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**The Behavioural Economics of Substance Use**

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## **Abstract**

Young adulthood is the time when alcohol and drug use peaks. These behaviours can interfere with important developmental processes, paving the way for chronic substance abuse, and have negative effects on social, academic, and health outcomes.

During this crucial developmental phase, substance misuse prevention efforts need to be guided by innovative, theory-based approaches. This essay examines the unique applicability of behavioural economic theory to young adults abusing alcohol and other drugs, and it explores the literature on prevention and intervention tactics that are in line with BE theory.

According to behavioural economic theory, decisions to use drugs and alcohol are influenced by the availability and cost of alcohol and substance-free alternatives, as well as by how much the immediate reward from using drugs outweighs the delayed reward from substance-free outcomes. It has been demonstrated that behavioural economic measures of motivation for substance use can predict patterns in substance abuse over time. These measures are based on relative levels of behavioural and economic resource allocation towards drugs vs alternatives.

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## **Introduction**

Individual and group behaviour have generally been the domain of several professions. Individual conduct fell under the purview of psychology, whereas group behaviour fell under the purview of economics concerning the distribution of scarce resources. However, some psychologists started to notice connections between the phenomena they researched and economic ideas and principles in the late 1970s.

As a result of this, behavioural economics emerged. Drug misuse and dependence were first routinely studied using behavioural economics in the late 1980s, and this field of research is indeed active today.

Testing the boundaries of the applicability of economic theories and reviewing research findings should be an integral component of research efforts in the behavioural economics of drug misuse. Knowing these boundaries can help you understand the relationship between individual and group drug usage and how much each can inform the other. The conclusions of this investigation will ultimately affect how behavioural economic research findings can influence policy and how it relates to the economics and behavioural economics of drug usage.

Such research should be able to answer two questions: Do economic principles and theories apply to the drug consumption habits of an individual, and is behavioural economic data reflected in empirical results from econometrics studies of drug consumption patterns? With this knowledge, it would be possible to provide narrowly focused and precisely defined justifications for forming policy from behavioural economic laboratory data.

Since the late 1970s, an increasing number of economists have concentrated on issues surrounding "anti-health behaviour," (established by Frank Chaloupka, 1995 ), including those in the National Bureau of Economic Research's Health Economics Program, led by Michael Grossman. Use of drugs like tobacco, alcohol, cocaine and marijuana are examples of this behaviour. These compounds share two characteristics in common. They are firstly addictive in that increasing previous usage causes increasing present intake. Second, both the consumer and others are harmed by their consumption. The existence of external costs (harm to others) and ignored internal costs (harm to self) justifies government intervention and research on the effects and benefits of alternative economic policies to curtail use of these drugs.

The government of the United States and many other nations have opted to control some addictive substances (such as cigarettes and alcohol) through taxation, minimum purchase-age laws, restrictions on advertising, bans on consumption in public places like schools and workplaces, and harsh fines for drunk driving. They decided to make additional substances illegal. These chemicals are more expensive as a result of taxes, various types of regulations, and bans. Bans also stimulate criminal activity and the creation of illegal markets, which could hurt blameless victims. The term "full price" of an addictive good can be used to refer to a range of costs, including not only the purchase price but also the costs associated with waiting in line and travelling to get the item, as well as the expected financial costs associated with drug possession and driving while intoxicated convictions. An significant factor in deciding the ideal level of taxation, the effects of various sorts of laws, and the implications of legalisation is how responsive these substances are to full price.

## **The Behavioural Economic Theory on Tobacco and Tobacco products**

Tobacco smoking could perhaps be the best substance to understand the similarity between the behavioural economics of individual consumption and aggregate consumption. The commercial availability of tobacco cigarettes gives us an enormous amount of information on prices and consumption patterns, allowing us to conduct economic analysis with ease, unlike the difficulty that comes with illegal drugs. Cigarette smoking is also a very well-researched area in the behavioural economics of drug abuse, allowing for thorough comparisons with econometric studies. Finally, tobacco use is a significant public health issue because it is the leading cause of preventable death.

### **Abstract**

Objectives Tobacco control is a multidisciplinary area that draws on theory and research from the fields of medical, public health, economics, and psychology in an effort to lessen the harm caused by tobacco use, which is the primary cause of mortality that can be prevented in the majority of developed nations. With a focus on the psychology of addiction and behavioural economic analysis of price policy and alternative products, this thesis takes a psychological approach to research potential tobacco control policies. In particular, this study is the first to evaluate e-cigarette ratings and substitutability across Maori/Pacific and New Zealand European smokers, as well as price sensitivity for these two ethnic groups. Additionally, the first assessments of simulated demand and subjective effects for cigarettes with very low nicotine content as well as for electronic cigarettes with various nicotine strengths are presented. The last step is to mimic demand and short-term adoption of electronic cigarettes using a combination of two subjective effects measures. This is the

first attempt to predict how the initial usage of electronic cigarettes influences the intended and actual use of these items.

## **Methods**

Five empirical investigations evaluate the possible effects of price policy and alternative products on demand and smoking-related behaviour using behavioural economic simulated demand methods, psychological measures of dependence, smoking behaviour, and subjective effects. The Cost of Smoking Study [N=357], a survey of smokers from four New Zealand cities who replied in 2012, 2013, and 2014, before and after two years, 10% tobacco excise tax increases, provided the data for the first two studies. To compare smokers from the Maori/Pacific and New Zealand European groups, group comparisons were conducted. After a brief ad libitum sampling period, two original laboratory investigations evaluated the subjective effects, simulated demand, and substitutability of alternative items. Content cigarettes and standard cigarettes were compared (N=40), as well as electronic cigarettes with various nicotine strengths (N=46). To assess the subjective consequences of smoking, the Modified Cigarette Evaluation Questionnaire was utilised, and fictitious purchase activities were used to produce simulated demand data. When e-cigarettes with different nicotine concentrations were available, a follow-up field trial [N=35] looked at subjective effects, smoking behaviour, and electronic cigarette use over the course of two weeks. To evaluate the use of both products and model e-cigarette use using data on subjective effects, mixed model analyses were utilised.

