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Socioeconomic Factors and Illicit Drug Demand

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Socioeconomic Factors and Illicit Drug Demand

Abstract

How do we help to control the social dilemmas that are results of drug abuse? By investigating and better understanding the relationship between drug demand and socioeconomic status, much can be done to improve illicit drug control and regulation. This paper examines the relationship between socioeconomic status and demand for illicit drugs.

Socioeconomic Factors and Illicit Drug Demand

Elizabeth Taylor

I. Introduction

“Annually, millions of people are arrested for driving under the influence of alcohol or illicit drugs and other offenses related to alcohol and drug use. The safety of many neighborhoods—and the people living and working in them—is threatened by the violence associated with drug sales (Schneider Institute, 2001).” Over \$414 billion is estimated to be the economic cost of substance abuse yearly, with drug use constituting \$109.9 billion. The economic cost includes productivity loss, healthcare costs, and criminal costs (Schneider Institute, 2001). The monetary effect that drug use holds on society is substantial. Clearly drug use and drug control is a topic that needs to continually be addressed due to changes in society.

Historically, drug use in the United States has been marked by constant shifts in attitudes and policies towards determining whether or not to tolerate drug use. Public policy has been instituted to control demand for illicit substances as well as regulate and control supply for drugs. The policies have had both positive and negative effects on the war on drugs. Policies come with a large bill, however. Much of drug policy in the US focused on stopping the flow of drugs costs approximately \$26 billion per year (Dave, 2004).

In 1998, nearly 13.6 million people in the United States used illicit substances. “No specific group in the population is immune to substance abuse and its effects (Schneider Institute, 2001).” The consequences of having this many people using drugs create an overwhelming burden on society’s members. For one, deaths and illnesses created from drug abuse put strain on the nation’s health care system. Drug related deaths have doubled since 1980, mostly due to a combination of

illicit drugs and alcohol. However, many drug related deaths are due to AIDS, which was contracted from sharing needles while using.

Other costs to society relate to the law. In the U.S. drug users make up an increasing percentage of incarcerated individuals. Increases in incarceration are due to increased minimum sentencing laws for drug offenses and are often blamed as major reasons for prison overcrowding (Schneider Institute, 2001).

How do we help to control the social dilemmas that are results of drug abuse? By investigating and better understanding the relationship between drug demand and socioeconomic status, much can be done to improve illicit drug control and regulation. This paper examines the relationship between socioeconomic status and demand for illicit drugs. Many questions come to mind with the topic. Does low socioeconomic status increase demand? Does higher socioeconomic status necessarily decrease demand? Past studies have taken many different approaches to studying illicit drug demand. Generally, two substances are studied and compared or one substance is studied over time. To expand on these previous studies, I will be utilizing several substances (the dependant variables) at two different time periods. I use eight regression models, one for marijuana, cocaine, heroin, and methamphetamines (or stimulants) in 1995 and 2005. These regressions should prove many things, including increases in family income result in decreases in drug demand, and as job status increases, demand for drugs decreases.

The sections of this paper are as follows: Section II provides a review of literature, Section III explains a theoretical background, Section IV includes my data and empirical model, Section V examines the results of the regressions, and Sec-

tion VI makes final conclusions, policy suggestions, and suggestions for future research.

II. Literature Review

In my research I look at several socioeconomic factors that contribute to demand for drugs. Past research has investigated aspects of the relationship of socioeconomic variables and drug use. I hope to expand the previous literature.

A. Economic Variables

Income: Illegal drugs are not inexpensive goods. A single gram of cocaine can cost as much as \$100 (Office of National Drug Control Policy, 2004). Income is necessary to support recreational or problematic drug use. One might be led to believe that people who use drugs get their money for drugs by selling drugs; however, this presumption is not entirely true since many different types of people with many different types of jobs and incomes demand illicit drugs.

Bushmueller and Zuvekas (1998) perform an interesting study that determines that income positively affects moderate drug use but negatively affects daily use. One important aspect of Bushmueller and Zuvekas' work is that they differentiate between young adults and what they defined as "prime age" adults (30-45 year olds). When controlling for age, the relationship between drug use and income is not monotonic for younger people. They find that income positively affects drug use for young workers. But income negatively affects heavy drug use and those with lower incomes use drugs more often than those with higher income levels. Also when controlling for age, prime age men display a negative relationship to problematic drug use and employment but younger men do not. It might be argued against Bushmueller and Zuvekas that drug use affects income attainment. In another comparable study, Gill and Michaels (1990) conclude that drug use actually increases wages a little for all ages of people, and thus people earning an income demand more illicit substances.

Many of the individuals who use drugs are adolescents between the ages of twelve and seven-

teen. This group might not have a full time job, nor is there an expectation of them to hold a full time job, since they often are in school. Consequently, understanding where they get their money from is important to understanding adolescents' demand.

Teenagers' primary income comes from allowances, wages from part time employment, and gifts. Many studies have found a positive relationship between drug use and income in younger people. However, Markowitz and Tauras (2006) investigate how budget constraints affect this group and they find that earned income (income from a part-time job) is positively related to the probability of use and frequency of use. Higher allowances also cause a positive effect with drug use but they do not predict the frequency of drug use. Finally, parental income might be important in relation to drug demand for youth. Markowitz and Tauras find that illicit drug demand does not necessarily decrease with an increase in family income, but higher family income does decrease the frequency of illicit drug use.

Employment: One issue that arises when considering drug policy is how drug use might affect productivity and in turn wages. Gill and Michaels find that drug use is associated with a reduced probability of employment. According to their demand side findings, lower productivity and increased absenteeism from work may indicate drug use. Supply side findings indicated that drug use seems to be a leisure activity. However, if use is a leisure activity then their results remain unclear because use of hard drugs has less negative effect than use of simple drugs (1992). In a previous but comparable study, Gill and Michaels (1991) suggest that a strong association exists between occupational categories and drug use.

