorical in nature with 8 choices (1 = Yes, 2 = No, 5 = Yes LOGICALLY ASSIGNED (from skip pattern), 85 = BAD DATA logically assigned, 91 = NEVER USED/MISUSED PAIN RELIEVERS, 94 = DON'T KNOW, 97 = REFUSED, 98 = BLANK (NO ANSWER). Pregnancy status (PREGNANT labeled 1), race (NEWRACE2) which was categorical with 7 choices (1 = NonHisp White, 2 = NonHisp Black/Afr Am, 3 = NonHisp Native Am/AK Native, 4 = NnHisp Native HI/Other Pac Isl, 5 = NonHisp Asian, 6 = NonHisp more than one race and 7 = Hispanic), and education status (EDUHIGHCAT) which was categorical with 5 choices (1 = Less high school, 2 = High school grad, 3 = Some coll/Assoc Dg, 4 = College graduate and 5 = 12 to 17 year olds) were the independent variables.

Research Questions

The following research questions guided this study in finding out if there were any associations between the variables:

RQ1: Is there an association between race and pain reliever misuse among pregnant women in the USA?

$H_0$1: There is not an association between race and pain reliever misuse among pregnant women in the USA.

H_a1: There is an association between race and pain reliever misuse among pregnant women in the USA.

RQ2: Is there an association between education level and pain reliever misuse among pregnant women in the USA?

$H_0$2: There is not an association between education level and pain reliever misuse among pregnant women in the USA.

H_a2: There is an association between education level and pain reliever misuse among pregnant women in the USA.

Analytical Strategies

SPSS was used to import the data and run frequency tables and cross-tabulations and is presented in the form of bar graphs and pie charts for descriptive analysis. The dependent and independent variables were categorical. For pain-reliever misuse, PRNMLIF focus was on choices 1 (YES) and 0 (NO), and the rest were treated as missing data. As discussed earlier, American Indian and Alaska Native adolescents are at a higher risk for adverse sexual and reproductive health outcomes due to lack of culturally appropriate sexual education as stated by King Bowes et al. (2018), and Romero et al. (2016), Sedgh et al. (2015), and Sung et al. (2005) stated that there is a higher rate of teen pregnancy among the African-American population. Race (NEWRACE2), which had seven choices, was, therefore, dichotomized into African-American (1) and non-African-American (0). For EDUHIGHCAT, the five choices were dichotomized into 0 = less high school and 1 = High school grad and above.

Since my research questions were on associations between the binary dependent and independent variables, multiple logistic binary regression was used. Multiple logistic binary regression applies when there is a single dichotomous outcome and more than one

independent variable (McDonald, 2015). The aim is to find an equation that best predicts the probability of the value of the dependent variable as a function of the independent variables. It is a predictive analysis used to understand the functional relationship between the independent variables and the dichotomous dependent variable (McDonald, 2015). This helped me identify the existence of any associations between the variables and confounders could also be accounted for (Laureate Education, 2016a; Laureate Education, 2016b). SPSS outputs were also used.

According to Statistics Solutions (n.d.) using multiple logistic binary regression means that six assumptions must be met, and these are:

1. The dependent variable should be binary - use of pain-relievers when not directed by doctor labeled PNRNMLIF focused on 1 = YES and 2 = NO choices hence binary in nature.
2. Since it assumes that P(Y-1) is the probability of the event occurring, the dependent variable must be coded accordingly i.e. for a binary regression, the factor level 1 of the dependent variable should represent the desired outcome. For this study, PNRNMLIF 1 = YES.
3. Model fitting with only meaningful variables being included – missing data was excluded.
4. No multicollinearity – multiple linear regressions were run to determine this.
5. The linearity of independent variables and log-odds
6. Requires large sample – NSDUH is a national survey and this study focused on all women who are pregnant.

The goodness of fit was determined using Pearson's chi-square statistic where large chi-square values indicate a poor fit for the model. A statistically significant result ($p < 0.05$) indicates that the data do not fit the model well. Hosmer Lemeshow test also determine if the observed values match the expected values in population subgroups. If the values are the same, you have a model that fits perfectly. These tests determine if findings from the study are representative of the population from which the sample was selected from.