## **Results**

The exponentiated demand model produced good fits for the simulated demand data for normal cigarettes, cigarettes with Very Low Nicotine Content, and electronic cigarettes. Based on reported actual behavioural change following two excise tax increases, and simulated demand data, smokers, particularly men, proved to be more price sensitive. Very Low Nicotine Content cigarettes demonstrated less reinforcing effects than conventional cigarettes but were still largely substitutable [CPE=.32]. However, subjective impacts and demand varied by nicotine concentration for first-time users; withdrawal symptom relief rose as nicotine increased while flavour and enjoyment elements declined [CPE=.20-.25]. Electronic cigarettes were only partially substitutable for traditional cigarettes. When considering whether to buy electronic cigarettes, smokers seemed to weigh advantages such as easing withdrawal symptoms against factors like taste and enjoyment, with lower nicotine content cartridges being rated most highly. Nicotine-containing electronic cigarettes were used more frequently and were said to lessen cravings more than non-nicotine cartridges after a two-week period of use. After brief, first-time exposure and brief use of electronic cigarettes over a two-week period, simulated demand was predicted by parameters related to flavour and enjoyment as well as the relief of withdrawal symptoms.

## **Conclusions**

These studies show how useful psychological and behavioural economic approaches are for advancing the study of cigarette control. The results imply that product attributes that affect subjective effects and pricing mechanisms may boost the adoption of novel substitute products (such as electronic cigarettes and cigarettes with very low nicotine content) and ultimately decrease cigarette smoking behaviour. The findings show that price regulation and the availability of nicotine-containing electronic cigarettes have the potential to lessen smoking disparities between New Zealand's European and Maori/Pacific smokers. However, they also imply that the impacts



might be limited when considered separately. Overall, a comprehensive nicotine and tobacco control policy that uses price differences to encourage transitions to less harmful products and uses the combination of nicotine reduction and electronic cigarettes to break the link between the reinforcing effects of nicotine and combustible cigarettes is likely to provide the greatest behavioural change.

## **Study on Alcohol Demand**

How much is desired or consumed at a specific price is referred to as demand, which is a fundamental notion in economics. Alcohol demand in a behavioural economic setting refers to how much alcohol is consumed in response to changes in pricing that can be in many different forms, including monetary or behavioural responses. Demand in this situation ostensibly indicates how important alcohol is to the person as a reinforcer.

Historically, costs were characterised as behavioural responses to alcohol or other drugs (such as plunger pushes), and demand was often evaluated using operant self-administration paradigms. In more recent research, buy tasks in which participants are asked to estimate alcohol intake at various levels of drink prices are frequently used to determine the level of demand for alcohol in human subjects. In particular, analysis of a person's level of consumption in the face of rising prices might result in five conceptually linked demand indices and a demand curve that sums up the relationship.

There are three types of demand: trait-based demand (general demand), state-based demand (the demand under different conditions), and behavioural theories of choice (i.e., alcohol demand versus other commodities )

### **Trait Based Demand**

Trait-based alcohol demand (i.e., the estimated typical level of consumption at varying prices) has repeatedly been linked to higher levels of weekly alcohol consumption, as well as more frequent heavy drinking, consumption of caffeinated alcoholic beverages, alcohol-related problems, and a

lessened tendency to cut back on drinking after a harm reduction intervention. Notably, a recent study indicated that, even after controlling for variations in normal drinking levels, symptoms of melancholy and posttraumatic stress disorder were specifically linked to heightened alcohol demand in heavy drinkers among college students. This shows that those who are experiencing adverse psychological symptoms may be more sensitive to the negative reinforcing effects of alcohol. Even after adjusting for alcohol intake, gender, alcohol problems, and depressive symptoms, a further intriguing recent study of college drinkers found that smokers had increased alcohol desire. These most recent studies demonstrate that the association between increased alcohol consumption and co-occurring processes like cigarette smoking and negative affective symptoms is specifically influenced by the demand for alcohol.

Although all of these studies used hypothetical rewards rather than real ones, a study found a strong correlation between value preferences for real and hypothetical alcohol, as well as between estimated consumption and actual consumption, proving the validity of using estimated consumption. Additionally, the hypothetical purchase of alcohol task has demonstrated to exhibit good to exceptional 2-week test-retest reliability. The temporal stability of a cigarette purchase task has been found to be similarly high, and more generally, the relationships between individual differences in tobacco demand and nicotine dependence have been very similar to the initial findings, suggesting the generality of these relationships. However, only one study has been conducted to date.

### **State-Based Demand**

The research that came before utilised an alcohol purchase task that concentrated on alcohol demand in a manner akin to a personality feature (i.e., how much a person predicted they would

consume on a normal drinking occasion). However, a lot of research used purchase tasks and related metrics to enhance the evaluation of acute alcohol motivation, which is typically evaluated by subjective craving. For instance, it has been demonstrated that state alcohol demand increases dynamically in an alcohol cue reactivity paradigm. Similar results were reported in two recent investigations that revealed that stress and negative affect significantly enhanced alcohol consumption. These results are consistent with recent research that used behavioural economics to analyse acute tobacco motivation. These results imply that existing measures of acute motivation, such as desire, affect, or arousal, may be supplemented by state-based alcohol demand. Cognitive Theories of Decision. The aforementioned methods scale the reinforcing value of alcohol against a domain-general (nonspecific) unit of cost to describe it (i.e., money, effort). In contrast, different techniques can be used to evaluate the relative worth of a good in comparison to, or even in conjunction with, a number of other readily available reinforcers. This method, known as behavioural theories of choice, captures how dependent alcohol is on the overall proportion of reinforcement. For instance, a person with a low ratio of proportionate alcohol-related reinforcement has a profile that shows drinking is a largely independent reinforcing activity. A person who has a low ratio of proportionate alcohol-related reinforcement, for instance, shows a profile that suggests drinking is a reinforcing activity that is typically independent of other types of reinforcement, whereas a person who has a high ratio of proportionate alcohol-related reinforcement suggests that alcohol works synergistically, as a complement, to many reinforcing activities in a person's life. There is evidence that young adults who drink heavily report receiving less reinforcement from non-drug activities than matched controls. Additionally, alcohol usage is considerably adversely correlated with alcohol-free reinforcement (i.e., the enjoyment of alcohol-free activities) and vice versa. Additionally, it has been found that proportionate alcohol-related reinforcement (i.e., the ratio of alcohol-related to alcohol-free activity participation and enjoyment) predicts treatment response, and a recent study discovered that a behaviour economic intervention