Van Ours (2006) investigates employment and productivity effects of the use of cocaine and cannabis. He finds that the job attainment rate decreases with cannabis use. In fact, as soon as someone starts using illicit drugs their likelihood of finding a job goes down. Much of this decrease can be attributed to required on-the-job drug testing. When an individual finally holds a full time

job, three different outcomes are possible for the individual according to Van Ours. First there can be past cannabis use and no current cannabis use, second there can be past and current cannabis use, and finally there can be no past cannabis use and no current cannabis use. The unemployment rate increases as past demand increases for cannabis, while the unemployment rate decreases as past cocaine use increases.

B. Background Variables

Education: The relationship between drug use and dropping out of high school has attracted the attention of researchers. There is little question that these issues are interrelated. Initially students become frustrated with school and then become less involved. These students are more likely to acquire deviant behavior and are consequently less likely to complete school. The impact of prior drug use on dropping out of school may be spurious because it plays so much on other school and family factors. Some theorists believe that dropping out of school reduces the level of frustration students feel and reduces involvement in drug use. Social control theorists, on the other hand, view dropping out of school as disengaging from society and thus increasing the rate of drug use (Krohn et al., 1995).

Krohn, Thornberry, Collins-Hall, and Lizotte (1995) use several variables related to school and family dimensions, as well as dropout status, drug use and serious delinquent behavior to estimate a model. They ask two questions: (1) what are the effects of prior delinquency and drug use (2) what is the effect of dropping out of school on subsequent delinquency and drug use? They find that it is not clear how these three forms of problematic behavior may precede dropping out of school, but these things may all also be caused by the same predictor values.

Chatterji (2006) also estimates a model to determine the association between illicit drug use during high school and the number of years of high school completed. He finds that marijuana and cocaine demand while in high school reduces the number of years of high school actually com-

pleted.

Prior Incarceration: Alcohol and illicit drugs are involved in many violent crimes and other serious offenses. For example, at least half of the adults arrested for major crimes, such as homicide, theft and assault, and more than eight in ten arrested for drug offenses, tested positive for drugs at the time of their arrest (Schneider Institute, 2001).” Approximately half of state prisons’ inmates and forty percent of federal prisoners arrested for committing violent crimes admit to being under the influence of drugs or alcohol at the time of their arrest.

A former drug addict himself, Charles Terry, studies the relationship between drug addiction and imprisonment. Escalating numbers of incarcerated individuals have committed a drug offense or several drug offenses. Their demand continually increases through their lifetime. The Bureau of Justice Statistics finds that 82 percent of people on parole are returned to prison because of drug and alcohol use. Further, the number of people in prison for drug use has increased seven-fold from 1978 to 1996 (Terry, 2003). Terry finds that the regular drug users in his study had similar characteristics. They all came from mostly lower socioeconomic environments in which violence, prison time and the use of illegal drugs were normal. As children the subjects were exposed to all of these factors and thus found themselves in the same situation later in life (Terry, 2003).

C. Demographic Variables

Geographic Location: It is believed that preferences towards drugs may differ over geographic areas. Many studies use geographic location in some way as an independent control variable. Some use geographic location to mean the difference between urban and rural areas. DeSimone and Farrelly (2003) caution against interpreting results when geographic fixed effects are not included because studies have showed that the magnitude of price responsiveness is overestimated when fixed effects are not included.

Age: According to Sickles and Taubman (1991) age is of marginal significance when

considering who uses illegal drugs. However, Caulkins, Reuter, Iguschi, and Chiesa (2005) believe that age does not matter and new drug users often are in their teens or young adult years. This research team investigates cocaine addiction, and since cocaine is such a highly addictive drug constant use quickly leads to heavy addiction at a young age. In fact, 17% of those that are heavy cocaine users started using cocaine at an early age. Niskanen (1992) also finds addictive behavior is more likely to occur in those that are younger.

Gender: Several studies have incorporated gender in some way. Van Ours (2006) studies the relationship between gender and employment on drug use. He finds that being female has no negative effects on employment when using drugs, and finds that being male has a negative effect on employment when using drugs. Most other studies already mentioned used gender as a control variable in some way.

Race/Ethnicity: Wallace and Bachman (2003) determine differences in high school seniors' drug use dependent on family background and lifestyle behaviors and experiences. Drinking has been found to be more prevalent among white Americans than among people of other races. Research indicates that drug use is generally lower than average among black and Asian youth. For Native Americans, drug use is generally higher. In another study, alcohol and drug consumption results indicate that black males and females have higher abstention rates than white counterparts. Black and white females have similar rates of heavy drinking, but black males have a higher rate of heavy drinking compared with white males.

III. Theoretical Framework

In my research I will be utilizing consumer demand theory. Basic consumer demand theory holds that the demand for a product is determined by price and other variables that influence the position of the demand curve. Each person responds differently to changes in equilibrium of supply and demand and must make a decision on how much they choose to demand. It should logically

follow, given the supply, that as drug demand decreases, the price goes down, and as drug demand increases, the price goes up (Pindyck and Rubinfeld, 2003). When a good becomes a necessity to an individual, the demand for the good becomes very price inelastic.

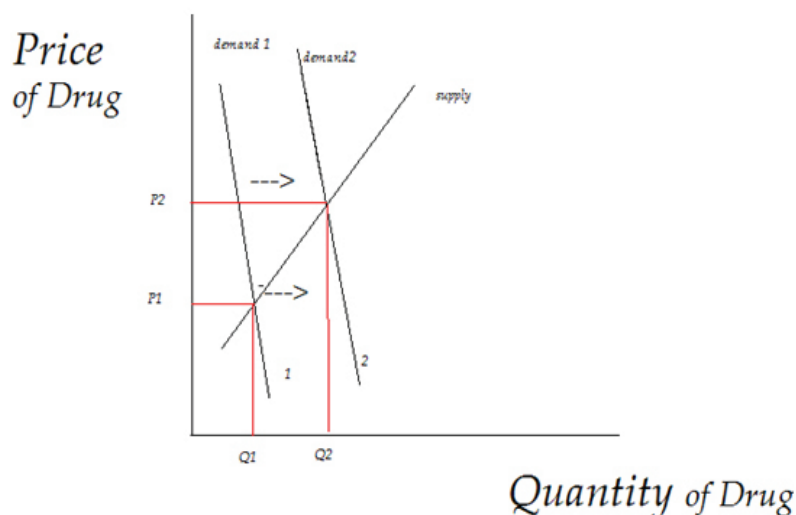
Income effects are demonstrated in an income-consumption curve and the curve indicates that changes in income lead to a shift in the demand curve itself. When the income-consumption curve has a positive slope, demand increases with income, and the good is considered a normal good because consumers want to buy more as income increases. When an income consumption curve has a negative slope, demand falls as income increases and goods are considered inferior goods (Pindyck and Rubinfeld, 2003).

