

THE REPERCUSSIONS OF CANNABIS LEGALIZATION
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Introduction

The wave of current cannabis legalization in the United States began with the implementation of medicinal use legislation, specifically Proposition 215, “The Compassionate Care Act,” in California in 1996. In such models of medicinal use, law enforcement does not pursue prosecution of individuals for cannabis use as long as they are in possession of a physician’s recommendation that stipulates possible medical benefit or alleviation of symptoms with the use of cannabis. Cannabis is currently a schedule I substance under the Federal Controlled Substances Act (CSA); therefore, doctors are unable to prescribe cannabis as doing so would be a violation of Federal Law. The apparent contradiction raises the issue of states’ rights as well as the democratic process, as every year more states adopt medicinal exclusion laws, typically via voter referendum. The current administration under President Obama has addressed the conflict between federal and state law with a policy implementation that has respected the decisions of voters in their respective states by non-enforcement of federal law. However, without the rescheduling of cannabis out of its current Schedule I category by Congress, that position can change with one election. In 2013, Washington and Colorado went a step further with complete legalization of the recreational use of cannabis by adults. The states delayed implementation of such legislation regarding retail sales until 2014 to allow development of plans to address sales tax revenue and other regulation.

As more states note the fiscal benefits of cannabis legalization and move toward their own liberalized policies, policy implementers and their constituents need to ask and answer important questions. Of primary consideration is whether any realized tax revenue is sufficient to overshadow detrimental effects such as increased abuse, increase in hard drug use, or increase in traffic fatalities? Does the wave of legalization in certain states have an effect on surrounding

states or even states hundreds of miles away in that entrepreneurs divert legal cannabis to states where possession is illegal, in a trend referred to as “spillover?” Will legalization result in decreased value of the commodity, resulting in lower profits for growers and dealers? How will cannabis legalization affect other forms of criminal behavior? Will the states that have implemented legalization experience a wave of “green” tourism in which consumers from other states travel to these areas to legally use cannabis, further injecting outside funds into the communities, and if so would that be an ongoing trend? In terms of issue salience, what if beyond the realized tax revenue and newly created jobs; there is no significant difference between models of legalization and prohibition in terms of the aforementioned concerns? What if the average citizen who does not use cannabis nor has any other vested interest, is unaffected other than the benefit of a better-funded and hence improved infrastructure?

The intent of this endeavor is to answer all of these questions, relying on academic research when possible and the development of an extensive cost-benefit analysis originally developed with the following possible negative consequences; increased use, (especially among adolescents), increased hard drug use, increased cost of tax enforcement, increased self-diagnosis/self-medication, and negative health effects. Additional possible negative effects included a decrease in value/loss of black market profit, decreased profits for pharmaceutical companies, and an increase in traffic fatalities/intoxicated driving arrests. Conversely, possible positive effects examined were increased tax revenue, decreased cost of law enforcement/incarceration, and a decrease in drug related violence in Mexico/border areas as well as in the U.S. Other possible positive repercussions are decreased reliance on pharmaceutical drugs, increased sales tax revenue of secondary industries (fertilizer, indoor grow lights), and a decrease in negative effects of “guerilla growing” (such as fertilizer run off and

associated safety issues). Additional positive effects exist such as a reduction in “spill over” or diversion of untaxed/legal cannabis to illegal areas, improvements in technology such as lighting, and an increase in low skill jobs in areas of legalization (such as “trimmers” or “bud tenders”). After excluding issues for which no academic literature existed, a working cost-benefit model developed as follows:

Cost	Benefit
Increased use especially in adolescents (Miron, 2005; Lynne-Landsman, et al., 2013; Williams, 2004)	Increased tax revenue (Crick et al., 2013; Miron, 2005)
Gateway use to hard drugs (Crick et al., 2013; Tarter et al., 2006)	Decreased cost law enforcement/incarceration (Miron, 2005)
Increase in traffic fatalities/OVWIs (Ashbridge et al., 2012; Battistella et al., 2013)	Decrease in violent crime (Morris, 2014; Shepard & Blackley, 2007)
Health concerns related to increased use (Batalla et al., 2013; Fried et al., 2002; Meier et al., 2012; Proal et al., 2013)	Reduction in untaxed "spillover"=sales of legal cannabis in illegal areas (Caulkins & Bond, 2012)
	Decrease in alcohol use (Anderson et al., 2013)

The methodology included herein relied on secondary sources to demonstrate that the initial result of cannabis legalization would be an overall positive effect for society. There was also utilization of online sources to determine the pricing effect on the black market and state reported revenue information in an attempt to demonstrate the economic repercussions of liberal cannabis policies. The majority of scientific research that involved cannabis in human trials comes from outside of the United States. The reason for this is that as a Schedule 1 drug, any research involving cannabis in the United States must first obtain licensure and approval from both the Drug Enforcement Administration (DEA) and the Food and Drug Administration (FDA). Furthermore, to obtain actual cannabis for research involves a laborious, formal process of obtainment from the National Institute of Drug Abuse (NIDA), an agency that supplies government grown cannabis only to researchers who have received funding from the National

Institute of Health and have had their scientific validity pre-approved by a Health and Human Services review panel. An extensive review of the available academic research clearly demonstrated that in a comparison of legal models, those of cannabis legalization produce more of a short-term benefit to society, than the legal model of prohibition, although policy implementation issues warrant additional consideration.

Historical Overview

Documentation regarding the medicinal and recreational use of cannabis exists as far back as biblical times. To have a better understanding of how personal cannabis use became criminal, it is beneficial to explore the etymology and cultural aspects of the plant. According to Lee (2012), the term cannabis has Greek as well as Sanskrit roots, and became a scientific classification in 1753 when botanist Carl Linnaeus labelled it “cannabis sativa.” Lee indicated further that the popular terminology of “marijuana” is a term that evolved from ethnocentrism and xenophobia, underlying notions that lead to the criminalization of use beginning in the early 1900s. “‘Marijuana’ is a Spanish language colloquialism of uncertain origin; it was popularized in the United States during the 1930’s by advocates of prohibition who sought to exploit prejudice against despised minority groups, especially Mexican immigrants” (Lee, 2012, p. 6). Lee wrote that further study of the history of the word finds the possible roots to have evolved from the Portuguese “mariguango,” meaning “intoxicant.” Due to the pejorative ethnic reasons for such a label and in the pursuit of objectivity, for the purposes herein, the scientific label of “cannabis” will be utilized to reference the three “land race” or original species of the cannabis genus; indica, sativa, and the lesser known ruderalis.

Cannabis indica is a species native to the Hindu-Kush region of Afghanistan and Pakistan, whereas sativa varieties are native to Central and South America, and the ruderalis is a northern hemisphere cannabis species. The indica plant is shorter, with broader leaves, than the more well-known, stereotypic sativa. All cannabis species produce psychoactive effects due to “delta-9-tetrahydrocannabinol” (THC), a molecule initially discovered by Israeli scientists Dr. Raphael Mechoulam and Yechiel Gaoni in 1964. To a lesser extent, the effects of cannabis are also influenced by another, more recently discovered “cannabidiol” (CBD) molecule that seems to offset the negative effects of THC (specifically anxiety), and by itself, has no intoxicating properties.

The increase in THC levels in cannabis over the last several decades observed by both law enforcement and cited by opponents of cannabis legalization as evidence that cannabis is not harmless, is not coincidental. A better understanding of how THC levels were increased and how THC levels affect pricing gradients is required because research in this area labels differing cannabis quality as either “low grade” or “high grade,” or in some articles as “commercial grade” and “sinsemilla” (Spanish for “seedless”). Users, providers, and in this case researchers, have defined cannabis grade and its value, primarily by high THC content, as well as subjective factors such as smell, taste, and desired effect. For example, some medicinal users in an attempt to address specific maladies have demonstrated preference for strains that have low THC but high CBD levels. Low-grade cannabis in the United States predominantly smuggled in bulk from Central and South America tends to be sativa strains. While it is possible that at the time of cultivation, these plants had significant THC levels, the packaging process in which the product is often compacted into bales for concealment, results in damage to the “trichomes” (stalk like, mushroom shaped glands of THC barely visible without magnification) and hence, lower THC

levels at the time of confiscation. Furthermore, southern smuggled low-grade cannabis is typically grown outdoors in large fields in which it is impossible to control variables such as pollination, which not only results in lower THC levels, but also less usable commodity due to the resultant seeds. Indoor cannabis cultivators control pollination by killing males once sex has been determined, or by using clones already sexed as females. This “high grade” or connoisseur grade indoor cannabis domestically grown in the United States has emphasized utilization of indica strains or predominantly indica hybrids as they tend to grow squat, mature faster than the sativa strains, and can produce higher yields than sativa strains. These confiscated samples have higher levels of THC due to crossbreeding genetics, the level of care taken in curing and packaging, and as noted above, an indoor environment that lends itself to more control over external factors such as pollination. The properly cared for and typically higher THC content cannabis costs more on both legal and black markets, whereas commercial grade cannabis tends to be more inexpensive and is mostly distributed in bulk.

To understand how the previous, costly policies of prosecution have backfired, it is also important to note that from an anecdotal perspective, there is some speculation that the current trend of indoor cultivation in America was the direct result of law enforcement efforts to eradicate outdoor farming in the early 1980’s. At that time, with the financial support of the federal government via the Drug Enforcement Agency (DEA), the Californians Against Marijuana Production (CAMP) helicopter campaign was implemented. As law enforcement arrested outdoor growers and destroyed their crops, resourceful individuals found that they could elude detection and control all environmental variables to produce a superior product by moving their operations indoors. The indoor growers could selectively crossbreed the three land race species to result in preferred characteristics such as higher levels of THC, taste, and yield. Lee

(2012) posited that the majority of technological advances in cannabis horticulture were the direct result of law enforcement efforts and grower attempts to elude detection. Indoor growers began using newer artificial light technology such as high intensity discharge lighting from metal halide and high-pressure sodium lamps, as well as the more recent lower radiant temperature options of induction and LED lighting. Growers also began using soilless growing methods such as variations of hydroponics and aeroponics to increase quality and yields; therefore, claims that THC levels are higher now than previous levels, are accurate; however, such increases did not occur naturally and according to the available literature have been a direct result of prosecution of cannabis use and production. Furthermore, whereas in the late '70's and early '80s there were a handful of cannabis strains available via the black market, by the mid '90s, there were hundreds of hybrid cannabis strains available for consumption due to selective cross-breeding.

