

Macroeconomics and Drug Use: A Review of the Literature and Hypotheses for Future Research

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Abstract: Despite more than a century of drug prohibition, problems of addiction and drug abuse continue to be major global public health and criminal justice concerns (United Nations Office on Drugs and Crime, 2015). It has long been obvious that many of these problems are entwined with other economic and social issues. The editors of *The Economist*, in reporting evidence of a decline in drug use in the UK, speculated on the impact of the concurrent economic slowdown and commented that, "few academics have studied the link between drug use and macroeconomic performance, and what work exists is inconclusive" (Drug use and abuse: The fire next time, 2011). The goal of this paper will be to examine the work that exists on this topic and to propose a set of hypotheses to be tested in future studies.

Keywords: Economics, recession, unemployment, drug use, drug abuse.

INTRODUCTION

Despite more than a century of drug prohibition, problems of addiction and drug abuse continue to be major global public health and criminal justice concerns (United Nations Office on Drugs and Crime, 2015). It has long been obvious that many of these problems are entwined with other economic and social issues. The recent worldwide economic crisis has raised the issue of the potential impact of macroeconomics on drug use and abuse.

Karanikolos, *et al.* (2013), Quaglio, *et al.* (2013) and Maddock, McGurk, and Thomas (2015) are among policy analysts raising the question of how the austerity many nations have adopted in response to the recession is affecting public health services, including drug abuse prevention and treatment activities. All find reason to fear that austerity budgets for drug abuse programming will have negative effects on the well-being of the public.

The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) (2010) expressed the concern that, "as Europe enters a period of economic austerity, with rising levels of youth unemployment, there are fears that this may be accompanied by an increase in problematic forms of drug use." As the

EMCDDA annual report points out such an increase spawned by the recession would be consistent with the observation that economically "depressed and marginalized communities have always been at elevated risk of experiencing drug problems"(p. 13).

In this regard, the editors of *The Economist* (2011), in reporting evidence of a decline in drug use in the UK, speculated on the impact of the concurrent economic slowdown and commented that, "few academics have studied the link between drug use and macroeconomic performance, and what work exists is inconclusive".

A recent literature review by DeGoeij, *et al.* (2015) found 16 studies that reported evidence for two behavioral mechanisms by which economic crises could influence alcohol consumption and alcohol-related health problems in a population. The first mechanism suggested is that psychological distress triggered by unemployment and income reductions can increase drinking problems. The second mechanism suggested is that less money will be spent on alcoholic beverages due to tighter budget constraints. How the opposite pressures of these two mechanisms balance out in their effect on levels of drug use and drug abuse in populations is an important question that has not been answered.

Dom *et al.* (2016) conducted a review of studies of drug use in the European Union countries during the 2008 economic crisis. They found a decrease in alcohol consumption and cigarette smoking, which they

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attributed to reductions in disposable income. In contrast, the limited number of studies on prevalence of use of illegal drugs showed increases in use during the economic crisis.

The goal of this paper will be to examine the published research that exists on the topic of the associations between macroeconomic change and the use and abuse of drugs. Consistent with the mechanisms identified by DeGoeij, *et al.* (2015), we will examine whether the literature shows differential effects on drug use and problematic drug abuse. We will also, consistent with Dom *et al.* (2016), examine the published research for evidence of differential effects on different categories of drugs, such as between effects on alcohol use and on use of illicit drugs.

In addition, we will propose a set of hypotheses that we believe should be tested in future studies along with data sources and analytic strategies that would be useful in conducting such studies.

THE STATE OF THE LITERATURE

A vast body of research exists that shows associations between socioeconomic class and various health status indicators (Feinstein, 1993; Yen & Syme, 1999; Lantz & Pritchard, 2010). There is much less evidence, however, indicating whether changing macroeconomic conditions are associated with changes in the prevalence of drug abuse or other health problems.

Macroeconomics and Community Health

Mortality rates are one community health status indicator for which there are studies of macroeconomic effects. Early on, the work of Brenner (1971, 1979, 1984, 2005) and his associates dominated the field. Brenner (1979) noted that, "The long-term upward trend in real per capita incomes is associated with better health, but the smoothed curve disguises cyclic fluctuations, recessions followed by periods of rapid economic growth, which may be stressful to certain groups in the workforce and, by extension, to their families". Applying a time-series model with lagged effects, they developed an economic change model of mortality and concluded that economic downturns were associated with increasing mortality. While Brenner's findings were widely reported and were consistent with what many economists and public health professionals considered to be common sense conclusions, the

methodology was criticized on statistical grounds by a number of economists and statisticians (e.g., Gravelle, Hutchinson, and Stern, 1981; Wagstaff, 1985; Sogaard, 1992). Criticisms have included the choice of lag lengths, the choice of covariates, the hypothesized pattern of lag coefficients, shifting specifications over time, and the implausibility of the finding of strongest effects for infants and the elderly, groups for which macroeconomic forces would not seem likely to have their greatest effects. Analyses that corrected for these problems have failed to replicate Brenner's findings (Forbes & McGregor, 1984; McAvinchey, 1988; Joyce & Moan, 1993; Wagstaff, 1985).

