Building the Illicit Drug Profile; Modeling Drug Use Frequency and Type with User Behaviors and Demographics

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Building the Illicit Drug Profile; Modeling Drug Use Frequency and Type with User Behaviors and Demographics

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Abstract

Background: Drug abuse and dependence have severe and adverse effects on the physical and social health of the person and over time accrues a large economic cost to society. However the money spent on prevention by the government has continued to spur criticism. Further evaluation of drug use behavior and demographics is necessary to increase effectiveness of prevention, education and treatment programs.

Methods: Using the four years of data from the 2008 to 2011 National Survey on Drug Use and Health (NSDUH), a survey which provides national and state-level data on the use of tobacco, alcohol, illicit drugs, this study evaluated 56,396 drug users and created a prediction model to understand the associations between drug use behavior and demographics with drug type and drug use frequency. This study used stepwise ordinal logistic regression for the drug use frequency evaluation and multinomial logistic regression for drug type evaluation.

Results: Stark differences exist between the behavior and demographic make-up of heavier and lighter drug users across seven different illicit drugs. The beginnings of the profiles of heavier drug users can be made and taken into consideration for further educational points. Evaluation into the differences in drug type choice revealed more unique characteristics in the social and cultural role the drugs play in US society.

Conclusion: This study shows that targeted anti-drug campaigns for young people will remain critical to prevention and intervention. Furthermore, an aim at minority communities will help alleviate the pressures of harder illicit drugs. Providing recovery and educational resources to the minority population may be another important step against illicit drug use and trade. An assessment for the education for analgesic drug abuse should be carried out. Further study into racial and ethnic differences is needed.

Introduction

Drug abuse and dependence have severe and adverse effects on the physical and social health of the person and over time accrues a large economic cost to society. According to the Office of National Drug Control Policy, a department created directly under the Office of the President of the United States of America, the use and abuse of illicit drugs, alcohol and tobacco is costing the United States nearly half a trillion US Dollars every year. More specifically the cost of Illicit Drug Use was most recently reported by the United States Department of Justice's National Drug Intelligence Center to have had an annual cost make up of crime, costing $113 Billion US dollars, productivity, consisting of $68 Billion US Dollars, and Health, costing $11 Billion US Dollars; the some economic cost for illicit drug use alone is $193 Billion US dollars in 2007.

Burden of Use

The impact of drug use on health is already widely known. Short term health costs of drug use can include the cost of lives lost from driving under the influence, drug related crime and violence, as well as the ever present danger of overdose to the user. Longer term costs of drug use include the spread of infectious disease, deterioration of livelihood of the user and his or her loved ones, and of course the economic costs to those who support them.

Drug use continues to leave a stunning stain on the lives and livelihoods of people all across the globe. According to the 2004 Global Health Statistics and Informatics released by the World Health Organization, Alcohol stands as the third greatest risk factor that attribute to Disability Adjusted Life Years (DALY) with Tobacco coming in at 6th and illicit drug use at 18th. Combined, these three drug types contribute to about 9% of the total Disability Adjusted Life Years around the earth. With such a devastating impact on

health and wellness, it is no wonder that the United States Government is willing to spend a significant budget on prevention campaigns against the use of drugs.

According to the Fiscal Year 2013 Drug Control and Performance Summary, the federal government requested $25.6 Billion dollars to be spent on budgeting new and existing programs in an effort to fulfill President Obama's 2011 Drug Control Policy which includes objectives to form a well-rounded approach to tackling such a problem: preventing illicit drug use and addiction before their onset, bringing more Americans in need of treatment into contact with the appropriate level of care, and countering drug production and trafficking within the United States to name a few.

History of Drug Prevention and Treatment in the United States

Prior to World War II the general approach taken by the United States government was strict prohibition, tight regulation and criminalization. Opiates and narcotics were given strict quantity limits, and most notable was the prohibition of alcohol, which was banned in the US Constitution starting in January 1st, 1920 until it was finally repealed in December 5th, 1933.

Starting in the 1950's a joint committee on Narcotic Drugs, consisting of representatives from the American Medical Association as well as the American Bar Association to evaluate whether drug addiction was best categorized as a criminal or medical issue and attempt to determine the association and possible causality between drug addiction and criminal behavior.

In the final report given by the Joint Committee of the American Bar Association and the American Medical Association on Narcotic Drugs, one of the key report recommendations states "The role of medicine and public health in dealing with drug addiction and the drug addict should be clarified. There must be a new determination of

the limits of good medical practice in the treatment of drug addiction, and an objective inquiry into the question whether existing enforcement policies, practices and attitudes, as well as existing laws, have unduly or improperly interfered with good medical practice in this area."

In 1967 the American Medical Association takes the recommendation to heart and officially identifies alcoholism as a "complex disease" and sparks a movement towards treatment of addiction as a treatable disease as opposed to a social and legal offense.

War on Drugs

After an accumulation of an increasing yet relatively unseen drug epidemic, a shocking report from two congressmen that had gone to study heroin addiction in US soldiers fighting in Vietnam; they had found that 15% of the servicemen were addicted to heroin. This sparked an immediate response from President Richard Nixon who underlined an increase federal effort to tackle drug abuse as "public enemy number one." With this Nixon is credited with starting the federal "War on Drugs," which, despite Nixon's effort to also include increased attention to rehabilitation and treatment, mostly focuses on stricter prohibition as well as military aid and enforcement on the national and international fronts to reduce illicit drug trade.

The war on drugs served as a complete rebound against the original recommendations of the American Medical Association/American Bar Association Joint Commission on Narcotic drugs to engage the treatment of drug abusers as a medical affliction. Despite efforts to include these recommendations of treatment and prevention in drug policy, due to some combination of media, social and political pressure, the "War on Drugs" continued on all the way up until the namesake was dropped by the Obama Administration.

Backlash Against Federal Drug Policy

With extended use of recreational and illicit drugs, many of these drugs are prone to become habit forming; however, it may be hard for a layperson that has never used any form of illicit drug to understand the ease of falling into addiction, dependence and abuse, and thus may not see the need for intervention and interventionist government policies. Indeed, as such, there are many groups critical of the governmental policies, particularly in times of national budget crises.

One particularly influential group critical to these prevention policies is the CATO Institute in Washington DC, a libertarian think tank ranked 14th worldwide according to the 2011 Global Go To Think Tank Index Report. The CATO Institute, whose stated mission is to increase the understanding of public policies based on the principles of limited government, free markets, individual liberty and peace, make a counterproposal for legalization and possible taxation of illicit drugs. Their argument revolves around the impossible task of balancing an ever increasing budget deficit in the United States Government and the ineffectual use of funding to create advertisement campaigns that simply do not work. They cite an independent study, Orwin et al, also funded by National Institute on Drug Abuse that stated in that the federal government's drug prevention program showed "little evidence of direct favorable campaign effects on youth, either for marijuana or early intervention initiatives, or for the campaign as a whole." Furthermore, the CATO Institute's proposal claims that drug legalization would not only cease the ever burgeoning federal budget in drug prevention but would also be able to reduce government expenditure by about $41.3 Billion US dollars annually.

However the main flaw in this argument is their failure to address the potential financial and societal costs of legalizing the rest of these illicit drugs. Their assumption is

that the Tobacco and Alcohol industries are working models of what legalizing drugs can be. According to Marketline, a Tobacco Market Overview in the United States, the US tobacco market had total revenues of $153.5 Billion US dollars in 2012. While this is a very large industry that moves a significant part of the United States market, it must also be weighed against the costs of the industry. The Center for Disease Control and Prevention published a study which states that during their study period of 2001 to 2004, the average annual smoking-attributable health-care expenditures were approximately $96 billion, and accounting for direct health-care expenditures and productivity losses (approximately $97 billion), the total economic burden of smoking is approximately $193 billion per year; this does not even include the state-based tobacco prevention and control programs which totaled $595 million in fiscal year 2007, as reported in a report by the Campaign for Tobacco Free Kids.

It is unclear whether the path of prevention and prohibition or the path of legalization and taxation is the correct approach for drugs in the United States of America, but whether drugs are legalized or not, prevention of use will be a critical part of the campaign that, as we have seen with Orwin's 2006 report, can very easily evolve into a complete waste of money if the approach is not methodical and precise.

Substance Abuse and Mental Health Services Administration (SAMHSA)

The Substance Abuse and Mental Health Services Administration (SAMHSA) was established in 1992 and has served as the forefront of understanding and analyzing the trends of drug abuse in America. SAMHSA is, as taken directly from their Executive Summary "charged with reducing the impact of substance abuse and mental illness on America's communities… SAMHSA provides leadership and devotes its resources—programs, policies, information and data, contracts and grants—toward helping the

Nation act on the knowledge that: Behavioral health is essential for health; Prevention works; Treatment is effective; and People recover from mental and substance use disorders."

In their prevention arm's website, SAMHSA's Prevention and Technical Assistance, they lay out a clear aim for the goals of prevention through understanding the way personal and social factors serve as risk or protective factors for substance abuse. Through this type of analysis SAMHSA wants to establish the "Behavioral Health Lens of Prevention" which serves to enable policy makers at all levels to understand and more effectively apply prevention and treatment.

Through technical study of risk behavior in over 60 different papers, researchers at SAMHSA were able to break down risk factors to several different influential factors.

The individual mentality acts as the most influential factor, which may modify the way the individual interacts at other levels, like the relationship or community level factors. Factors that influence risk on the individual level include, but are not limited to: age, education, income, health and psychosocial problems. However there are also factors which impact risk at an individual level, but can also be considered shared factors that can influence other people's individual risk. Shared individual risk factors may include housing instability, illness, low household income, poverty, unemployment and injury.

Within their study, SAMHSA ascertained the next most influential factor, is the relationship factor. A person's closest relationships can determine a large amount the level of risk and protection the individual is susceptible to and can include their friends, family and partners. Shared relationship level factors can include divorce or separation, intimate partner violence, lack of social support, physical assault, and rape or sexual assault.

The next layers outside the relationship are the community and then the societal wide influential factors. These types of risk factors can include any large groupings of society that can help prevent stress or may in some way cause greater stress. These stress factors can include military service, educational attainment, stressful environments like a risky or unforgiving work environment.

Limitations of Previous Behavioral Studies

In their analysis of the 60 behavioral studies, SAMHSA recognized the limitations of the previous behavioral studies. Without the understanding of how all of the individual, relationship, communal and societal level risk factors interact together, it may be impossible to lay out a true behavioral model that is applicable to at risk populations.

This is precisely why it is necessary to create an annual evaluation of the population profiles of drug users using the data acquired by SAMHSA. With a clear image of demographic and behavioral nuances of heavy drug users within each drug group, it will make targeted prevention campaigns and support services significantly more effective.

Objectives

Using the four years of data from the 2008 to 2011 National Survey on Drug Use and Health (NSDUH), a survey which provides national and state-level data on the use of tobacco, alcohol, illicit drugs (including non-medical use of prescription drugs), this study will attempt to advance the demographic and behavior profiles of adult drug users, while taking into account the individual, relationship, communal and societal risk factors together. We aim to understand which factors influence drug users to use more of each specific type of drug, as well as to understand what factors influence drug choice.

Background

Drug Information

The core drugs asked about in this survey were alcohol, marijuana, cocaine, crack, heroin, hallucinogens, inhalants, analgesics, oxycontin, tranquilizers, stimulants, methamphetamine, and sedatives.

Alcohol

Alcohol's effects on the body, as with all drugs depend on the amount consumed. At low levels of consumption, the user may experience euphoria, decreased anxiety and may lead to general sedation, impaired memory and reactions. At higher levels of alcohol consumption a user may experience confusion, nausea, ataxia, and lapses of consciousness. At the highest levels of consumption the user may experience acute alcohol poisoning, leading to unconsciousness, seizures, respiratory depression and eventually death.

Marijuana

Marijuana principal active drug component is tetrahydrocannabinol, THC, and is generally extracted from marijuana through smoking though its essential oils may be extracted other ways and may be ingested. The acute effects of THC may include euphoria, relaxation, joviality, and increased awareness of sensation which lead to increased libido and appetite. (Ashton 2001) Although it is very difficult to experience a toxic overdose of cannabis, higher levels of consumption may lead to ataxia, dizziness, nausea, hallucinations and sometimes a sensation of dying. At the highest levels of consumption, the user may experience oxygen deprivation or overwhelming sensation both of which lead to unconsciousness.