The demand for cannabis and resultant market has resulted in other horticultural innovations to increase yields and harvest frequency. Cannabis is grown in two stages; vegetative growth that equates to summer months in outdoor grows, and a fruition or bud cycle that occurs in the fall with the natural decrease in hours of sunlight. When grown indoors under the aforementioned artificial lighting, growers replicate the summer/vegetative growth season with a minimal one-month cycle of 18 hours of light, and then the growers must replicate the fall fruiting cycle by a reduction in the light cycle to 12 hours of light to reproduce the reduction of sun light in the fall. The typical result is that indoor cycles represent a minimum duration of three months. In recent years, Dutch cannabis breeders have been cross-breeding ruderalis strains, that typically contain low levels of THC, with indica and sativa strains resulting in hybrids that “auto-flower” or do not need an adjustment in light cycle, thereby further reducing the time needed to complete the indoor growth cycle, as the vegetative growth stage is reduced or eliminated. The

result of this practice is a potential increase in annual indoor production cycles from four a year to five or six a year, so that both legal and illegal producers of cannabis enjoy increased yields and profits.

To understand how cannabis came to be a valuable cash crop, and a sought after commodity, it is important to examine use trends, as well as the varying degrees of prosecution in the United States. Lee (2012) wrote that toward the end of the 1800s medical journals identified cannabis being an effective remedy to address numerous types of pain. Over a hundred years later, on October 27, 1970, with Congressional ratification of the CSA, the federal government made the determination that cannabis was to be categorized as a Schedule I drug due to it having no accepted medicinal use and a high likelihood of abuse. During that century long gap, attitudes toward cannabis use evolved out of the scarcity and competition for jobs due to the Depression, and later out of fears related to the spread of communism. Along the way, those underlying societal tensions manifested themselves in the demonization of cannabis both in the media and from the government.

The history of how cannabis came to be illegal is fraught with irony. In the early 1900's, there was no government regulation of drug use for either medicinal, or recreational use. Lee (2012) wrote that concern for public safety lead to the passage of the Pure Food and Drug Act in 1906 and an aspect of the act, was prohibition of cannabis use for anything other than medicinal use. Therefore, it would appear as if from a historical perspective, the government acknowledged over a hundred years ago that cannabis had medicinal value. The next legislation to address drug use concerns was the Harrison Act of 1914. The Harrison Act did not specifically address cannabis, as the main intent was to address an increase in opiate use; however, two aspects of the Harrison Act are of interest regarding cannabis, as these aspects would later come to define

issues pertinent to cannabis use and regulation. Lee wrote that it was at this time that the government began to differentiate between medicinal and recreational cannabis use, and that prosecution of physicians for liberal prescribing practices began. Due to “strong lobbying by the pharmaceutical industry, marijuana was not covered by the Harrison Act” (Lee, 2012, p.42), this aspect of the Harrison act served to reiterate that historically, cannabis did have widely accepted medicinal and commercial applications. That would change with time, as states began to implement cannabis control measures for reasons unrelated to the plant itself.

Martin and Rashidian (2014) also reviewed the chronological persecution of cannabis use in *The End of Cannabis Prohibition: A New Leaf*. Their overview of the implementation of cannabis regulation included the observation that the Harrison Act was the direct result of international pressure as it followed closely the regulation model of the 1912 International Opium Convention at The Hague that attempted to address increasing heroin and cocaine use. Along with international pressure, negative attitudes regarding alcohol use and an increased belief in “abstinence at the heart of a fulfilling life” (Martin and Rashidian, 2014, p.39) also resulted in increased legislation against cannabis use. What remains unclear is why society initially condemned alcohol use, from the implementation of Prohibition in 1920 to its repeal in 1933 when attitudes toward alcohol use were relaxed, yet cannabis use continued to be targeted behavior. The answer according to both sources was an underlying class tension based on ethnic and racial division.

California led the charge to criminalize cannabis in 1913, which is somewhat ironic because California also started the wave of medicinal legalization eighty-three years later. Both sources indicated that the California legislation had ethnocentric undertones. After California, the state of Texas was the next to act when cannabis was “outlawed... in 1919 amid a wave of

labor unrest” (Lee, 2012, p.42). As both states had and continue to have large Latino populations, it is possible that the implemented legislation was addressing underlying ethnic tension. Federal intervention regarding cannabis use did not occur until 1929, when Congress passed the Narcotic Farms Act, which incorrectly associated cannabis with narcotic drugs that were at high levels of abuse at the time. A direct result of the legislation was the establishment of the Federal Bureau of Narcotics, originally directed by Harry Anslinger. According to Lee, the bureau did not focus on cannabis until budget concerns became an issue during the Depression. Why there was initially no examination of cannabis as a tax source with the focus instead being on criminalization is also unclear but it is possible that the same ethnocentric undertones resulted in such policy measures.

Anslinger established a relationship with media mogul William Randolph Hearst, who used his media sources to “stigmatize marijuana and the ‘foreigners’ who smoked it, Hearst succeeded in exacerbating anti-Mexican sentiment during the Great Depression, when many Anglos felt they were competing with brown skinned migrants for scarce jobs” (Lee, 2012, p.51). This collusion led to emphasis of the term “marijuana” in the media to focus attention away from the previously socially accepted medicinal use, to a menacing plant that represented foreign competition for jobs. Their attempts to demonize cannabis came to fruition in 1937 with House Bill 6385, which sought to limit recreational cannabis use through taxation. Lee wrote that the Marihuana Tax Act of 1937 passed Congress even though dozens of medications containing cannabis were still obtainable. The annual cannabis taxes required by HR 6385 were “\$50 imposed on manufacturers, compounders, and importers; \$15 for dealers; \$25 for producers (growers); and \$1 for researchers and medical professionals who sought to prescribe it” (Martin and Rashidian, p.41). The act did not legalize cannabis; however, the lack of compliance with tax payments could result in penalties including incarceration and fines.

Lee (2012) provided several examples of irony related to the tax act; the first person convicted and incarcerated for violating the tax act was an unemployed Colorado farmhand, Samuel Caldwell (Colorado being the first state to implement recreational legalization of cannabis in 2013). Furthermore, Timothy Leary had his 1966 Texas cannabis conviction overturned in the United States Supreme Court when his attorneys successfully argued that the law violated his Fifth Amendment rights regarding self-incrimination and double jeopardy, in that purchasing a federal tax stamp was an admission of illegal behavior because doing so would clearly violate Texas law. Additionally, the low \$1 per year tax for medical professionals is further evidence that the government recognized the medicinal value of cannabis. The federal government would continue to target cannabis, as societal concerns transitioned from underlying notions of racial tension to the perceived spread of communism and along with it, government concern for any activity considered subversive.

The Nixon administration reacted to the Leary Supreme Court decision in an overt attempt to ensure no further Constitutional conflicts in 1970 with the CSA. The Congressionally ratified legislation still in effect today, categorized drugs based on their perceived negative effects and positive benefits to society. The category ranges from drugs with no accepted medicinal use and possible high levels of abuse as schedule I drugs; whereas, controlled substances with medicinal use and low levels of abuse are schedule IV. Since its implementation, cannabis has been categorized a schedule I drug along with most of the psychedelics and heroin. The schedule category of the CSA is also resplendent with obvious ironies as cocaine and methamphetamine have always been less restricted under the legislation; both are schedule II drugs due to having accepted medical purposes. Furthermore, synthetic THC under the pharmaceutical trade name of Marinol has been a schedule III drug with both accepted medicinal

use and a perceived low risk of abuse since approval of its original formulation in May of 1985. Therefore, for the past forty-two years, as far as the government is concerned, cannabis is more dangerous than both cocaine and methamphetamine, and in its natural state, offers no medicinal benefit; but, in its synthesized form of pure THC, it can be a beneficial medicine.

In further validation of medicinal use policies, it is noteworthy that during this time several individuals had legal access to medicinal cannabis. Robert Randall successfully sued the Federal government in 1976 to recognize his need for and provide him cannabis to relieve glaucoma related eye pressure. This continued during the Carter administration in which several individuals received monthly cannabis supplies from a research farm in Mississippi. In 1991, Kenneth and Barbara Jenkins were the first AIDS patients accepted into the federal “Compassionate Investigational New Drug (IND) Program.” Shortly thereafter, a wave of applications to the program began. The response from the Bush administration was to discontinue the program in March of 1992. When the Bush administration discontinued the program, there were eight individuals receiving legal medicinal cannabis from the federal government.

What would eventually grow into a nationwide trend toward liberalized cannabis policy began in California in 1996 with the passage of Proposition 215, “The Compassionate Care Act.” Championed by Dennis Peron of San Francisco, the act was a statewide referendum that sought legislative consistency, as medicinal cannabis use had been accepted practice in the San Francisco area since 1991 with the passage of the citywide “Proposition P.” That San Francisco was the starting point for medicinal cannabis initiatives was no coincidence, as during the same time, the city was dealing with the AIDS epidemic and individuals suffering with AIDS found that cannabis use alleviated some of the negative side effects of the pharmaceutical cocktails

prescribed to delay onset of full-blown AIDS. Furthermore, the west coast in general, and California specifically, have always been bastions of tolerance and progressive ideals; therefore, the accepted use of cannabis for purely recreational purposes and liberal policies regarding the acceptance of the same should not be overly surprising. The voters of California made history in 1996 when they approved medicinal use of cannabis, which would lead to a transformation of perspectives and legislation regarding both medicinal and recreational cannabis use.

Literature Review-Economic Issues

Although the trend toward liberal cannabis policies is a relatively recent one, academic study regarding the economic effects of decriminalization and legalization has been available almost since the passage of the CSA. The decriminalization model is one in which cannabis use and possession does not result in outright arrests; however, cannabis possession may still result in prosecution by law enforcement in terms of civil infractions such as fines. The legalization model is one in which cannabis use is permitted within the context of regulation and oversight. In review of the abundant existing research for this assignment, primary emphasis was on work published within the past decade in an attempt to ensure timely relevance. Miron (2005) examined both the offset costs of law enforcement and potential tax revenue in a legalized model. He specified that his focus is the model of regulated legalization, such as state monitored retail sales to adults, as this model completely eliminates arrest costs and leads to related savings, whereas in a decriminalization model there are the costs associated with ticketing individuals in an infraction manner as well as the subsequent Court process. Furthermore, in the outright legalization model, the possibility exists to generate revenue via taxes.