The regression coefficient (B) is the coefficient for the constant given in log odds. In logistic regression, the Exp(B) is the exponentiation of the B coefficient and is an odds ratio and is easier to interpret. According to Mathew Jones in Laureate Education, (2017d), an odds ratio of 1.00 means all things are equal and if B is negative then the Exp(B) will be less than one hence decreasing the odds and vice versa. Variables with significance levels $p < .05$ will be interpreted.

Most researchers present results based on a 95% confidence interval as stated by Pourhoseingholi et al. (2013), and this study will also report results based on a 95% confidence interval. For more confidence in the results, a higher percentage can be used.

Threats to Validity

The design and methods of research contribute to how sound the study is, and these, in turn, lead to the generalizability of findings to the population from which the study subjects were sampled. Internal validity is affected by factors within the study itself and the results deviate from the truth hence no conclusions can be drawn (Patino &

Ferreira, 2018). Without internal validity, external validity is irrelevant as stated by Patino and Ferreira (2018).

Internal Validity

The NSDUH is conducted yearly since 1971 and administered by SAMHSA and provides data on tobacco use, alcohol, illicit drugs (including non-medical use of prescription drugs such as pain relievers), and mental health issues in all the 50 states in the USA (National Institute on Drug Abuse [NIDA], 2018). According to NIDA (2018), RTI International, a non-profit research organization based in North Carolina, has conducted it since 1988.

Drawing conclusions and making correct inferences is important, hence internal validity checked in this study include the history which ensures that all study participants experience the same external events; maturation which entails selecting study participants who may change or mature at about the same rate. For this particular study, the study population is all pregnant women, and comparisons, was done according to age groups (Creswell, 2014).

Another component is regression/subject variability, which ensures that study participants with almost similar characteristics are selected (Creswell, 2014). Restricting the analysis to all the pregnant women surveyed fulfills the component of subject variability as described above and selection which involves the process of using random selection to get a fair distribution of study participants (Creswell, 2014). Mortality and instrumentation/task sensitivity are other components addressed by using a large sample size to account for dropouts and maintaining the same instrumentation during the

research (Creswell, 2014). NSDUH uses the same survey tool to collect data from all the study participants in the 50 states (SAMHSA, 2017).

External Validity

The extent to which findings can be generalizable to other groups or contexts depends on their external validity. Incorrect inferences from study samples made to other people or settings and to different times lead to threats in external validity (Creswell, 2014). The study subjects are described using the inclusion and exclusion criteria and this meets the external validity component of describing the population characteristics. In the NSDUH according to (SAMHSA, 2017) all civilian residents of the 50 states and the District of Columbia who were not institutionalized and were aged above 12 were included in the national survey and this study focused on all pregnant women. Generalizing findings to this population in the United States, therefore, is in alignment.

The effect of time is another external validity factor and NSDUH is conducted yearly hence can find out if results can be replicated (Creswell, 2014). Data collection methodology for NSDUH, according to SAMHSA (2017), was stratification and first-, second-, and third-stage sample selections were done with a more detailed description of the design and sampling utilized made available in their report.

External validity is increased by using broad inclusion criteria resulting in a study population that closely resembles the real-world population (Patino & Ferreira, 2018).

Ethical Considerations

Ethical considerations aim to protect the respondents and participants so that they are confident in giving their responses and in participating (Osho, 2017). Walden

University Ethics Committee/Institutional Review Board (IRB) reviewed the proposal and was approved on 9/14/2020 after meeting their ethical standards (Approval number 09-14-20-0575030).

For this study, a secondary analysis of the NSDUH-2016-DS0001 dataset was done. Directed by SAMHSA which is a Department of Health and Human Services agency, the NSDUH of 2016 applied ethical considerations especially in the recruitment of the study participants where those with no fixed household addresses, the active military personnel, and those residing in institutions such as jails were excluded (SAMHSA, 2017).