Cocaine and Crack Cocaine

Cocaine is a stimulant produced through the essential chemical found on the leaves of the coca plant, a plant which has been used for centuries due to its anesthetic and potentially medicinal qualities. Crack cocaine is a hypothetically more pure form of cocaine due to a process known as freebasing, which extracts cocaine from its salt form using baking soda, water and a heat source, into its pure oil form; this oily freebase is extracted a long thin object, such as a pin, and the oil dries into a rock-like shape and becomes crack cocaine. Users of cocaine will experience alertness, feelings of well-being and euphoria, energy and motor activity, feelings of competence and sexuality. However, it is common for users to continue using until they have run out of the drug in their possession, meaning users may spend many hours, ignoring sleep, to continue their cocaine binge. In higher dosages users may experience tremors, convulsions and even sudden cardiac death. According to the White House's 2012 report on "What America's Users Spend on Illegal Drugs," which henceforth shall be referred to as WAUSID, chronic cocaine users will spend an average of $986 per month in 2006. Occasional cocaine users will spend an average of $51 per day of use.

Heroin

Heroin is a depressant narcotic created by processing the extract from the seed pod of the poppy plant. Originally heroin was produced as a less addictive form of the pain reliever, morphine, also a processed extract from the poppy plant. Heroin is a strong analgesic with users reporting feelings of intense euphoria and relaxation. Reported in a study published in Lancet 2007, heroin is the most addictive and harm inducing drug of the drugs studied, an overdose of which will cause respiratory depression, low blood pressure, coma and possibly death. According to the 2012 WAUSID, chronic heroin users

will spend $1055 per month. Occasional heroin users will spend $47 per day of use.

Hallucinogens

Hallucinogens are drugs that induce experiences which may not be recreated in any type of normal conscious state. Hallucinogens as the name suggests induce hallucinations. Hallucinogens generally are physically safe to use and are nearly impossible to overdose on the drug, but this drug may also have profound effects on the mind and may cause temporary or even long term psychosis. (Cohen 1960)

Inhalants

Inhalants are generally depressants producing similar affects to anesthetics; nitrous oxide, a common inhalant, remains a common form of anesthesia particularly in dental offices of the United States of America. Inhalants may include aerosols, like spray paint or hair spray, solvents, gasoline and glue to name a few; ease of use and obtaining materials poses a particular problem with children when concerning inhalants. When inhaled, along with the general effects of oxygen deprivation, the drug will induce mild euphoria along with, general sedation. Inhalants may cause sudden death when repeated use causes extreme respiratory depression.

Over the Counter Depressants and Analgesics

Analgesics, which act as depressants, are a broad name to classify any drug which acts as a pain reliever, one example of which is the opioid derivative OxyContin. Tranquilizers, generally used to deal with stress or as a sleep aid, like other depressants cause general sedation. All these drugs are generally over the counter drugs and when used recreationally may cause mild euphoria and relaxed state; higher dosages cause respiratory depression, coma and death.

Over the Counter Stimulants and Methamphetamine

Stimulants are clinically used to treat depression, narcolepsy and other mental diseases. However, stimulants like other drugs are very easily abused, and users may become addicted very easily due to the sense of exhilaration, enhance self-esteem, wakefulness and overall euphoria when using stimulants. Methamphetamine a purified derivative of these chemical stimulants, has the strongest kind of psychological addiction, as well as physical addiction since during withdrawal the user will tend to experience a severe crash. According to the 2012 WAUSID, chronic methamphetamine users will spend $1,055 per month, whereas occasional users will spend $62 per day of use. Overuse of stimulants will cause tremors and over exertion of the body and may lead to cardiovascular collapse.

Methods

Data Sourses

To find any duplicated or related topics on the subject, we conducted a search through www.pubmed.gov for any published data relevant to the study. The search included using different combinations and iterations of the key terms: (1) drug use behavior, (2) drug use, (3) social disability, (4) patterns, (5) NSDUH. I further limited the search to American publications as well as being published after 2005 to maintain relevance and social application.

After a thorough search for papers using drug use and drug use behavior specific to the National Survey on Drug Use and Health, we reviewed all of the published papers with citations using the NSDUH 2008 to 2011. The search provided useful material for my research and also confirmed the uniqueness of my study.

Data Review

The National Survey on Drug Use and Health (NSDUH) is an extensive annual nationwide survey conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), an agency U.S. Department of Health and Human Services. Each year approximately 69,500 people are surveyed using stratified random sampling. The first strata is at the state level; 3600 people surveyed from eight large populations states and 900 from the remaining 43 states and District of Columbia. In the second stage the non-institutionalized population of each state is grouped into State Sampling Regions in such a way that any individual State Sampling Region would yield approximately the same amount of people; thus, the eight large population states were divided into 48 State Sampling Regions, whereas the rest of the 43 smaller states were divided into 12 sampling regions. At the third stage the SSRs are then organized into urban or rural areas

and then high and low socioeconomic status. The regions are reorganized in such a way that there are 150 urban dwelling areas and 100 rural dwelling areas in each region. The regions were then recorded as they were split in this last stage, and then randomly assigned to a year and a quarter of data selection.

As this study is using the surveys across four years, we had to study the codebooks for the four years of NSDUHs (2008-2011) to isolate all relevant variables to the study. While most of the variables available remained unchanged across the four years of surveys, many variables used a slightly different data format as the data in the other years, in which case, new variables would need to be made that would match all four years of data.

Data Extraction

Through the SAMHSA website, the NSDUH survey data files were provided in a compressed SAS format. To extract the data from their compressed format, we used the statistical software SAS 9.2 to import the file using the 'proc cimport' command for SAS to properly make an uncompressed dataset for SAS to read. This procedure was repeated for each of the four compressed data sets for NSDUH 2008-2011. All following procedures and tables were made using SAS 9.2.

Drug Variables Defining Use and Abuse

While in the past drug dependence was a broad diagnosis doctors made to cover a wide range of problems, as our study and understanding of the nature drugs and their use and abuse, medical doctors began to categorize and reorganize the drug abuse patterns into specific and definable diagnoses. In the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders. As expanded in this Psychiatric Manual, the DSM-IV states that "When an individual persists in use of alcohol or other drugs despite

problems related to use of the substance, substance dependence may be diagnosed. Compulsive and repetitive use may result in tolerance to the effect of the drug and withdrawal symptoms when use is reduced or stopped. These, along with Substance Abuse are considered Substance Use Disorder"

The NSDUH created their survey with this DSM-IV definition of substance abuse and dependence in mind. They formed a group of questions that would provide a semi-accurate diagnosis of whether or not the subject was abusing or depending on a drug and took those same set of question and modified them just a bit to fit all the drugs for the study.

NSUDH's Drug Abuse or Dependence Schedule

The following are criteria for drug dependence and abuse as stated by the *NSDUH Codebook:*

A respondent was defined as having marijuana, inhalant, hallucinogen, or tranquilizer dependence if the respondent reported a positive response to three or more of the following six dependence criteria:

1. Spent a great deal of time over a period of a month getting, using, or getting over the effects of the substance
2. Unable to keep set limits on substance use or used more often than intended
3. Needed to use substance more than before to get desired effects or noticed that using the same amount had less effect than before
4. Unable to cut down or stop using the substance every time he or she tried or wanted to
5. Continued to use substance even though it was causing problems with emotions, nerves, mental health, or physical problems

6. Reduced or gave up participation in important activities due to substance use

An additional question pertaining to withdrawal symptoms was asked for the following 6 drugs: alcohol, pain relievers, cocaine, heroin, sedatives, and stimulants. The withdrawal question asked the respondent if they had experienced substance specific withdrawal symptoms at one time that lasted for longer than a day after they cut back or stopped using. The specific number and type of listed withdrawal symptoms varied by substance. A respondent was defined as having alcohol, pain reliever, cocaine, heroin, sedative, or stimulant dependence if the respondent reported a positive response to 3 or more of the 7 dependence criteria (including the six standard criteria listed above plus a seventh withdrawal symptom criteria).

A respondent was defined as having alcohol, marijuana, cocaine, heroin, hallucinogen, inhalant, pain reliever, tranquilizer, stimulant, or sedative abuse if they reported a positive response to one or more of the following four abuse criteria:

1. Respondent reported having serious problems due to substance use at home, work or school
2. Respondent reported using substance regularly and then did something where substance use might have put them in physical danger
3. Respondent reporting substance use causing actions that repeatedly got them in trouble with the law
4. Respondent reported having problems caused by substance use with family or friends and continued to use substance even though it was thought to be causing problems with family and friends

In the annual NSDUH reports, they used the above questions together to diagnose whether the person was abusing or depending on any drug. Together they would be able

to gather an annual estimate as to what portion of the population abusing or depending on a substance. This data is very compelling and provides a very useful data point to use in models for estimates about what may induce or what may be caused by substance abuse or dependence. However, the abuse and dependence criteria themselves present very interesting and unique habits that has the potential to delineate the behavioral differences between users of different drugs. As such, we will not be using the summary reports of each users' dependence or abuse of each drug and will instead use their behaviors in attempts to differentiate behaviors of heavy and light users of each drug.

As the dependence and abuse schedule was only given to the adults surveyed, we further truncated the data to the target population which was adults of all races aged 18 and older. In 2011 the total available study population was 58,397; 19,264 subjects aged 17 and lower were eliminated from the study, and only the 39,133 adults remained in the study from 2011. In 2010 the total available study population was 57,873; 18,614 subjects aged 17 and lower were eliminated from the study, and only the 39,259 adults remained from the study in 2010. In 2009 the total available study population was 55,772; 17,705 subjects aged 17 and lower were eliminated from the study, and only the 38,067 adults remained from the 2009 study. In 2008 the total available study population was 55,739; 17,842 subjects aged 17 and lower were eliminated from the study, and only the 37,897 adults remained from the 2008 study. At the end of this truncation remained 154,356 adults in the study population.

Now with this population, we selected all relevant variables to the model of drug use behavior, as well as all possible control variables including sex, age, race, employment status, military service status, marriage status, depression, and mental health need and treatment.

Depression was measured by two factors: Kessler Psychological Distress Score (K6) and the World Health Organization Disability Assessment Schedule (WHODAS) score. The Kessler scale is a set of questions developed with support from the National Center for Health Statistics for use in another survey for the American Public, the US National Health Interview Survey. The point of this scale is an attempt to get a diagnosis of depression and mental health illness that was a fast and easy screening process, instead of using the DSM-IV gold standard the Composite International Diagnostic Interview (CIDI 3.0). According to a recent study by Cornelius 2013, the K6 is confirmed as a suitable survey to use to determine a DSM-IV mental health illness. Further is the WHODAS which was developed through a collaborative international approach for the World Health Organization with the aim of developing a single generic instrument for assessing health status and disability across different cultures and settings. In this case the WHODAS measures the social disability of the survey takers. While the NSDUH tries to combine the WHODAS and the K6 scores to determine a composite depression probability, our study will leave the two scores separate as their measures determine slightly different mental health symptoms.

In 2008 the NSDUH was trying to determine which of the disability assessment scales they should include in their survey from 2009 and on. SAMHSA included two disability assessment scales in the 2008 NSDUH: the Sheehan Disability Scale and the WHODAS. Half of the adults surveyed in 2008 were randomly chosen to take the Sheehan Disability Scale and the other half were selected to do the WHODAS. Thus in this study we only used half the adult population of the 2008 NSDUH and this truncated our study to 135,227 adults who had taken the WHODAS.