In contrast to Brenner's conclusions, when Ruhm (2000) examined state-level vital statistics data he found that mortality increases during economic upturns and declines during recessions. Ruhm found that for every 1% increase in the state unemployment rate the total mortality rate could be expected to decrease by 0.5%. Increases in unemployment were predictive of particularly large reductions in traffic deaths and other accidental fatalities. Unemployment rate increases also seemed to be predictive of decreases in deaths due to heart disease, influenza/pneumonia, and infant mortality. Cancer mortality was found to be unrelated to unemployment rates. Suicide was the only major cause of death that was found to increase when unemployment increased. These findings were replicated in an analysis of data on twenty-three European nations (Gerdtham & Ruhm, 2006). For these nations every 1% decline in unemployment predicted that total mortality would increase 0.4%, liver disease deaths 1.8%, motor vehicle deaths 2.1%, and other accidents 0.8%.

In an analysis of US vital statistics and economic data, Tapia Granados (2005) found that during the 20th Century the long-term trend toward declining total mortality and mortality for specific groups, ages and causes accelerated during recessions and was reduced or even reversed during periods of economic expansion. The sole exception was that of suicides, which increased during recessions.

In a subsequent study, Tapia Granados (2008) found that economic growth was positively associated with improving population health in Sweden throughout the 19th century. However, the relationship became weaker as the century continued and was completely reversed in the second half of the 20th century. In the second half of the century economic growth began to negatively affect health indicators. Models using

inflation and unemployment as economic indicators revealed similar results.

In attempting to answer the question, "what will the current economic crisis mean for the health of the people of Northern Ireland?," Stuckler, *et al.* (2009a) reviewed the experience of three major economic crises in the 20th century: the Great Depression (1929), the Post-communist Depression (early 1990s) and the East Asian financial crisis (late 1990s). They concluded that the historical evidence suggested that health is at risk in times of rapid economic change – both in booms and busts. Further, they noted that history also showed that the impact of economic downturns on mortality was exacerbated where people have easy access to the means to harm themselves and was ameliorated by strong social cohesion and social protection systems. On this basis, they predicted that the health of the people of Northern Ireland might escape relatively unscathed in the short term.

Stuckler (2009b) used multivariate regression, correcting for population ageing, past mortality rates, past employment trends, and country-specific differences in health-care infrastructure, to examine associations between changes in unemployment rates and mortality for 26 European Union countries between 1970 and 2007. They found no consistent evidence for an increase in all-cause mortality when unemployment increased. Increases in unemployment were associated with significant short-term increases in premature deaths from intentional violence and in reduced traffic fatalities.

Microeconomics and Drug Use/Abuse

A number of studies have examined the impact of unemployment on individuals' use of alcohol. Crawford, *et al.* (1987) found in a general population survey in the United Kingdom that unemployment was associated with heavier alcohol use. Ettner (1997) examined data from the US 1988 National Health Interview Survey and found that non-employment significantly reduces both average daily alcohol consumption and number of symptoms related to alcohol dependence. Ettner suggested that this was probably due to an income effect. In an analysis limited to cases of involuntary unemployment he found a mixed effect whereby job loss increased the consumption of alcohol in the total sample but reduced dependence symptoms among individual respondents.

A series of studies have examined this issue at the individual level in Finland. Mustonen, Paakannen, and

Simpura (1994) found an association between unemployment and heavier alcohol use in Finland. Lahelma, Kangas, and Manderbacka (1995), on the other hand, found that neither frequency of drinking nor of intoxication was associated with employment status for men or women. In contrast, they found that the frequency of health problems due to drinking was associated in a statistically significant way with unemployment among men but not among women. Luoto, Poikolainen, and Uutela (1998) found that before and during the recession of the 1990s unemployment was weakly associated with the upper consumption level (8 or more drinks per week for men, five or more for women) among poorly educated, single unemployed men and highly educated, single unemployed women.