Miron (2005) began by examining the possible savings realized by local and state governments regarding law enforcement with the reduction of resources for cannabis prosecution. He adopted a three-pronged approach to examine the cost to law enforcement, which included an estimate of reduced use of law enforcement, the reduction in cost to the criminal court system, and the reduced cost of corrections regarding incarcerating individuals. The methodology included totaling the percentage of cannabis arrests multiplied by police budget, percentage of prosecutions multiplied by court budgets, and percentage of incarcerations compared to department of corrections budgets, to estimate a total cost savings of cannabis legalization. Miron utilized state cannabis arrest records from 2000 and noted that he excluded any arrest in which possession of cannabis was incidental to arrest or in his terminology, only cannabis arrests that are “stand alone.” He clarified this stance as being due to “if marijuana possession were not a criminal offense, the suspects in such cases would still be arrested on the charge that led to the search” (Miron, 2005, p.5). Miron conceded that being able to differentiate between “stand alone” and “incidental to arrest” charges is difficult to extrapolate from existing data; therefore, he used what he noted to be a conservative estimation of 50% of total arrests to be “stand alone.” Miron concluded that in 2000, the total amount spent by law enforcement nationwide on cannabis enforcement in terms of arrests was \$1.71 billion.

In terms of court costs, Miron (2005) examined the amount spent on felony convictions in state courts and concluded that the amount spent by prosecutors and courts for 2000 was \$2.94 billion. This calculation appeared to be grossly conservative as it failed to account for misdemeanor convictions that would be the majority of “first time” possession convictions. This court cost calculation also failed to account for diversion programs that in many states allow first time offenders to have a period of informal supervision, often with treatment, for a determined

duration in exchange for a dismissal of charges. Such programs also consume prosecutorial and court resources that results in budgetary strain. Miron explained that misdemeanor possession data was unavailable; therefore, he used a working assumption for this research that these arrests were equivalent to the percentage of trafficking convictions.

Miron (2005) then examined the cost of incarceration in terms of prisoners incarcerated as result of cannabis convictions and determined that cost in 2000 to be \$484 million. He provided total law enforcement costs of cannabis prosecution in 2000 as approximately \$5.1 billion and explained that the estimate is liberal because in high felony cases, the proceeds from auctioned seized property go back to law enforcement, and there is income generated by court fees and fines offsetting the costs of enforcement. Miron (2005) indicated such “offsetting revenue has been at the most \$100 million per year... this implies a net savings of criminal justice resources from marijuana legalization of \$5.0 billion in 2000” (p. 8).

Miron (2005) also examined the costs of cannabis prosecution for the federal government, which he estimated to be approximately \$2.6 billion in 2002. This number is substantially lower due to the majority of cannabis prosecutions occurring at the state level; the federal government rarely gets involved in cannabis matters with the exception of cases that involve trafficking large amounts or those that involve various forms of money laundering. Miron’s data (cited as obtained from “Sourcebook of Criminal Justice Statistics Online”) indicated that just over 18% of federal (DEA) arrests in 2002 were cannabis arrests. Miron also used National Survey on Drug Use and Health statistics from 2002 that indicated 74% of all drug use in the United States was cannabis use. He multiplied that number to the total amount of law enforcement expenditure on all drug enforcement (\$13.6 billion) to estimate that the total annual cost of cannabis enforcement in the United States in 2002 was approximately \$10 billion.

Legalization opponents question the validity of information regarding the law enforcement savings inherent in legalizing cannabis. Vitiello (2009) addressed the proposed legislation in California to legalize cannabis outright, “A.B. 390” also known as the “Ammiano Bill.” Vitiello presented opinions expressed by the California Police Officers’ Association that questioned cited costs of cannabis law enforcement. The specific issue of contention was whether law enforcement and the Courts in California were actively prosecuting cannabis users and the opinion Vitiello espoused was that simple possession of cannabis rarely resulted in incarceration. Vitiello (2009) posited that what was happening instead was the aforementioned issue of “stand alone” offenses, in that arrests that resulted in multiple charges would eventually result in a plea to the lesser cannabis offense, thus “some offenders who appear in the statistics as marijuana offenders are in fact more serious criminals” (p.1370). Another related statistical concern is that incarcerated individuals may have had to return to serve the remainder of their sentences after having their parole or probation revoked due to positive drug screens that indicated cannabis use. The question then becomes whether the legal status of cannabis or the original offense and failure to comply with release requirements resulted in the incarceration. Vitiello (2009) presented 2007 statistics that in California, there were a total of 833 individuals incarcerated for serious cannabis infractions, whereas “between 1998 and 2006...on average, California imprisoned approximately 1480 new marijuana offenders each year” (p.1380). As California voters passed Proposition 215 in 1996, the fifty-six percent decrease in cannabis related incarcerations that have occurred may allude to a correlation in a change in law enforcement and prosecution that has presented a savings to tax payers regarding the cost of incarceration.

Miron (2005) then analyzed the possible tax revenue implication of cannabis legalization. His methodology in examining potential tax revenue included examining use trends and differentiating between the types of possible forms of taxation. Miron (2005) stated he used statistics from the Office of National Drug Control Policy, which indicated, “in 2000 U.S. residents spent \$10.5 billion on marijuana” (p. 11). He examined what effect legalization would have on supply and demand. Miron (2005) wrote under the assumption that a change in legal status would not affect use rates in any drastic sense and that any noted increase would likely be from occasional recreational users. He also noted that a “forbidden fruit” effect could offset demand and “likely biases the estimated tax revenue downward” (p.12). Vitiello also referenced the forbidden fruit effect in his work as he cited statistics that compared use rates in the United States with use rates in the Netherlands between 1997 and 2001. The cited statistics indicated that cannabis use in the more tolerant Netherlands during that time was “about half the rate as it is in the United States” (Vitiello, 2009, p. 1376). Miron continued that changes in quality and price would result from changes in supply conditions; specifically the removal of threat of arrest and therefore costs related to same, and hence result in decreased prices after legalization. However, he noted that those same cannabis suppliers in a regulated market would be responsible for the costs of taxes that would result in offsetting this cost reduction. To estimate the costs under a legal market, Miron (2005) used what he considered to be the best available information at the time, which was to compare U.S. cannabis prices with prices in the more liberal, decriminalized Netherlands and concluded that “retail prices in the Netherlands are roughly 50-100 percent of U.S. prices” (p.13). In other words, when compared with the quasi-legalization model of the Netherlands, cannabis as a commodity fetches about the same price as black market cannabis in the United States. Miron’s footnote indicated that his data did “not

adjust for potency or other dimensions of quality”; however, given that Dutch growers have been at the forefront of cannabis horticulture for decades, the assumption is that the compared commodity was of high grade and price classification. Utilizing this information in conjunction with demand “elasticity,” Miron concluded that legalization could result in a possible price decline of 25%, or total annual user expenditure under legalization of about \$7.9 billion.

There are two possible tax scenarios for regulated cannabis, a tax policy that treated cannabis similar to other taxable goods, and that of “sin tax” in which cannabis would be taxed more heavily than other goods. Miron (2005) estimated under the first model, in which the tax rate would be about 30%, annual revenue would be approximately \$2.4 billion. Home production could negatively affect that number; however, he indicated a lack of concern for this factor noting that after Alcohol Prohibition was repealed, home production decreased. Like home brewing, home growing is labor intensive, and aside from hobbyists, there is unlikely to be more home production under legalization if retail market price would be deemed to be fair and not justify the expenditure of time and labor. If taxed at a higher level such as tobacco and alcohol, Miron noted possible annual revenue to be \$9.5 billion. He downplayed a concern that high rates of taxation could lead to more black market activity as he noted that the European tobacco market included high levels of taxation without a resultant increase in black market activity. He also noted the second, higher estimate was based on “any standard taxation applied to marijuana income as well as the sin tax on marijuana sales” (Miron, 2005, p. 15). Miron’s work went a step further and examined the division of tax revenue between the states and the federal government. Miron (2005) concluded that in a model of national legalization, working “under the assumption that each state collected revenue equal to 10% of the income generated by legalized marijuana and the federal government collected income equal to 20%...the federal government would

collect \$1.6 billion in additional revenue while on average each state would collect \$16 million” (p. 16). Utilizing 2002 data from the Substance Abuse and Mental Health Services Administration (SAMHSA) that indicated a six percent cannabis using population in Indiana to approximate a total Indiana user figure, Miron estimated that annual cannabis tax revenue in Indiana would total \$17.8 million.

Crick, Hasses, and Bewley-Taylor (2013) examined issues of tax revenue by comparing the two legalization models of Washington and Colorado. In the Washington model, the Washington State Liquor Control Board regulates cannabis consumption. There is no home growing allowed (with the exception of medicinal users already permitted to grow), there is a 25% tax rate, and there is no limit on “non-state residents” purchase amounts. Furthermore, advertising is directly addressed as retail stores “can only have one sign... advertising must not contain misleading statements or be designed in a manner to appeal to children” (Crick et al., 2013, p.7). The implemented regulations imply a lack of concern for individuals travelling to Washington for the specific purposes of obtaining cannabis as well as an obvious attempt to curtail minor usage as with alcohol and tobacco.