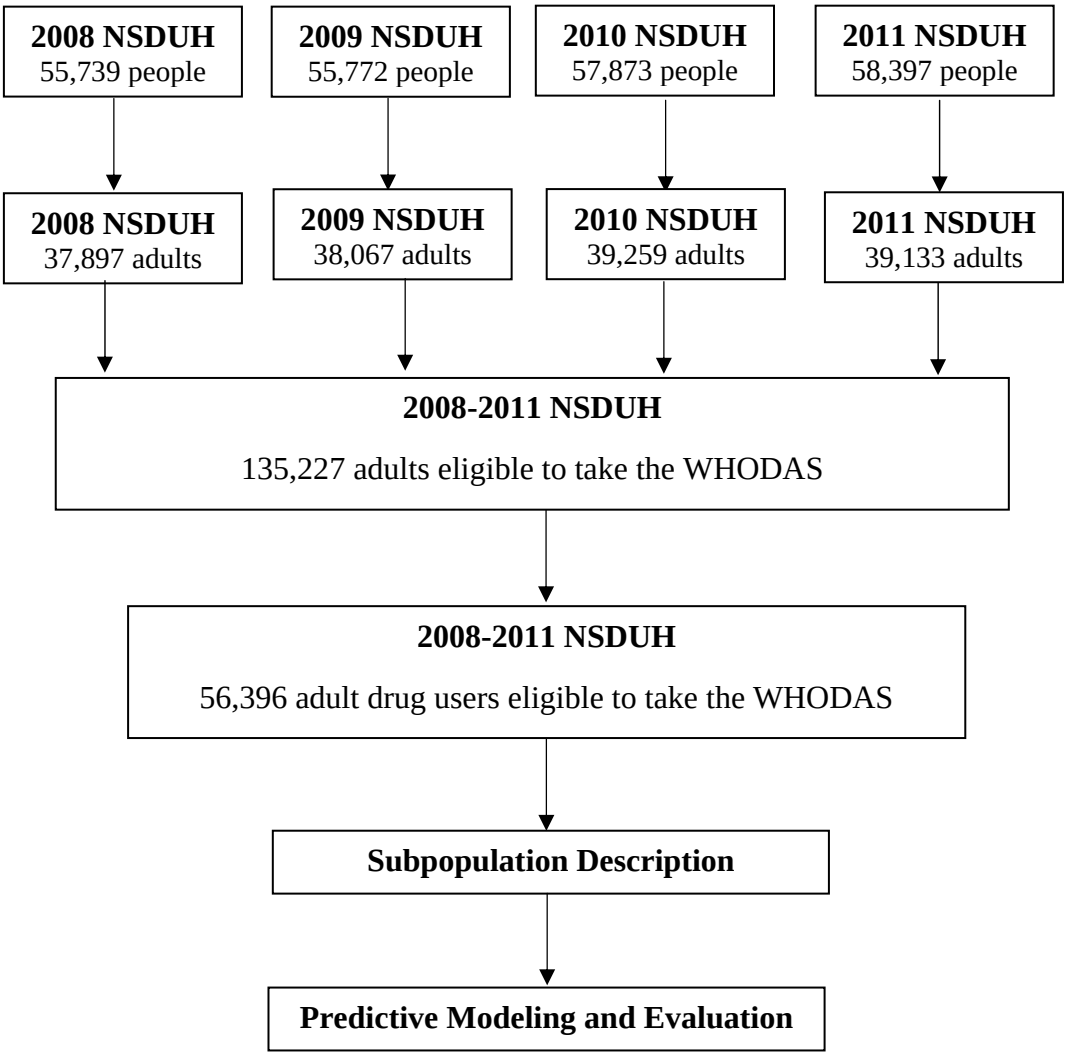

Figure 1: Flow Chart of Study Population Selection

Lastly we only wanted to see the data concerning drug users and how the influence of different variables shift whether they are light or heavy users of the drug. The final elimination of the 25,763 non-drug users in the last year and with the removal of 12,000 missing data from targeted demographic information, truncated the data set to 56,396 adult drug users. The data truncation history is shown in Figure 1.

We aimed to explore the demographic characteristics of the surveyed drug users. The demographic variables we chose to explore were: race, sex, age, self-reported health condition, marriage status, poverty level, military service, education, perceived mental health need, mental health treatment, age of first illicit drug used, mental illness severity, Here in Table 2 we delineate the frequency and percentage distributions of each of the above demographic categories in hopes to elucidate information and general trends of drug users in society. All of these demographic variables were chosen from the database on the basis of their potential connection to drug use as well as their broad and encompassing differentiable factors in society. Other variables in the database either did not have a previously reported connection to drug use habits or the variables were intended for more specific study and were simply too narrow in scope for this study.

Upon further inspection we decided to combine the demographics of sex and age, as well as of mental health need and treatment, together into unique variables, as they showed non-linear trends when cross tabulated with annual drug use frequency quartiles, signifying interacting effects. The combination of sex and race also mimics the protocol used by the NSDUH reports that also show clear interaction effects between these two variables.

During our analyses we found that alcohol and marijuana use were the most commonly used drugs in the group; furthermore, due to their pervasive use in conjunction

with all other drug groups, it would be extremely difficult to parse their specific effects from the other drugs in the group. Thus, we decided to use the above median use of alcohol and marijuana as a potentially influential factor for our subsequent analyses.

Lastly we wanted to see how drug related behavior and demographics influenced heavy drug use choice. We modeled the response variable in attempts to best differentiate the explanatory variables' influence on each drug, while taking into account the potential for drug use crossover. The most effective way to best make use of our limited data was to categorize the response variable in such a way that each value referred to the above median annual frequency of use in one drug and a below median annual frequency of use in all other drugs. When analyzing, for example, how age is associated with the cocaine value of the response variable, we are assessing how the increase in age indicates heavier use of cocaine and not any other drug in comparison to the reference group which is those who have below median annual drug use across all drugs. Furthermore when organizing the response variable in such a way we can easily compare how explanatory variables might be more highly associated with strong use in one particular drug and how that relation might differ from the other drug use groups.

We constructed a multinomial logit model to find how drug use behavior and demographic characteristics indicated whether the person would be an above or below median drug user for each of our surveyed drug groups, using as reference the below median drug users across all drugs as the reference group. The odds ratios of this model is shown in Table 4 and is located above their respective confidence intervals. Again the significance of each of their estimates can be seen by the appended superscript letter to each significant parameter estimate with a, b and c indicating significance at the .05, .01 and .001 levels respectively.

Statistical Analysis

The frequency of the basic demographics of the drug using population were represented according to their drug of use. The continuous data of the annual frequency of use for each drug was then analyzed in accordance to their weight and stratification variables to obtain summary data true to the population.

We then investigated the usage statistics of the different drugs of our study. As the survey was modeled in such a way to allow for an accurate representation of the United States populace, we decided to take advantage of the survey model and ran these usage statistics taking into account the stratification and distribution weights. Using a survey analysis procedure provided by SAS 9.2, proc surveymeans, in conjunction with the stratification and weight variables provided by the NSDUH surveys, we procured drug use estimates and summary measures at the population level as seen in Table 2. The quartile information was an estimate at the population level and was reported with decimals in the original analysis, but for the purposes of this study we rounded these numbers to the closest integer. We used the population adjusted frequency of drug-use quartiles as grouping categories for analysis in the remainder of this study. It should be noted that because the population-level drug use annual frequency quartiles were used to delineate these groups instead of just using the surveyed drug use quartiles, we are able to ascertain information characteristics truer to the drug use quartiles at the population-level. We originally planned to use these weight variables to assist in all of our analyses but decided to limit the analysis to the primary grouping variable as further use would be overly complicated and not critical for the purposes of the study.

We also examined what drug use behaviors and demographic characteristics differentiated heavier drug users from lighter drug users. For each drug we ran a Stepwise

Ordinal Logistic Regression, which served to compare the differences between a step increase in drug use quartiles. Using a selection of entry and selection of stay of 0.2, we able to explore the potentially influential drug use behavior and demographic models for each drug, the resulting odds ratios of which are displayed on Table 3. The parameter estimate for odds ratio stands above their confidence interval. To clarify which odds ratios held significance, we appended a superscript letter to each significant parameter estimate with a, b and c indicating significance at the .05, .01 and .001 levels respectively.

Developing models

Logistic regression is based on the same concept as the linear regression function but we step around the limitation of needing a continuous outcome variable and transform the outcome into a binary variable using the logit transformation. Instead of using the binary variable we transform an odds model into a log odds which can act as a continuous outcome variable used the same in the linear regression model.

Generalized Linear Model: $\text{logit}(p_i) = \ln\left(\frac{p_i}{1-p_i}\right) = B_0 + B_1 x_1 + \ldots + B_m x_m$

We used two different extensions of logistic regression: ordinal logistic regression [proportional odds model] and multinomial logistic regression. Ordinal logistic regression is similar to logistic regression except that we use ordered data to provide us with a proportional odds. Multinomial logistic regression essentially combines a set of many instances of subset regressions into one.

Using these variables that categorized the annual frequency of use drug data for each of the drugs, we developed models to predict the step increase of quartile of annual frequency for each drug by using stepwise multiple ordinal logistic regression and adding to the model all the drug abuse behavior and demographic variables.

Next we developed a new model using multinomial logistic regression in which we compared above median drug use for six different drugs to drug users of below median use.

Results

Evaluating the simple frequency results of the demographics of all surveyed drug users, including anyone who may have drank alcohol in the last year, we see that while males and females were evenly distributed across the drug users surveyed, we find that 67% are white, non-Hispanic 11% are black, non-Hispanic, 15% are Hispanic, and finally 8% are other races. Comparatively, according to the 2010 United States Census, the United States population is made up of 64% White, non-hispanic, 12% black, non-hispanic, and 16% hispanic, and again another 8% are other races. We find that this distribution between the races of people who used drugs in the past year to be quite similar to the race distribution in the United States meaning there is not a great imbalance as to which race tends to be drug users if we define alcohol to be included as a drug.

However in the case of illicit drugs, differences in race and sex become slightly more pronounced. It is clear that black males, and slightly less true for black females, are more likely to have used marijuana in the last year. Furthermore age is a very influential factor for past year drug use. Over 84% of those who used Marijuana in the past year and 92% of the Other Illicit Drug Users were from the 18-25 age group, which is vastly different from the alcohol only group, and these number are most likely reflected in the fact that a significantly higher portion of illicit drug users have never been married.. Around 27% of illicit drug users lived under the federal poverty threshold, compared to the 16% of those who had only used alcohol in the past year, in which only 16% lived under the federal poverty threshold. Those who only drink are much more likely to be employed full time, whereas marijuana and other illicit drug users are more likely to be unemployed than just drinkers.

Next we found that illicit drug users were more likely to have a type of mental illness and were more likely to have needed or used mental health treatment. Accordingly the WHODAS and their max K6 scores also scored a bit higher, indicating, as stated in the previous sentence, that they were more likely to be have great distress or were mentally distraught. Lastly we found that having tried illicit drugs prior to their 18th birthday greatly influenced whether or not the surveyed persons used illicit drugs in the past year. The remainder of the differences will be further illuminated through the use of more rigorous statistical analyses.

In table 2 we use the survey frequency procedure included with SAS9.2 to find measures of location for the past year frequency of use for all the drugs in this survey. One thing in common found in all these measures is that the mean is always greater than the median, signifying a right skewed distribution. Interestingly, while the median days of use for alcohol, marijuana and heroin are all the same, the third quartile and means of marijuana and heroin are much higher than alcohol. This implies that due to some combination of the drug culture and the addictive qualities of the drug, there are a large percentage of marijuana and heroin users that use very frequently maybe even every day. Conversely, due to the social pressures against such frequent drinking in conjunction with painful and obvious withdrawal symptoms from alcohol influence alcohol users to drink slightly less often, rarely drinking every day.

Next we wanted to understand which drug behaviors and demographic factors influenced users of specific drugs to become heavier users of each of those drugs. Using a stepwise ordinal logistic regression we created models for cocaine, hallucinogens, inhalants, analgesics, tranquilizers, stimulants and heroin.

Here in Table 3 we find the results of an ordinal logistic model which displays the odds ratio of from moving from one quartile of drug use to a higher quartile given the independent variables.