Bor, Basu, Coutts, McKee, and Stuckler (2013) compared surveys of alcohol use in the overall U.S. adult population conducted prior to (2006/2007) and during (2008/2009) the Great Recession. That study found a small but significant decrease in the proportion of drinkers from prerecession (52%) to recession (51.6%). This decrease appeared to be due to an increase in the number of individuals who had lost the financial resources, perhaps due to job loss, to purchase alcohol. Among drinkers, however, number of drinking days per month and number of monthly binge drinking episodes increased significantly from prerecession to recession.

Frone (2015) similarly compared data from two surveys of U.S. workers conducted prior to (2002–2003) and after (2008–2011) the Great Recession. The results revealed a higher proportion of drinkers among middle-aged employees, but not among young employees, after the recession. Gender and race did not moderate the relation of the recession to drinker status. Among drinkers, the recession was not related to frequency or quantity of alcohol use, but was positively related to the frequency of heavy drinking and intoxication. Among drinkers, gender, race, and age did not moderate the relation of the recession to alcohol use.

Macroeconomics and Mental Health

Since abuse of and addiction to alcohol and other drugs falls within the rubric of mental disorders, studies of macroeconomic factors and mental disorders are relevant to our study. The seminal study on this subject is that of Faris and Dunham (1939), which studied the place of residence of 35,000 Chicago residents who

had received psychiatric treatment between 1922 and 1931 at area mental hospitals. Faris and Dunham found that rates of schizophrenia were highly associated with the socioeconomic status of the neighborhoods in which persons lived. Hollingshead and Redlich (1958) found the same thing in New Haven, Connecticut. Social researchers theorized that this association was due to people living in poverty being isolated from the normal social contacts necessary to develop a mentally healthy personality. This was commonly stated as “the slums are the breeding ground of mental illness” and was known as the “breeder hypothesis” (Duncan, 1988, p. 97).

More than two decades later a study of the prevalence of schizophrenia in Detroit found no significant difference when the economic status of the person's parents was examined rather than their own current economic status (Dunham, 1965 and Dunham, Phillips, & Srinivasan, 1966). Based on these results, Dunham theorized that schizophrenics became poor because of their illness rather than ill because of their poverty. This became known as the “drift hypothesis” because it suggested that schizophrenics drifted into the slums because of their inability to function successfully in the workplace.

Brenner (1967) examined the association between mental hospital admissions and unemployment in New York State over the period 1910 to 1960. He found a strong inverse relationship between mental hospital admissions and the employment index. The data revealed, however, that subgroups among the hospitalized population exhibited grossly different patterns of reaction to economic changes. In Brenner's words, “For reasons not yet well understood, risk of exposure to economic stress appears to vary with diagnostic category of illness and socioeconomic status.”

Brenner (1975) also looked at the relationship between economics and alcohol use. He found that the long term trend and shorter term fluctuations in the state of the economy were both related to alcohol consumption, but in different ways. The long term trend of increasing per capita personal income was positively correlated to per capita alcohol consumption. In short term fluctuations, however, there was an inverse relationship.

In his state-level analysis Ruhm (1995) found a procyclic (positive) association between state economic conditions and alcohol consumption. Freeman (1999),

using an extended panel, confirmed Ruhm's finding of a pro-cyclical pattern in alcohol consumption.

Makela (1999) studied the alcohol-related mortality rates in Finland during a period of economic boom followed by recession. The analysis showed that alcohol-related mortality increased during the economic boom and decreased slightly during the recession. Persons of low socioeconomic status tended to have a greater increase during the economic boom and a smaller decrease during the recession.

Freeman (2001) examined beer sales in the US in relation to economic upturns and downturns and concluded that, “beer consumption is relatively impervious to the vicissitudes of economic cycles”. Kruger and Svensson (2010) studied alcohol sales in Sweden and found that they increased during short-term economic upturns. Dee (2001) conducted an analysis of data from the Behavioral Risk Factor Surveillance System that showed the prevalence of binge drinking to be strongly countercyclical.

As we previously noted from an editorial in *The Economist* (2011), few studies have examined the prevalence of drug use in relation to economics. Examining government data from five countries, Smart and Murray (1983) found that increases in officially recorded measures of drug abuse were related to improvements in economic conditions. Extending their analysis to 152 countries, they found that measures of public health status rather than economic indicators were the best predictors of level of drug abuse. Smart and Murray (1985) concluded that the data did not support a hypothesis that drug abuse was associated with higher levels of socioeconomic development.

Catalano, Rook, and Dooley (1986) examined data describing approximately 3,850 principal wage earners interviewed over a four-year period in the Los Angeles-Long Beach metropolitan area. Results suggest that job insecurity due to high levels of unemployment increases the likelihood of drug abusers considering seeking help and of them actually seeking help. The effect withstands controlling for most known person-level predictors of help-seeking including symptoms of psychological distress and social support.