Ethical considerations include principles of ethics such as respect for persons by acknowledging their autonomy and protecting their diminished autonomy (Yip, Han, & Sng, 2016). In this study, as seen in the NSDUH survey, voluntary involvement and exclusion of those who were institutionalized, those who were homeless, as well as those in active duty with the military was applied. Yip et al. (2016) also stated that beneficence and justice are important principles meaning doing no harm and being fair. According to SAMHSA (2017), NSDUH's main aim is to measure the illegal use of prescription and non-prescription drugs as well as mental disorders and with multi-stage sampling, all regions are well-represented.

Summary

This section presents the research design and methodology used for the study. This is done by describing the NSDUH of 2016 giving characteristics of the population and how they were selected for the survey. The research population is also described and

a brief discussion on the sampling procedure done in the NSDUH of 2016, variables of interest, threats to validity, ethical considerations, and limitations of the study are also presented. The next section will present the results and findings in alignment with the research questions guiding it.

Section 3: Presentation of the Results and Findings

Introduction

This study was conducted to investigate the misuse of pain relievers by pregnant women in the USA. Using data from the NSDUH of 2016 and two research questions, this cross-sectional study was designed to understand the relationship between misusing pain relievers and variables such as education and race among pregnant women.

To ensure only the target population was studied, the data were filtered by selecting only those respondents who responded Yes (1) to be pregnant. This is because this study was focusing on pregnant women. To achieve the best and most meaningful analysis, the data set and corresponding codebook of the NSDUH 2016 were adjusted to adequately reflect the variables of interest. The dependent variable, for example, was recoded to have two possible outcomes, Yes (1) and No (0), with Yes, logically assigned and Never used/misused pain relievers being assigned as Yes and No respectively.

As earlier stated, the race of focus was the African-Americans, and the education level was whether one had a high school diploma or higher. These variables were dichotomized with 1 representing African-American while 0 represented all the other races, and for education 1 represented high school diploma and higher while 0 represented below high school and those aged 12 to 17.

According to the inclusion criteria for this study focusing on pregnant women, the final sample size was 732 pregnant women. With the adjustments, the following research questions and their respective null and alternative hypothesis guided the study:

RQ1: Is there an association between race and pain reliever misuse among pregnant women in the USA?

$H_0$1: There is not an association between race and pain reliever misuse among pregnant women in the USA.

H_a1: There is an association between race and pain reliever misuse among pregnant women in the USA.

RQ2: Is there an association between education level and pain reliever misuse among pregnant women in the USA?

$H_0$2: There is not an association between education level and pain reliever misuse among pregnant women in the USA.

H_a2: There is an association between education level and pain reliever misuse among pregnant women in the USA.

Descriptive Demographics of the Sample

For the 732 pregnant women surveyed in 2016, 84 (11.5%) misused pain relievers and 648 (88.5%) did not misuse pain relievers as depicted in Table 1 below.

Table 1

Distribution of Pregnant Women According to Misuse Vs Non-Misuse of Prescription Pain Relievers (N=732)

Prescription pain reliever misuse	N	%
Yes	84	11.5
No	648	88.5

Table 2 shows the distribution of pregnant women according to age. Most of the women were aged between 18 and 44 years (96.6%). Figure 1 is a pie chart showing the distribution of pregnant women according to age.