Similarities of Drug Abuse Behavior and Demographics in Predicting Heavier Illicit Drug Users

Here we find that from our stepwise modelling that nearly all of the drug use profiles are strongly positively influenced by the quantity effects variable, meaning it is very likely that for any drug user, if they need more drugs to experience the same effects, then they will likely be a higher quartile of drug user. Another common significant contributor to heavier drug use was whether or not the user had tried the drug prior to the age of 18; for nearly all drugs, if they had tried the drug prior to the age of 18, they had two times greater odds to be a heavier drug user than one who had not tried the drug prior to 18. Not surprisingly, if the user happened to be an above median drinker or marijuana user, they also had about 1.5 times greater odds to be a heavier user of their drug than those who were below median drinkers or marijuana users. The use of these types of albeit “softer” drugs, shows a tendency for the user to enjoy using drugs, for whichever purpose, so it follow that these above median alcohol and marijuana users would also be heavier illicit drug users.

One odd find is that in this model that takes into account drug abuse behaviors as well as many different demographic aspects, many illicit drug models found that Hispanic males and black females, more so, had much greater odds of being a heavy user of illicit drugs than white males.

Education, when comparing to those people who had never completed high school, had a very significant and protective effect against most types of drug use. Slightly contrary to

education was employment status. If you were only part time employed or unemployed altogether, then it served as a protective effect against most types of drugs. This could be explained if the under employed people did not have the proper income to support a heavier illicit drug habit.

Drug Abuse Behavior and Demographics in Predicting Heavier Use in Specific Drug Groups

One of the principal advantages of comparing these types of drug models is to see which behaviors and demographics get selected into the representative model, but also which do not. The differences in the selections of the models elucidate the differences in the drugs and their resulting behaviors.

By the very nature of the drug, you would not expect to see, Cocaine or Stimulants select in their individual models the drug dependence induced behavioral change of decrease in daily activity and in table 3 this is what we find. It is quite obvious drugs considered “uppers”, which according to the Drug Enforcement Agency’s 2011 Drug Fact sheet, increase activity, extend wakefulness for a prolonged period, enhance self-esteem and produce a sense of exhilaration. Subsequently, it would also make sense if these models of uppers contained behavior which produced exhilaration, like combining their drug use with dangerous activity which may get them in trouble with the law, both of which are behaviors separately selected for the Stimulant and Cocaine model respectively.

Models

Cocaine

As with any illicit drug, partaking in the distribution or sale of the drug can be dangerous and may get you arrested. It's no large wonder that cocaine selected getting in "trouble with the law" as part of its model, even if it unfortunately does not have a significant estimate for odds ratio. Another behavior chosen was is the drug user unsuccessfully cut down on cocaine, they have 2 times greater odds of being a heavier cocaine user. Lastly it is important to note the protective effect of the perceived risk of use. Those of higher perceived risk are significantly less likely to be a heavier cocaine user.

Hallucinogens

There is a protective effect if the user successfully sets a limit, but reverses if the user breaks said limit, he or she is then at 4 times greater odds of being a heavier hallucinogen user than a user who did not perceive to need a limit. Furthermore if the user has drug induced social problems and continued to use, he is also around 3.5 times greater odds of being a heavy user than one who had no drug induced personal problems.

Evaluating the demographic variables, Hispanics and black females seem to be at greatest odds of being heavier hallucinogen users than white males. Also being slightly above the poverty line tends to evoke heavier users. Lastly if a user has a perceived mental health problem in need of some help, they are significantly less likely to be a heavier user of hallucinogens, perhaps due to a fear of what a bad mental state could due to you when taking hallucinogens.

Inhalants

Inhalants seem to be, as construed in their model, reactionary. If the inhalant user unsuccessfully sets a limit, has emotional problems while using the drug and still continued use or if the drug has caused serious problems at home, school or work then the user is significantly more likely to be a heavier inhalant user. One significant difference to note is that inhalants were the only drug group to not select the above median marijuana user into its model.

Analgesics

Analgesics were one of the only drugs to select withdrawal symptoms into its model and reports if the user experiences two or more symptoms of withdrawal they have some greater odds to be a heavier user of analgesics. Further, there is quite a significant trend of married being more likely to use this drug.

Tranquilizers

Most significant with tranquilizers is the conclusion that users that experience emotional problems are significantly more likely to be heavier users. This speaks to the point that perhaps tranquilizers have the capacity to evoke emotional problems, or perhaps users will take tranquilizers to ignore their own emotional problems and when they continue to feel the emotional problems even after they have taken tranquilizers.

Stimulants

Stimulants were the only drug model to use military service. If there was any history of military service, there is a very little chance of that person being a heavier user. However, those of higher mental illness severity have greater odds of being a heavy user.

Lastly in Table 4 we explore the associations of drug abuse behavior and demographics with heavier use of a single drug type. The drug use behavior variables are slightly

different in this multinomial logistic regression. In this case the drug behavior applies to any illicit drug they may have taken, thus the interpretation of the outcome of this type of analysis can be a little vague.

Drug Use Behaviors

Setting a drug limit

If a user setting a limit for any type of illicit drug they have greater odds of being a heavy user of cocaine or analgesics, particularly if they fail to keep their limit set. Multi-Drug heavy users seem also identify their need to set a limit but often fail.

Curtailment of drug use

For the most part the odds lie quite evenly across the group of drugs for those aiming to cut down on their drug use, with two exceptions: (1) Cocaine has the highest odds of the group meaning there are probably a lot more people in the cocaine group thinking of cutting down on drugs and have a 13 times greater odds of being a heavy cocaine user if they unsuccessfully cut down on a drug, meaning there are a great number of cocaine users unsuccessfully attempting to set a limit on cocaine; (2) Analgesics is the only odds ratio that goes below one, there probably are not many heavy analgesic users who identify a need to curtail their drug use. These combine to say two unique things. First, cocaine is hard drug to quit even if people know they should cut down, and speaks volumes about the addictive qualities of the drug. Second, it is highly likely that many heavy analgesic users do not see any need to cut down on their use of the drug.

Withdrawal symptoms in past year

Here we find that heavy analgesics and multi drug users have a great number of people experiencing withdrawal symptoms. Combined with the last behavior, this ever present threat of withdrawal symptoms may clarify why heavy analgesic users feel less need to

cut down. Whereas multi-drug users identify they need to set a limit and cut down on their drug use. However, as the DEA 2011 Drug Fact sheet states, many heavy drug users that encounter different withdrawal symptoms may use other drugs to help them cope with the withdrawal symptoms of the first.

Emotional Problems Due to Drug Use

Here we find heavy hallucinogen, stimulant and multi-drug users afflicted with emotional problems due to drug use. Both hallucinogens and stimulants both afflict the psyche with a potential aggrandizement, the withdrawal from which may cause emotional stability.

Increased Drug Tolerance

While most drugs display users that increase their tolerance it seems most apparent in the group heavy multi-drug group.

Drug Induced Social Interference

With the heavy cocaine use group being the only significant group, it stands to say that it there are slightly greater odds that a drug induced social interference has its roots in a heavy cocaine use problem.

Endangering Drug Behavior

Drug induced endangering behavior is slightly significant with the cocaine group, but highly significant in the multi-drug use group. There seem to be high odds that drug users that do some kind of dangerous activity are likely heavily using more than one drug at once.

Paired Drug Use

Above Median Alcohol User

In this case there are many significant groups with the above median alcohol user, but there does not seem to be a particular inclination to any group.

Above Median Marijuana User

Above median marijuana users seem to have favor for hallucinogens and a very significant group also belong in the cocaine group, with another some number in the heavy tranqulizer use group. The significant multi-drug group is likely some combination of above median hallucinogen and either cocaine or tranquilizers. Inhalants stand out the most here as being the only drug with an odds ratio lower than one. It is likely that many marijuana users do not enjoy using inhalants.

Demographics

Race/Sex [vs. White Male]

Female, White

Less likely than a white male to be a heavy user of hallucinogens and more likely to be a heavy user of stimulants

Male, Black

Black males have around a two and a two and a half times greater odds than white males to be heavier hallucinogen and analgesic users respectively

Female, Black

As with black males have significantly greater odds to be heavy users of hallucinogens and analgesics, but also less significantly so a heavy user of cocaine

Male, Hispanic

Hispanic males tend to have a 4 times greater odds for being a heavy user of cocaine than white males, with some preference to analgesics and hallucinogens.

Female, Hispanic

Hispanic females also follow the same trend as Hispanic males, but have a slightly stronger preference to hallucinogens and a slightly lesser preference to cocaine.

Male or female, other races

There are no significant drug groups here. Most likely the grouping of females and males of the rest of the races eliminated specificity

Age

Older age groups have a higher likelihood of being heavy cocaine users than under median drug user

Health

Those people reporting worse health conditions have a slightly increased odds that they are heavy multi-drug users, and are otherwise spread evenly to the other drug groups.

Marriage Status

Being married means you have two times greater odds of not being any kind of over median drug user than being an over median hallucinogen user. Being married or formerly married means some preference to heavy use of analgesics.

Poverty Level

Being in poverty gives a greater odds to heavy use of analgesics, while being slightly out of poverty lends some increase of odds in heavy use of tranquilizers.

Employment Status

Being anything less than fully employed means significantly less odds of heavy cocaine use. Being part time also means significantly less odds of heavy analgesic use. The unemployed have a slight increase of odds that they will use of tranquilizers heavily.

Education Level

Increasing education has profound protective effects against the odds of being heavy analgesic or multi-drug users, also somewhat true for cocaine, inhalants and hallucinogens.

Perceived Mental Health Need and Treatment

If a user has a perceived need or has received treatment, they have significantly lower odds for the heavy use of analgesics. Whereas, if there is still a perceived need after treatment, then there are almost 2.5 times odds greater that this person will be a heavy tranquilizer user than of a person who needs no mental health treatment.

Age of First Illicit Drug Use

If an user's first experience with illicit drugs was only after they turned 18, they significant protective affects against the heavy use of nearly all drugs, but it is especially true for heavy use of inhalants, analgesics and, most significantly, heavy use of multi-drug.

Table 1 Demographic Characteristics of Surveyed Drug Users

Variables	Alcohol only	Illicit Drugs		Total
		Marijuana Only	Other Illicits	
	N (Column %)	N (Column %)	N (Column %)	N (Column %)
Total	42,343 (75.08%)	7,366 (13.06%)	6,687 (11.86%)	56,396 (100%)
Race				
Male, White	13,091 (30.92%)	2,224 (30.19%)	2,433 (36.38%)	17,748 (31.47%)
Female, White	15,419 (36.41%)	1,976 (26.83%)	1,991 (29.77%)	19,386 (34.37%)
Male, Black	1,786 (4.22%)	864 (11.73%)	324 (4.85%)	2,974 (5.27%)
Female, Black	2,332 (5.51%)	549 (7.45%)	316 (4.73%)	3,197 (5.67%)
Male, Hispanic	3,353 (7.92%)	592 (8.04%)	597 (8.93%)	4,542 (8.05%)
Female, Hispanic	3,168 (7.48%)	464 (6.30%)	461 (6.89%)	4,093 (7.26%)
Male or female, other	3,194 (7.54%)	697 (9.46%)	565 (8.45%)	4,456 (7.90%)
Age				
18-25	22,177 (52.37%)	6,209 (84.29%)	6,179 (92.40%)	34,565 (61.29%)
26-34	5,987 (14.14%)	633 (8.59%)	299 (4.47%)	6,919 (12.27%)
35-49	8,683 (20.51%)	441 (5.99%)	170 (2.54%)	9,294 (16.48%)
50-64	3,266 (7.71%)	82 (1.11%)	29 (0.43%)	3,377 (5.99%)
65+	2,230 (5.27%)	1 (0.01%)	10 (0.15%)	2,241 (3.97%)
Health				
Excellent	12,150 (28.70%)	1,800 (24.44%)	1,380 (20.64%)	15,330 (27.19%)
Very Good	17,341 (40.96%)	3,057 (41.51%)	2,703 (40.43%)	23,101 (40.97%)
Good	9,863 (23.30%)	1,938 (26.32%)	2,018 (30.18%)	13,819 (24.51%)
Fair/Poor	2,981 (7.04%)	569 (7.73%)	585 (8.75%)	4,135 (7.33%)
Marriage				
Married	16,297 (38.49%)	794 (10.78%)	539 (8.06%)	17,630 (31.26%)
Widowed/Divorced	4,070 (9.61%)	310 (4.21%)	176 (2.63%)	4,556 (8.08%)
Never Been Married	21,976 (51.90%)	6,262 (85.01%)	5,972 (89.31%)	34,210 (60.66%)
Poverty				
<100% of poverty	6,716 (16.28%)	1,915 (27.16%)	1,689 (26.55%)	17,630 (31.26%)
100-199% of poverty	8,906 (21.58%)	1,927 (27.33%)	1,659 (26.08%)	4,556 (8.08%)
>=200% of poverty	25,639 (62.14%)	3,208 (45.50%)	3,013 (47.37%)	34,210 (60.66%)
Employment				
Employed full time	21,843 (51.59%)	2,601 (35.31%)	2,183 (32.65%)	9,130 (16.19%)
Employed part time	8,684 (20.51%)	1,988 (26.99%)	1,845 (27.59%)	19,144 (33.95%)
Unemployed	3,229 (7.63%)	1,198 (16.26%)	1,117 (16.70%)	17,167 (30.44%)
Other	8,587 (20.28%)	1,579 (21.44%)	1,542 (23.06%)	10,955 (19.43%)