Regardless of price and income, in many situations economic, social and psychological forces shape consumer tastes. I need to consider how the demand curve is affected due to the addiction, tolerance, and dependence that result as a part of drug use. "Addiction is a state in which an organism engages in a compulsive behavior, even when faced with negative consequences. This behavior is reinforcing, or rewarding (NIDA, 2007)." In this case, a person using drugs loses all sense of control and continually uses because he or she believes that he or she must engage in drug use. "When drugs...are used repeatedly over time, tolerance may develop. Tolerance occurs when the person no longer responds to the drug in the way that person initially responded (NIDA, 2007)." Also, as users develop increased tolerance, they demand more and more of a drug. Finally, dependence occurs when repeated exposure to drugs occurs within neurons and they then only function normally when the drug is present in the system. In this case, users attempt to avoid pain or sickness due to withdrawal symptoms because of their dependence, and demand shifts right as it increases (NIDA, 2007).

In my research I assume that the consumer demand curve is price inelastic since changes in price probably will not strongly alter the demand

curve due to addiction, tolerance, and dependence. Further, changes in demand cause the demand curve to shift (right for an increase in demand and left for a decrease in demand). These two ideas are demonstrated in Figure 1. An inelastic demand curve is relatively vertical like Figure 1 demon-

Figure 1: Demand shifts



(NSDUH). The NSDUH surveys different members of United States households over the age of 12 yearly, which means that these data sets are cross sectional data sets collected at two separate times. Because of this I am not able to look at individuals' demand preferences over time. However, my intention is purely to compare demand patterns from 1995 and 2005 and determine if any conclusions can be drawn.

For my model, I will use several Ordinary Least Squares (OLS) regressions. The dependent variables are demand for marijuana, demand for heroin, demand for methamphetamines, and demand for cocaine. Independent variables I will be using include economic variables, background variables, and demographic variables. A complete list of all my variables with accompanying definitions and expected outcomes are found in Table 1. My empirical model follows.

strates. As demand increases from demand curve 1 (D_1) to demand curve 2 (D_2), price increases from P_1 to P_2 and vice versa.

Based on previous literature and consumer demand theory, I propose a theoretical model to explain the dependent variable of marijuana, cocaine, heroin, or methamphetamines demand. The demand is dependent upon four categories of independent variables: addiction variables, economic variables, background variables, and demographic variables. The resulting theoretical model follows:

Demand = f(Addiction Variables, Economic Variables, Background Variables, Demographic Variables)

IV. Data and Empirical Model

The data for my dependent variable and independent variables come from the 1995 and 2005 *National Survey on Drug Use and Health*

$$\begin{aligned} \text{DRUGDEMAND} = & \beta_1 + \beta_2 \text{NEEDMORE} + \beta_3 \text{LOTTIME} + \beta_4 \text{INCOME} + \beta_5 \text{JOBSTATUS} + \\ & \beta_6 \text{EDUCATION} + \beta_7 \text{INCARCERATION} + \beta_8 \text{LOCATION} + \beta_9 \text{AGE} + \beta_{10} \text{GENDER} + \\ & \beta_{11} \text{RACE} + \mu \end{aligned}$$

After analyzing the previous literature and theories related to demand and drug addiction, I determined the hypotheses to be tested, which follow:

1. As more of a drug is needed to obtain a high, drug demand increases. ($\beta_2 > 0$)
2. As more time is spent looking for and using a drug, drug demand increases. ($\beta_3 > 0$)
3. As family income increases, drug demand decreases. ($\beta_4 < 0$)
4. As job status increases, drug demand decreases. ($\beta_5 < 0$)
5. As education level increases, drug demand decreases. ($\beta_6 < 0$)

6. Previous incarceration increases drug demand.
($\beta_7 > 0$)

ear models of demand so I create midpoints of the assigned categories, and thus create an approxi-

Table 1: Variable Definitions and Expected Signs

Variable	Definition	Expected Sign
Dependent Variables-		
MJYRTOT	Total number of days used marijuana in past year	
COCYRTOT	Total number of days used cocaine in past year	
MTHYRTOT	Total number of days used methamphetamines in past year	
HERYRTOT	Total number of days used heroin in past year	
Addiction Variables-		
NEEDMORE	Need more of drug X to get desired effect?; dummy variable; 0=no; 1=yes	+
LOTTIME	Spent a lot of time getting or using drug X ?; dummy variable; 0=no; 1=yes	+
Economic Variables-		
INCOME	Total family income	
-LOWINC	Less than \$20,000; omitted to compare to	
-LOWMIDINC	Between \$20,000 and \$49,999; categorical variable; 1=between \$20,00 and \$49,999; 0=otherwise	-
-MIDINC	Between \$50,000 and \$74,999; categorical variable; 1=between \$50,000 and \$74,999; 0=otherwise	-
-HIGHINC	Greater than \$75,000; categorical variable; 1=greater than \$75,000; 0=otherwise	-
JOBSTATUS	Work Situation	
-UNEMPLOY	Unemployed; categorical variable; 1=unemployed; 0=otherwise	+
-FEMPLOY	Full time employed; omitted to compare to other employment variables with	

Table 1 Continued: Variable Definitions and Expected Signs

-PTEMPLOY	Part time employed; categorical variable; (2005) 1=part time employed; 0=otherwise (1995) 1=Any input not unemployed or full time employed; 0=otherwise	Uncertain
Background Variables-		
EDUCATION	Highest level of education	
-INSCHOOL	In school still; categorical variable; 1=in school still; 0=otherwise	Uncertain
-LESSHS	Did not complete high school; categorical variable; 1=less high school; 0=otherwise	+
-HS	Received high school diploma or equivalent; omitted to compare to	

A. Dependent Variables

I use the number of times per year an individual uses either marijuana, cocaine, heroin, or methamphetamines as my dependent variable. In 2005, respondents self report a specific number of days they used (1 day to 365 days). These values are relatively easy to interpret. In 1995 however, respondents self report the number of days they used in nine categories. A categorical measure requires that I utilize a non-linear model for 1995 data. I do not want to compare linear and non-lin-

mate measure of the continuous dependent variable (see Appendix B for 1995 proxy number of days demanded).