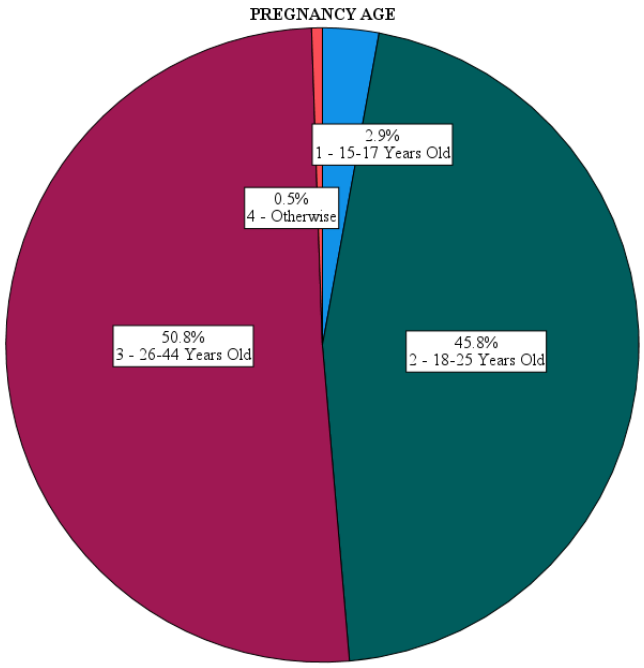
Table 2

Distribution of Pregnant Women According to Age (N=732)

Pregnancy age	N	%
1 – 15-17 years old	21	2.9
2 – 18-25 years old	335	45.8
3 – 26-44 years old	372	50.8
4 – otherwise	4	0.5

Figure 2

Distribution of Pregnant Women According to Age



Tables 3 and 4 show the distribution of the pregnant women according to race and the crosstabulation respectively. Most of the pregnant women were non-African-American (85.1%).

Table 3

Distribution of Pregnant Women According to Race (N=732)

Race	N	%
African-American	109	14.9
Non-African-American	623	85.1

Table 4

*Race * Pain Reliever Misuse Crosstabulation*

		Pain reliever misuse		
		0	1	Total
Race	0	540	83	623
	1	108	1	109
Total		648	84	732

Tables 5 and 6 show the distribution of the pregnant women according to education level and the crosstabulation respectively. Most of the pregnant women had a high school diploma and higher (84.2%).

Table 5

Distribution of Pregnant Women According to Education Level (N=732)

Education	N	%
High school and above	616	84.2
Below high school	116	16.8

Table 6

*Education * Pain Reliever Misuse Crosstabulation*

		Pain reliever misuse		
		0	1	Total
Education	0	104	12	116
	1	544	72	616
Total		648	84	732

Study Results

Table 7 below shows the prescription pain relievers misused in the past 12 months with hydrocodone being misused by eight pregnant women.

Table 7

Last Pain Reliever Used by Pregnant Women not Directed by the Doctor in the Past 12 Months

Last pain reliever used	N	%
1 - Vicodin	4	12.1%
2 - Lortab	1	3.0%
5 - Hydrocodone	8	24.2%
6 - OxyContin	3	9.1%
7 - Percocet	2	6.1%
10 - Oxycodone	1	3.0%
12 - Ultram ER	1	3.0%
14 - Tramadol	1	3.0%
16 - Tylenol with codeine 3 or 4	4	12.1%
17 - Codeine pills	1	3.0%
26 - Suboxone	4	12.1%
27 - Buprenorphine	2	6.1%
37 - Some other pain reliever	1	3.0%

Table 8 presents the chi-square tests with the statistics being the same (21.301) since no stepwise logistic regression was used and no blocking was done. The chi square

test is done to determine if there is any relationship between the variables. The p value, 0.000 is the probability of obtaining the chi-square statistic, given that the null hypothesis is true. This is the probability of obtaining 21.301 if there is no effect that race and education level, taken together, have on the misuse of prescription pain relievers by the pregnant women. The *p*-value, 0.000 is less than 0.05 which is our critical value hence the model is statistically significant and not just by chance.

Table 8

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	21.201	2	.000
	Block	21.301	2	.000
	Model	21.301	2	.000

Table 9 presents Cox & Snell R-square and Nagelkerke R-square values (between 0 and 1) to show the goodness of fit of the model of this study data. Approximately 3% and 6% of the variability in the misuse of prescription pain relievers is explained by both race and education level as demonstrated by the Cox & Snell R^2 = .029 and the Nagelkerke R^2=.056. Cox & Snell R-square summarizes the proportion of variance in the dependent variable associated with the predictor (independent) variables; however, its value range is between 0 and < 1. Nagelkerke R-square corrects this, adjusting the scale to cover 0 to 1.

