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An Investigation of the Factors Associated with Opioid Misuse

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ABSTRACT

The primary objective of this study is to identify and describe the factors with prescription opioid misuse. This study used the data from the 2016 National Study for Drug Use and Health (NSDUH) survey. The data provides evidence that a person who exhibits certain factors is more likely to misuse prescription opioids than one who does not share the same characteristics. The factors that influence the propensity to misuse opioids include; mental health, age, race, cigarette use, alcohol frequency, marijuana frequency, sedative use, and smokeless tobacco use.

INTRODUCTION

The drug epidemic in America is one of the most prevalent, pressing issues faced today. There are lives lost and copious amounts of money spent every year in the name of it. In particular, America's opioid crisis consumes the lives of over two million people.[1] On top of this, the opioid crisis cost the U.S. Economy over $504 billion dollars.[2] Prescription opioids such as codeine, fentanyl, hydrocodone, morphine, and oxycodone are a few of the drugs that are being prescribed by doctors and medical professionals at an alarming rate. The Center for Disease Control has been quoted as saying, "Sales of prescription opioids in the U.S. nearly quadrupled from 1999 to 2014, but there has not been an overall change in the amount of pain Americans report. During this time period, prescription opioid overdose deaths increased similarly." [3]

With the clear problem that opioid abuse presents, there is also a clear need for a solution. However, to formulate a solution, the problem itself must be understood in detail. For government officials to be able to successfully dissuade citizens from misusing opioids and provide strategies for intervention, they must clearly distinguish the variables that are associated with misuse behavior.

METHODS

This study used the data from the 2016 The National Study for Drug Use and Health (NSDUH) findings, which consists of 2,665 variables and 56,897 observations. The National Study for Drug Use and Health's overview reads:

> The 2016 NSDUH is the 36th in a series, the primary purpose of which is to measure the prevalence and correlates of drug use in the United States. This survey series provides information about the use of illicit drugs, alcohol, and tobacco among members of the U.S. civilian, noninstitutionalized population aged twelve years old or older. The survey also includes several modules of questions that focus on mental health issues. Surveys have been conducted periodically since 1971, with the most recent ones in 1979, 1982, 1985, 1988, and 1990 through 2016.

DATA PREPARATION
The first step in preparing the data included an examination of the NSDUH 2016 Codebook. The NSDUH 2016 Codebook includes a list of each variable with frequency distributions and

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[1] NIDA, America's Addiction to Opioids: Heroin and Prescription Drug Abuse, www.drugabuse.gov.

[2] Ax, Joseph. Opioid Crisis Cost U.S. Economy $504 Billion in 2015: White House, www.reuters.com.

[3] CDC, Opioid Overdose, www.cdc.gov. https://www.cdc.gov/drugoverdose/data/prescribing.html.

additional explanatory paragraphs about any imputed variables. We identified the target variable, Misuse, defined in the NDSUH Codebook [4] as PNRNMLIF, which poses the question, "Have you ever, even once, used any prescription pain reliever in any way a doctor did not direct you to use it?". The nature of this question lead to our definition of misuse as being any way in which a doctor did not direct.

The next step involved identifying our initial set of predictor variables. All variables in the Codebook existed at different granularity; however, this research paper only included variables that represented general categories. For example, the collective stimulant variable was chosen as opposed to variables involving specific stimulants such as Adderall. To properly choose variables that best depicted the desired category, the team carefully assessed each variable manually by reading all the survey questions. The selected variables were chosen due to the nature of the survey question, such as "Ever Smoked a Cigarette" to depict cigarette usage. The final number of elected variables was 20 out of the 2,665 variables. The variables included simple demographic, socioeconomic, psychological, and other risk variables. The demographic variables include gender, age, marital status and race. The socioeconomic variables are income and education. The psychological variables included sections such as whether an individual received any mental health treatment in the past year and categorical mental illness indicator. The other risk variables include the individual's usage of certain drugs, such as cigarettes, marijuana, alcohol, inhalants, LSD, cocaine, smokeless tobacco and sedatives. After creating the initial set of predictors, the next step includes data cleaning to account for the missing responses. The final data set is partitioned so that 70% is used for model building and the remaining 30% is used for validating the candidate models.