In either case, the measure is not a true quantity of drug demanded because of certain addiction considerations (i.e. needing more to get high). Differences like this shift demand rather than determine quantity. Since I am interested in how demand shifts, measuring demand by the number of days of use or estimated days is appro-

priate.

For each drug in each year, the dependent variable is selected from the entire data set based on whether or not someone used one of the drugs at least once in the past year. This study's focus is meant to determine demand of marijuana, heroin, methamphetamines and cocaine so my samples consist only of those who have previously demanded any of these drugs.

These missing variables almost inevitably will lead to errors or other issues in OLS regression results.

C. Economic Variables

Income: In my economic variables I use total family income as my measurement of income. Incomes are reported to the NSDUH in categories. So in order to assign a value to these measures, I create categorical dummy variables by

-SOMCOLLEGE	Went to college but did not finish; categorical variable; 1=some college; 0=otherwise	-
-COLLEGE	Completed at least a bachelor's degree; categorical variable; 1=college; 0=otherwise	-
JAIL	Ever been in jail or detention center?; dummy variable; 0=no; 1=yes	+
Demographic Variables-		
URBAN	Rural or Urban (with over 1 million people); dummy variable; 0=non-urban; 1=urban	+
AGE	Category of current age	
-AGE12TO17	Ages 12 to 17; categorical variable; 1=12 to 17; 0=otherwise	Uncertain
-AGE18TO25	Ages 18 to 25; omitted to compare to	
-AGE26TO34	Ages 26 to 34; categorical variable; 1=26 to 34; 0=otherwise	Uncertain
-AGE35PLUS	Ages 35 plus; categorical variable; 1=35 plus; 0=otherwise	Uncertain
FEMALE	Gender; dummy variable; 0=male; 1=female	Uncertain
RACE	Race by category	
-WHITE	White; omitted to compare to	
-AFRICANAMER	African American; categorical variable; 1=African American; 0=Otherwise	Uncertain
-ALLOTHERS	Some other race selection; categorical variable; (2005) 1=Any input not white or African American; 0=otherwise (1995) 1=Other; 0=Otherwise	Uncertain

B. Addiction Variables

Since addiction has been found to cause changes in the orientation of the demand curve, I utilize variables which indicate that consumption characteristics are not completely voluntary. Addiction should have a positive effect on drug demand. For all drugs, two variables are used in the regression. First, a dummy variable asks whether or not an individual needs more of a particular drug to get the same desired effect that a previous amount had on them (XNEEDDMORE). A second addiction dummy variable indicates whether or not an individual spent a lot of time in search of their drug of choice (XGREATTIME). The addiction variables provided by the NSDUH limit the model because there are many missing variables.

reassigning values. The categories of income are less than \$20,000 (LOWINC), between \$20,000 and \$49,999 (LOWMIDINC), between \$50,000 and \$74,999 (MIDINC), and greater than \$75,000 (HIGHINC). I will not be including less than \$20,000 in my regressions so I will have a value in which to compare the results. I believe that a greater income will cause consumers to demand less, thus a negative effect is predicted for those with incomes above \$20,000.

There are some errors that occur with income data. The twelve year olds in the data cannot have income aside from allowances and gifts, so this must be considered when analyzing results. Further, this income level is self reported and in-

interviewee honesty is an issue.

Employment: Job status is measured as a categorical variable in both 1995 and 2005, too. The categories are not employed (UNEMPLOY), part time employed (PTEMPLOY), or full time employed (FTEMPLOY). Homemakers, retired, and disabled are included in unemployed category. When transforming the data, 1995 categories were defined differently than 2005 categories of income. Consequently, 1995 income is a proxy variable, and must be considered as such. I will not include those who are full time employed in the regression so as to provide a baseline reference point in evaluation of my results. Based on previous research I am inclined to believe that those who hold no job will demand more drugs. I am not sure of how part time employment might affect drug demand.

D. Background Variables

Education: Education is measured as a categorical variable. Education is reported as the highest level of education completed. The categories of educational attainment are those people who dropped out of high school (LESSHS), those people that completed high school or an equivalent program (i.e. GED) (HS), those people that completed some college but did not receive a bachelors degree (SOMECOLLEGE), and those people who have completed a bachelors degree or higher (COLLEGE). The final education category includes those who are in school still (INSCHOOL). This variable may lead to problems because the NSDUH took the age category, AGE12TO17, to create INSCHOOL. In the regression I omit those who have received a high school diploma, as I feel that this is a good baseline for educational attainment. Education has proven to be a large contributing factor to drug use, so I predict that the higher the level of education completed, the less likely drug abuse will be a problem for an individual.

Jail: In the OLS regression whether or not someone has been incarcerated (JAIL) acts as a dummy variable. If someone has spent any time in jail in the past 12 months, this is measured. I believe that due to the nature of jail, lacking pol-

icy, and the inefficiency of treating drug addicts while in jail, previous incarceration will create a positive effect on drug demand.

E. Demographic Variables

Several demographic variables are included in my model in order to control for various factors that might play a role in determining drug demand. These demographics have been used in previous studies and I believe that as a whole they are a good representation of some non-addiction or socioeconomic factors, which might affect demand for illicit substances.

Population density: Where you live can affect how much drug and what kind of drug you can get with ease. I expect that larger areas with higher population densities make it easier to obtain substantial amounts of various drugs, thus a positive result is predicted. This variable is represented as URBAN in my regressions.

Age: Age is split into four categories: Ages 12 to 17, Ages 18 to 25, Ages 26 to 34, and Ages 35 plus. The category containing ages 18 to 25 is omitted from the OLS regression in order to have a comparison value. I am not sure how age will affect regression results since previous literature disagrees with how age affects use.