Table 9

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	500.383[a]	.029	.056

a. Estimation terminated at iteration number 7 because parameter changed by less than .001.

In Table 10, the Hosmer-Lemeshow test is non-significant since the value .940 is greater than .05 and this indicates a good model fit, while Table 11 is the contingency table for the Hosmer and Lemeshow Test with the observed and expected values being almost similar (71 observed vs 71.223 expected and 461 observed vs 460.777 expected as two examples) which also indicates a good model fit hence the sample is representative of the population (external validity).

Table 10

Hosmer-Lemeshow Test

Step	Chi-square	df	Sig.
1	.006	1	.940

Table 11

Contingency Table for Hosmer-Lemeshow Test

		Misused		Did not misuse		
		Observed	Expected	Observed	Expected	
Step 1	1	71	71.223	461	460.777	532
	2	12	11.777	79	79.223	91
	3	1	1.000	108	108.000	109

On the classification, the specificity of the model was at 0% while the sensitivity of the model was at 100% with an overall classification percentage of 88.5. Table 12 depicts this below.

Table 12

Specificity and Sensitivity of the Model

			Predicted Pain reliever misuse		
	Observed		Yes	No	Percentage correct
Step 1	Pain reliever misuse	Yes	0	84	.0
		No	0	648	100.0
	Overall percentage				88.5

a. The cut value is .500

For the binary logistic regression, Table 13 below shows that education level high school and above is not a significant predictor of misusing prescription pain relievers (b=-.039, se=.334, and sig=.907) since the significance level is .907 which is greater than .05. African-American race on the other hand is a negative and significant (b=-2.806, se=1.012 and sig=.006) predictor of the probability of misusing prescription pain relievers among pregnant women in the USA.

Research question 1 stated as follows:

RQ1: Is there an association between race and pain reliever misuse among pregnant women in the USA?

$H_0$1: There is not an association between race and pain reliever misuse among pregnant women in the USA.

The null hypothesis was tested, using the Wald test for the strength of the significance between the predictive model and race. The African-American race is a

negative and significant (b=-2.806, se=1.012, Wald=7.691, and sig=.006) predictor of the probability of misusing prescription pain relievers. The OR indicates that for every pregnant woman of the non-African-American race, the odds of misusing prescription pain relievers decrease by 6% in the pregnant women of the African-American race. This means that the African-American race had a lower odds/probability of misusing prescription pain relievers. P-value 0.006 is less than 0.05 hence at 95% confidence level we fail to reject the null hypothesis and conclude that African-American race is a predictor of misusing prescription pain relievers among pregnant women in the USA.

Research question 2 stated as follows:

RQ2: Is there an association between education level and pain reliever misuse among pregnant women in the USA?

$H_0$2: There is not an association between education level and pain reliever misuse among pregnant women in the USA.

The null hypothesis was tested, using the Wald test for the strength of the significance between the predictive model and education level. Education level is a non-significant predictor of the probability of misusing prescription pain relievers (b=-.039, se=.334, Wald=0.014, and sig=.907). P-value 0.907 is greater than 0.05 hence at 95% confidence level we reject the null hypothesis and conclude that high school diploma and higher is not a predictor of misusing prescription pain relievers among pregnant women in the USA.

Table 13

Binary Logistic Regression

								95% C.I.for EXP(B)	
		B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Step 1	Education	.039	.334	.014	1	.907	1.040	.540	2.001
	Race	-2.806	1.012	7.691	1	.006	.060	.008	.439
	Constant	-1.906	.310	37.872	1	.000	.149		

a. Variable(s) entered on step 1: EDUHIGHCAT2, NEWRACE3.

All the six assumptions of using binary logistic regression were met as follows. The dependent variable should be binary - use of pain-relievers when not directed by doctor labeled PNRNMLIF was recoded as 1 and 2 with 1 representing those who misused prescription pain relievers and 2 representing those who did not misuse prescription pain relievers.