Gascon and Spiller (2009) conducted a trend study to determine if there was a relationship between counties unemployment rates and rates of opiate exposure in Kentucky. The time period analyzed was from 2000 through 2005. Data were obtained from the

US Census Bureau, US Department of Labor, and the Kentucky Regional Poison Center. Three of the six years (2000, 2002, 2003) showed a significant positive correlation between higher unemployment rate and higher rate of opiate exposure. The largest negative correlation was noted in 2004, which was also the period wherein the unemployment rate decreased statewide. Correlations for the remaining two years (2001 and 2005) failed to reach statistical significance.

Positive associations between economic growth and alcohol and other drug use and negative (countercyclical) associations between unemployment rates and such use has usually been attributed to greater ability to afford drugs in times of prosperity. A number of person level studies support this interpretation. Bellis, *et al.* (2007), for instance, found that British adolescents with more spending money were more likely to drink frequently, to binge drink, and to drink in public. Martin, *et al.* (2009) similarly found that college students in the US with lower levels of spending money had lower levels of drinking and getting drunk. Humensky (2010) found that higher parental income is associated with higher rates of binge drinking and marijuana use among their children.

PROPOSED HYPOTHESES

Based on this examination of the extant literature, we have formulated six hypotheses that we believe would be worth testing regarding the relationship between the state of the economy and the non-medical use and abuse of alcohol and other drugs. These six hypotheses are not proposed as exhaustive of the possible topics worth study but simply as a good starting point in studying this largely unexamined subject.

Hypothesis One: In times of low unemployment (< 5%), non-medical drug use will increase. Around 69% of the US gross domestic product is private consumer spending (The Economist, 2015, p.236). While spending in the illegal drug trade is not assessed in the GDP because it is a black market, it seems likely that the impact of the larger economy on spending behavior in this market is similar. It can be argued that drug consumption behaves in a pro-cyclical fashion. In times of lower unemployment (<7%), individuals have access to more money and have the opportunity to demand more goods including illegal drugs.

Hypothesis Two: Alternatively, it can be theorized that non-medical drug use behaves in a countercyclical

manner, that is, that in times of higher unemployment (> 7%), drug consumption will increase. As unemployment increases, more individuals are out of work and have less access to money to demand normal goods/services. Along lines pioneered by Brenner (1971, 1973), one can hypothesize that high unemployment creates stresses for individuals that may motivate them to take drugs for relief or escape.

Hypothesis Three: The price environment, as measured by the Consumer Price Index (CPI) will have a differential effect on the moderate use of illegal drugs among low income and middle income persons compared to high income persons. It is conceivable that spending on drugs is affected by the amount of disposable income people have. If such is the case, then we would expect those with greater reserves of disposable income to have their spending on drugs affected to a lesser extent than those with more tenuous incomes.

Hypothesis Four: The price environment (as measured by CPI) will have a differential effect on the moderate use of alcohol and other legal drugs among low income and middle income persons compared to high income persons. It may be that the portion of their income that wealthy individuals spend on alcohol and other drugs is so small compared to their total disposable income that fluctuations in the economy have little or no effect on their drug expenditures. This might insulate their drug spending from economic impacts that may affect those with smaller incomes.

Hypothesis Five: The association between the price environment (as measured by CPI) and moderate drug use differs significantly from their impact on drug abuse. For moderate drug users spending on drugs may be thought of as discretionary spending from the money left after paying for necessities. It can thus be seen as akin to entertainment, dining out, or other such expenditures. For the addicted drug abuser, spending on drugs is one of the necessary expenditures of daily life and thus less open to being reduced in response to any decline in income or worries about the economy. Furthermore, it is possible that personal stressors related to an economic downturn may make vulnerable individuals more likely to begin or increase abusive drug taking.

Hypothesis Six: The association between the price environment (as measured by CPI) and moderate use of alcohol, a legal drug, will differ significantly in strength from that with use of illegal drugs. In most

places in America alcohol is sold in a legal market. The currently illegal drugs, on the other hand, are only available in a black market in most places in America. This could have a material impact on the way in which economic fluctuations might affect spending on alcohol versus illegal drugs. For instance, the more diverse market in alcohol, with clearer differences in price and in quality, may make alcohol expenditures more fungible. It can be much easier for the alcohol purchaser to switch to a cheaper brand than it would be for the purchaser of illegal drugs to do so in a black market where the choices available may be far more limited.

MEASUREMENT

Drug Use Measures

There are a number of potential data sources on drug taking (both use and abuse) that could be utilized in a study of the impact of the economy on drug consumption. The most extensive and sophisticated of these appear to be surveys conducted in the United States. These surveys could provide the drugs data for a study of the US economy and drug taking. Most appropriate are the National Survey on Drug Use and Health, the Monitoring the Future survey, and the Youth Risk Behavior Survey.