Gender: In the model gender is represented by FEMALE. I am not certain of how gender might affect the regression results.

Race: Several of my sources believe that race has some effect on drug use and demand. I believe that this observation might be true so I include several categories of race in the regression. Included in the model are those who identified as white or Caucasian (WHITE), those who identified as African American (AFRICANAMER), and those who identified in some other category (ALLOTHERS). In 2005, the category ALLOTHERS contains several other categories including Native Alaskan, Native American, Native Hawaiian, Pacific Islander, Asian, Multiracial, and Hispanic. Since the 1995 data set only defined race in three categories, I have only used three categories in hopes that my action will not hinder my results. I am not certain what kind of affect these particular

race categories will have on drug demand.

V. Results

A. Descriptives

Running initial demographic calculations helps to create a bigger picture of what is going on with the data. In Table 2, I include the sample size for each type of use I test. Some of the sample sizes are quite large and should create sufficient results (i.e. 1995 and 2005 marijuana); however, some of the sample sizes are significantly smaller (i.e. 1995 and 2005 heroin) which has the potential to lead to regression problems. With a sample size as small as 43, the degrees of freedom for some of my lengthier regressions will limit the sample size by about a third. Consequently, any significant results found here might not be significant at all.

Also included in Table 2 are percentages that indicate how much of the sample size is contained within a certain variable. For example, 19% of those who used marijuana in 1995 were part time employed, and 41% of those who used marijuana in 1995 were unemployed.

include Models 1, 6, 7, 8, and 9 in my results section. I believe that these models demonstrate the most important results that I produce.

Marijuana.

The results for marijuana demand are presented in Tables 3 and 4. The addiction variables included always appear robust and significant when they are included. This result matches my original prediction. However, a data problem makes it necessary for GREATTIME to be removed from the 1995 regressions. Demographics (see Appendix) indicate that both the minimum and maximum for marijuana was 1. This means that everyone spent time retrieving or using marijuana so it is a constant and cannot be included in OLS regressions.

It appears in 1995 LOWMIDINC results in less marijuana demand, however, the 2005 regressions indicates that when controlling for addiction this category of income is positive. This discrepancy might be contributed to an outside economic factor not controlled for here, such as inflation between 1995 and 2005. But if there are no outside

Table 2: Descriptive Statistics							
Type of Abuse	N=	PT EMPLOY	UN EMPLOY	LESS HS	SOME COLLEGE	COLLEGE	JAIL
1995 Marijuana	2148	.197 (.398)	.414 (.493)	.260 (.439)	.098 (.293)	.274 (.446)	.091 (.289)
1995 Cocaine	433	.166 (.373)	.393 (.489)	.328 (.470)	.083 (.276)	.141 (.350)	.240 (.428)
1995 Heroin	43	.302 (.464)	.511 (.506)	.279 (.454)	.047 (.213)	.372 (.489)	.256 (.441)
1995 Meth	192	.165 (.369)	.500 (.501)	.271 (.446)	.052 (.223)	.302 (.460)	.219 (.414)
2005 Marijuana	9142	.242 (.428)	.098 (.297)	.147 (.354)	.249 (.433)	.102 (.302)	.061 (.240)
2005 Cocaine	1813	.231 (.421)	.103 (.304)	.180 (.384)	.307 (.461)	.098 (.297)	.133 (.340)
2005 Heroin	142	.169 (.376)	.141 (.350)	.211 (.410)	.345 (.477)	.021 (.144)	.352 (.480)
2005 Meth	461	.191 (.393)	.174 (.380)	.187 (.390)	.315 (.465)	.046 (.209)	.213 (.410)
~Means on top; standard deviations in parentheses below.							

B. Regressions

I ran a sequence of 9 regressions by adding and removing variables for each drug. I only

factors, then marijuana has become a normal good since 1995. MIDINC and HIGHINC are statisti-

cally negative and statistically significant across all 2005 regressions and some 1995 regressions, which means higher income decreases demand and proves Gill and Michaels wrong.

Another notable result in the economic variables is employment. Most of the results between the two years carry opposite signs from each other. The results from 2005, however, are significant in comparison to 1995 results. The certainty of this assertion is lacking however, due to the fact that GREATTIME is not included in both years. I believe that this difference might be due to how the 1995 categories are defined differently than the 2005 categories. UNEMPLOY was expected to be positive and 2005's results prove Gill and Michaels' findings accurate. PTEMPLOY was predicted to have uncertain results produces

mixed results throughout the regressions, so the answer to how PTEMPLOY effects marijuana demand could be considered uncertain still; however 2005's positive results are significant so they might be more reliable.

Even though LESSHS is negative in 1995, 2005 regression results are positive, which is what I predicted. Finding no reason to distrust these results, I believe that they mean that those with less than a high school education are now more inclined to demand marijuana than before. IN-SCHOOL's definition makes it difficult to interpret reliably. The results show this variable is not very robust at all, even though in 1995's Model 3 and 2005's Model 9, Model 3, and Model 6 it is significant to the .01 level. COLLEGE is negative and statistically significant to the .01 level, which

Table 3: 1995 Marijuana Regressions

Variable	1	6	7	8	9
Constant	39.80***	44.74***	52.75***	53.81***	51.13***
Addiction					
NEEDMORE	101.43***	101.74***	102.86***	103.61***	101.03***
GREATTIME	---	---	---	---	---
Economic					
LOWMIDINC		-1.67	-7.04	-5.38	-5.70
MIDINC		-4.86	-14.65*	-8.26	-13.09
HIGHINC		-7.81	-14.72*	-11.39	-12.16
UNEMPLOY		-1.19	1.69	5.74	-1.27
PTEMPLOY		3.83	7.09	9.56	6.21
Background					
INSCHOOL		12.98*			12.18
LESSHS		-.78			-2.98
SOMECOLLEGE		-3.18			-4.61
COLLEGE		-25.52***			---
JAIL		19.09***			13.19**
Demographic					
URBAN			11.36**		12.02**
AGE12TO17			-25.92***	-27.04***	-23.05***
AGE26TO34			7.01	10.84**	5.88
AGE35PLUS			.881	5.64	.58
FEMALE			-23.86***	-21.65***	-22.66***
AFRICANAMER			-2.00	-3.67	-1.92
ALLOTHER			1.05	-8.11	-.325
Model Statistics					
N=	2051	2051	1667	2147	1677
R ²	.194	.227	.227	.224	.231
*Significant at .1 level **Significant at .05 level ***Significant at .01 level					

is what I forecasted. Also, JAIL is statistically significant and positive, which means that jail time in the last year caused an increase in marijuana demand very much like Terry predicted. It seems likely that time in prison is correlated with