Conversely, the Colorado legislation is such that individuals may grow up to six plants; pay a 15% excise tax as well as a 2.9% state sales tax, and local sales tax determined by each community. In addition, there is a non-resident purchase limit of $\frac{1}{4}$ of an ounce per transaction in an attempt to curtail diversion of legal cannabis to other states. Crick et al. (2013) noted both Washington and Colorado required retail locations implement security measures including video cameras, guards, and alarms in an attempt to minimize diversion of legal cannabis to the black market. The Colorado legislation entailed more constraints on advertising, including restrictions on internet and mobile phone marketing (i.e. “banner” and “pop-up” ads). The authors posited

that the main area for future consideration by researchers should be the differences between the two states' approach to advertising as "there is wide ranging evidence showing the benefits of advertising restrictions on reducing alcohol and tobacco use among young people" (Crick et al., 2013 p.22). They also noted that although not passed, eleven other states had considered legalization with an emphasis on taxation, indicating that the issue of cannabis legalization and regulation is a trend likely to continue that will eventually require clarification from the federal government. Crick et al. examined poll data that states that allowed medicinal cannabis use had higher levels of support for total legalization than states without medicinal allowances. This polling suggests that communities that have adopted a liberal approach to cannabis use have not experienced any significant negative effects that would sway their opinion back toward criminalization.

Regarding tax revenue law, the Colorado Department of Revenue website provided extensive information for consumers, producers, and retailers including the aforementioned breakdown of each form of retail tax indicating that legal cannabis sales in Colorado result in total tax revenue for the state of 27.9%. The information indicated that the first \$40 million of 15% retail excise tax is by statute earmarked for school construction, with any surplus going toward "the state in regulating and enforcing the marijuana industry." Of additional interest in this state tax information site for cultivators regarding their tax responsibility, was the document under the section "Information for Cultivators; Average Market Rate" dated 12/27/13, a letter prepared to prospective cultivators and retailers advising of current rates for cannabis. This document indicated that "The Average Market Rate for unprocessed retail marijuana for the period of January 1, 2014 through June 30, 2014 is: \$1,876 a pound ["retail flower rate]." After accessing information via the anonymously reported black market rates of "priceofweed.com," it

is noted that illegal “high quality” cannabis as of 5/10/14 ranges in price from \$1,920 per pound (Denver), to \$6,400 per pound (Aurora). The noted price discrepancy is due to either that specific strain being of an exceptionally higher quality, the distance from the primary source (Denver), or the possibility that the listed \$400 per ounce price is an undiscounted, retail price that decreases for wholesale “quantity” if purchased at the pound quantity. Regardless, the primary significance is to note the relative similarity between legal and black market cannabis prices in a legal market.

Substantial media attention is devoted to the new gold rush in Colorado and resultant taxes. An article in “Reuters” published online on 4/11/14 reported that “Moody’s Corporation” which specializes in credit ratings and financial analysis, speculated that cannabis tax revenue in Colorado for 2014 might be as much as \$98 million exceeding previous estimates by about forty percent. Additionally, the Reuters article indicated that although the tax revenue “started off slowly...only totaling \$7.5 million [to date],” the higher estimated revenue was attributed to the low quantity of approved recreational retailers/approved permits at the beginning of the year, both of which should increase throughout the remainder of the year. In comparison, Miron’s research indicated that each state tax revenue would be approximately \$16 million, so even if Colorado were to continue only on its current revenue trajectory (which according to the article would amount to approximately \$45 million for the year), the realized tax revenue for the state of Colorado will far exceed any academic estimation. An interesting quote from a Moody’s analyst in the article is that these newly realized tax revenues are “still a very small fraction of the state’s overall budget. It’s not going to sway things too much in one way or another” (Respaut, 2014, p.1). This observation is noteworthy for two reasons; the majority of this revenue is new to the state, as the previous medicinal cannabis tax rate of 2.9% may not have amounted to much in relation to the overall budget; however, recreational sales tax is an entirely new revenue stream.

Furthermore, it is questionable if a reversal of the scenario, that instead of appropriating \$40 million in funds, someone suggested cutting \$40 million from the school system budget, if the opinion would hold that those cuts would not “sway things too much.”

The Washington State Liquor Control Board website provided similar information regarding taxes and the retail to consumer process as Washington began the retail sales component of their experiment the first week of July 2014. According to the state site, their three-tiered process from growth to consumer ensures taxation at every level at an excise rate of twenty-five per cent. Therefore, producers pay that tax upon sales to a “processor” who then pays that tax upon sales to a retailer, who would then presumably include the appropriate local level of sales tax to the consumer. The Washington website indicated estimated cannabis tax revenues within the first five years of sales to be “between 0 and \$2 billion.” Based on media reports of the first full week of retail sales that indicated a shortage due to demand and a resultant increase in per gram prices by the retailers, the safe assumption is that the realized tax revenue will be closer to the latter estimation.

Pacula, Kilmer, Grossman, and Chalopka (2010) investigated the effect of medicinal cannabis laws on supply and posited that the ambiguity in most state laws in terms of how patients are to receive their cannabis may result in increased supply to the black market (due to increased home growing or lax monitoring of dispensaries) and therefore a reduction in price. They then analyzed black market prices of “commercial grade [low grade]” cannabis utilizing data gained from the Office of National Drug Control Policy from 2002 and 2004 and the Middle Atlantic-Great Lakes Organized Crime Law Enforcement Network. Their work indicated, “prices increase as one moves away from the source...the mean price per bulk gram for marijuana got statistically higher as the cities got more distant from the mid-west/Appalachian growing region”

(Pacula et al., 2010, p. 6). A critique of this observation is that it does not clearly identify whether the researchers were discussing indoor or outdoor domestically grown cannabis.

In their supply and demand analysis, Pacula et al. (2010) noted that cannabis legalization should result in a decrease in user arrests and not affect supplier arrests; therefore, there should be no change in market price. Their data showed that in states where there are medical provisions and possession arrests continue for non-licensed users: “arrestees pay more per bulk gram.” However, they also noted that “we cannot rule out these differences are simply attributable to chance [and] also cannot rule out whether these differences are attributable to some other confounding factor” (Pacula et al., 2010, p. 15). It appears as if this data failed to control for quality, as the self-reported data from arrestees does not clearly indicate whether interviewers obtained this information. It is possible that in the states with medical exemptions, the non-licensed arrestees were in possession of higher-grade cannabis, which may be more readily available and would explain the above average reported cost. Pacula et al. readily admitted to this methodology flaw indicating a lack of available information, but that it was “unclear” if such omitted information would lead to research bias. The researchers also observed a relationship between price and the size of the population, with a lower price in larger cities. This finding is indicative of a correlation between higher population areas that include more users and hence not only more demand, but also more supply or access.

Pacula et al. (2010) concluded in states that permit medicinal use, “prices should fall...but because we see an overall positive effect of these policies on price, it suggests that the shift in demand exceeds the shift in supply” (p. 25). This increased demand and shortage of supply resulted in increased price in Colorado when medical dispensaries began selling to recreational users on 1/4/14. Media reports included images of long lines and an almost 100%

increase in retail prices, above and beyond the required increase to address recreational sales taxes, “in part to ward off a shortage” (Denver Post “Scenes From Day One of Colorado’s Recreational Marijuana Sales”, 1/2/14 p.1) . The same supply and demand issue occurred in Washington when retail sales began the first week of July 2014; therefore, the suggestion that the imposed retail price increase is to avoid selling out of product is questionable and it would appear more likely related to profit motive.

Californian voters narrowly defeated “Proposition 19,” a measure to legalize recreational cannabis use in 2010; however, speculation has continued that the historically progressive state will be one of the next few to move toward outright legalization. Caulkins and Bond (2012) focused on the concern that liberalized cannabis policies in one state can affect black markets in other states as in the aforementioned phenomena of diversion in which entrepreneurs smuggle legal cannabis to other states, an effect the authors refer to as “spillover.” As a methodology, they examined data sets from what they term “Mexican or commercial grade” cannabis and the correlation regarding market price, and its increase as the product travels further from its place of origin.

Caulkins and Bond (2012) specific concern regarding spillover was the resultant revenue loss. They proposed a solution of taxation at the production part of the process, rather than on the retail end. Their analysis included a comparison of current cannabis prices in U.S. cities with the predicted “post-legalization” price of cannabis in California, plus additional export and/or transport fees. They noted that any resulting price decrease would be concerning, and alluded to previous research that indicated a price decrease could result in use increase, especially amongst younger users. Conversely, the authors noted that resultant price decreases and increased market competition “would not be all bad. Marijuana accounts for roughly 20% of Mexican Drug

Trafficking Organizations' drug export revenue. Shrinking those revenues may help shrink trafficking related violence in Mexico" (Caulkins and Bond, 2012, p. 29).

Using California cannabis price data from 2010, Caulkins and Bond estimated the cost of transporting legal cannabis to different destinations within the United States and compared current prices with projected prices after legalization. Caulkins and Bond (2012) utilized the now familiar quality distinction of high-end ("sinsemilla") and low-end cannabis ("ditch weed" or "commercial grade"), in their work and predicted after legalization the majority of cannabis production to be high grade. They explained this assumption as the current model of criminalization bases sentences on weight and not quality. In this time of quasi-legalization, the risk of transporting cannabis illegally through more conservative states is offset by doing so with cannabis of a higher quality and hence more value, as the risk of arrest would be the same per weight as that of lesser quality and less profitability.

Caulkins and Bond (2012) used government and media data from the DEA, the Arrestee Drug Abuse Monitoring system ("ADAM"), High Times magazine, and the Price of Weed website. They explained that they relied on the distance from U.S. cities and Mexico to produce a linear model and observe its slope because, although there are other sources (Canada and domestic production for high end), the majority of cannabis consumed in the U.S. is low-grade quality imported from Mexico. Their data set relied on an average cost per pound at the Mexican border of \$400 and indicated that the value of that cannabis increased exponentially at a rate of \$400 per 1,000 miles from entry. The authors noted that four U.S. cities showed a divergence from this formula, specifically San Jose, Portland, Spokane, and Seattle all of which had higher average cannabis prices. They found that "not coincidentally, all four were in or near Northern California, a region associated with sinsemilla production" (Caulkins and Bond, 2012, p. 33). It

is also noteworthy that two of those cities Spokane and Seattle, are in Washington, which recently went to the full legalization model and began allowing retail sales. Furthermore, San Jose and Portland being in California and Oregon respectively are both in states with liberal medicinal policies and leaning toward outright legalization. The entire west coast and Northwest region as noted earlier has an extensive history of cannabis production; therefore, it should not be surprising that prices are higher in those areas as the price information utilized did not clearly indicate quality of product.