was effective in improving treatment response. Particularly for people with low baseline levels of alternative reinforcement, intended to increase alcohol-free rewards dramatically reduced drinking.

## **Summary**

Two strong conclusions are suggested by the body of study in this field overall. First, human laboratory and purchase task studies offer compelling evidence in favour of an operant perspective on alcohol motivation, demonstrating that response cost contingencies have a significant impact on intake. Second, individual variations in alcohol demand are highly related to alcohol intake levels, the severity of alcoholism, and other clinically significant factors. The etiological significance of increased alcohol demand, however, is still not entirely apparent at this time. To put it another way, is alcohol demand a symptom of alcohol abuse or does it recursively anticipate the progression of abuse? Theoretically, the former is true, but to test that claim, longitudinal studies are required, and none have been released to date. Additionally, longitudinal studies are required to elucidate the links between these behavioural economic variables and other traditional risk measures, such as drinking intentions or alcohol expectancies. Furthermore, since the majority of research studies to date have focused on college students, it is crucial to replicate and extrapolate these findings to adult community populations and young adults who have not yet entered college.

## **Combatting Cocaine and Marijuana use with the BE theory**

Cocaine misuse is still a serious public health issue. Half of arrested people test positive for recent cocaine use, the number of frequent cocaine users (use more than once per week) is around 600,000–750,000 people, the demand for treatment for substance abuse is on the rise, and the number of emergency cases are also rising. Although new therapies for cocaine abuse are being developed, there is no doubt that high drop outs of early phase of therapy and continued substance use are still widespread, leaving no room for uncertainty regarding the requirement for more and more successful therapeutic measures. It's also crucial to remember that most cocaine and other drug users do not attend professional substance abuse treatment programmes. Therefore, methods for lowering cocaine addiction in other contexts are required. Prevention of cocaine misuse is better than treating the issue after it has arisen, just like it is in other areas of public health. Effective methods to stop cocaine abuse are desperately needed.

Following is research conducted by Frank J. Chaloupka and Stephen T. Higgins, both attempting to contribute to the discussion on drug control policies by presenting some data on impacts of drug prices and the legal penalties on possession and sale on teen substance usage.

### **Studies conducted by Frank J. Chaloupka**

A sample of high school seniors across the nation, participates in the Monitoring the Future poll each year, and the findings were examined by Grossman and Chaloupka in 1998. Each class is divided into a sample of roughly 2,400 people, one half being observed on even years and the other half during odd years. Results from follow-up data spanning ten consecutive years were used by

Grossman and Chaloupka. The frequency of cocaine use of those using before and participation in cocaine use from one follow-up to the next were studied. Both the measures were examined in relation to price, which was calculated using the System to Retrieve Information from Drug Evidence (STRIDE), a database of prices across the United States maintained by the Drug Enforcement Agency, for the various geographic residences of the survey participants (DEA). Both measures of cocaine consumption showed statistically significant negative correlations between the price of the drug and use (higher price correlated with lower use).

Saffer and Chaloupka (1997) used information gathered from more than 49,000 participants in the Household Surveys to analyse the sensitivity of cocaine usage to price. The Household Survey collects data on illegal drug, alcohol, and cigarette use among civilian, non-institutionalised Americans aged 12 and above. They evaluated cocaine use participation as a function of its price, the latter of which was determined using the STRIDE database. Cocaine use and pricing had a negative and statistically significant relationship. This study also demonstrated that cocaine and alcohol have complementary effects, supporting the findings of the earlier mentioned laboratory and clinical trials.

### **The study conducted by Higgins**

The applicability of these ideas is demonstrated by a study by Higgins, Bickel (1994) on human cocaine users who responded under carefully monitored laboratory circumstances. Four healthy persons who had recently used cocaine occasionally but did not fulfil diagnostic criteria for cocaine dependence or any other type of drug dependence (apart from nicotine) served as the subjects. Cocaine hydrochloride was given intravenously in 10 mg unit doses or a placebo pill containing

around 0.4 mg of cocaine and 9.6 mg of lactose. A psychoactive dose of 100 mg of cocaine was the highest amount that could be consumed in one session. In two consecutive sessions, subjects tried cocaine and placebo under double-blind circumstances with the substances labelled drug A and drug B.

They had a third session, during which they could choose just ten times between medications A and B. Choices between were made by completing a fixed-ratio (FR) 10 schedule on one of two that were provided at the same time and linked to the medicine and placebo options. Subjects could also choose not to use either. The longest session was two hours long. During that double-blind choice of cocaine-versus-placebo, subjects were supposed to select cocaine at least seven times over the placebo in order to take part in future cocaine-versus-money sessions. That standard was not disclosed to the subjects. The criterion was created because we wanted to investigate people for whom cocaine served as a reinforcer because this is a key aspect of cocaine consumption. Sessions involving cocaine and money were set up similarly to sessions involving cocaine and a placebo, except this time, the subjects had to decide between cocaine and different amounts of money. Prior to each cocaine-versus-money session, subjects were told of the monetary values, and the values varied from session to session. Values ranged from \$0 to \$2.00 per option, or \$0 to \$20 for each session, in total. The payment was made right away at end of each session.