The National Survey on Drug Use and Health (NSDUH), originally called the National Household Survey on Drug Abuse (NHSDA), is an annual nationwide survey of a representative sample of persons aged 12 or older at their places of residence, which has been conducted since 1971. Data from the NSDUH provide national and state-level estimates on the use of tobacco products, alcohol, illicit drugs (including non-medical use of prescription drugs) and mental health in the United States. The NSDUH serves as the U. S. Government's primary source of information on the nature and extent of substance use and abuse in the population (Substance Abuse and Mental Health Services Administration, 2012).

Monitoring the Future is a research program exploring changes in important values, behaviors, and lifestyle orientations of contemporary American youth through three substudies: (1) an annual survey of high school seniors that was initiated in 1975; (2) ongoing panel studies of representative samples from each graduating class that have been conducted by mail since 1976; and (3) annual surveys of 8th and 10th graders that were initiated in 1991. The surveys are conducted using a multistage area probability sample

design involving three selection stages: (1) geographic areas or primary sampling units (PSUs), (2) schools (or linked groups of schools) within PSUs, and (3) students within sampled schools. Students in each grade are randomly assigned to complete one of four questionnaires, each with a different subset of topical questions but containing a set of "core" questions on demographics and drug use. The survey annually samples an average of about 400 public and private schools and about 50,000 students. (Bachman, Johnston, O'Malley, & Schulenberg, 2006; Johnston, O'Malley, Bachman, & Schulenberg, 2013)

The U.S. Centers for Disease Control developed the Youth Risk Behavior Surveillance System (YRBSS) to monitor six categories of priority health-risk behaviors among youth nationwide. Conducted biennially since 1990, the Youth Risk Behavior Survey (YRBS) measures behaviors related to intentional and unintentional injury, sexual activity, diet, physical activity, tobacco use, and alcohol and other drug use among representative samples of students in grades 9 through 12. The YRBSS includes a national school-based survey conducted by CDC as well as state, territorial, and local school-based surveys conducted by education and health agencies (Brener, Kann, Shanklin, Kinchen, Eaton, Hawkins, & Flint, 2013).

Most of the above sources will provide data on levels of drug consumption in general but researchers may want to examine the relationship between economic change and drug abuse. The National Survey on Drug Use and Health derives estimates for levels of drug dependence and abuse in the population based on a set of questions derived from diagnostic criteria from the American Psychiatric Association (1994). A researcher who wishes to examine associations between economic indicators and drug abuse might find the National Survey of Substance Abuse Treatment Services or the Treatment Episode Data Set useful.

The National Survey of Substance Abuse Treatment Services (N-SSATS) is an annual census of all drug and alcohol abuse treatment facilities in the United States. N-SSATS is designed to collect data on the location, characteristics, and utilization of services at public and private alcohol and drug use treatment facilities throughout the 50 States, the District of Columbia, and other U.S. jurisdictions. This includes a patient census for each facility.

The Treatment Episode Data Set (TEDS) is a compilation of data detailing the demographic and

substance use characteristics of admissions to and discharges from substance use treatment. TEDS is part of the Behavioral Health Services Information System (BHSIS), formerly known as the Drug and Alcohol Services Information System (DASIS), a cooperative program among the Substance Abuse and Mental Health Services Administration and state substance abuse agencies to collect data on substance use treatment services.

Non-US data sources tend to be of more recent origin, providing less data for historical comparisons. A number do exist, however, and they might prove useful for researchers wishing to take a European or world approach to the subject. National data also will be available for many individual countries, which some researchers may choose to utilize.

The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) is one of the European Union's decentralized agencies. Inaugurated in Lisbon in 1995, it has been designated by the EU as the reference point on drugs and drug addiction information in Europe. EMCDDA initiated an annual European Drug Report in 2014 (Mounteney & Griffiths, 2014). Previously they had published an Annual Report on the State of the Drugs Problem in the European Union from 1995 through 2012.

The European School Survey Project on Alcohol and Other Drugs (ESPAD) is a collaborative effort of independent research teams in more than forty European countries and the largest cross-national research project on adolescent substance use in the world (Ritson, 2003). The overall aim of the project is to repeatedly collect comparable data on substance use among 15–16 year old students in as many European countries as possible. Surveys have been conducted since 1995, with 39 countries participating since 2011.