Caulkins and Bond (2012) noted that in a legalized model, estimated production costs in a greenhouse scenario would “be \$200-\$400 per pound...with additional processing costs of US \$20 to US \$35 per pound” (p. 36). After assuming a 25% supplier mark up, the authors estimated that the prominent market price after legalization and before taxation would be approximately \$300-\$500 a pound, which represents an 80-90% decrease from current prices. It would appear based on those numbers that the 2010 defeat of outright legalization in California may have been the direct result of lobbying from cannabis producers specifically in the “Emerald Triangle” region of Mendocino, Humboldt, and Trinity counties where there is little other employment or legal income available. The previously referenced Crick et al., (2013) literature indicated, “the three counties that grew the majority of marijuana...in California all voted resoundingly against Proposition 19” (p. 5). Therefore, an underlying reason for keeping cannabis illegal in California may not have been concerns for issues such as increased use, but rather, a concern of continued decrease in profit. Caulkins and Bond (2012) specifically stated that “legalization in any one state could depress prices elsewhere [and] California-produced marijuana would undercut existing sinsemilla prices in every state...the only way sinsemilla producers outside California could stay in business would be by cutting prices” (p. 37). They then examined the issue of

taxation and noted that in Proposition 19, a generally accepted level of cannabis taxation was \$50 per ounce and that anything beyond that amount would present challenges regarding collection.

Caulkins and Bond (2012) concluded that legalization decreases cost and profitability and that the lowered cost may result in increased use, specifically amongst youth whose use may be limited due to income. They referenced the “Prisoner’s Dilemma” scenario in which two co-defendants who face the same charges are offered leniency in exchange for testimony against the other. If only one testified, he received a lesser sentence than the other, and if neither testified, they would receive a lesser but same sentence (under the assumption that there is no other contributing evidence). If both betray each other, the conviction is the same, harsher sentence. Assuming that individuals act in self-interest, both parties would accept the offer to cooperate, to the detriment of both. Likewise, with states and legalization, “everyone would be better off if no one legalized, but it is in any individual state’s interests to legalize,” because to do so is in that state’s interest in terms of experiencing increased revenue from outside via “green tourism” (Caulkins and Bond, 2012, p. 40). Conversely, if all states were to follow the model, the novelty of such a trend might wear off, resulting in a decrease in revenue. An example of this effect would be the “river boat casino” gambling model that became prevalent in the 1980s. As more states allowed an increase in varying forms of legal gambling, there has been a parallel decrease in revenue for each specific state in terms of gambling revenue. Furthermore, although the work was specific to legalization in California, Caulkins and Bond noted legalization in any state would result in similar findings, especially with consideration to California being an expensive area to produce cannabis due to high utility and property costs.

Internet analysis to determine the effect of “spillover” or effect on cannabis prices in surrounding states where use remains illegal demonstrated that the legal status definitely affects

value, presumably due to enforcement negatively affecting supply. According to self-reported data on “Priceofweed.com,” in the states bordering Colorado; Arizona, Kansas, Nebraska, New Mexico, Utah, and Wyoming, the mean per pound price of illegal “high quality” cannabis was \$4357.52 (compared to the \$1,876 per pound Colorado value per the state tax website). Across the country, in traditionally conservative Virginia, the price per pound of cannabis according to the same site is almost six thousand dollars. In the Mid-West, cannabis in Michigan, a state that allows medicinal use, is about \$4,700 a pound, whereas in neighboring Indiana where it remains illegal, pound price is around \$5,300. Based on market structure, these pound prices were calculated using reported ounce prices that would presumably be higher due to that quantity being more of a retail unit in the distribution process. Wholesale pound prices would presumably be lower due to the quantity involved, but to ensure analytical consistency, all values were converted to pound unit values.

Whether any of this reported cannabis originated in areas of legalization and then diverted to areas of higher enforcement to increase profit is difficult to ascertain; however, it is apparent that legal status may affect price somewhat. On 5/10/14, the current price of legal retail cannabis as reflected in the online menu of “The Farm,” an organic retail supplier in Boulder, CO, indicated current rates of taxed, recreational cannabis as being from \$65-\$85 per “quarter ounce” quantities. In comparison, on the same day, according to the online website “priceofweed.com,” in which individuals anonymously report their cost of acquiring black market cannabis, the rate for illegal/untaxed cannabis in Boulder, Co is \$250 for an ounce of high-grade cannabis (or \$62.50 per quarter ounce). This would support the aforementioned theories that legal status has negligible effect on price, as well as provide support to the notion of decreasing use amongst youth by influencing price via taxation.

The reviewed research of economic repercussions after legalization regarding market value and tax varies from a twenty-five percent reduction in price per Miron, a more drastic reduction according to Caulkins and Bond, or a short term increase due to demand per Pacula et al.. Whether the government would offset the possible depreciation in value with the imposition of higher sales or sin tax to result in the same price or higher cost is speculative; however, the previously referenced literature indicated that such a strategy would be crucial to offset an increase in adolescent use. Tax revenue forecasts vary from predicted nation-wide revenues of \$2.4-\$9.5 billion (dependent on form of taxation) to possible individual state revenue of \$16 million annually. What is most compelling from the reviewed literature is that any income generated from cannabis legalization pales in comparison to the saved resources in terms of law enforcement, an annual savings that according to Miron (2005) represents almost \$10 billion.

Literature Review-Social Issues

Although primary considerations of cannabis legalization are the economic repercussions, a cost-benefit analysis must also include other direct societal effects of legalization. Secondary considerations warranting examination include the possible effects of legalization on other drug use (the “gateway” theory), effects on the rate of violent crime both in the U.S and in the border areas of Mexico, related illegal behavior-such as driving intoxicated, and the negative effects of increased use, especially amongst adolescents. For some of these issues, there exists vast and often conflicting academic research; however, for some of the externalities regarding legalization, there exists limited research due to the relatively recent nature of the phenomena. Again, primary focus was on research published within the last decade in an attempt to procure the most current available information regarding these secondary issues.

Mental Health Effects

Arguably, the most emotional aspect of cannabis legalization is the effect on adolescent use as the brain is in a stage of development through the early twenties, and there is a concern regarding impeded development and increased incidence of mental health issues due to drug use. Batalla et al., (2013) reviewed forty- three MRI studies, eight of which specifically examined the effects of cannabis abuse on the adolescent brain. The medical interpretation of those studies was that “long term cannabis use may result in persistent alterations in brain function and morphology that would extend beyond a period of intoxication, and that the earlier onset of use may be associated with greater detrimental effects” (Batalla et al., 2013, p.2). The medical review also noted a gender correlation might exist as female subjects demonstrated more of a difference in scan “abnormalities.” Batalla et al. noted the majority of brain dysfunction appeared to be temporary as with the exception of the “hippocampus,” the area of the brain associated with memory functions. The research team analyzed MRI studies in which cannabis abusers compared to a control group while performing “cognitive task performance” tests demonstrated less activity in certain areas of the brain than the user group. Batalla et al. observed that other areas of the brain showed increased activity they interpreted as a “compensatory neural effort.” The authors noted a need for additional research in the area including large sample, long-term studies that would include male and female subjects spanning adolescence through maturity.

Research has also sought to clarify the alleged correlation between cannabis use and a decrease in IQ levels. Fried, Watkinson, James, and Gray (2002) published “Current and Former Marijuana Use: Preliminary Findings of a Longitudinal Study of Effects on IQ in Young Adults.” The initial basis for this longitudinal study was the “Ottawa Prenatal Prospective Study”

that began in 1978 with an original intent of assessing the effect of prenatal cannabis use by pregnant women on the fetuses and a secondary objective to determine if regular cannabis use resulted in a permanent decline in intellectual functioning. The methodology utilized included a study group of seventy individuals, aged seventeen to twenty years old. The categories of research participants included current cannabis users, former users, and individuals without use history. The research team calculated IQ differences by subtracting scores taken when the individuals were nine to twelve years old when tested using the “Wechsler Intelligence Scale for Children-III,” from their young adult scores that used the “Wechsler Adult Intelligence Scale-III.” The researchers utilized a self-report questionnaire and verification via urine screens to determine cannabis use frequency.

The study used regression analysis and controlled for other variables such as socioeconomic status, education, age, gender, and mother’s use history. The researchers interpreted their findings as “the IQ difference score for the heavy current users differed from that for non-users, but no such differences were apparent between light current users and non-users” (Fried et al., 2002, p.890). They offered a possible explanation for IQ decreases in heavy users as due to the residual presence of THC and noted that had those participants not been tested previously, the subjects “would have appeared to be functioning normally” in that, the observed four point decrease in IQ score did not represent a serious deficiency (Fried et al., 2002, p.890). Fried et al. observed no significant difference between the IQ levels of former users and non-users, indicating a lack of permanent effects. IQ testing is controversial with respect to possible cultural bias; however, in this case it would appear that as a study measure, it has been useful to demonstrate that any perceived decrease in intelligence due to cannabis use is due to regular use and a discontinuation of use results in a return to normalcy.

Meier, et al. (2012) critiqued the Ottawa study for its small sample size of seventy individuals, as well as the study participants having only consumed cannabis on a regular basis for an average of two years. The “Dunedin Study” examined a sample size of 1,037 individuals from birth to thirty-eight years old. After controlling for education, the researchers examined six hypotheses, the most relevant being the “developmental vulnerability” hypothesis-that age at onset of use has more of a detrimental effect on functioning, and the “recovery” hypothesis- that discontinued use results in a restoration of normal functioning. Their findings suggested, “study members with more persistent cannabis dependence showed greater IQ decline...to a loss of 6 IQ points” (Meier et al., 2012, p. 2). The analysis indicated that this relationship between cannabis use and decreased IQ was more prominent with adolescent onset. Specifically, the study found an average eight point decline in IQ levels within individuals who used on a regular basis from adolescence (conversely the Ottawa study indicated a possible four point decline). Regarding “recovery,” Meier et al. observed a similar pattern in which discontinuation of use for at least a year resulted in no noted decrease in IQ in adult users, but the same lack of resiliency in past chronic adolescent users. Therefore, the researchers concluded that regular adolescent use is detrimental to neuro development, and irreversible.