Alcohol only- group consisting of people who drank in the past year, but no illicit drugs; Marijuana only- group consisting of marijuana users, but no other illicit drugs; Other illicits- group consisting of those who used any illicit drug, regardless of whether or not they used alcohol and marijuana;

Table 1 Demographic Characteristics of Surveyed Drug Users (cont'd)

Variables	Alcohol only	Illicit Drugs		Total
		Marijuana Only	Other Illicits	
	N (Column %)	N (Column %)	N (Column %)	N (Column %)
Military Service				
Yes	2,804 (6.62%)	141 (1.91%)	104 (1.56%)	3,049 (5.41%)
No	39,531 (93.38%)	7,224 (98.09%)	6,583 (98.44%)	53,338 (94.59%)
Used Illicit Drug Other than Marijuana Prior to Age 18				
Yes	4,791 (11.31%)	2,435 (33.06%)	4,976 (74.41%)	12,202 (21.64%)
No	37,552 (88.69%)	4,931 (66.94%)	1,711 (25.59%)	44,194 (78.36%)
Education				
Less than high school	5,547 (13.10%)	1,793 (24.34%)	1,790 (26.77%)	9,130 (16.19%)
High school graduate	13,646 (32.23%)	2,821 (38.30%)	2,677 (40.03%)	19,144 (33.95%)
Some college	13,173 (31.11%)	2,094 (28.43%)	1,900 (28.41%)	17,167 (19.43%)
College graduate	9,977 (23.56%)	658 (8.93%)	320 (4.79%)	10,955 (19.43%)
Perceived Mental Health Need and Mental Health Treatment				
No perceived need; Did not receive treatment	28,403 (78.39%)	4,329 (67.71%)	3,258 (57.10%)	47,445 (84.49%)
No perceived need; Received Treatment	4,402 (12.15%)	1,078 (16.86%)	1,152 (20.19%)	5,049 (8.99%)
Perceived need; Received Treatment	1,579 (4.36%)	479 (7.49%)	567 (9.94%)	1,605 (2.86%)
Perceived need; Did not receive treatment	1,849 (5.10%)	507 (7.93%)	729 (12.78%)	2,053 (3.66%)
Past Year Mental Illness Category				
No Mental Illness	36,474 (86.43%)	6,055 (82.46%)	4,916 (74.38%)	47,445 (84.49%)
Mild Mental Illness	3,593 (8.51%)	684 (9.31%)	772 (11.68%)	5,049 (8.99%)
Moderate Mental Illness	931 (2.21%)	256 (3.49%)	418 (6.32%)	1,605 (3.66%)
Serious Mental Illness	1,202 (2.85%)	348 (4.74%)	503 (7.61%)	2,053 (3.66%)
WHODAS Range(0-8)				
[Mean ± Std. Dev.]	0.88 ± 1.83	1.23 ± 2.09	1.67 ± 2.37	1.04 ± 1.97
K6 Max Past Year Range(0-24)				
[Mean ± Std. Dev.]	5.31 ± 5.53	7.06 ± 6.24	8.68 ± 6.78	6.04 ± 5.93

Alcohol only- group consisting of people who drank in the past year, but no illicit drugs; Marijuana only- group consisting of marijuana users, but no other illicit drugs; Other illicits- group consisting of those who used any illicit drug, regardless of whether or not they used alcohol and marijuana; K6- Kessler Psychological Distress Score; WHODAS- World Health Organization Disability Assessment Schedule score;

Table 2. Past Year Frequency of Use

Category of Drug	Total Users	Mean (S.E.M.)	Q1	Median	Q3
Alcohol	69,637	87.62 (0.77)	12	51	119
Illicit Drugs					
Marijuana	18,150	112.24 (1.43)	5	51	206
Cocaine	2,312	31.85 (2.47)	2	5	30
Crack	250	63.73 (10.15)	3	23	102
Heroin	272	121.60 (12.13)	11	51	202
Hallucinogen	3,496	17.71 (1.13)	1	3	12
Inhalant	802	20.89 (2.51)	1	3	16
Nonmedical Use of Psychotherapeutics					
Pain Relievers	5,751	46.59 (1.39)	3	12	52
Oxycontin	996	45.52 (3.03)	2	10	51
Tranquilizer	2,356	43.50 (2.47)	3	12	51
Stimulant	1,565	46.78 (2.85)	3	12	52
Methamphetamine	313	80.27 (7.53)	5	36	107
Sedative	186	53.02 (6.88)	3	12	50

S.E.M.- Standard Error of Mean; Q1, Q3- Quartile one and three

Table 3 Drug-Specific Annual Frequency of Use Prediction Models Based on Drug Abuse Behaviors and Demographics

Variables *[Reference Group]*	Cocaine	Hallucinogens	Inhalants	Analgesics	Tranquilizers	Stimulants	Heroin
	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)
Drug Abuse Behaviors							
Setting a drug limit [No perceived need for limit]							
Successfully set a limit	1.341 (0.95-1.90)	0.790[a] (0.64-0.98)	1.312 (0.88-1.95)	1.162 (0.98-1.38)	-	-	-
Unsuccessfully set a limit	1.796 (0.92-3.50)	3.978[a] (1.23-12.89)	16.097[b] (2.80-92.72)	2.583[c] (1.76-3.79)	-	-	-
Curtailment of drug use [No perceived need for cut]							
Successfully cut down on drug	1.000 (0.72-1.40)	-	-	-	0.766[a] (0.59-0.99)	-	0.644 (0.32-1.29)
Unsuccessfully cut down on drug	2.272[a] (1.07-4.81)	-	-	-	2.328 (0.83-6.56)	-	3.081[a] (1.16-8.16)
Withdrawal symptoms in past year [No withdrawal symptoms]							
Felt 2+ non-simultaneous symptoms	0.505 (0.17-1.54)	-	-	1.452[a] (1.04-2.03)	-	13.469[b] (2.84-63.98)	-
Felt 2+ simultaneous symptoms	1.479 (0.84-2.60)	-	-	1.800[c] (1.35-2.39)	-	1.395 (0.79-2.47)	-
Emotional Problems Due to Drug Use [No emotional problems]							
Had emotional problems while using a drug and discontinued use	0.897 (0.53-1.53)	1.313 (0.79-2.18)	0.240 (0.06-1.02)	-	4.338[c] (1.96-9.61)	-	-
Had emotional problems while using a drug and continued use	1.772 (0.98-3.20)	1.660 (0.88-3.14)	9.513[a] (1.22-74.17)	-	2.771[a] (1.24-6.19)	-	-
Personal Problems Due to Drug Use [No personal problems]							
Had personal social problems while using a drug and discontinued use	-	1.296 (0.50-3.35)	-	0.721 (0.43-1.20)	-	0.271[a] (0.08-0.92)	-
Had personal social problems while using a drug and continued use	-	3.477[a] (1.33-9.12)	-	1.709[a] (1.08-2.71)	-	1.467 (0.66-3.27)	-

This is a compilation of stepwise ordinal logistic regressions for 7 drugs. Selection of stay and entry=0.2. If a variable under a drug is marked with a dash (-), then it was not selected to fit that drugs model. Each variable on the left is accompanied by the *[Reference Group]* enclosed in the brackets. P-value: a:p<.05; b:p<.01; c:p<.001

Table 3 Drug-Specific Annual Frequency of Use Prediction Model Based on Drug Abuse Behaviors and Demographics (cont'd)

Variables *[Reference Group]*	Cocaine	Hallucinogens	Inhalants	Analgesics	Tranquilizers	Stimulants	Heroin
	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)
Increased Drug Tolerance [No increased tolerance]							
Needed more drugs to get the same effect, otherwise less effect	2.586[c] (1.77-3.78)	2.772[c] (1.98-3.89)	-	3.051[c] (2.52-3.69)	2.603[c] (1.77-3.82)	3.150[c] (2.07-4.79)	4.256[c] (2.00-9.07)
Drug Induced Social Interference [No Problem]							
Drug Caused Serious Problem at home, school or work	-	-	3.690[a] (1.12-12.21)	-	-	-	2.308 (0.90-5.91)
Endangering Drug Behavior [No Dangerous Activity]							
Drug use combined with dangerous activity	-	1.927b (1.19-3.13)	-	1.316 (0.93-1.86)	-	1.646 (0.81-3.34)	-
Drug Induced Decrease in Daily Activity [No Decrease in Activity]							
Drug use resulted in less activity	-	-	-	-	1.976[a] (1.05-3.71)	-	2.282 (0.91-5.73)
Drug Related Law Illegal Activity [No Law Trouble]							
Drug Caused Trouble with Law	1.565 (0.96-2.55)	-	-	1.867 (0.99-3.51)	-		0.510 (0.19-1.34)
Paired Drug Use [Below Median User]							
Above Median Alcohol User	1.571[b] (1.17-2.12)	1.583[c] (1.32-1.91)	1.705[b] (1.17-2.49)	1.483[c] (1.30-1.69)	1.768[c] (1.43-2.19)	1.447[a] (1.09-1.93)	-
Above Median Marijuana User	1.499[b] (1.11-2.03)	1.675[c] (1.37-2.06)	-	1.644[c] (1.43-1.88)	1.533[c] (1.24-1.90)	1.428[b] (1.09-1.87)	-
Demographics							
Age [Younger age groups]							
Older age groups	1.402 (1.00-1.97)	-	1.711 (0.97-3.03)	1.156 (0.99-1.35)	1.497[b] (1.12-2.00)	1.567 (0.99-2.48)	-

This is a compilation of stepwise ordinal logistic regressions for 7 drugs. Selection of stay and entry=0.2. If a variable under a drug is marked with a dash (-), then it was not selected to fit that drugs model. Each variable on the left is accompanied by the *[Reference Group]* enclosed in the brackets. P-value: a:p<.05; b:p<.01; c:p<.001

Table 3 Drug-Specific Annual Frequency of Use Prediction Model Based on Drug Abuse Behaviors and Demographics (cont'd)

Variables *[Reference Group]*	Cocaine	Hallucinogens	Inhalants	Analgesics	Tranquilizers	Stimulants	Heroin
	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)
Race/Sex [White Male]							
Female, White	0.540[c] (0.37-0.78)	0.901 (0.72-1.13)	1.110 (0.72-1.71)	1.119 (0.95-1.32)	-	-	-
Male, Black	1.771 (0.65-4.86)	0.908 (0.70-1.17)	1.078 (0.34-3.44)	1.092 (0.93-1.28)	-	-	-
Female, Black	8.837[b] (1.87-41.72)	4.742[c] (2.86-7.86)	4.714[b] (1.59-13.94)	2.009[c] (1.47-2.74)	-	-	-
Male, Hispanic	1.257 (0.82-1.92)	1.688[b] (1.23-2.32)	2.986[c] (1.60-5.58)	1.484[b] (1.16-1.90)	-	-	-
Female, Hispanic	0.825 (0.50-1.38)	1.553[a] (1.06-2.27)	0.908 (0.70-1.17)	1.285 (0.98-1.69)	-	-	-
Male or female, other races	0.957 (0.56-1.63)	1.213 (0.87-1.68)	1.695 (0.93-3.10)	1.089 (0.85-1.40)	-	-	-
Health [Better self-reported health condition]							
Worse self-reported health condition	1.218[b] (1.05-1.41)	-	-	1.147[c] (1.07-1.24)	1.191[b] (1.06-1.35)	-	-
Marriage Status [Single, Never Married]							
Married	-	-	-	1.266[a] (1.00-1.60)	-	1.545 (0.80-3.00)	3.377 (0.63-18.20)
Widowed, Divorced or Separated	-	-	-	1.188 (0.79-1.80)	-	2.545 (0.74-8.78)	13.197[a] (1.18-147.57)
Poverty Level [>200% of federal poverty threshold]							
<100% of federal poverty threshold	-	1.107 (0.89-1.37)	-	1.092 (0.93-1.28)	1.165 (0.90-1.51)	1.223 (0.89-1.67)	-
100-199% of federal poverty threshold	-	1.369[b] (1.11-1.69)	-	1.187[a] (1.02-1.39)	1.522[c] (1.19-1.95)	1.310 (0.88-1.96)	-