All the four subjects unanimously preferred cocaine instead of the placebo, indicating cocaine served as a reinforcer and met the requirement for entry into the second stage of the experiment. As the amount available in the monetary option increased across sessions comparing cocaine and money, the choice of cocaine dropped, as all subjects solely choosing the monetary one as per the \$2.00 per choice option. In terms of economics, cocaine use declined as cost of opportunity (i.e., the amount of money lost) rose.



The preceding facts are further illustrated by a second study that used the same methods. Eleven volunteers who shared the same traits as those mentioned in the previous discussion served as the subjects. In the choice session, nine out of the 11 participants consistently selected cocaine over the placebo, proving the drug served as the reinforcer and become eligible for the cocaine-versus-money sessions. The cocaine-versus-money sessions were not open to two participants who failed to meet the qualifying requirement and two others whose schedules clashed with the sessions. Once more, cocaine preference fell in a systematic manner in response to opportunity cost. But this study stood apart from the earlier study because of one additional aspect. Subjects received various alcohol treatments (placebo, 0.5, and 1.0 g/kg) before each session of cocaine versus money. In the high money condition, pretreatment with active doses of alcohol boosted the preference for cocaine over the monetary reinforcer. In terms of economics, cocaine and alcohol complements each other, meaning that as alcohol consumption rose, as well the cocaine usage. It should be noted that, while it did so in some cases, alcohol pre-treatment generally not abolish sensitivity towards opportunity cost; but it modulated that link.

### **Summary of the study**

The findings shown by Chaloupka above show unequivocally that teenage cocaine use is price-sensitive. A 10% rise of cocaine price reduces the likelihood of juvenile usage by 9% while reducing the frequents of cocaine users ingest cocaine by over 5%, according to data from the combined 1982 and 1989 Monitoring the Future surveys of high school seniors. The price elasticity of teenage past-year cocaine usage is projected to be more than twice as high as Saffer and Chaloupka's (forthcoming) estimate, which was based on a sample that was primarily made up of adults. Furthermore, the price elasticity estimate of juvenile previous-month cocaine usage is higher by three times than the corresponding estimate of Saffer and Chaloupka. This supports what several

researchers have discovered when examining the price sensitivity of young people's and adults' needs for two licit drugs, alcohol and cigarettes: Compared to adult substance use, youth substance use is more responsive to price. Additionally, the estimates shown above imply that increased penalties for marijuana and cocaine possession have detrimental and statistically significant effect of the drugs' usage . The size of the estimates suggests, in order to reduce use substantially, very substantial increase of monetary penalties that can be imposed for first-time possession would be required. For instance, over the time period included by these data, tripling the penalty that might be levied for cocaine possession would have very slightly decreased the likelihood of juvenile cocaine use—by less than 4%. The likelihood of juvenile marijuana use would have been lowered by less than 1% with an increase of sanctions for possession of same. Similar to previous example, marijuana decriminalisation is predicted to increase the likelihood of previous year marijuana usage by around 4 per cent and has no effect on the likelihood of recent marijuana use or the frequency of use.

## **Conclusion**

From preclinical investigations with lab animals to epidemiological studies using national samples, behavioural economics appears to be able to subsume and organise empirical findings about cocaine usage. It shows that behavioural economics encompasses concepts and principles are crucial to onset and maintenance of use and abuse. Such conceptual breadth is uncommon in the field of drug misuse. The conceptual breadth of behavioural economics also has a lot of potential heuristic value because it gives cocaine researchers working in very various contexts (labs, clinics, communities) a chance to build on one another's research.

Beyond theory, behavioural economics provides highly useful recommendations for cutting down on cocaine usage and misuse. When compared to other methods that have been tried, those strategies appear to be similar or even more effective at reducing cocaine abuse, given the scant amount of research that has been done on them. This is not to imply that behavioural economics has any quick fixes to the problems caused by cocaine abuse. There isn't. It does, though, provide evidence-based tactics for enhancing preventative and treatment efforts, which demand deeper programmatic analysis. Additionally, behavioural economics suggests a lot of alternative approaches to the treatment and prevention of substance misuse, which is advantageous. Variety should only be advantageous as we search for and create more efficiency.

## **Substances vs Poverty**

For most, using illegal drugs and poverty go hand in hand. Underdeveloped neighbourhoods are characterised by high drug usage and drug dealing activity rates. Similar to this, a large percentage of drug users in cities make up the homeless population. Drug usage by acquaintances, friends, family members frequently only comes to light during times of crisis when the drug user has suffered a severe personal setback, often defined by a deteriorating financial situation. As a result, there is a substantial body of empirical evidence linking drug use and poverty, some of it anecdotal and some of it systematic. Furthermore, it would appear that a broad assumption exists that drug use contributes to several adverse social and economic effects, including poverty, based on support and willingness to pay for drug control programmes.