The World Drug Report, produced annually by the United Nations Office On Drugs and Crime (UNODC), presents an overview of developments in the world's illicit drug markets, focusing on the production, trafficking and consumption of the main types of illicit drugs, along with the related health consequences of those drugs. The report currently compiles data from national sources in ninety-eight nations.

The Global Drug Survey is an exchange hub for surveys conducted in many nations. A new entry into the field, it may become a useful source for prospective data but has little or no data for retrospective analysis.

Economic Measures

One of the most important measures of the economic status of the nation is the Consumer Price Index (CPI). The index is based upon a national recurring survey that is conducted by the U.S. Department of Labor's Bureau of Labor Statistics (BLS), which is part of the U.S. Department of Labor (Bureau of Labor Statistics, 2015). CPI seeks to identify the level of real spending by consumers on a market basket of represented goods/services (Casler, 1992; Bureau of Labor Statistics, 2015). Examples of market basket items include but are not limited to food, medical care, professional services, shelter, clothing, transportation, and electronics (Bureau of Labor Statistics, 2015). The index is calculated by analyzing the price changes of these basket items from year to year. The market basket items are then weighted to reflect their perceived importance to the consumer (Casler, 1992).

In order to determine sample weights, the Bureau of Labor Statistics currently tracks the spending patterns of consumers by using three types of indices: CPI-W, CPI-U and C-CPI-U. The Consumer Price Index (CPI-W) for Urban Wage Earners and Clerical Workers index, which is the original index, seeks to collect data on households where 50 percent or more of household income comes from wages and clerical workers' earnings (Reed & Stewart, 2014). The CPI-W represents approximately 30 percent of the total U.S. population (Reed & Stewart, 2014). The CPI-U (which has been used since 1978) is a broader and more commonly used index that is based on the expenditures of residents of urban or metropolitan areas. Professionals, the self-employed, the poor, the unemployed, and retired people, as well as urban wage earners and clerical workers are all included in this survey, which is generalizable to approximately 90% of the total U.S. population (Reed & Stewart, 2014).

Chained CPI-U for All Urban Consumers (or C-CPI-U), which also represents the urban population as a whole, uses the same market basket of represented goods and services as the CPI-W and the CPI-U. However, a different formula is used to determine item weights (Bureau of Labor Statistics, 2015). If a consumer's primary goods and services becomes too pricey or unavailable, the formula used in the chained CPI attempts to account for the consumer's ability to switch to substitute goods and services (Bureau of Labor Statistics, 2015). This index is viewed as a more conservative measure of price increases (Bureau of

Labor Statistics, 2015). People living in rural nonmetropolitan areas, in farm households, on military installations, in religious communities, and in institutions such as prisons and mental hospitals are not included in any of the CPI indices (Reed & Stewart, 2014; Bureau of Labor Statistics, 2015).

The information garnered from the CPI is used to determine the cost of represented goods and services in the United States. This information is used by federal and state agencies such as the Center for Medicare and Medicaid Services (CMS), the Social Security Administration and by state pension agencies to make cash flow and cost of living adjustments (Bureau of Labor Statistics, 2015). CPI is also used to identify the presence of inflation, deflation or price stability in the market (Evans, 2013; Higgins & Verbrugge, 2015).

Inflation is defined as a sustained increase in the general level of prices for goods and services in an economy (CPI Inflation rate of 2.5% or higher). Inflation occurs when there is a decrease in the availability of demanded goods and services (McKenna, 1977; Evans/Harvey Mudd College, 2013). In the short run, the demand for these services can become greater than the supply of these services (McKenna, 1977; Casler, 1992). Due to this occurrence, suppliers will increase the prices of the goods and services. However, over time, the cost of the goods and services will increase beyond the purchasing power of the consumer (demander of goods/services). Due to this increase, the purchasing power of the demander will eventually decrease and the average standard of living will start to decline (McKenna, 1977; Casler, 1992).

Deflation is defined as the sustained decrease in the general level of prices for goods and services (CPI Inflation rate of $< 0\%$). Deflation usually occurs because of a reduction in personal, or government spending, which can occur in periods of high or increasing unemployment (Shilling, 1999; Evans, 2013). The reduction in spending has the ability to decrease demand which in turn reduces the price for these goods and services. As a result, suppliers can no longer afford to supply items at the decreased price. These suppliers will start to reduce their supply and in turn lay off their employees. This has the potential to exasperate a situation where there is already high or growing unemployment (Shilling, 1999). As a result of these potential occurrences, the presence of deflation is associated with a poorly performing economy (Atkeson & Kehoe, 2004; Evans, 2013)

A price stable environment, CPI inflation rate between 0- 2.5%, is identified by low economic inflation and constant market growth (Akerlof, Dickens, & Perry, 1996; Evans, 2013). In a price stable environment, the price of goods and services remain relatively stable in a market and there is relatively little economic fluctuations. As a result of the consistency in the market, price stable environments are also associated with high levels of economic activity and employment (Akerlof, Dickens, & Perry, 1996).