This is a compilation of stepwise ordinal logistic regressions for 7 drugs. Selection of stay and entry=0.2. If a variable under a drug is marked with a dash (-), then it was not selected to fit that drugs model. Each variable on the left is accompanied by the *[Reference Group]* enclosed in the brackets. P-value: a:p<.05; b:p<.01; c:p<.001

Table 3 Drug-Specific Annual Frequency of Use Prediction Model Based on Drug Abuse Behaviors and Demographics (cont'd)

Variables *[Reference Group]*	Cocaine	Hallucinogens	Inhalants	Analgesics	Tranquilizers	Stimulants	Heroin
	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)
Employment Status [Full-time Employment]							
Employed part time	0.912 (0.67-1.24)	0.769[a] (0.62-0.96)	0.703 (0.46-1.08)	0.791[b] (0.67-0.93)	-	0.619[b] (0.44-0.86)	-
Unemployed	0.540[c] (0.37-0.78)	0.784 (0.61-1.01)	0.525[b] (0.32-0.85)	0.963 (0.79-1.17)	-	1.111 (0.72-1.72)	-
Other	0.603 (0.31-1.19)	0.908 (0.70-1.17)	0.737 (0.23-2.33)	0.916 (0.76-1.10)	-	1.007 (0.69-1.47)	-
Education Level [Never completed high school]							
High school graduate	0.798 (0.63-1.01)	0.781[a] (0.63-0.97)	-	0.861 (0.73-1.01)	1.092 (0.93-1.28)	0.858 (0.61-1.21)	-
Some college	0.547[c] (0.42-0.71)	0.637[c] (0.50-0.81)	-	0.621[c] (0.52-0.75)	0.751 (0.56-1.01)	0.659[a] (0.46-0.95)	-
College graduate	0.484[c] (0.33-0.72)	0.517[a] (0.31-0.87)	-	0.637[b] (0.46-0.89)	0.406[b] (0.24-0.70)	0.633 (0.36-1.12)	-
Perceived Mental Health Need and Treatment [No mental health need nor treatment]							
No perceived need; Received Treatment	-	0.841 (0.64-1.10)	-	0.886 (0.73-1.08)	1.428[a] (1.07-1.91)	1.310 (0.88-1.96)	-
Perceived need; Received Treatment	-	1.121 (0.77-1.64)	-	0.789 (0.60-1.03)	1.020 (0.72-1.45)	1.445 (0.87-2.40)	-
Perceived need; Did not receive Treatment	-	0.704[a] (0.51-0.98)	-	0.745[a] (0.59-0.95)	0.896 (0.64-1.25)	0.838 (0.52-1.34)	-
Mental Illness Category [Lower Mental Illness Severity]							
Higher Mental Illness Severity	-	-	-	-	-	1.158[a] (1.01-1.33)	-
Age of First Illicit Drug Use [First use after 18]							
First use of Illicit prior to 18?	-	2.095[c] (1.74-2.52)	2.416[c] (1.65-3.53)	2.390[c] (2.08-2.75)	2.684[c] (2.16-3.34)	1.934[c] (1.45-2.58)	-

This is a compilation of stepwise ordinal logistic regressions for 7 drugs. Selection of stay and entry=0.2. If a variable under a drug is marked with a dash (-), then it was not selected to fit that drugs model. Each variable on the left is accompanied by the *[Reference Group]* enclosed in the brackets. P-value: a:p<.05; b:p<.01; c:p<.001

Table 3 Drug-Specific Annual Frequency of Use Prediction Model Based on Drug Abuse Behaviors and Demographics (cont'd)

Variables *[Reference Group]*	Cocaine	Hallucinogens	Inhalants	Analgesics	Tranquilizers	Stimulants	Heroin
	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)
Military Service [Never in Military]							
History of Military Service	-	-	-	-	-	0.189[a] (0.05-0.78)	-
Perceived Risk of Use [Lower Perceived Risk]							
Higher Perceived Risk	0.750[c] (0.65-0.86)	0.926 (0.85-1.01)	-	-	-	-	0.795 (0.59-1.07)

This is a compilation of stepwise ordinal logistic regressions for 7 drugs. Selection of stay and entry=0.2. If a variable under a drug is marked with a dash (-), then it was not selected to fit that drugs model. Each variable on the left is accompanied by the *[Reference Group]* enclosed in the brackets. P-value: a:p<.05; b:p<.01; c:p<.001

Table 4 Drug Type Prediction Model Based on Drug Abuse Behavior and Demographic Variables

Variables *[Reference Group]*	Cocaine O.R. (95% C.I.)	Hallucinogens O.R. (95% C.I.)	Inhalants O.R. (95% C.I.)	Analgesics O.R. (95% C.I.)	Tranquilizers O.R. (95% C.I.)	Stimulants O.R. (95% C.I.)	MultiDrug O.R. (95% C.I.)
Drug Abuse Behaviors							
Setting a drug limit [No perceived need for limit]							
Successfully set a limit	1.397[a] (1.01-1.94)	1.184 (0.95-1.48)	0.680 (0.40-1.15)	1.691[c] (1.39-2.06)	1.028 (0.70-1.51)	0.655 (0.41-1.04)	1.577[c] (1.30-1.91)
Unsuccessfully set a limit	2.829[b] (1.47-5.44)	0.939 (0.46-1.91)	2.345 (0.84-6.56)	2.354[b] (1.40-3.97)	0.606 (0.21-1.78)	1.008 (0.40-2.52)	3.210[c] (2.01-5.12)
Curtailment of drug use [No perceived need for cut]							
Successfully cut down on drug	3.596[c] (2.60-4.97)	1.453[c] (1.17-1.81)	2.706[c] (1.72-4.26)	0.166[c] (0.13-0.22)	1.496[a] (1.03-2.18)	1.594[a] (1.05-2.42)	1.203 (0.99-1.46)
Unsuccessfully cut down on drug	13.428[c] (6.09-29.60)	2.577[a] (1.10-6.04)	5.824[b] (1.72-19.69)	0.343[a] (0.14-0.87)	4.427[b] (1.62-12.09)	3.646[a] (1.23-10.79)	2.667[b] (1.37-5.18)
Withdrawal symptoms in past year [No withdrawal symptoms]							
Felt 2+ non-simultaneous symptoms	1.720 (0.73-4.07)	0.710 (0.32-1.57)	1.280 (0.29-5.61)	4.476[c] (2.73-7.34)	0.909 (0.27-3.10)	1.943 (0.64-5.90)	3.087[c] (1.88-5.07)
Felt 2+ simultaneous symptoms	1.682 (0.97-2.91)	0.257[c] (0.13-0.51)	0.670 (0.19-2.42)	2.315[c] (1.57-3.41)	0.423 (0.18-1.02)	1.997 (1.00-4.00)	1.747[b] (1.22-2.51)
Emotional Problems Due to Drug Use [No emotional problems]							
Had emotional problems while using a drug and discontinued use	1.007 (0.57-1.79)	1.679[a] (1.10-2.57)	0.886 (0.30-2.65)	1.216 (0.78-1.90)	1.221 (0.60-2.49)	2.592[b] (1.32-5.08)	1.156 (0.80-1.67)
Had emotional problems while using a drug and continued use	1.338 (0.70-2.55)	1.884[a] (1.10-3.23)	0.517 (0.10-2.59)	1.365 (0.85-2.20)	1.483 (0.67-3.30)	4.160[c] (2.01-8.60)	2.053[c] (1.36-3.10)
Increased Drug Tolerance [No increased tolerance]							
Needed more drugs to get the same effect, otherwise less effect	1.556[a] (1.06-2.28)	1.921[c] (1.46-2.52)	1.468 (0.80-2.69)	3.634[c] (2.88-4.58)	2.899[c] (1.94-4.34)	1.954[b] (1.21-3.16)	5.687[c] (4.61-7.01)

This is a multinomial logistic regression that separates drug users into 7 "heavy use" drug groups- A user is categorized into one of 6 different drugs if they are over median annual frequency for that drug and not over median in any other drug. For those over median in more than one drug they fall into the one multidrug category. Each variable on the left is accompanied by the *[Reference Group]* enclosed in the brackets. P-value: a:p<.05; b:p<.01; c:p<.001

Table 4 Drug Type Prediction Model Based on Drug Abuse Behavior and Demographic Variables (cont'd)

Variables *[Reference Group]*	Cocaine	Hallucinogens	Inhalants	Analgesics	Tranquilizers	Stimulants	MultiDrug
	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)	O.R. (95% C.I.)
Drug Induced Social Interference [No Problem]							
Drug Caused Serious Problem at home, school or work	1.918[a] (1.08-3.41)	1.508 (0.90-2.53)	0.893 (0.24-3.29)	0.857 (0.52-1.40)	1.461 (0.67-3.18)	0.604 (0.24-1.50)	1.450 (0.96-2.19)
Endangering Drug Behavior [No Dangerous Activity]							
Drug use combined with dangerous activity	1.735[a] (1.04-2.90)	1.422 (0.91-2.21)	0.665 (0.19-2.29)	1.435 (0.96-2.14)	1.395 (0.71-2.75)	1.811 (0.92-3.55)	2.000[c] (1.42-2.81)
Paired Drug Use [Below Median User]							
Above Median Alcohol User	1.190[a] (1.03-1.38)	1.021 (0.93-1.12)	1.026 (0.83-1.27)	1.093[a] (1.01-1.19)	1.232[a] (1.05-1.45)	0.911 (0.75-1.10)	1.142[b] (1.05-1.24)
Above Median Marijuana User	1.900[c] (1.45-2.49)	4.609[c] (3.84-5.53)	0.568[b] (0.38-0.85)	0.917 (0.79-1.07)	1.365[a] (1.02-1.83)	1.030 (0.75-1.42)	4.010[c] (3.43-4.69)
Demographics							
Race/Sex [White Male]							
Female, White	1.386 (0.97-1.97)	0.776[a] (0.63-0.96)	0.652 (0.40-1.07)	1.018 (0.84-1.23)	1.398 (0.99-1.97)	1.514[a] (1.06-2.17)	1.126 (0.94-1.34)
Male, Black	1.761 (0.88-3.52)	1.861[b] (1.27-2.72)	1.690 (0.69-4.13)	2.448[c] (1.74-3.45)	1.559 (0.74-3.27)	0.651 (0.20-2.14)	1.279 (0.86-1.89)
Female, Black	2.356[a] (1.12-4.94)	3.150[c] (2.12-4.68)	1.971 (0.84-4.63)	3.319[c] (2.36-4.68)	1.651 (0.75-3.61)	0.514 (0.12-2.17)	1.123 (0.71-1.79)
Male, Hispanic	4.152[c] (2.83-6.09)	1.361[a] (1.01-1.84)	1.620 (0.89-2.94)	1.477[b] (1.13-1.93)	0.549 (0.26-1.17)	0.979 (0.50-1.91)	1.098 (0.83-1.45)
Female, Hispanic	2.574[c] (1.53-4.34)	1.989[c] (1.43-2.77)	0.997 (0.45-2.20)	1.804[c] (1.35-2.42)	1.200 (0.64-2.25)	1.494 (0.78-2.88)	1.248 (0.90-1.73)
Male or female, other races	1.609 (0.97-2.68)	1.190 (0.88-1.60)	1.338 (0.72-2.47)	1.208 (0.92-1.59)	1.287 (0.76-2.17)	0.791 (0.40-1.57)	0.966 (0.73-1.28)