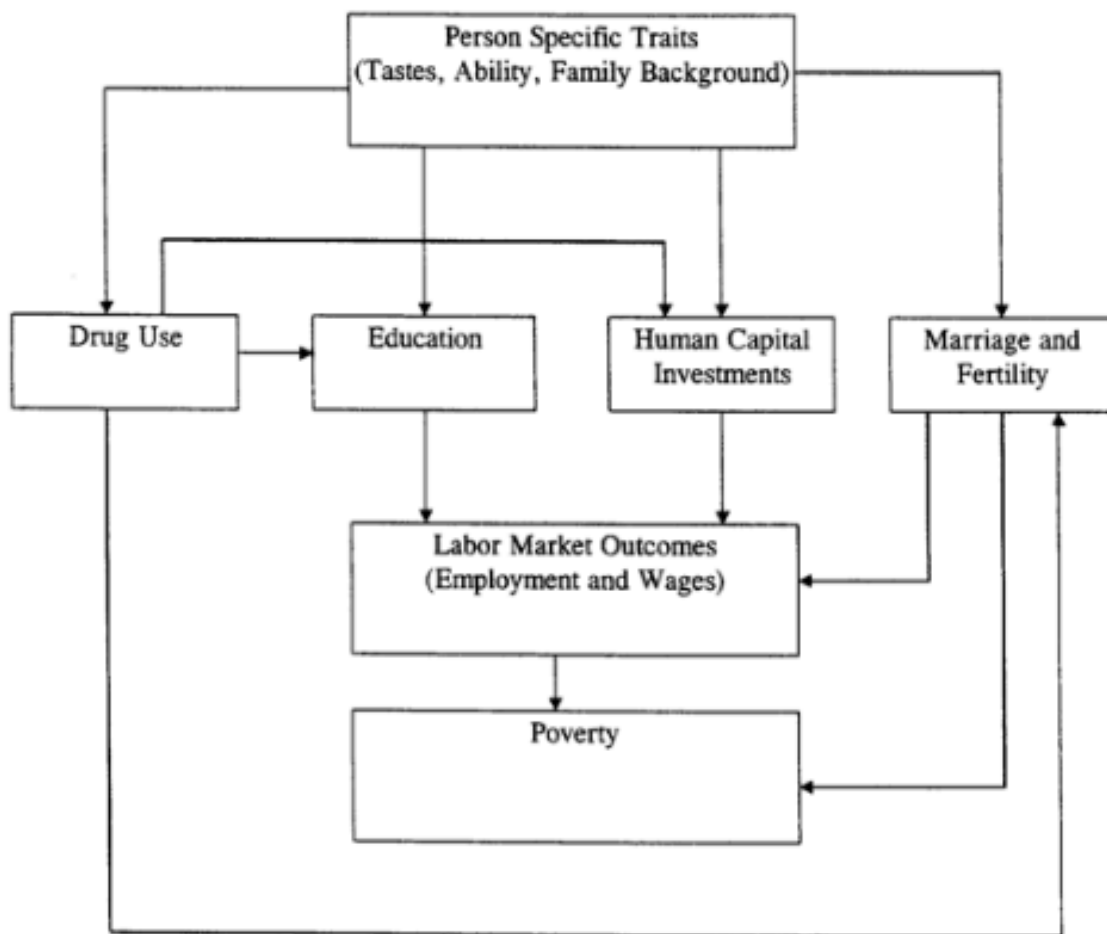
Validating or disputing conventional wisdom is a significant contribution of social science. The pertinent question in this situation is if drug use contributes to poverty. A lot of earlier research; however, it hasn't always been specifically concerned with poverty. For instance, numerous studies have looked at how drug use affects factors such as income, labour supply, marital status, born-out-of-wedlock deliveries, and welfare use. Surprisingly, this research has offered less evidence that drug use contributes to poverty. For instance, prior studies have demonstrated that drug usage got relatively few adverse consequences with respect to earnings, employment etc, both as crucial factors determining poverty. Contrarily, research on the impact of drug use on fertility and family structure shows considerable positive correlations between drug use and postponed marriage, marital divorce, and unmarried pregnancies. Thirdly, As a result, the crucial public policy topic of whether drug use contributes to poverty remains up for debate. In fact, the government invests a

significant amount of money in combating drug usage, with one of the justifications for that investment being the alleged negative consequences of drug use on financial stability.

Following is research studying the effect of substance use on poverty, providing empirical information about their association. We will see a descriptive as well as multivariate analysis of their relationship using two samples of young adults. One sample is drawn from the National NHSDA; the other is from the NLSY. The results indicate that drug use is associated with greater poverty for both samples.

### **Pathways of Influence**

Labour market outcomes and family compositions determine poverty. By altering the size, sources and quantity of unearned income, family composition affects poverty. Labour market outcomes are determined by personal human capital like education and other capital investments. Family compositions also influence labour market outcomes; family structure changes can affect an individual's ability to work. The physiological and psychological effects of drug use, especially in chronic cases, lead to a reduction in physical and cognitive skills; therefore, drug use and poverty are related because drugs affect the determinants of poverty: education, family composition, capital investments, skill accumulation etc. Drug usage may impair a person's capacity for using contraception or their judgement regarding its use, which could increase the number of unintended pregnancies. Or, using drugs may exacerbate marital conflict and result in divorce. Finally, stigma toward drug users may make it less likely for someone to find a partner. All of these possible effects of drug usage would worsen poverty. The figure provides a pictorial representation of the pathway of influence to poverty.



The relationships explained above are mostly intuitive. It provides a simple directory for empirical analysis of the issue. The relationship between drug usage and labour market outcomes has often been studied, keeping other factors like family composition constant. Still, we can see that the effects of drug usage strongly affect family composition, education and other components of human capital, which in turn influences labour market outcomes. Thus, when these factors are kept constant, there is a minimal role for drug use to play in studying its relationship with poverty. The "**reduced-form**" effect of drug use on poverty is studied by removing education, human capital and other determinants of poverty from the multivariate empirical analysis. This shows us the total effect of drug use on poverty.

The above figure ignores two critical issues: Poverty may cause drug use, which is more prevalent when opportunities for work are a demand-determined phenomenon. Therefore, there is reduced human capital and earnings in addition to the monetary cost of drugs. In areas of low work opportunities and low return on human capital investments, the cost of drugs is also less and thus is more likely to be consumed. A way to address this is to include demand-side factors in the multivariate empirical analysis.

The second issue, similar to the first one, is the possible reverse causality of determinants of labour market outcomes, e.g., education. We have seen that drug use affects education, marriage, fertility human capital investments, but it is possible that these factors reversibly affect drug consumption. This is important as it affects the interpretation of the reduced-form estimate of the effects of drug use on poverty, for example. If low education causes drug use, we shouldn't incorrectly omit it from

our analysis, as the estimated effect of drug use also captures some of the impact of low education on poverty.