When URBAN is included in the regression it limits sample size, so I removed it to see what might happen without its presence. Model 8 accommodates the removal. In 1995 URBAN increased marijuana demand and in 2005 it de-

Table 4: 2005 Marijuana Regressions					
Variable	1	6	7	8	9
Constant	81.09***	92.02***	101.45***	100.68***	99.96***
Addiction					
NEEDMORE	97.42***	96.96***	97.90***	97.69***	97.12***
GREATTIME	44.90***	18.09***	46.79***	48.27***	46.54***
Economic					
LOWMIDINC		2.50	2.03	1.75	1.92
MIDINC		-7.93*	-8.07*	-9.41**	-8.08*
HIGHINC		-7.41*	-10.40**	-10.38***	-9.59**
UNEMPLOY		4.24	7.22	5.62	6.10
PTEMPLOY		-9.75***	-7.78**	-7.53**	-7.86**
Background					
INSCHOOL		-38.20***			-36.84***
LESSHS		5.67			2.46
SOMECOLLEGE		5.49			5.18
COLLEGE		-14.82***			-15.67***
JAIL		7.58			8.71*
Demographic					
URBAN			-2.04		-1.26
AGE12TO17			-37.65***	-37.49***	---
AGE26TO34			-2.88	-4.60	-.77
AGE35PLUS			8.621*	9.69**	9.32*
FEMALE			-17.85***	-16.89***	-17.23***
AFRICANAMER			4.16	2.78	3.25
ALLOTHER			-1.81	-3.09	-2.48
Model Statistics					
N=	6648	6648	6172	6648	6172
R ²	.236	.264	.265	.267	.267
*Significant at .1 level **Significant at .05 level ***Significant at .01 level					

drug use because they were in prison *due* to the drug use, so this result cannot be held in too high of regard.

Between the 2005 and 1995 data sets, the race category, ALLOTHER, is defined differently, and I believe that may be contributing to the discrepancies between positive and negative answers in the two years. None of the regression results are significant, and I believed that there would be a significant relationship.

creased marijuana demand. Removal does increase sample size. For both 1995 and 2005 all included age categories chose less marijuana than 18 to 25 year olds, with the exception of AGE35PLUS in 2005 and AGE35PLUS and AGE26TO34 in 1995 when also controlling for addiction variables. This means that demand is directly related to age. This finding is very much against the work of Niskanen and Caulkins, et al.

One of the most robust variables for mari-

juana demand is FEMALE. In both 1995 and 2005, FEMALE is negative and statistically significant to the .01 level. Females demand marijuana around 25 fewer days per year than males.

In Model 6, there are many discrepancies in the results. Perhaps there is a certain degree of multicollinearity between income level and educational attainment level. Overall, the regression results from 2005 are more significant, most likely due to an increased sample size and due to the true continuous dependent variable.

Cocaine.

The same regressions were run for cocaine as were run for marijuana. Many of the same errors and issues arose. Results are located in Tables 5 and 6. Both addiction variables have a positive effect on drug demand again. The results are also

very robust across years. In 2005, NEEDMORE has a stronger effect compared to GREATTIME.

LOWMIDINC does not appear to have a significant effect on cocaine demand in either year. However, MIDINC has a negative effect for both 1995 and 2005. Even though 2005 has consistently significant results to the .01 level and 1995 does not, both sets of results are robust across regressions. Also HIGHINC has negative results for both years. I believe that this means cocaine can be considered an inferior good for those who earn anything more than \$20,000 per year. As with marijuana before, outside factors not controlled for in the equation that affect income must also be considered.

Between 1995 and 2005 UNEMPLOY continues to have a positive effect on cocaine

Table 5: 1995 Cocaine Regressions					
Variable	1	6	7	8	9
Constant	19.31***	11.52	-.67	5.70	-1.52
Addiction					
NEEDMORE	50.16***	49.13***	53.23***	47.84***	54.73***
GREATTIME	52.75***	44.53***	45.81***	42.69***	44.69***
Economic					
LOWMIDINC		-1.85	-3.04	.77	-.787
MIDINC		-15.25	-19.40	-13.25	-17.08
HIGHINC		-17.28	-22.86	-18.65	-19.26
UNEMPLOY		21.91***	22.65**	17.50**	19.46*
PTEMPLOY		13.12	14.39	11.93	11.11
Background					
INSCHOOL		16.01			17.34
LESSHS		-1.98			-2.743
SOMECOLLEGE		-.56			-6.54
COLLEGE		-12.89			---
JAIL		2.24			-4.53
Demographic					
URBAN			12.12		10.56
AGE12TO17			-11.08	-8.88	-7.56
AGE26TO34			6.86	3.71	5.87
AGE35PLUS			5.11	3.31	7.12
FEMALE			7.76	7.12	8.45
AFRICANAMER			19.39*	28.22***	18.11*
ALLOTHER			-15.37	-20.38	-17.61
Model Statistics					
N=	410	410	346	410	346
R ²	.198	.240	.299	.259	.308
*Significant at .1 level **Significant at .05 level ***Significant at .01 level					