This is a multinomial logistic regression that separates drug users into 7 "heavy use" drug groups- A user is categorized into one of 6 different drugs if they are over median annual frequency for that drug and not over median in any other drug. For those over median in more than one drug they fall into the one multidrug category. Each variable on the left is accompanied by the *[Reference Group]* enclosed in the brackets. P-value: a:p<.05; b:p<.01; c:p<.001

Table 4 Drug Type Prediction Model Based on Drug Abuse Behavior and Demographic Variables (cont'd)

Variables *[Reference Group]*	Cocaine O.R. (95% C.I.)	Hallucinogens O.R. (95% C.I.)	Inhalants O.R. (95% C.I.)	Analgesics O.R. (95% C.I.)	Tranquilizers O.R. (95% C.I.)	Stimulants O.R. (95% C.I.)	MultiDrug O.R. (95% C.I.)
Health [Better self-reported health condition]							
Worse self-reported health condition	1.190[a] (1.03-1.38)	1.021 (0.93-1.12)	1.026 (0.83-1.27)	1.093[a] (1.01-1.19)	1.232[a] (1.05-1.45)	0.911 (0.75-1.10)	1.142[b] (1.05-1.24)
Age							
Older vs younger age groups	2.071[c] (1.65-2.61)	0.794 (0.59-1.07)	1.288 (0.87-1.90)	1.217[a] (1.04-1.43)	1.196 (0.87-1.64)	1.261 (0.86-1.85)	0.868 (0.70-1.07)
Marriage Status [Single, Never Married]							
Married	0.775 (0.48-1.27)	0.462[b] (0.29-0.74)	0.565 (0.26-1.23)	1.363[a] (1.06-1.75)	1.408 (0.87-2.28)	0.671 (0.34-1.31)	0.990 (0.74-1.33)
Widowed, Divorced or Separated	1.628 (0.83-3.20)	1.142 (0.60-2.17)	1.528 (0.54-4.30)	1.647[a] (1.06-2.57)	1.138 (0.46-2.83)	0.486 (0.11-2.14)	1.040 (0.62-1.75)
Poverty Level [>200% of federal poverty threshold]							
<100% of federal poverty threshold	0.953 (0.69-1.32)	0.983 (0.81-1.20)	1.261 (0.80-1.99)	1.341[b] (1.12-1.61)	1.232 (0.86-1.76)	1.428 (0.98-2.08)	1.024 (0.86-1.22)
100-199% of federal poverty threshold	0.994 (0.72-1.37)	1.187 (0.97-1.45)	1.430 (0.92-2.23)	1.361[c] (1.14-1.63)	1.591[b] (1.13-2.24)	1.299 (0.88-1.92)	1.234[a] (1.03-1.47)
Employment Status [Full-time Employment]							
Employed part time	0.499[c] (0.35-0.71)	0.944 (0.77-1.16)	0.685 (0.41-1.13)	0.741[b] (0.61-0.90)	1.019 (0.70-1.49)	1.051 (0.71-1.56)	0.730[c] (0.61-0.88)
Unemployed	0.654[a] (0.45-0.96)	1.023 (0.80-1.31)	0.887 (0.50-1.56)	0.872 (0.70-1.09)	1.570[a] (1.04-2.38)	0.935 (0.55-1.58)	1.018 (0.82-1.26)
Other	0.582[b] (0.40-0.85)	0.992 (0.78-1.26)	1.162 (0.72-1.89)	0.785[a] (0.64-0.97)	1.045 (0.69-1.59)	1.208 (0.77-1.89)	0.894 (0.73-1.10)
Age of First Illicit Drug Use [First use prior to 18]							
First use of Illicit drug after 18?	0.663[b] (0.50-0.88)	0.838[a] (0.71-0.99)	0.452[c] (0.29-0.70)	0.544[c] (0.46-0.64)	0.694[a] (0.51-0.95)	0.748 (0.54-1.04)	0.333[c] (0.28-0.40)

This is a multinomial logistic regression that separates drug users into 7 "heavy use" drug groups- A user is categorized into one of 6 different drugs if they are over median annual frequency for that drug and not over median in any other drug. For those over median in more than one drug they fall into the one multidrug category. Each variable on the left is accompanied by the *[Reference Group]* enclosed in the brackets. P-value: a:p<.05; b:p<.01; c:p<.001

Table 4 Drug Type Prediction Model Based on Drug Abuse Behavior and Demographic Variables (cont'd)

Variables *[Reference Group]*	Cocaine O.R. (95% C.I.)	Hallucinogens O.R. (95% C.I.)	Inhalants O.R. (95% C.I.)	Analgesics O.R. (95% C.I.)	Tranquilizers O.R. (95% C.I.)	Stimulants O.R. (95% C.I.)	MultiDrug O.R. (95% C.I.)
Education Level [Never completed high school]							
High school graduate	0.749 (0.54-1.03)	0.799[a] (0.64-1.00)	0.692 (0.44-1.08)	0.756[b] (0.63-0.91)	0.925 (0.64-1.33)	0.767 (0.48-1.22)	0.857 (0.71-1.03)
Some college	0.546[b] (0.38-0.79)	0.909 (0.72-1.14)	0.572[a] (0.35-0.95)	0.461[c] (0.37-0.57)	0.692 (0.46-1.04)	0.959 (0.61-1.52)	0.673[c] (0.55-0.83)
College graduate	0.538[a] (0.31-0.95)	0.549[b] (0.37-0.81)	0.382[a] (0.15-0.95)	0.324[c] (0.23-0.46)	0.521 (0.26-1.03)	1.431 (0.80-2.57)	0.398[c] (0.28-0.57)
Perceived Mental Health Need and Treatment [No mental health need nor treatment]							
No perceived need; Received Treatment	0.703 (0.45-1.10)	0.995 (0.77-1.29)	0.841 (0.45-1.58)	0.770[a] (0.61-0.98)	1.443 (0.96-2.17)	0.718 (0.44-1.18)	0.997 (0.80-1.25)
Perceived need; Received Treatment	1.006 (0.59-1.71)	0.751 (0.50-1.12)	1.406 (0.68-2.93)	0.598[b] (0.42-0.85)	2.407[c] (1.53-3.78)	0.746 (0.39-1.43)	1.002 (0.74-1.36)
Perceived need; Did not receive Treatment	0.520[a] (0.29-0.94)	0.649[a] (0.46-0.92)	1.418 (0.75-2.69)	0.580[c] (0.43-0.79)	1.224 (0.74-2.03)	0.574 (0.30-1.11)	0.897 (0.68-1.18)

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FIGURE 2.
HEAVIER DRUG USE DIFFERENCES ACROSS RACES VS WHITE MALES

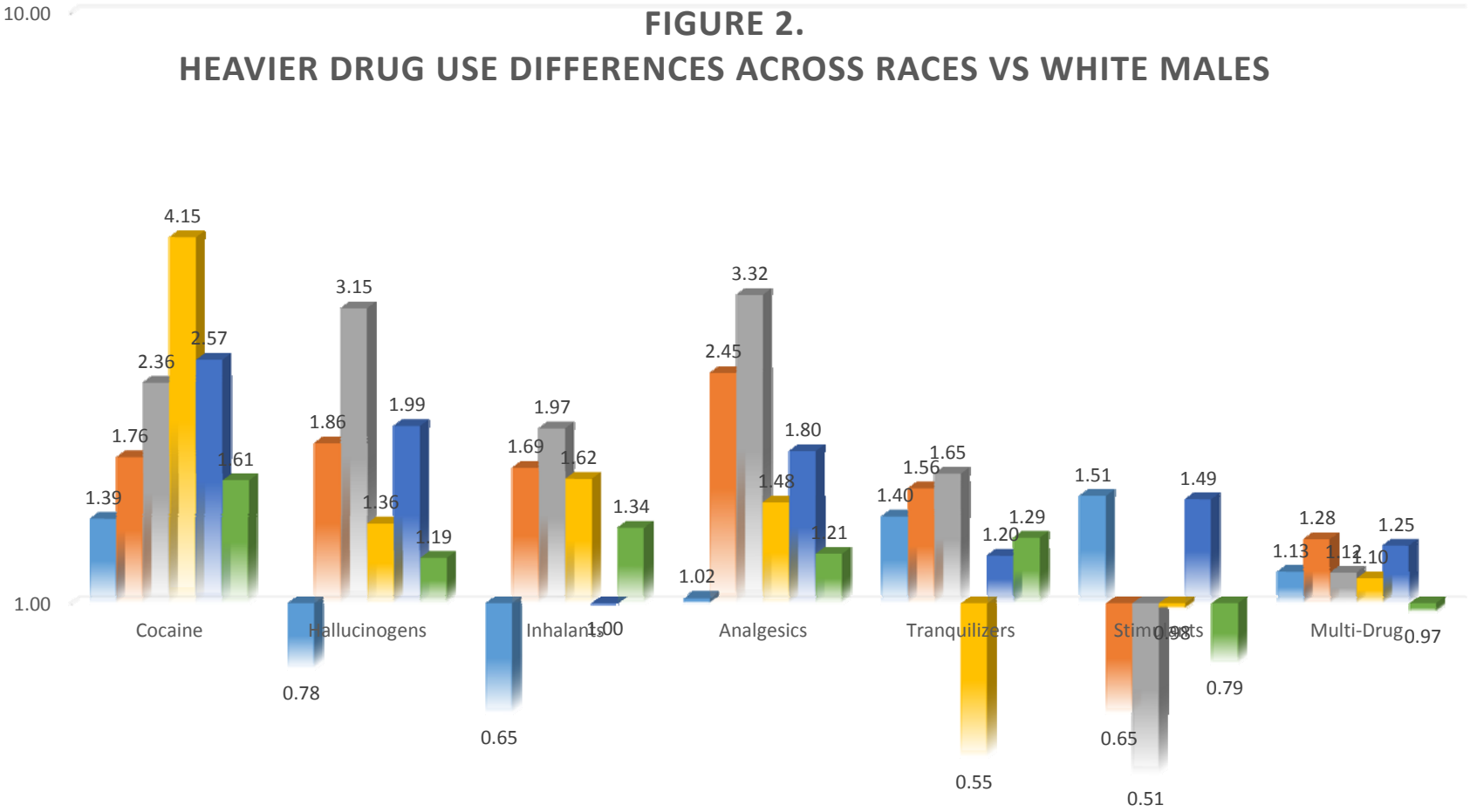
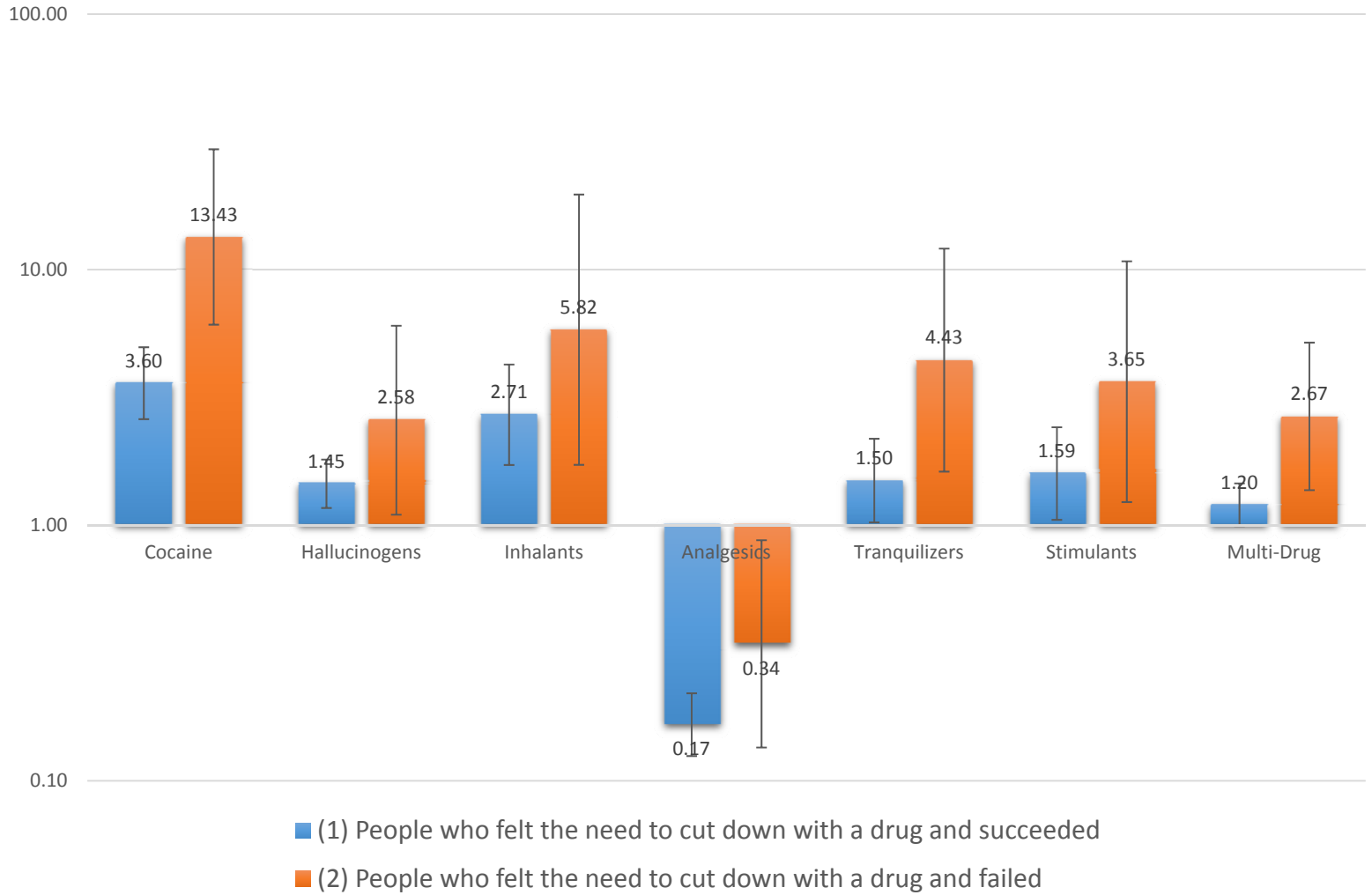