The fact that drug use typically starts before marriage, having children, and making many other human capital investments is one piece of evidence in favour of the causal model in the figure. For instance, among those who admit to having used marijuana in the past, 75% had done so for the first time by the age of 18, and 95% had done so by the age of 21. The age of initiation for cocaine is a little higher, but even in this case, 50% of those who report some past use also say they used it for the first time by the age of 19, and 75% of this group say they did so by the age of 22. These statistics, which all refer to adults between the ages of 18 and 40, are taken from the 1994 NHSDA. These comparatively young start ages are in line with the causative model's description in the figure. Drug use patterns and risk factors are formed quite early in life, before most human capital investments and marriage. Furthermore, according to theories of rational addiction like Becker and Murphy's (1988), drug users are forward-thinking, and their early consuming decisions establish a pattern of use that should be relatively unaffected by planned investments in human capital and education. Indeed, decisions of early consumption are made knowing well what choices would be made in the future regarding drug use, education, marriage, fertility, and other human capital investments.

Additionally, there are some earlier empirical data that supports the specification of the causal model in the figure. In earlier research, He specifically checked for the endogeneity of drug usage in an examination of how drugs affect the formation and breakdown of families and discovered strong evidence that drug usage influences marital decisions but limited evidence that marital decisions significantly affect drug use. There is comparatively little historical empirical research examining the causal linkages stated in the figure for additional variables of interest.



In conclusion, previous studies looking at the connection between drug use and poverty have concentrated more on how drugs affect the factors that cause poverty than on poverty itself. These works have made an effort to estimate the structural characteristics connected to the figure in econometric terms. One issue with this strategy is that there may not be a strong structural connection between drug usage and poverty. Estimates of specific structural characteristics may, therefore, not be important, which could lead to the potentially incorrect conclusion that drug usage has little impact on poverty. However, the connection between drug use and poverty may be hazy and only become clear when considering the whole picture. Because of this, we concentrate on estimating the reduced-form model and obtaining a reduced-form estimate of the effect of drug use on poverty.

### **Econometric Strategy**

The reduced-form model of poverty is to be estimated by the empirical analysis. The figure's underlying assumptions allow for the reduced-form model to be expressed as :

$$\text{Poverty}(t) = \alpha_0 + \alpha_1 \text{ Age} + \alpha_2 \text{ Race} + \alpha_3 \text{ Family} + \alpha_4 \text{ Demand} + \alpha_5 \text{ Drugs} + \varepsilon$$

According to the equation, a person's level of poverty in year  $t$  depends on characteristics like age, race, family history, local economic conditions (also known as demand factors), and drug use. The coefficient on drug use estimates the overall impact of drug usage on poverty, assuming the causal linkages in the figure are accurate. The aggregate of drug use's indirect effects on poverty is what affects investments in human capital, marriage and fertility, and education.

The equation can be expanded to incorporate some of the factors influencing poverty and the job market in order to obtain insight into the specific ways that drug use affects poverty. For instance, the model might include education. For example, the model might include education. The coefficient on drug use in this example reflects the overall impact of drug usage on poverty after adjusting for any indirect effects of drug use on poverty that are caused by improvements in education. The effect of drug usage on poverty as it relates to education can be estimated by taking the difference between the two estimates. Other causes of poverty may be addressed using a similar methodology. The identification of many structural parameters and the reduced-form estimation is the procedure's results.

## **Results and Inference**

In this study, Two national samples of young adults have been used to establish a range of estimates of the relationship between marijuana and cocaine use and poverty. The majority of the estimations showed that using cocaine and marijuana greatly increases the likelihood of being poor. Drug users were more likely than nonusers to use public assistance programmes and had lower family incomes. Estimates in some situations were fairly considerable, suggesting increases in the rate of poverty, as evaluated in this paper of 50% or more. These findings demonstrate that drug usage is a serious issue and that public initiatives aimed at reducing drug use might have some favourable economic benefits on people's lives.

Other data from the study about the connection between drug use and poverty can be used to guide policy. Unexpectedly, despite the fact that a wide range of family background variables were

significant predictors of poverty, they had no impact on the estimates of the impact of drug use on poverty. This outcome is unexpected given that both drug use and poverty are frequently linked to disadvantaged familial backgrounds. Consequently, it becomes sense to assume that family background will play a large confusing role in the relationship between drug use and poverty. It transpires that this is untrue.

For the female sample, marriage and fertility performed significant mediation roles, but not for the male group. In fact, drug use's impact on female poverty through marriage and procreation is its most significant impact. When these variables were taken into account in the analysis, drug use's remaining effects were frequently negligible and lower than the structural effects that were brought about by marriage and reproduction. However, among men, marriage and procreation had little of a mediating impact. Although education was a more significant mediating factor in this group, the residual impact of drug use was still greater than the projected structural effects.

For instance, the estimated effect of drug use in the male sample remained very large after adjusting for factors such as education, marital status, the number of children, and confounding variables. In every instance, it exceeded the predicted underlying structural effects.

Concluding with a word of warning. Although this study's findings strongly imply that drug usage is connected with poverty and may even be a cause of poverty, there were a number of methodological constraints that make this research less than conclusive. First, both drug use and poverty may be attributed to individual variables. Although a sizable amount of family background variables and even some psychosocial indicators were included in the analysis of the NLSY sample,

there is still significant sample heterogeneity, which may explain the association between drug use and poverty. Future research that could address this issue in a more conclusive manner than this publication could be beneficial. Second, there were numerous assumptions made in the causal model shown in figure that might not be true. For instance, drug use may be greatly impacted by educational attainment and success. According to Becker and Mulligan (1995), education may alter a person's preference for a particular rate of time, which suggests that preferences may vary as people get more educated. Education is now considered a cause of drug use because of these effects, and the reduced-form model should reflect this by include education. What factors in general lead to drug use? In this essay, I made the assumption that people exclusively use drugs for their consumption value, however this assumption might not be accurate. Drug usage may contribute to the production of other things (such as rebellion), the demand for which is influenced by a number of environmental conditions that may also contribute to poverty. Future research should therefore thoroughly examine the applicability of other causal models than the one employed here. Finally, the assessments of drug use in this study were rather basic and dependent on self-reports that might have been skewed. Thus, estimates of the impact of drug use on poverty may have been muddled by measurement error and unobserved variability among user categories. Similar to how significant portions of the drug using population are not included in the sample because they are homeless or institutionalised, the impact of chronic drug use on poverty may be underestimated.