Table 6: 2005 Cocaine Regressions					
Variable	1	6	7	8	9
Constant	20.36***	15.86***	17.65***	18.15***	9.03**
Addiction					
NEEDMORE	58.51***	55.81***	53.51***	53.55***	51.08***
GREATTIME	30.88***	28.41***	31.23***	31.64***	28.95***
Economic					
LOWMIDINC		-.89	1.12	1.90	.50
MIDINC		-11.55***	-11.91***	-11.19***	-11.47***
HIGHINC		-6.72*	-5.55	-3.91	-5.44
UNEMPLOY		-.69	5.20	4.13	1.72
PTEMPLOY		-8.79***	-7.83**	-7.86**	-7.43
Background					
INSCHOOL		5.63			8.52*
LESSHS		20.81***			19.55***
SOMECOLLEGE		11.73***			10.64***
COLLEGE		1.63			-.61
JAIL		17.42***			18.08***
Demographic					
URBAN			3.24		3.62
AGE12TO17			3.50	2.48	---
AGE26TO34			10.01**	7.69	9.77**
AGE35PLUS			21.87***	23.33***	21.63***
FEMALE			-1.28	-.252	-.66
AFRICANAMER			28.16***	28.18***	25.96***
ALLOTHER			5.53	5.25	4.36
Model Statistics					
N=	1798	1798	1684	1798	1684
R ²	.222	.253	.258	.259	.279
*Significant at .1 level **Significant at .05 level ***Significant at .01 level					

demand, contrary to Van Ours' finding, but 1995 results indicate a larger, significant positive relationship, dependent on the Model. The results for PTEMPLOY changed between 1995 and 2005. 1995 regressions continually find PTEMPLOY increases cocaine demand, but PTEMPLOY in 2005 finds a negative relationship. This change might be due to definitional differences in the employment variable, but the change might also be contributed to part time employees earning more in 2005 than in 1995 and as a result reducing their demand between the two years.

Many of the background variables I include in my regressions are found to be contradictory of each other. Hence I believe that the demand patterns have changed for cocaine. INSCHOOL

has as positive effect on cocaine use. Interestingly, in 1995 when just controlling for background variables individuals who are in school now use cocaine 43.19 days more than someone who has completed high school. Based on the other much lower results I feel that this outlier might not be accurate though. For those who completed less than high school and some college, 2005's cocaine demand is positive and significant at the .01 confidence level and 1995 does not have any statistically significant results. This result indicates that LESSHS and SOMECOLLEGE have become more important determinants of cocaine demand since 1995. SOMECOLLEGE is not intuitive of the original negative prediction. Finally JAIL also indicates a positive and significant result, as Terry

predicts, for 2005 cocaine regressions meaning JAIL has become more of a determinant. JAIL might also be more significant in 2005 because more individuals are now arrested for drug demand than they were in 1995.

One of the most counterintuitive results I found in my regressions concerns age and cocaine demand. Against most previous research but according to my results, as age increases cocaine de-

mand increases as well. In 2005's Model 7, and Model 9, people between the ages of 26 and 34 demanded more cocaine than 18 to 25 year olds at the .01 significance level. For AGE35PLUS how-

ever all of the regressions are robust and showed a positive result for cocaine demand. In addition, AFRICANAMER for both 1995 and 2005 is found to be significant for all regressions at the .01 level. The number of days indicated shows that African Americans demand cocaine anywhere from 18 to 56 days more than whites. Clearly, cocaine has a very high demand for this group. This result differs from the find-

Table 7: 1995 Methamphetamines Regressions					
Variable	1	6	7	8	9
Constant	35.90***	57.80***	24.24	21.49	32.13
Addiction					
NEEDMORE	26.52**	20.59	8.77	19.35	11.18
GREATTIME	82.09***	93.36***	108.48***	105.28***	108.80***
Economic					
LOWMIDINC		-21.28	-20.64	-23.74	-20.27
MIDINC		-54.66**	-60.91**	-51.50	-59.14*
HIGHINC		-11.29	-13.81	-7.62**	-13.80
UNEMPLOY		3.91	-10.14	2.14	-11.57
PTEMPLOY		8.80	10.69	13.98	8.00
Background					
INSCHOOL		-26.77			-19.47
LESSHS		8.56			1.89
SOMECOLLEGE		-10.33			-39.12
COLLEGE		-18.62			---
JAIL		-3.55			-5.04
Demographic					
URBAN			5.23		8.36
AGE12TO17			14.16	5.21	7.64
AGE26TO34			51.83	44.34	53.75**
AGE35PLUS			21.64**	18.39**	16.62
FEMALE			15.38	10.74	12.75
AFRICANAMER			38.81	33.06	32.48
ALLOTHER			50.18	52.19**	49.85
Model Statistics					
N=	171	171	136	171	136
R ²	.162	.213	.229	.243	.239
*Significant at .1 level **Significant at .05 level ***Significant at .01 level					

mand increases as well. In 2005's Model 7, and Model 9, people between the ages of 26 and 34 demanded more cocaine than 18 to 25 year olds at the .01 significance level. For AGE35PLUS how-

ings of Wallace and Bachman. ALLOTHER did not have any important findings.

Heroin.

The regressions for 1995 and 2005 hero-

in demand produce statistics that appear to be of little significance. I believe that the regressions are flawed due to the tiny sample sizes, which are narrowed further by low degrees of freedom while running regressions with many variables. Consequently, I have no results to report for heroin. My regression statistics can be found in the Appendix.

Methamphetamines.

Results for methamphetamines are displayed in Table 7 and Table 8. The methamphetamine regressions are unique in that their addiction

a result, I believe that the addiction variables are not the best indicators of how much more methamphetamines are demanded in comparison to those who do not need more methamphetamines or spend a large quantity of time looking for or using methamphetamines. In 1995 SPENDTIME is significant across all regressions, whereas in 2005, NEEDMORE is significant across all levels. All of the regressions do produce a positive result which is in line with predictions.

The only economic variable that really can be considered significant is MIDINC in 1995.