Figure 3. Failure and Success in Cutting Down Drug Use



Discussion

It is clear that there is lots of information to be gained from these kinds of analysis. While the premise of this study is chiefly exploratory, the odds ratios derived from this study still hold some weight. Chiefly where there are stark and very significant shifts in the odds ratio when looking at different drug groups, as in figure 2 and figure 3, we begin to flesh out the true nature of the habits of each drug in hopes to be able to better target for prevention as well as treatment and recovery.

For example, while we see that the amount of tolerance effects have a very positive influence on the odds of whether a drug user is in a higher quartile, there may need some deeper analysis into this statement. Needing higher quantity to experience the same effect does not just imply an increase of tolerance but also implies that the drug user intended to explore the drug enough to pursue that same level of euphoria in the past. Perhaps people may experience increase tolerance to the drug that they are using, but when answering this question it may more be more highly influenced by the people who wish to “chase the high.” In many studies regarding abusers of the harder illicit drugs, like cocaine, heroin, and crack, users spend a lot of time attempting to reach that same high as their original high. Although this is more stereotypical for stimulants, like cocaine, crack and methamphetamines, many drug users fall into the cyclical habit of increasing their drug dosage to get the same high even as their body chemistry slowly changes to not allow the same high to be reached.

Addiction Awareness and Societal Understanding

In figure 3 we see the graphical summation of the multinomial logistic regression for the differences in the drug abuse behavior of the self-realization of the need to cut down on drugs across each specific drug group.

This figure is interesting in that it illuminates something fundamental about part of the drug abuse cycle. Either through health education or through first hand experiences, the drug user comes to understand the harms of drug use to his body, so attempting to cut down on the drug they are currently using is a critical step out of the drug abuse cycle. As with most illicit drugs, figure 3 shows that if the user fails to cut down on their drug use, it can often be caused by the fact that they are quite heavy users already. The social pressure, as well as the physiological dependence on the drug, both positive addiction and withdrawal aversion, can cause the user to return to his old ways very easily. In this figure we see that cocaine and analgesic groups stand out the most. If a user fails to cut down on the drug, there are very high odds that they may be failing because they are attempting to quit cocaine, which is notoriously addictive. The user fails to quit, despite knowing the damage it can cause, and return to square one and try to quit again.

In contrast, the heavy analgesic group has an odds ratio quite contrary to odds ratio of cocaine. At first glance you might assume that given the opposite direction, it may be said that there are not many people who are trying to cut down on the drug because it is easy and can be done without consequence. However, it also may be the case that there are not many heavy analgesic users trying to quit because either they do not know the dangers of heavy analgesic drug use, or they fear the symptoms of the consequential analgesic withdrawal,

which is very well documented in table 3 and table 4. This study alone cannot possibly prove this unique aspect of analgesics, but it deserves an in depth look as to its causes. If type of problem can be easily addressed by education and outreach, it should become a priority.

Racial Profiles of Heavy Drug Use

In figure 2 we see the graphical summation of the multinomial logistic regression for the differences in sex-race across each drug group. This model which adjusts for poverty level, education, self-reported health status, marriage status, employment and mental health status, still provides a robust odds ratio that exemplifies the blatant differences between the sex-race and category of drug. Blacks and Hispanic females have significantly higher odds to be heavy users of hallucinogens and analgesics, in contrast to whites. Furthermore there is a association with heavy analgesic use and poverty, as well as with hallucinogens and marijuana, which has been mentioned in Table 1 and has been well documented in studies that blacks have a strong tendency towards marijuana (Terry McElrath et al, 2010). These cultural and ethnic differences between specific drug types need further study. Many studies, including those directly established by NSDUH, try to understand racial differences in overall drug use, but fail to realize the societal differences between the drugs themselves. By creating a more in-depth understanding of these differences, targeted programs for ethnic minorities can become much more effective.

Weight

In attempts to have the most accurate data about drug use of each of the different sectors and populations around the country, the Substance Abuse and Mental Health Services Administration accumulated by sampling stratifying the population of the United States at the

state level and further into the subpopulations within the states. The Substance Abuse and Mental Health Services Administration modeled their stratification sampling in their weights which were included in each of the datasets provided. Further reconstructions of the weights were included in the 2009 data set post-publication that took advantage of the 2010 decennial United States census data, instead of the 2000 census data, which was used for stratification and weight data prior.

In 2008, the NSDUH aimed to introduce a new social disability survey into the annual survey, but they wanted to know which of two possible surveys would give the best results within their own survey. Thus, in the 2008 survey SAMHSA randomly split the aged 18 and over sampled population in half and had half of the surveyed population take the Social Disability Schedule formed and approved by the World Health Organization, World Health Organization Disability Assessment Schedule, WHODAS, while the other half of the sampled population took the Sheehan Disability Scale with the rest of their NSDUH. Thus to accommodate the slight change of the survey during this year, the SAMHSA also made separate weights appropriate for each half of the population that took either Disability Assessment Schedule. In my analysis, I only included the half of the population who took the WHODAS along with their NSDUH and thus used the distinct weighting variable that went along with the population half that took the WHODAS that year.

Lastly, the weighting variable SAMHSA included in each of the datasets was unique to each of the individual years to give the best estimate of the statistics of the population of the United States in that given year. To increase the number of eligible drug users in my population, I decided to combine the previous four years of data, NSDUH 2008-2011.

However, the weighting variable, which is the same in all the datasets across these four years does not accurately depict the population. Thus in order to accurately predict the population data over four years, each of the weight variables for each of the four surveys had to be divided by each additional year that was included, which in my case meant that the weights had to be divided by four.

Accounting for Survey Data Stratification Models During Analysis

When given complex stratification and weighting to a sampled population, it is not sufficient to simply perform all your statistical analyses on the sample population and still expect to have data representative of your population. As shown in this paper by David L. Cassell, while using regular statistical analyses in SAS, like proc means or logistic, the actual estimate from your data given the stratification may be much different. Thus, when SAMHSA used the NSDUH they would use SUDAAN, in conjunction with other elementary procedures, to obtain data estimates true to the Stratification Models used. Furthermore, when combining multi-year sampling data, SAMHSA also used SUDAAN or a statistical modeling extraction program similar to SUDAAN, to obtain proper estimates for multi-year data.

Unfortunately, due the limited resources at my disposal during this project, I was unable to obtain a Statistical Software package like SUDAAN for my analysis. Fortunately, however, SAS recently developed a couple of new procedures to properly analyze data with complex stratification modeling. Three procedures, proc surveymeans, proc surveyreg, and proc surveylogistic, are the statistical analogs of a means analysis, linear regression and logistic regression for survey data, and serve as the three basic survey procedures to supplant those without the additional resources for a premium statistical software package like SUDAAN.

In the analysis for this study we used proc surveymeans and proc surveylogistic in conjunction with the weight and stratum data provided by SAMHSA for each dataset to accurately summarize and describe the characteristics and regression patterns of the population. These survey procedures were used only to make approximations about the population which included finding the drug use quartiles as well as using to find the survey logistic regression trends.

2005-2009 consisted in 50% overlap in the second stage area segments of the stratification. This was designed so that the year to year data analysis would have more accurate estimations than from without it, which would cause an expected positive correlation from inevitable resulting overlapping sampling. 2010 and 2011 were extensions of the 2005-2009 model.

Limitations

Application of Cross-Sectional Data

Survey data, while being amongst the easiest types of data to ascertain from a population, has a very limited scope of use. Despite using logistic modeling techniques, at the very most we can find strong associations between behaviors and drug use groups; the information of causality is lost from the very start of data acquisition.

Limited Drug Use Data

With an intense adherence to the principles of population stratification, it is nearly impossible to obtain a proper estimate for some of the more rarely used drugs, like heroin and crack cocaine. In this study we combined the data from certain drugs, with other larger encompassing drug groups. While their effects may be quite similar to the encompassing drug group, it can be argued that the associated behavior for each drug can be quite different due to

Population Stratification and Weighting Techniques

As it was both economically and logistically unfeasible to take an annual census with all this specific type of information, SAMHSA had to take a stratified random sample of the population. Due to the limitations of household data, it was also unfeasible for SAMHSA to have access to institutionalized populations, including those in mental, administrative and correctional institutions. SAMHSA argues that the NSDUH still produces an accurate estimate of drug use in America despite these limitations because they believe it is difficult for institutionalized populations to obtain and thus use drugs, and thus are safe from not being included in the overall estimate. While their argument holds some logical validity, it

can be argued that perhaps some of the institutionalized population, prior to being institutionalized, were some of the largest drug users of the population and were arrested or otherwise institutionalized for their involvement with illicit drug use and/or distribution.

Annual Survey Data

As with all other surveys, this data at most provides a cross section of drug use behavior and drug use profiles across a four year period. This estimation of US population data, even ignoring the potential in adequacies of the stratification and weighting methods, still at best only show a snap shot of drug user characteristics, and will be unable to extract causality from data; at most we find meaningful associations, but without causality it will be harder to use this information as a predictive model for drug use and drug use associated behavior.

A $30 cash payment was given to give as a reward to each respondent that completed the full interview. In years past, prior to 2002, no reward was included. SAMHSA conducted a study subsequent trials to see if a reward was necessary to improve the response outcome, and if it was successful, at what amount would give the greatest response outcome while staying within the confines of a their proposed budget. Their research showed that there was a marked improvement of response outcome if they included a reward, and thus, SAMHSA included a respectable $30 reward with the completion of their survey to assure the best outcome of their study.

Conclusion

This study shows that targeted anti-drug campaigns for young people will remain critical to prevention and intervention. Furthermore, an aim at minority communities will help alleviate the pressures of harder illicit drugs. Providing recovery and educational resources to the minority population may be another important step against illicit drug use and trade. An assessment for the education for analgesic drug abuse should be carried out. Further study into racial and ethnic differences is needed.

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