ANALYSIS

Once selecting the specific variables for SAS, the first step includes coding the Misuse variable to create a target variable. The target variable indicates that 87.79% of the population does not misuse opioids while 12.21% identify with misusing opioids. The following step includes running a Logistic Regression option on the SAS Enterprise Guide software to explore the best possible model. The significance of knowing the best prediction model aids the research by focusing on the variables most related to opioid abuse. Along with the Logistic Regression report, the output includes an Odds Ratio table.

Figure 1

Odd Ratio Significant Variables				
Survey Question		Estimate	95% Confidence Limits	
Categorical Mental Illness Indicator	⬆	1.371	1.322	1.42
Education	⬆	1.039	1.003	1.076
Alcohol Recency	⬆	0.995	0.993	0.997
Marijuana Recency	⬆	0.993	0.992	0.994
Cocaine Recency	⬆	0.991	0.99	0.992
Ever Used LSD	⬆	0.99	0.989	0.991
Heroin Recency	⬇	0.985	0.983	0.987
Gender and Race	⬇	0.957	0.94	0.973
Age	⬇	0.809	0.785	0.833
Any Mental Health Treatment In Past Year	⬇	0.771	0.706	0.841
Cigarettes Ever	⬇	0.727	0.66	0.8
Smokeless Tobacco	⬇	0.679	0.63	0.732

Figure 1 – Odds Ratio Estimates

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[4] NSDUH, 2016 National Survey on Drug Use and Health Public Use File Codebook.

The odds ratio gives the odds that a certain outcome that will happen given a certain input. The table indicates the point estimate at which an individual would be more likely to abuse opioids, which the green arrow depicts the increase. An illustration of the red arrow might include if a person indicates a mental illness, that individual is more likely to abuse opioids. When examining an individual who misuses prescription opioids, he or she will have higher odds to misuse due to the possible factors of mental health illness, education and alcohol usage. The green arrows portray the opposite in which an individual would be less likely to abuse opioids. The individuals will have lower odds of misusing opioids from trying smokeless tobacco and receiving any mental health treatment in the last year. With many variables included in the model, it is important to also note which variables have little to no impact (even if the team previously assumed they would), such as marital status and prior arrest. Since both numbers have p-values above .05, we cannot conclude that their impact is significant enough to influence misuse.

DEMOGRAPHICS

The demographic section analyzes the gender, age, race, and marital status of the individual. With using SAS Enterprise Guide, the team isolated each variable in accordance with the Misuse variable. When investigating the isolated variables, a relationship seems to exist between race and gender. After examining the interaction between race and gender, the final model includes the interaction since the smaller information criteria fits the model better as opposed to the variables separately. The Figure 2 below shows a basic demographic representation of the data showing misuse against gender and race. White males are the most prone to opioid misuse, while black females are the least prone.
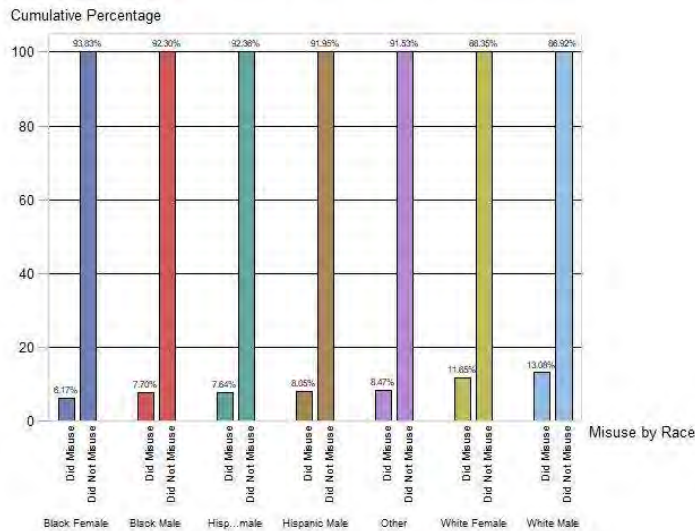
Figure 2

Figure 2 - Misuse by Gender and Race

SOCIOECONOMIC

The socioeconomic variables include income and education. Prior to the research, the team assumed that these two variables would be highly correlated with the Misuse variable. Income and education were isolated to carefully inspect whether the effect of the variables impacted the analysis. Education depicts a positive relationship with misuse exists. However, the income was not selected in the final model due to the lack of correlation.