## **The role of Income and Employment in Substance Use**

### **Employment**

The therapy of drug misuse may benefit from employment, according to descriptive and experimental research. There is a strong correlation between drug usage and unemployment, according to descriptive data from a number of sources. The analysis presented in this chapter focuses primarily on how drug use and work interact as operant behaviours. Various environmental factors determine the circumstances in which increases in employment should result in a decrease in drug usage. The time spent working limits the amount of time available for drug use under regular employment circumstances, but reinforcement contingencies or penalties for drug use are typically missing or inconsistent. There is little reason to believe that employment should significantly lower drug use in these circumstances. In reality, jobs may encourage or sustain drug use by giving money to buy drugs because money and drugs may work as complementary reinforcers. Two randomised controlled trials examining the impact of hiring drug addicts in supported positions failed to find a connection between employment and drug usage, supporting this idea. Participants in these studies worked in low-paying occupations with no overt drug use requirements. More importantly, this chapter's statistics revealed that methadone maintenance patients used heroin and cocaine at very high rates, even when they had full-time jobs.

Research on the contingency management of drug use in treatment populations, and in particular research on voucher-based abstinence reinforcement, demonstrates that tying monetary rewards to drug-free urine tests can have a significant impact on drug usage. When methadone patients who

abuse cocaine have had trouble receiving effective treatment in the past, voucher-based reinforcement of cocaine can encourage long periods of cocaine abstinence. Additionally, this intervention effectively encourages polydrug abstinence and opiate abstinence. Even among some of the most treatment-resistant methadone patients, the intervention can achieve significant effects at high voucher magnitudes. These findings imply that employment may have therapeutic value and discourage drug use to the extent that pay for work is tied to documented abstinence from drugs.

This contingency may be met, for instance, by demanding that an employee submit a drug-free urine sample each day in order to enter the workplace; pay could then be granted based on successfully completing work shifts. This linked schedule would essentially make remuneration dependent on both employment and drug-free living. According to research done on patients who are resistant to treatment, the success of an employment intervention depends on both the size of the wage and whether or not it is linked to drug abstinence. Significant abstinence-contingent salaries will be required to encourage abstinence in patients with the most severe substance usage issues. Because many chronically unemployed methadone patients lack the skills necessary to obtain high incomes, the necessity for high pay poses a problem in practice. An intense skills-training programme that might provide patients with the abilities needed to compete for well-paying jobs may be necessary as part of an effective employment intervention. This would create a mechanism wherein a high income could be earned and made dependent on abstinence. Although a significant portion of the educational technology required to teach this population the skills they will need to function effectively in the workplace is currently available, it appears that reinforcement contingencies for participation in training will be required in addition to the current educational curriculum and teaching methods for a substantial portion of drug abuse patients.

On the principles and findings described in this chapter, an employment-based treatment intervention is now being created for chronically unemployed heroin and cocaine abusers. There are three essential parts to this therapeutic workplace intervention: (1) Voucher-based rewards for effort and abstinence, (2) skill development, and (3) supported employment. Participants have to give a urine sample each day before they can enter the office. The person may work that day if the sample is drug-free. The participants are then given a cash voucher after finishing their work shift for the day. As the number of continuous days of abstinence and workplace attendance rises, voucher values do as well. Urine tests that tested positive for drugs or unexcused absences reset the voucher value to its low starting point. Participants receive training for a variety of office professions during working hours, including instruction in fundamental academic skills, typing, number entry, and computer use. Data entry and word processing tasks are assigned to participants who finish this training or who begin the programme with these skills. The intervention appears to enhance abstinence from opiates and cocaine, according to preliminary findings from a randomised trial comparing methadone maintenance patients who receive it (therapeutic workplace group) and those who do not (control group).

The studies by Kenkel and Wang, Silverman and Robles, and Robles and Silverman provide fresh, intriguing, and complimentary viewpoints on how substance addiction and labour market behaviour intersect. Kenkel and Wang are particularly interested in the phenomena of alcohol dependence, occupational qualities, and earnings, whereas Silverman and Robles are principally interested in the phenomena of employment and illegal drug use. In order to establish the scene, it is helpful to discuss each paper's primary findings briefly.

### **Kenkel and Wang**

The analysis of NLSY data reveals that young males who fit the requirements for alcohol dependence are actually working in subpar positions. Their work is more hazardous at smaller companies and less likely to come with significant fringe benefits. Due in part to the fact that alcoholics lack the same level of human capital as their non-alcoholic counterparts, their occupations also pay less. Some of the benchmark patterns are compatible with the career choices of logical addicts who foresee the negative effects of alcoholism on the labour market, especially given the significance of human capital determinants.

### **Silverman and Robles**

Although this research has shown the potential value of opportunity cost and abstinence reinforcement in treating drug dependence, it has not yet discovered a feasible way to implement these interventions on a large scale. This is the main focus of this chapter. However, according to the analysis and research given, employment may certainly fulfil this role as a means of financing, executing, and maintaining on a broad scale powerful reinforcement contingencies for drug abstinence and significant opportunity cost for drug use.

Why and how can understanding the structural models or treatment outcomes that Kenkel, Wang, Silverman, and Robles are pursuing ultimately be helpful? Estimates of these structural effects would be helpful components of cost-benefit or cost-effectiveness analyses of programmes, medical technologies, and other proposed interventions in both cases; with proper accounting for all pertinent factors, it would be possible to determine the worth of such interventions. The perspective of the "what ifs" that are crucial in the specification and estimate of treatment effects like those mentioned above are one that is taken into account in proper cost benefit or cost effectiveness analysis.