Unemployment

Unemployment occurs when a person who is actively seeking employment but is unable to find work. The most frequently cited measure of unemployment is the unemployment rate, which is a measure of the number of unemployed persons/ people in the labor force (Layard, Nickell, & Jackman, 1991). In any economy, there is a rate of unemployment that is expected when an economy is functioning at full capacity. This is known as the natural rate of unemployment, which is estimated to be at about five percent (Hall, 1979; Blanchard & Katz, 1997; Shah, 2012).

There are three commonly used categories of unemployment: structural unemployment, frictional unemployment, and cyclical unemployment. Structural unemployment occurs when technological changes in the market creating demands for certain types of skilled labor, while reducing the demand for other types of skilled labor (Leonard, 1986; Casler, 1992). Frictional unemployment occurs when workers are voluntarily between jobs. With this type of unemployment, an individual leaves the workforce to find another job, which better suites their lifestyle or career goals (Leonard, 1986; Casler, 1992). Cyclical unemployment occurs when they are downturns in the overall business activity (Abraham & Katz, 1986; Casler, 1992). There is an inverse relationship between business cycles and cyclical unemployment. When the business cycle is at its peak, cyclical unemployment will be low. If the business cycle is low, then cyclical unemployment will be high (Casler, 1992).

The unemployment rate is often used as a measure of health of the economy. In times of low unemployment ($<5\%$), consumers have greater opportunities to work or to find jobs which will give them more access to money and more opportunity to demand normal goods and services; while in times of high unemployment, consumers have less opportunity

to work or to find jobs which lead to less money and less opportunity to demand normal goods/services (Layard, Nickell, & Jackman, 1991).

SUGGESTED ANALYTIC APPROACHES

Regression Analysis

Due to the complexity associated with modeling health risk behaviors such as drug abuse we propose that a binary logistic regression model may be used. A model of this nature will allow the researcher to analyze the influence of the predictors of interest (unemployment rate, CPI), while simultaneously controlling for demographic (age, gender, race/ethnicity) and sociodemographic (marital status, occupation, income level) variables. A binary logistic regression model is defined as $z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_k X_k$. predicts the log odds of the dependent variable (z). The log odds of the dependent variable (z) encompass two categories (1 and 0). One is defined as the value of the dependent variable, and zero is used as the reference value (Garrison, 2009). For purposes of this analysis, the dependent variable could be the use (or abuse) of an illegal drug over the past year. The individuals who engaged in this behavior would be categorized as a (1) and the individuals who did not engage would be placed in the reference category (0). On the opposite side of the equation there is β_0 , which is the constant. Listed after the constant, there is the possibility of having k coefficients and k independent variables. Based on the theoretical nature of the investigation these predictors are also allowed to interact (Garrison, 2009). The allowance of k independent variables allows the opportunity to test for associations while controlling for multiple predictors simultaneously (Hennekens & Buring, 1987; Garrison, 2009). We believe that a model of this nature can be used to successfully analyze the influence of macroeconomic indicators which controlling for intrapersonal and interpersonal factors as they relate to drug use or abuse.

Time-Series Analysis

In addition, since the goal is to focus on the influence of differing macroeconomic measures over several time periods, the proposed investigation will require the use of a time series cross-sectional type of design. This type of design involves pooling of several cross sectional data sets, which were taken at different time periods (i.e., years), into one data set. The effect of combining the cross sectional data sets provides for

certain advantages. The first being the opportunity to analyze a large pooled data set (Beck, 2006). The larger sample will increase the precision of the estimators and will increase power for detecting significant associations (Wooldridge, 2009). In addition, the cross-sectional time series design allows the opportunity to account for the influence of unobserved time-specific variables (or events), which have the potential to influence outcomes (Wooldridge, 2009). For example, major watershed moments such as the 2001 terrorist attacks may potentially impact the mindsets, health behaviors, and health outcomes of the population and thus can unduly impact the results from a cross-sectional study that uses data from that specific year. The impacts of these incidents are then mitigated when surveys from these eventful years are pooled with surveys from different years, and the model control for "year effects" to account for year-specific characteristics that may bias the main results of interest. As a result of these methods we will have a more accurate analysis. There are, however, some limitations with this design. The logistic regression model requires adherence to the independence assumption, which states that the information taken from one observation is independent of information taken from any other observation. If this assumption fails then the observations are believed to be correlated and the chance of making type 1 error increases (Beck, 2006). The independence assumption violation can be avoided by placing time corresponding dummy variables in the model to represent all the years (except the first year) from which the sample was drawn (Beck & Katz, 1995; Beck, Katz, & Tucker, 1997, p. 3). This strategy can be incorporated into the proposed analysis by placing time invariant dummy variables from selected years into the regression model.