Table 8: 2005 Methamphetamines Regressions					
Variable	1	6	7	8	9
Constant	53.11***	35.54***	38.661***	36.62***	25.84*
Addiction					
NEEDMORE	35.97***	34.22*	48.51***	31.85**	48.68***
GREATTIME	33.49**	31.05*	23.01	37.37**	22.17
Economic					
LOWMIDINC		5.87	4.64	9.65	2.50
MIDINC		2.40	.50	1.83	2.29
HIGHINC		16.88	22.72	18.77	25.73*
UNEMPLOY		13.25	20.03*	-7.35	17.77
PTEMPLOY		-8.84	-12.09	16.51	-11.54
Background					
INSCHOOL		-.716			---
LESSHS		44.75***			47.25***
SOMECOLLEGE		20.70*			20.69*
COLLEGE		13.45			3.67
JAIL		-1.13			-.395
Demographic					
URBAN			-5.35		-5.21
AGE12TO17			-17.39	-17.42*	3.84
AGE26TO34			26.52	23.07*	32.92**
AGE35PLUS			20.24	22.54*	24.42**
FEMALE			7.03	9.29	-8.92
AFRICANAMER			20.62	11.42	15.72
ALLOTHER			19.16**	12.52	18.51*
Model Statistics					
N=	455	455	397	455	397
R ²	.066	.113	.124	.104	.152
*Significant at .1 level **Significant at .05 level ***Significant at .01 level					

variables actually measure stimulant addiction and not specifically methamphetamine addiction. As

Since the results in 2005 for MIDINC are insignificant nothing can definitely be suggested in

contrast to 1995, however, it appears that income has become less of a factor in hindering methamphetamine demand making it a more of a normal good, even though it remains inferior.

In 2005, LESSHS and SOMECOLLEGE have significant positive effects on methamphetamine demand. Like cocaine, SOMECOLLEGE has opposite the anticipated sign. Even though the 1995 results for these two variables are not significant, the 2005 results do indicate a change in consumption patterns for methamphetamines.

Demographic results are so scattered and lacking in significance that it makes it difficult to draw any conclusions about the results. Some of these errors may be due to a smaller sample sizes in the 1995 data.

Overall, the methamphetamine regressions do not provide much significant information, but the little that they do provide makes them worth discussing. I believe that if the NSDUH had provided proper addiction variables and dependent variables rather than addiction variables for the broad category of stimulants and dependent variables methamphetamine, the results might have been more notable.

VI. Conclusion

This paper set out to investigate socioeconomic factors that contribute to drug demand and also to find whether or not demand patterns for illicit drugs have changed from 1995 to 2005. I find that for some drugs, when testing for select variables, that demand patterns have changed, but there is no very broad conclusion to be drawn from these changes.

All the findings of this project are not exactly what I hypothesized. I believe that the most important prediction that I did affirm is that addiction, which has the most influence over drug demand, has a positive effect on drug demand. Even though I predicted higher incomes to have a negative effect on all drugs tested and I found that to be true, it appears that demand for marijuana has become more inelastic (normal) over time. Part time employment which was believed

to have an uncertain outcome was found to really be uncertain across drugs and across time. For the most part as education level increases drug demand decreases. But cocaine and methamphetamines prove that a negative relationship is not true all of the time. One of the most surprising findings that I found involved age. Even though I was uncertain of what the result would be as age increased, I was more inclined to believe that as age increased drug demand would decrease and it did for marijuana. The paper proves that assumption is not true for the other drugs.

Because drug use is a national problem, public policy has been implemented for many years. Some policy becomes outdated though. In my results, I noticed that previous incarceration had significant positive effects for cocaine and marijuana. This result might be due to the fact that more and more people are sent to prison for drug offenses, but when they are in prison they are clearly not receiving appropriate treatment to stop drug addiction. This topic is not a new controversy, but my results just further expand the argument for better policy concerning drug treatment in jail.

My education variable results for cocaine and methamphetamines prove that drug use is not being curbed at a lower level in school, but rather individuals are using more of these drugs while in school. The argument has previously been made that school programs, such as D.A.R.E., need to be revamped. Clearly these programs are not working as effectively as they might. Harder drugs such as cocaine need to be stressed and included in prevention education.

The topic of drug demand is very broad and can be expanded upon in many ways beyond this paper. Even though it has already been done in many different contexts, supply side investigation rather than demand side provides a different outlook on drug use. Additionally, any studies concerning the supply and how potential supply might be limited would be an interesting topic to cover.

In regards to further understanding my own

paper, I would like to figure out heroin demand. A larger sample size is necessary and perhaps looking at a different data set might provide a sample size large enough to find significant results which might explain demand patterns. Overall, running a different sequence of regressions might make it easier to tell the story of a given substance's demand and this option should be considered in the future. Also, I might consider how the four drugs tested are substitutes for each other and how demand elasticities change. One further idea for future research involves predicting the addiction variable based on other categories, such as economic variables and demographic variables.

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Appendix A: Descriptives

1995 Marijuana Descriptives

	N	Minimum	Maximum	Mean	Std. Deviation
MJYRFREQ	2148	1.5	332.5	68.717	104.5235
MJEVERDU	2139	1.00	1.00	1.0000	.00000
GRTMMRJD	2052	.00	1.00	.2865	.45226
BTOLMRJD	402	1.00	1.00	1.0000	.00000
GENDER	2148	.00	1.00	.4432	.49688
URBAN	1755	.00	1.00	.5744	.49458
LESSHS	2148	.00	1.00	.2598	.43861
SOMECOLLEGE	2148	.00	1.00	.0950	.29324
COLLEGE	2148	.00	1.00	.2742	.44622
PTEMPLOY	2148	.00	1.00	.1969	.39777
UNEMPLOY	2148	.00	1.00	.4143	.49272
AGE12TO17	2148	.00	1.00	.2742	.44622
AGE26TO34	2148	.00	1.00	.2742	.44622
AGE35PLUS	2148	.00	1.00	.0829	.27575
JAIL	2148	.00	1.00	.0917	.28869
AFRICANAMER	2148	.00	1.00	.2435	.42928
ALLOTHER	2148	.00	1.00	.0335	.18003
BTW20AND49999	2148	.00	1.00	.4250	.49447
BTW50AND74999	2148	.00	1.00	.1224	.32787
GRTR75000	2148	.00	1.00	.0861	.28062
Valid N (listwise)	330				

Appendix B: 1995 Frequency of Marijuana, Cocaine, Heroin, and Stimulants

Category	Label	Assigned Midpoint
1	More than 300 days	332.5
2	201 to 300 days	250
3	101 to 200 days	150
4	51 to 100 days	75
5	25 to 50 days	37.5
6	12 to 24 days	18
7	6 to 11 days	8.5
8	3 to 5 days	4
9	1 to 2 days	1.5