Since it assumes that P(Y-1) is the probability of the event occurring, the dependent variable must be coded accordingly i.e., for a binary regression, the factor level 1 of the dependent variable should represent the desired outcome. After the recode, PNRNMLIF became PNRNMLIF2 and 1 represented yes/those who misused prescription pain relievers.

Model fitting with only meaningful variables being included. The Hosmer-Lemeshow test compares the observed and expected frequencies and assesses how well the model fits. The p-value was higher than the chosen p-value (.940 vs .05) hence the

predicted probabilities were not deviating from the observed probabilities indicating a good model fit.

No multicollinearity – from the multiple linear regressions ran, we got variance inflation factors (VIFs) for pain reliever misuse as 1.007, for race as 1.000, and for education as 1.020 (see appendix A). These were all below 4. According to PennState Eberly College of Science (2018), VIFs exceeding 4 require further investigation and VIFs exceeding 10 require correction due to serious multicollinearity.

The linearity of independent variables and log-odds. The dependent variable was categorical and so were the independent variables. In this study, all the variables were binary after the independent variables were transformed.

Requires large sample – NSDUH is a national survey and this study focused on all women who were pregnant. After selecting the target group of pregnant women, a final sample of 732 was used.

Table 14

Summary of Findings

Variable	N	Percentage (%)
Age		
15 – 17	21	2.9
18 – 25	335	45.8
26 – 44	372	50.8
Otherwise	4	0.5
Race		
Non-African-American	623	85.1
African-American	109	14.9
Education Level		
Below high school	116	15.8
Above high school	616	84.2
Prescription pain reliever misuse		
Yes	84	11.5
No	648	88.5
Total	732	100

Summary

People who misuse prescription pain relievers may have varying characteristics but based on the results from this study, race plays a significant role. Section 3 presented the results and findings of my study on the misuse of prescription pain relievers by pregnant women in the USA. Using data from the NSDUH of 2016, a secondary analysis

was done to find out the associations race and education level (independent variables) have with the misuse of prescription pain relievers (dependent variable) by pregnant women. Detailed analysis and discussion of these findings will be discussed in the next section, Chapter 4. Chapter 4 will elaborate on the findings and their interpretations, and the significance or positive social impact of these findings will also be discussed. These will be in alignment with the HBM model which guided this study. Recommendations that will guide future studies will also be documented.

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

Introduction

This study aimed to investigate the misuse of prescription pain relievers by pregnant women in the USA. Guided by two research questions, this cross-sectional study was undertaken to understand the associations between misusing pain relievers and social determinants of health especially education level and race in pregnant women using secondary analysis of data from a countrywide survey (NSDUH 2016). Section 4 includes a summary and interpretation of the key findings, limitations of the study, recommendations especially for future studies, implications for professional practice and social change, and the conclusions.

Interpretation of Findings

In this section, findings are analyzed in alignment with the HBM model portraying the social impact they have.

Table 15

Summary of Results by Research Question and Predictor (Pain Reliever Misuse)

Research question	Results
Is there an association between race and pain reliever misuse among pregnant women in the USA?	African-American race decreases the odds of misusing prescription pain relievers (change by a factor of 0.06)
Is there an association between education level and pain reliever misuse among pregnant women in the USA?	Education level does not have an association with pain reliever misuse.

Pain Relievers Misused

From this study, the most misused pain reliever was Hydrocodone followed by Vicodin which contains Hydrocodone, Tylenol with Codeine 3 or 4, and Suboxone. NIDA (2020) explains that Hydrocodone is the most prescribed prescription pain reliever in the USA, and this could be a factor leading to it being the most misused as shown by these findings. This can be viewed in terms of perceived barriers, but in this case, it is an enabler since it is commonly prescribed hence leading to higher availability and accessibility.