Stratification: Effect Modification

Hypothesis six which focuses on the effect of CPI on drug usage as moderated by an individual's income attainment will require the use of a study design which takes into account the possible effect of the third variable. This type of analysis can be accomplished by stratifying the study sample into low income, middle income and upper income individuals.

Stratification is a strategy that can be used to control for confounding and/or determine the presence of effect modification (Gordis, 2000). Confounding is defined as the occurrence of an effect, which distorts the true relationship between the predictor variable and the outcome variable (Gordis, 2000). Stratification

controls for confounding by creating strata where homogenous groups of individuals are placed (e.g., stratum of all women, stratum of people who have health insurance, stratum of single individuals with no dependents). Due to the lack of variability resulting from the homogenous composition of the stratified population, confounding is not allowed to occur (Hennekens & Buring, 1987; Gordis, 2000).

In addition to using stratification to control for confounding, this analysis will employ the use of multivariate logistic regression. The use of multivariate logistic regression will allow for measures of association while simultaneously controlling for a number of potential confounders (Hennekens & Buring, 1987; Garrison, 2009). The use of stratification will in turn be used to identify the presence of effect modification. Effect modification is identified when the association between the predictor and outcome variable varies across a third factor. With the analysis of effect modification, the goal is to describe how the association of interest is modified by a third factor (Hennekens & Buring, 1987).

SUMMARY

In summation, we hope that this discussion will provide a stimulus for new and more creative avenues for drug policy research. As noted by Duncan, Nicholson, White and Ellis-Griffith (2014), the current "war on drugs", or more precisely drug prohibition, has been the dominant global policy for the past century. Drug use and drug abuse, however, remain relatively unabated (Blackwell, 2014; Drucker, 1999; Levine, 2003). For example, the U.S. alone has devoted approximately one trillion dollars (US) to this war since just 1980 (Mendoza, 2010; Drug Policy Alliance, 2015). Given that human beings have been using drugs for as long as the historical record indicates (Crocq, 2007; Nicholson, Duncan & White, 2002; Westermeyer, 1988), it is not surprising that issues related to drug behavior have not dramatically changed overnight.

Today, the basis of drug policy seems to be shifting away from prohibition, even if intermittently or sporadically, to a more diverse range of approaches (Duncan, 1994). These include harm reduction, decriminalization, legalization, and such related practices as medical marijuana, heroin maintenance, etc. This greater diversity of approaches requires a broader examination of the causes of drug use and abuse.

The policy approach of prohibition has been founded in large part on the perception of drug users as persons of weak moral character or poor self-control and of the prohibited drugs as overwhelmingly powerful, dangerous, and even evil (Hoffmann, 1990; Room, 2005). Even in this Century, physician/essayist Theodore Dalrymple (2006) gained considerable attention for his reassertion of the traditional view that the origins of drug addiction lie in frailties of the addict's character and that addiction, therefore, can only be treated by a mixture of coercion and appeals to morality and self-interest. Specifically in the policy field, Hobson (2014) notes that the U.N. Single Convention on Narcotic Drugs is unique among international conventions in its emphasis on combating "evil" as its *raison d'être*.

The National Research Council (2001, p. 37) has pointed out that "A basic understanding of the determinants of drug use, especially of abuse and addiction, is a prerequisite to serious discussion of drug control policy." In contrast to the focus on individual factors in drug use and abuse that suited the prohibition model, the broader based approaches being considered in place of prohibition requiring a basic understanding to address a complex system of causes affecting drug taking (Galea, Hall, & Kaplan, 2009; National Research Council (2010). Unfortunately, it appears that, "to date, scientific research provides limited support and clarity to the complex system which results in substance use and its problems" (Birckmayer, Holder, Yacoubian, & Friend, 2004). Exploration of options for a wider range of policy responses to non-medical drug taking will require the consideration of a wider range of correlates and determinants of drug use and abuse (Gerstein & Green, 1993, pp. 45-67; Birckmayer, Holder, Yacoubian, & Friend, 2004; National Research Council, 2001 & 2010). The relationship between the economy and drug consumption is one of those areas that should merit such examination. These authors argue that now is the time to do more research on economics and drugs, addressing the paucity noted by The Economist (Drug use and abuse: The fire next time, 2011). It is to be hoped that this review will stimulate research in this area.

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