Meier et al. (2012) offer self-critiques in that they admitted a possible causal relationship in that teens that begin regular use often demonstrate a lack of motivation that results in a withdrawal from educational settings. Although they attempted to control for education, they admitted that “the toxic effects of cannabis on the brain may result in impaired neuropsychological functioning, poor academic performance, and subsequent school dropout, which then results in further neuropsychological decline” (Meier et al., 2012, p.5). Use of frequency data in this study was limited to self-reported data without corresponding drug screens

to ensure validity of that information. The researchers admitted this might have resulted in incorrect findings; however, they offer no explanation as to the lack of supporting screens. Again, concerns regarding a possible cultural bias to IQ testing exist, as well as the limits of determination of functionality regarding the IQ scale. In common practice, average intelligence is an IQ of 100 with a standard deviation of fifteen points (Meier et al., 2012, p.6). Functionality concerns arise around an IQ of 70, generally considered as the cut-off point for borderline mental retardation. As such, it is questionable whether a decrease of four to eight points in IQ is significant, especially given a standard deviation of fifteen points.

There is also an often-cited correlation between adolescent cannabis use and an increased predisposition for schizophrenia (Cannabis and Schizophrenia: A Longitudinal Study of Swedish Conscripts, Lancet, 1987). A combined effort between researchers from the Harvard Medical School and the Veterans Administration published initially in late 2013 examined the possible correlation, and instead noted that although cannabis use may affect the time of onset of symptoms; the underlying cause for the schizophrenia is genetics. Proal, Fleming, Galvez-Buccollini, and Delisi (2014) questioned the earlier research findings due to the lack of control groups, including subjects with substance abuse issues involving other drugs, and the use of small sample sizes.

The research entailed four sample groups; no history of mental illness or drug use (control), no history of psychosis but history of heavy adolescence cannabis only use (control), patients with no history of cannabis or any other drug use and less than ten years of symptoms, and patients with history of chronic cannabis use only during adolescence and prior to onset of symptoms. The study ran from 2007-2012 and the researchers concluded “an increased familial risk for schizophrenia is the underlying basis for schizophrenia...while cannabis may have an

effect on the age of onset...it is unlikely to be the cause” (Proal et al., 2014, p.287). The researchers expressed caution of their findings due to the use of small samples; however, they felt it was important to exclude any subject with other drug use to ensure no spurious relationship existed. They also noted a research limitation in that the reported cannabis use was from illicit (“street”) users in Boston and New York in which THC and CBD levels were unknown. The authors wrote that this unknown variable is of concern because although THC is known to elicit intoxicating effects, other research by Serena Deiana has suggested, “CBD is the component that is thought to have medicinal value even in schizophrenia” (as cited in Proal et al., p.287).

Effects on Use Prevalence and Other Drug Use

Therefore, the related question is “does legalization increase cannabis use amongst youth?” If so, does cannabis use result in a progression to other, hard drug use? Williams (2004) provided an explanation of Australia’s current cannabis legislation to be one of decriminalization known as “expiation” that began in South Australia in 1987 and spread to the “Capital” and “North” territories in the 1990s. As such, possession of amounts deemed to be for personal consumption in most of the Australian states result in a civil fine. Williams utilized a logistic regression model with a dependent variable of frequency of use and independent variables that included four variables of price (dependent on the “high grade” versus “low grade” model and quantities of single grams and single pounds), variables of states based on decriminalization or prohibition, and the year of implementation. In addition, Williams separated her sample groups by age and gender.

Her research indicated that within the two models of “decriminalized” versus “criminalized” states, there was no noted difference in cannabis use amongst twenty-five to

twenty-nine year olds; however, there was a five percent increase in use of fourteen to fifteen year olds, and a seven percent increase in use amongst thirty to thirty-four year olds. Williams (2004) noted that cannabis use peaks between twenty and twenty-four years old and that use frequency is price sensitive. Williams' regression model showed cannabis use to be lower in states where its use remains an illegal activity; however, she observed a discrepancy in frequency of use between males and females in that relaxed laws result in increased use by males, but a decrease in use among females. Furthermore, the prevalence of use amongst adolescents is more affected by price (which may correlate with legal status) than the actual legal consequences of use. The research indicated a .1 percent decrease in use for every dollar per gram cost increase. Williams (2004) offered a recommendation to focus on the price aspect in terms of harm reduction attempts; "increasing the price of marijuana can be expected to have a larger impact on the prevalence of consumption in the youth population" (p. 135). Therefore, in a legalization model, emphasis should not only be age limits to possession such as those of alcohol and tobacco, but also the imposition of heavy excise taxes to pose a barrier to adolescent use.

Conversely, Lynne-Landsman, Livingston, and Wagenaar (2013) utilized "Youth Risk Behavior Survey" statistics available from four states that had implemented medicinal use laws: Delaware, Michigan, Montana, and Rhode Island. They used demographic variables such as age, ethnicity, and gender as well as adolescent use variables of daily use, weekly use, or use within the previous month to estimate a linear regression model. After analyzing twenty comparisons, the researchers found "only a single unadjusted model produced a statistically significant difference with respect to changes in frequency of marijuana use...[that] can be accounted for by chance alone" (Lynne-Landsman et al., 2013, p. 1504). In addition to the researchers not observing significant change in use patterns, they observed a decrease in daily cannabis use

amongst adolescents in Montana. A possible explanation of this relationship is the aforementioned “forbidden fruit” effect; as cannabis use becomes more widely accepted, youth may be less inclined to use cannabis as a form of rebellion. The authors noted research limitations of self-reported behavior as well as the short duration of analysis between pre- and post-legislative use changes. The earliest state, Montana had enacted legislation in 2004, Michigan in 2008, and the analysis for Delaware was unclear due to enactment of their law in 2011 and the team examining data a year after enactment.

In addition to concerns regarding how regular adolescent cannabis use may affect development and rates of use, is concern regarding the “gateway” theory and whether cannabis use leads to harder drug use. The gateway theory, which is often misunderstood as beginning with cannabis use, is defined as a drug use sequence in which abuse patterns begin with legal intoxicants (alcohol and tobacco), followed by cannabis use, then leading to addiction issues involving harder drugs. Tarter, Vanyukov, Kirisci, Reynolds, and Clark (2006) examined a sample size of 224 males studied as a baseline between ten to twelve years old, and then at varying ages up to twenty-two. The research design excluded females due to a limited sample size. Tarter et al. selected participants whose fathers had substance abuse disorders in an attempt to increase the probability of individuals with genetically predisposed substance use issues.

The subjects were divided into three groups for comparison; adolescents who used alcohol and tobacco, but at the outcome assessment had not progressed to cannabis use, those who used cannabis after alcohol and tobacco use and demonstrated the gateway theory, and youths whose use patterns began with cannabis use then moved on to alcohol and tobacco use (“reverse sequence”). Comparison of the first two groups would allow observance of environmental or character factors to explain drug use progression, whereas comparison of

groups two and three would validate the gateway theory. To clarify use criteria, the subjects had to rate the substance in question as a “preferred” intoxicant and had to have consumed it within the previous month. Additionally, for each participant, thirty-five variables such as individual characteristics, neighborhood setting, education, peers, and family setting were examined.

The research indicated that drug use patterns correlated more to environment and socio-economic factors, than from a hierarchical progression from substance to substance, as almost a third of the sample demonstrated the reverse sequence pattern. The individuals who demonstrated the reverse sequence typically came from an economically deprived background, with more exposure to drug use, and a lack of supervision. Furthermore, the authors speculated, “in a neighborhood where there is high drug availability, youths who have low parental supervision are likely to consume marijuana before alcohol and/or tobacco” (Tarter et al., 2006, p. 2138). The implication is within the current model of prohibition, cannabis is readily available to youths, and may be even more so than alcohol and tobacco due to the existing regulations involving those two “legal” substances. Therefore, the presumption is that existing regulations to ensure alcohol and tobacco are not accessible to minors is effective, and a similar implementation of policies regarding cannabis will be just as effective. The researchers concluded that their work showed no correlation in the drug use hierarchy other than early childhood parental involvement effects use patterns more so than what drug a person will end up using and in what sequence.

The recent legalization of cannabis in Uruguay is an example of a governmental policy response based on research that questioned the validity of the gateway theory. According to Codetta Youngers, Senior Fellow of the Washington Office on Latin America and Associate of the International Drug Policy Consortium, that South American nation’s recent policy change

was implemented as a direct result of increasing addiction within the populous to a cocaine base referred to locally as “paco.” The government implemented cannabis legalization in an effort to “separate the markets so that marijuana users would not be exposed to ‘paco’ by dealers and to allow law enforcement officials to concentrate on what is deemed to be a more problematic substance” (Crick et al., 2013, p.18). This progressive policy is an example of the government allowing a less harmful form of intoxication, with the expectation that the result is less abuse of a more destructive drug. Whether this this recent policy implementation results in a decrease in cocaine use is unclear at this time due to a postponement in retail sales until 2015 to ensure time to develop a government sanctioned retail market.

Effects on Crime

The issues regarding how cannabis prohibition correlates with other criminal behavior is a multi-faceted one with varying degrees of related crime in the inner cities of the United States, as well as international crime, specifically drug related, Cartel violence in Mexico and its border areas. Shepard and Blackley (2007) analyzed crime data from U.S. cities from 1994 to 2001 and found that cannabis arrests have a positive correlation with increased homicides, burglary and theft arrests, as well as increased arrests for other drugs. The authors referenced Miron’s research in noting that cannabis law enforcement efforts cost “about \$7.7 billion” annually and questioned whether that expense is justified in terms of affecting behavior. Shepard and Blackley specifically referenced the microeconomic theory of marginal benefit being equal to marginal cost in that resources are allocated to law enforcement only to the extent that the marginal benefit is equal to the marginal cost, and cost effective when compared to other methods. They also referenced supply side economic theory indicating that if law enforcement resources focus on the supply of illegal commodities, the prices of those commodities increase. The authors criticized

government-produced research referenced by the DEA and the Office of National Drug Control Policy that indicated criminal behavior is due to drug use because it failed to account for other variables such as individuals' characteristics, demographics, and familial backgrounds.