Pregnancy and Misuse of Pain Relievers

Pain is inevitable, and pregnant women experience it too. Management of pain in pregnant women is a challenge due to possible effects these may have on the fetuses (Black et al., 2019). Prescription of pain relievers including opioids for the management of such pain occurs, and some end up misusing them. According to Dirks (2018), there was a rise in the misuse of prescription pain relievers in the last 2 decades due to the increased awareness of chronic pain by physicians. Dirks noted that an even more distressing issue is that 99% of prescription hydrocodone produced is consumed by Americans. Black et al. (2019) stated that the treatment of pain should be at the lowest therapeutic dose and for the shortest duration possible, but with increased prescription and the trust people have in their doctors, the feeling of euphoria may lead to misuse of the drugs (Dirks, 2018).

To achieve target 3.5 of the SDG 3 and RWJF vision of ensuring healthy lives and giving everyone an equal opportunity to good health regardless of their differences

including race, targeting prevention strategies to those who are at higher risk, which the findings from this study show to be the non-African-American race, will yield good results. Krans and Patrick (2016) state that controlling the prescription of pain relievers to protect mothers and infants should involve education and monitoring of prescribers. Non-African-American individuals are at a higher risk of misusing prescription pain relievers among pregnant women. Targeting education messages to these women and their prescribers will lead to good progress toward achieving the SDG goals and the vision of the RWJF.

Collier (2020) explained that among the prescription pain relievers used in pregnancy, opioids such as oxycodone and hydrocodone are prescribed for moderate to severe pain. Prolonged and increased amounts used lead to consequences such as NAS, premature deliveries, and poor fetal growth as well as the risk of stillbirths. These side effects can be traumatizing to the family members. According to Dirks (2018), these effects include those affecting the unborn fetus, and those that affect the people around the misusers. Neglect and child abuse, both physical and emotional, have been listed as some effects of misusing prescription pain relievers by pregnant women.

Limitations of the Study

Since this study was based on the NSDUH data which relied on self-reporting, the respondents may have failed to report that they were pregnant or may have been unaware of their pregnancy status at the time of the survey. Some may have reported that they were pregnant when they were not. However, the use of self-report measures of

pregnancy is considered to be a valid and reliable approach in epidemiological research, as stated by Overbeek et al. (2013).

OTC pain relievers such as Tylenol, aspirin, Advil, and Aleve were excluded from the list of prescription pain relievers in NSDUH, as stated by SAMHSA (2017). According to Trottier et al. (2012), systemic non-opioid analgesics such as acetaminophen, aspirin, and nonsteroidal anti-inflammatory drugs are used to treat pain during pregnancy. CDC, (2019) lists Tylenol, aspirin, Advil, and Aleve as OTC medicines used by pregnant women. These could also be prescribed by medics for use to treat pain since not all medications are safe to use during pregnancy.

Recommendations

Pregnant women form a complex group to manage especially due to the unborn fetuses that they are carrying. Black et al. (2019) in their study explained that because of ethical concerns, safety information on drugs used during pregnancy is largely reliant on animal data. This is true for pain relievers. According to Ray-Griffith et al. (2018), pain management among pregnant women is left to the obstetricians. Pregnancy is also one exclusion criteria for most pain programs as explained by Ray-Griffith et al. (2018), yet they also experience pain. Studies and programs on pain management should include mothers who have recently given birth for evidence-based strategies to be developed.

As noted by Black et al. (2019) and Ray-Griffith et al. (2018), pregnant women are excluded in various studies, hence recommending further studies to be conducted to understand the safety profile of these medications. Hydrocodone is highly misused; hence

more studies need to be conducted to establish a better understanding of its safety with race as a variable to focus on.

Implications for Professional Practice and Social Change

This study introduced African-American race as a factor that decreases the odds of misusing prescription pain relievers among pregnant women. Pregnant women surveyed during the NSDUH of 2016 formed the study population in this study hence the findings are generalizable to them. Black et al. (2019) Ray-Griffith et al. (2018) reported that pain management in pregnant women poses a challenge due to safety issues and this leads to obstetricians being left with the task of managing their pain on their own.