PSYCHOLOGICAL

The psychological factors included mental health treatment and psychological disorders. For the final model, the two variables that were selected included as whether an individual received any mental health treatment in the past year and categorical mental illness indicator. Both of the two variables listed above were selected for the final model, indicating that a correlation exists between certain psychological factors and Misuse. The first variable included whether or not the individual received any mental health treatment in the past year, which can be interpreted as having had no treatment as opposed to having had treatment increases the likelihood that one would Misuse. As for the second variable, it acts as a categorical representation of the range of mental illness a person possesses. As the mental illness increases in severity, the less likely one is to misuse. Below is the analysis of mental health severity against opiate misuse.
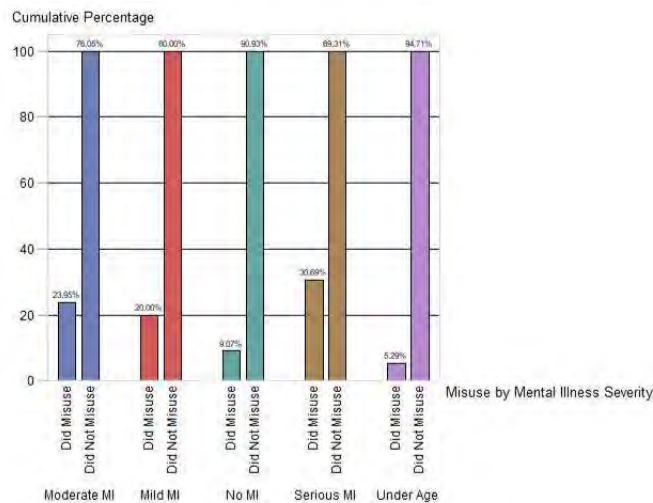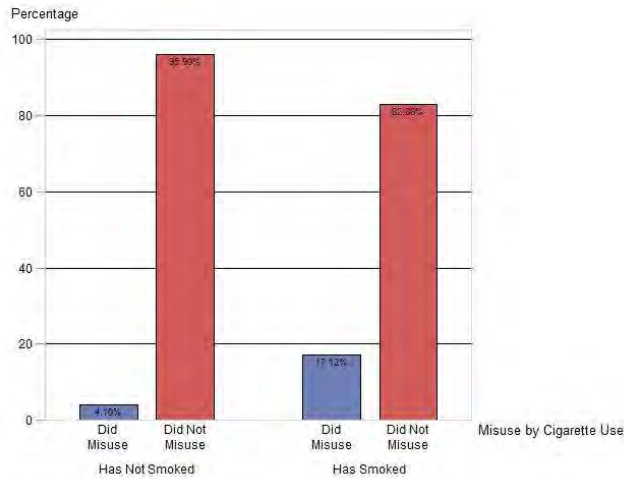
Figure 3

Figure 3- Misuse by Mental Health Severity

OTHER RISK FACTORS

The other risk factor variables involve variables that ask the individual about certain drug usages. The drugs included for other risk factors are cigarettes, marijuana, alcohol, inhalants, LSD, cocaine, smokeless tobacco and sedatives. The variables were questions used in the survey that ask the preliminary question of "have you ever used this drug" and "most recent use of this drug". The analyses for these variables are the following. For individuals that used alcohol, marijuana, cocaine, and LSD recently the more likely the individual is going to misuse opioids. For individuals that used heroin recently, cigarettes, and smokeless tobacco the less likely the individual is going to misuse opioids. See below a representation of cigarette usage against misuse. Note that someone who smokes is significantly more prone to misuse.

Figure 4

Figure 4 - Smoking against Misuse

CONCLUSION

For future studies to be successful, it can be assumed that demographics, mental health issues, and risk behaviors can be targeted. A focus on white, upper class citizens with mental health disorders and a history of drug use can be safely used. We would suggest using an independent study to focus on these individuals in order to provide even more specific details to readers. Any continuing research should consider narrowing the research by a certain identifying factor, whether that be demographic, socioeconomic, psychological, other risk factors, etc. We also suggest comparing the 2016 data set with other years to conduct more comparison analysis year to year.

In conclusion, the factors that influence the outcome of the model include; mental health treatment, education, age, race, cigarette use, alcohol frequency, cigarette frequency, marijuana frequency, cocaine recency, LSD use, mental illness severity, and smokeless tobacco use. In order to combat the opioid epidemic in America today, it is clear which citizens should be focused on and provided additional assistance to. With a detailed view of who is at risk, the budget for the epidemic can be allocated with more precision, and American lives can be spared.

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