Shepard and Blackley (2007) provided six reasons why cannabis enforcement may result in an increase in other crime; a disruption in established drug "networks" may result in disputes, dealers may instead choose to engage in other criminal activity, and medicinal users may result to other criminal behavior if they are unable to meet their needs. Furthermore, the higher prices associated with illegality may result in increased incentive for new participants leading to more of the aforementioned competition. Additionally, law enforcement resources focused on drug enforcement results in constraints in which those same resources cannot focus on other types of criminal behavior, and the incarceration of non-violent drug offenders stresses prison capacities leading to an overall reduction in sentences and less incarceration for perpetrators of other criminal activity.

Shepard and Blackley (2007) observed that an increase in cannabis arrests results in a corresponding increase in larceny and vehicle thefts. They theorized this increase might be due to an individual's cannabis arrest disrupting either their employment or education situation. They also noted a positive relationship between cannabis arrests and homicide rates noting that incarcerated dealers may lead to a disruption of stable supply networks, resulting in violence. Shepard and Blackley also noted a relationship between cannabis arrests and an increase in "hard drug" arrests and indicated this effect might be due to users resorting to other drug use when cannabis is unavailable. Shepard and Blackley concluded that they did not observe any exasperation of crime issues due to the relaxation of cannabis laws and suggested that other crime rates may decrease due to law enforcement being able to refocus their attention toward that

other behavior. They reiterated a change in legal status might lead to an increase in use; however, they also referenced previous research findings (such as Williams') that use frequency is not significantly associated with legal status.

Morris, TenEych, Barnes, and Kovandzic (2014) found no exacerbating effect for liberalized cannabis policies on crimes such as rape, robbery, burglary, larceny, and auto theft, but a possible correlation with a reduction in homicides and assaults. They criticized earlier research that had examined positive drug screen results at the time of arrest and questioned whether such a research method accurately reflected a correlation between use and criminal behavior or whether a spurious relationship might exist. The team used Department of Justice statistics from 1990-2006 from each of the fifty states and a total sample size of 850. Control variables included employment status, income, education, and urban residency. They then performed an ordinary least squares regression model comparing states that had enacted medicinal cannabis laws and states where use remained illegal and utilizing each specific crime as dependent variables. Morris et al. found although there was a general reduction in crime rates in both sets of states, the reduction was more significant in states that had passed medicinal cannabis legislation. At the onset of medicinal cannabis legislation, one of the concerns was the possible effects of cannabis dispensaries on their neighborhoods as they presumably presented a target due to the amount of cash and the quantity of commodity on hand. Instead, the authors theorized that one possible explanation for the noted decrease in crime rates might be a deterrent effect realized due to the increased security of dispensaries as they utilize heightened security measures and this increased security might result in overall increased safety for the surrounding areas. The research team also suggested that the observed decrease in crimes such as homicides

might be the result of “substituting marijuana for alcohol [which] leads to minor reductions in violent crimes that can be detected at the state level” (Morris et al., 2014, p. 7).

Another aspect of cannabis related crime is the effect of U.S. consumption on criminal behavior in the border areas of the United States and Mexico. The previously referenced Caulkins and Bond (2012) article indicated that approximately twenty percent of Mexican cartel income is from cannabis distribution. During the administration of Felipe Calderon from 2006-2012, there was increased use of state military personnel to address the drug issue in Mexico. Calderons’ drug policies resulted in an increase in competitive tension between the Sinaloa and Zeta cartels and a “brutal drug war that had claimed more than 40,000 lives” (Lee, 2012, p. 402). The cartels are arguably predominantly focused on the more lucrative profits presented with cocaine, heroin, and methamphetamine exports; however, if the estimates are accurate that a fifth of their income comes from exporting low grade/commercial quality cannabis, then a relaxation of policy in the United States should have a direct impact on those operations. Whether that impact would be a reduction in violent crime is debatable as the cartels may simply refocus their efforts on the exportation of the other harder drugs; however, maintaining the status quo for the citizens of those border areas (specifically Juarez), should not be a consideration.

A valid concern regarding cannabis legalization is the possible increase in traffic fatalities due to intoxicated driving. Two recent studies examined, one published in 2012 by a research team in Canada, and another published in 2013 by a Swiss research team lent credence to this concern. Both nations have implemented liberalized cannabis policies regarding personal use within the past two decades. Asbridge, Hayden, and Cartwright (2012) noted that research regarding “case-control” and “culpability” studies have produced conflicting results from an increased risk, to no relationship, or even a decrease in risk. They also criticized some of the

existing literature for not having controlled for the possibility of other substances such as the presence of alcohol or other drugs. After excluding those studies, and then focusing on nine studies of “high” and “medium” qualities under the scoring system of the “Newcastle-Ottawa” measurement, the researchers concluded that driving under the influence of recently consumed cannabis presents approximately twice the risk of a collision than a sober driver. Although driving under the influence of recently consumed cannabis does present an increased risk, they noted, “alcohol remains the substance most often present in crashes, and the observed association between cannabis consumption and crash risk is less robust than that for alcohol” (Asbridge et al., 2012, p. 8). Anderson, Hansen, and Rees (2013) found that cannabis legalization, specifically in states with medicinal cannabis legislation, resulted in a significant reduction in alcohol abuse, specifically, a seven percent decrease in binge drinking amongst twenty to twenty-nine year olds, a group that constituted a third of traffic fatalities involving alcohol between 1990-2010. Such reduction in alcohol use amongst young Americans may serve to provide additional support for the benefit analysis of legalization.

Battistella et al. (2013) conducted an experimental study that involved thirty-one male participants subjected to consistent dosages of THC as well as a placebo, then monitored for brain activity and perceived driving ability via performance of psychomotor skill tasks. Potential subjects excluded from the study included those with an existing diagnosis of other mental illness, other drug use, or high blood THC level indicative of regular consumption. In addition, the day of the experiment, subjects underwent testing for drug and alcohol use including cannabis use within the previous twelve hours as determined by nanograms of THC in their blood samples. The volunteers were then provided either a cannabis cigarette (noted to be 11% THC and <1% CBD which is above average THC content), or the placebo after which time they

were to drive a virtual vehicle on a program utilizing a computer screen and joystick. Furthermore, MRI's were done on the participants forty-five minutes after cannabis consumption as this time increment was noted to be the "rapid distribution" phase of THC in which consumers would be at the highest level of intoxication as well as the time period in which intoxicated drivers are most often arrested.

The results of the experiment showed that THC levels in the participants' blood was highest immediately after consumption, but that three hours later "THC levels had dropped to relatively low levels (less than 5ng/ml)" that corresponded with a decrease in reported level of intoxication (Battistella, et al., 2013, p.5). The driving simulator scores and MRI images indicated a decreased level of performance immediately after consuming THC, an impairment level that peaked at the one-hour mark and thereafter declined gradually. Similar to the aforementioned research regarding the development of the adolescent brain, the researchers observed a "compensatory" effect in the MRI brain scans indicating that "after cannabis smoking, subjects need to recruit the SMA [Supplemental Motor Area] more to compensate for the decrease in activation in the cerebellum" (Battistella, et al., 2013, p. 13). Therefore, the brain makes adjustments to compensate for the presence of THC in the body. Relevance of this study regarding policy implementation includes the need for law enforcement to utilize appropriate testing tools to determine levels of intoxication. As THC remains measurable in blood and urine for a prolonged period, and the risk affiliated with operating a vehicle after use decreases at the three-hour mark, implementation of intoxicated driving legislation should include definitive cut-off levels of THC, as well as accurate testing measures to determine approximate time of use and level of current intoxication.

As with economic effects, conflicting consensus regarding secondary issues exists. It appears that early onset of cannabis use affects brain development and function, especially concerning memory functions. Whether this damage is permanent or ceases to be present after long-term discontinuation of use is debatable. With both memory and driving (motor skills) functions, the research indicated that the brain develops a compensatory effect in which other areas take over for negatively affected areas. There is similar lack of consensus regarding regular use and intelligence as research findings vary from an average decrease of four points to as much as an eight point decrease in IQ levels. Furthermore, there is a lack of consensus as to whether that observed decrease is temporary or permanent. Where the findings are similar is that regular adolescent use is more detrimental for mental health; however, it does not appear as if youth use correlates with legal status, as much as it does with price. Additionally, with the possible exception of an increase in DUI's, it appears as if cannabis liberalization has a negative effect on crime rate, specifically regarding violent crime. Various explanations for this negative relationship exist, such as increased vigilance due to heightened security and a possible decrease in alcohol abuse, which is often associated with various forms of criminal behavior.

Policy Implementation Issues

Concerns regarding issues of cannabis legalization will arise as the experiment unfolds and conflicts occur, requiring additional policy implementation or clarification. In Colorado, voters have rejected proposals to allow public consumption of cannabis (such as in bars), in a concerted effort to minimize related traffic fatalities. The people of Colorado are cognizant that their model will demonstrate either responsible implementation of cannabis policy or a failure of the same. Furthermore, issues regarding privacy and the workplace have arisen, issues that will have to be decided by the state supreme court. Former Dish Network employee Brandon Coats, a

medicinal cannabis user, tested positive for THC resulting in termination of employment. His pending tort action against Dish Network entailed legal complexities such as constitutionally implied privacy rights, conflicts between state laws, and the inadequacy of current drug testing measures.

Coats admitted to cannabis use with the recommendation of his primary physician for a spinal injury under what at the time was a medical exemption; however, he denied ever being intoxicated at work. Colorado law allows for discharge from employment if an employee is intoxicated in the workplace, but at the same time, protections exist under state law regarding engaging in legal activity on one's own time. The type of drug screen Coats submitted to was an oral screen that only indicated the presence of THC, not any quantifiable measure that could indicate level of current intoxication or approximate time of use. Such specific testing is unavailable at this time, so just as there is the need for such testing regarding driving while intoxicated, a need exists within the workplace environment to ensure the fair and legal treatment of employees. In an analogy involving alcohol, if alcohol use on one's own time in the privacy of their home (not involving intoxication at work), is protected private behavior for legal consistency in areas where cannabis is legal, similar behavior involving cannabis should also have protected status. The Colorado Supreme Court will begin reviewing Coats' case in September 2014. It is unlikely that the case will result in Supreme Court involvement, as the conflict of Federal Supremacy and the schedule 1 status of the CSA present an array of difficulties, and furthermore, the Supreme Court has already addressed cases involving the medicinal use of cannabis with decisions not favorable to legalization proponents (*Gonzalez v. Raich* 2005).