Perceived susceptibility, which is one of the constructs of HBM, the model that guided this study, is reflected by the findings in terms of African-American race being a negative predictor of misusing prescription pain relievers among pregnant women. Strategies to combat the misuse of prescription pain relievers by pregnant women can be guided by this study's findings since African-American race decreases the odds of misusing the prescribed pain relievers. The non-African-American race can be targeted by the strategies. Development of guidelines in pain management can be guided by this meaning the obstetricians should consider race when making their prescriptions and include in-depth education especially when it is inevitable to prescribe them. Ray-Griffith et al. (2018) listed guidelines that can be a starting point in the discussion of pain management among pregnant women including conducting thorough medical histories, discussing other substance use such as alcohol, and involving the pregnant women in establishing the treatment goals.

NIDA (2020) stated that these prescription pain opioids require attention due to the rising cases of NAS associated with the increasing prescriptions and deaths. The non-medical use of prescription pain relievers can be addressed by involving prescribing clinicians as well as the patients. According to NIDA (2020), more than 84% of Americans had contact with healthcare professionals hence placing them in good positions to identify potential misusers. This could be through tracking refills and any frequent change in doctors. As these clinicians balance between those who will benefit from the prescriptions and those who are just misusers, they are also expected to educate them (NIDA, 2020).

Clear education on how to take the prescriptions in terms of the correct dosage, potential drug interactions, and to never use other people's prescriptions should be done. Proper disposal of leftover and expired prescription pain relievers and giving honest medical histories including what other prescriptions they may be taking is a role the patients can take in curbing this increase (NIDA, 2020). With the non-African-American race being at higher odds of misusing prescription pain relievers, clinicians should ensure that these patients get all the education and counseling regarding their correct use.

Launched in August 2020, Healthy People 2030 (HP2030) maintained the objective of reducing the non-medical use of prescription pain relievers which was in Healthy People 2020 (HP2020). To achieve its mission of promoting, strengthening, and evaluating the nation's efforts to improve its people's health and well-being, one plan of action is to direct actions to specific groups HHS, n.d.). The department plans to use evidence-based data and findings from this study from the pregnant women who misused

prescription pain relievers, which will address this plan of action through guiding in the development of strategies and targeted actions.

Comprehensive management of pregnant women especially concerning pain is a vital subject. CDC (2020) noted that MAT in combination with counseling, and behavioral therapies used to treat substance use disorders can lead to more favorable outcomes. One major concern with the misuse of prescription pain relievers by pregnant women is the effects it will have on the unborn child. NAS can be a consequence of using MAT among pregnant women hence clinicians should discuss the benefits that outweigh this. According to CDC (2020), providing families with plans of safe care is fundamental.

Pregnant women should also be screened for other mental health conditions. Anxiety and depression have been listed to affect women who misuse prescription pain relievers especially opioids (CDC, 2020). Screening for depression, anxiety, and other mental health conditions should be done for all pregnant women especially those of the non-African-American race and this should be done to include providing access or referrals to appropriate psychosocial support as needed CDC, 2020).

Conclusion

The misuse of prescription pain relievers is a public health concern that needs interventions and Bonnie et al. (2019) explained that with the increased recognition of pain and its diagnosis, more physicians are prescribing pain relievers leading to an increase in its accessibility and consequently its misuse. CDC (2018) and NIDA (2020) listed hydrocodone as one of the most misused prescription pain relievers and this study found that it was the most misused prescription pain reliever among pregnant women.

Education level was not associated with the misuse of prescription pain relievers among the pregnant women while race was. Non-African-American pregnant women were more likely to misuse prescription pain relievers. Prevention and intervention programs addressing the misuse of prescription pain relievers are necessary especially targeting racial and ethnic groups.

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Appendix

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	Education	.993	1.007
	Race	.993	1.007

a. Dependent Variable: Pain reliever misuse

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	Race	.981	1.020
	Pain reliever misuse	.981	1.020

a. Dependent Variable: Education

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	Pain reliever	1.000	1.000
	Education	1.000	1.000

a. Dependent Variable: Race