Assume that the findings from Kenkel, Wang, Silverman, and Robles are accurate predictions of the critical treatment effects. The focus of appropriate policy would then be on (i) how it might be feasible to provide interventions that might elicit the kinds of behavioural changes (counterfactuals) that seem (based on the findings of Kenkel and Wang, Silverman and Robles) to be desirable, and (ii) how expensive it might be to deliver such interventions. How expensive is turning alcoholics into non alcoholics to society? How expensive is it to turn drug users from those who are unemployed into those who are working and, as Silverman and Robles would say is required, reasonably well paid?

Although these difficulties are not addressed by the Kenkel, Wang, Silverman, and Robles studies—and they were not intended to—understanding the overall social worth of alternative candidate therapies is undoubtedly where this line of research should be taken. There is undoubtedly a lengthy number of such candidate interventions, but a small sample might include:

1. Cutting-edge pharmacologic therapies for excessive drinking, such as naltrexone and acamprosate.
2. Restructuring managed care organisations, mental health care providers, and other entities' policies on health insurance coverage, treatment recommendations, and the like
3. Creating employee assistance programmes, workplace reward programmes, training programmes, and drug testing programmes, among other things
4. Using the tax system to give firms employment incentives.

The foundation for some of the upcoming studies in this exciting field is laid by the degree to which these and other options would (i) be effective and (ii) cost-efficient. We now have a better understanding of the complex interactions between substance misuse and labour market phenomena thanks to the significant contributions made by Kenkel, Wang, Silverman, and Robles. Although there is still much to be done, both of these studies have established strong bases and provided clear guidelines for future research.

## **Income**

When assessing the demand for pharmaceuticals, income is a crucial aspect to take into account. The quantity of money, resources, time, or possibilities to acquire products during a predetermined time period is referred to as "income." When considering how resources (money) are distributed across different consumer choices, the income variable becomes extremely intriguing. Depending on the cost of the commodities, the decision between two reinforcers may change with income.

Overall, it found that a significant economic factor influencing drug-rewarded behaviour is money. Income decline decreased consumption of reinforcers, both drugs and non-drugs. On the non-drug reinforcer, the effect was, however, substantially stronger. Therefore, changes in income can show how strongly drugs reinforce compared to non-drug substances. The non-drug item was preferred at high-income levels but drugs were preferred at low-income levels as a result of this differential response to reduced income. These findings were in line with a study by Shurtleff et al. (1987), who discovered that at low-income levels, food preferences were inverted to food preferences for saccharin. The data indicate that medicine is acting as a necessity, like food. The results of the trials comparing PCP and ethanol to saccharin were not consistent with those of Elsmore et al. (1980), which demonstrated that people preferred food to drugs when their income was low. This might

have been because food was presented in the Elsmore et al. (1980) study as the essential good while heroin was the luxury good, placing food in a closed market. Food was available post-possession or in an open economy in the drug-saccharin experiments, while drugs were only available during certain seasons (closed). Another significant economic factor that may affect the efficacy of treatments (such as alternative non-drug reinforcers) for drug dependence is the state of the economy (open versus closed). Dose levels, unit pricing of food versus drug, closed versus open economies, specific pairs of commodities that were supplied, or closed versus open economies may all have contributed to the differences between these trials. Consumption of both nutritional supplements (food, saccharin) and narcotics (such as ethanol, heroin, and PCP) grew as income climbed, indicating that they were either standard goods or, in the case of saccharin, superior goods. In contrast, studies using several forms of the same commodity, such as food or smoking, revealed that one substance was a normal good while the other was a subpar good (intake decreased as income increased). More research is required to identify the non-drug qualities (such as inferior or normal versus superior, elasticity of demand) that are most effective at lowering drug self-administration.

The economic factors that were previously identified to change drug self-administration were affected by changes in income as well. For instance, declining income decreased PCP and ethanol demand intensity. The relationship between income and the drug's unit price had another effect. When the medication's price was high as opposed to low, lowering income led to a higher suppression in drug use. However, the suppressive impact of a substitute non-drug reinforcer on drug intake was unaffected by differences in income. The maximum unit price ( $P_{max}$ ) at which maximum PCP and ethanol rewarded responses occurred was reduced by concurrent saccharin (vs water), but the degree of these adjustments was the same at all income levels. Saccharin dramatically decreased drug intake, as was previously demonstrated, and this impact was

proportionately greater at the higher FRs or unit prices. Saccharin had a general lowering of the intensity of drug demand. According to earlier research, saccharin appeared to serve as a cost-effective alternative to medications in all income scenarios. It should be emphasised that substitution effects have not been significant in these trials. This may be because a ceiling effect occurred at the fixed prices utilised for saccharin. Alternative non-drug reinforcers and income manipulations have a significant impact on drug-reinforced behaviour, although they appear to work independently of one another. However, even when only small amounts of saccharin were consumed, the reduction in concurrent drug intake was comparable to when larger amounts were consumed when income was high. It should be noted that income has a significant impact on saccharin intake, reducing it by 80 to 90 per cent when changes are made from high to low income. This result is similar with a previous study in which saccharin's price was left unfixed but the FRs for contemporaneous PCP and saccharin were both altered. Whether saccharin consumption was low as a result of FR rises or stayed high at the fixed price, the ensuing suppression of the PCP demand curve was the same.

In conclusion, the decision between a drug-based and non-drug reinforcer is significantly influenced by the current economic climate. The unit pricing of the various commodities will have an impact on consumer choice since the demand for drug reinforcers is less elastic than that for non-drug reinforcers. Although income has a very limited impact on overall drug intake, changes in wealth may dramatically affect the relative preference for drug and non-drug reinforcers. Low income, a high drug price, and, most importantly, the availability of substitute non-drug reinforcers are the ideal economic circumstances for reducing drug use.

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