In similar conflict involving employment, there have arisen policy issues regarding “green tourism” and travel to Colorado or Washington specifically to engage in recreational cannabis use. On August 14, 2014, Indianapolis Public Safety Director Troy Riggs announced a policy implementation of zero tolerance regarding cannabis use by public safety staff regardless of where the use occurred, i.e. if consumed legally in a state such as Washington or Colorado during travels. Again, this policy implementation alluded to a conflict not only between states, but also regarding constitutional implied rights to privacy. Just as with the issues regarding driving under the influence, time specific testing would be beneficial in this situation because as previously noted, if one engaged in legal activity in their own time, and that activity does not affect productivity upon return to employment, what cause does an employer have to get involved? It is questionable whether such labor issues will result in tort action as Indiana is considered an “employment at will” state, in which employers can terminate employment with or without cause.

Other employment concerns include the debate regarding cannabis use and a reduction in productivity, as well as concerns that legalization will lead to this becoming more of an issue. A 2011 data set and analysis by the National Drug Intelligence Center (NDIC) indicated that all illicit drug use represented an annual loss in productivity of \$120 billion. The NDIC defined this loss as “reduced labor participation” (\$49 billion), involuntary unemployment due to drug conviction incarceration (\$48 billion), and drug related homicides (\$4 billion). Although the data does not indicate how much of this productivity loss is specifically due to cannabis abuse there exists a theorized association between cannabis use and reduced ambition or the notion of “anti-motivational syndrome.” As previously noted, cannabis possession alone does not typically result in incarceration, and the reviewed literature indicated that legalization correlates with a

reduction in violent crimes such as homicide; therefore, the employment issue specific to cannabis use would presumably be a reduction in labor participation.

A review of online media information indicated such a concern is without merit. A Forbes article published on April 28, 2014 indicated that out of the top fifteen cities for employment growth, Denver and Seattle both appeared on that list. In 2013, the year in which both cities' respective states legalized, Denver recognized an increase in job growth of 3%, whereas, during that same period, job growth in Seattle was 2.4%. An article published on NPR on May 8, 2014, reviewed thirteen newly created jobs or careers associated with cannabis legalization. These previously non-existent low skill jobs present not only opportunities for individuals to be gainfully employed and generate income, but also another revenue source for the state [and federal] government in terms of income tax. While difficult to determine the correlation between legalization and job growth, what remains obvious is that neither of the regions that have implemented those policies have a struggling job market. Periodic analysis would assist in determining if there is any relationship between the job market and cannabis legalization as well as the strength and direction of that correlation.

Washington and Colorado legalized recreational cannabis use; however, along with that legalization came new ways of ingesting and stronger forms of cannabis that will require additional regulation. The edible cannabis market in Colorado has gained media attention due to unfortunate incidents that have occurred of individuals consuming legally purchased THC infused "edibles" and experiencing negative effects, often resulting in injury. This occurs for several reasons: when consumed orally THC takes longer to enter the bloodstream as opposed to inhaled cannabis, with a common result of the individual consuming more than intended. Furthermore, when consumed orally, the chemical composition of THC breaks down differently

in the liver, resulting in more of the hallucinogenic effect of cannabis. The combination of the two differences in oral ingestion can result in anxiety and confusion in the inexperienced consumer, and has resulted in tragic incidents. Furthermore, some of the packaging of these edibles is questionable in terms of child safety as the forms of cannabis foods include THC infused gummy bears and chocolate bars. Regulation in this area has already begun, with retail sales including childproof packaging; however, additional regulation such as THC content labelling and consistency or warning labels such as those found on tobacco products may be beneficial for a reduction in unanticipated ingestion or over-indulgence.

In addition to the edibles market and issues, the retail industry has blossomed from one in which not only are flowers [“buds”] being sold in stores, but also more potent forms of cannabis. “Shatter” or “Wax” are forms of THC concentrate along the lines of hash and hash oil sold in retail stores by the half-gram and gram. Whereas the highest grades of cannabis flowers have THC content around twenty percent, these forms of concentrate have THC levels that can be twice as high. Much like the issue with edibles, there have been incidents in which individuals unaccustomed to the effects of THC ingestion find themselves in situations in which they experience adverse reactions, including what from a medical standpoint could be considered to be an overdose. If compared to forms of alcohol, cannabis flowers would be beer or wine, whereas these concentrates would be liquor. A possible solution to address the issue would be to have separate retail sale locations such as some states do with beer and wine sales, and separate state controlled liquor stores. The separation would presumably ensure that the state is able to provide more oversight regarding compliance with quantities and age regulation. Another possible policy implementation would be legislation regarding a set limit of THC levels for any retail sales or fines from illegal possession of these forms of THC concentrate. Unfortunately,

that legislation could prove difficult to enforce as wax production can occur in the home, furthermore, any enforcement of THC concentrate law would negate the cost savings aspect of legalization. An unforeseen repercussion of the legalization of recreational cannabis will be the additional regulation needed to protect public safety regarding edible and concentrate forms of THC.

An interesting conundrum that may actually lead to Supreme Court involvement to clarify Federal Supremacy is the issue that arises from “Rocky Mountain National Park.” The park, which spans 415 square miles in the north-central area of Colorado, is federal land. As such, one can be within their legal rights to possess and use cannabis in the entrance town of Estes Park, but were that individual to drive north-west one mile, that same activity would be illegal under federal law and the individual would be subject to arrest. Park management has included a precautionary statement on information pamphlets to ensure visitors are aware of the issue. What is unclear is whether park staff work under a mandate to make arrests or possess discretion to take a less proactive approach to the issue.

Information available online indicated that in the first year of recreational legalization in 2013, over 100 people were arrested for simple possession in both Mt. Rainier National Park (WA) and Rocky Mountain National Park (CO) (Associated Press, 2013). A request for additional information submitted via the Rocky Mountain National Park website generated an email response that indicated arrests for possession were “rare,” and are instead resolved with a citation. There have been thirty to forty such citations to date in 2014, and there has not been “a huge increase in possession/use cases, as marijuana use has historically always been present in the park, legal or not” (J. Sanborn, personal communication, October 1, 2014). This response validated previously addressed aspects such as a low number of actual incarcerations due to

cannabis use, as well as the notion that legal status alone does not have significant impact on use. As most of these federal parks incidents have only resulted in fines of nominal amounts, to date no one has chosen to pursue further legal remedy via tort action. Should such an incident lead to actual imprisonment or a substantial fine, it would be interesting to observe the outcome of appellate court action.

There is also an immediate need for policy change regarding objective research. As previously noted, due to the current schedule 1 status of cannabis, the procedure to apply for and obtain cannabis for research is a laborious one. Former University of Arizona researcher and medical professional Dr. Suzanne Sisley was relieved of her position on June 27, 2014 after working on research regarding medicinal cannabis use to offset symptoms of Post-Traumatic Stress Disorder in veterans. Whereas the school indicated the reason for the dismissal was the lack of financial funding for Dr. Sisley's research, she has expressed the opinion that politicians opposed to the research pressured the administration. As a result of the DEA and NIDA not funding or approving objective research for cannabis, its medicinal qualities remain anecdotal. Until Congress reclassifies cannabis out of schedule 1, research regarding possible benefits remain constrained by those respective agencies, and as noted above will be limited to other countries that will make gains in research beyond those allowed in the United States.

Additional policy implementation considerations include law enforcement costs and substance abuse counseling options. The primary economic benefit to cannabis legalization appears to be the saved resources regarding law enforcement. Policy implementation should include a definitive resolution as to how much law enforcement resources to allocate for tax evasion or black market sales of cannabis. Using the marginal benefit/marginal cost analysis, determination should occur regarding what amount of resources to spend on such enforcement

and substance abuse counseling and whether that use of resources is wise given current budgetary challenges of local governments.

Analysis of data provided by the government is instrumental in the “marginal benefit equal to marginal cost” analysis of those two issues. According to the National Institute of Health/NIDA website, “the abuse of tobacco, alcohol, and illicit drugs is costly to our Nation, exacting over \$600 billion annually in costs related to crime, lost work productivity and healthcare.” The website referenced this information as being obtained from resources from the Center for Disease Control regarding the costs of tobacco use, a study regarding the economic effects of alcohol abuse, and the previously referenced 2011 report from the NDIC. The included data did not specifically address cannabis costs, but rather included all drug use together as “illicit drugs.” Most notable in the report was the annual health care cost of tobacco use, reported to be eight and a half times more than the health care costs associated with all illegal drug use (\$96 billion as opposed to \$11 billion). Furthermore, the combined annual “overall” costs of alcohol and tobacco use is two and a half times more than that of all illegal drug use (\$428 billion compared to \$193 billion).

The NDIC report also included data sets regarding drug use trends from 2005-2009 obtained from the “National Survey of Drug Use and Health,” and perceived “Greatest Drug Threat” by region and nationwide as reported by state and local law enforcement. Although the report introduction indicated that cannabis use amongst adolescents has increased between 2005 and 2009, the provided data set indicated that the largest percentage increase of “past year” use was in the age group eighteen to twenty-five year olds. That age group demonstrated a 2.6% increase in use; while the twelve to seventeen year old group increased .3%, and the over twenty-six year old increase was .8% (p.51). This data supports the previously referenced research

posited by Williams (2004) that “use peaks for people in the 20-24 year age group” (p.132). Whether an increase in use by that group is a concern is subjective; however, restrictions regarding tobacco and alcohol use allow individuals in this age group to make their own decisions regarding use as societal norms have dictated that this is when one is an “adult.”

The same data set regarding use trends in the U.S. indicated that of all illicit drugs, cannabis use far exceeded that of all other drug use. The report included data gleaned from a 2010 nation-wide survey of state and local law enforcement that presented an apparent contradiction; although cannabis use in the US is the most prevalent, from the perspective of law enforcement agents in varying roles, it is the least concerning. As reported by law enforcement, the drugs of most concern that warrant the most attention are cocaine, methamphetamine, heroin, and other controlled prescription drugs. Cannabis is at the bottom of that list as only presenting an enforcement concern to 11.9% of those surveyed (p.46). Therefore, although cannabis is the most widely used illegal drug in the United States, the opinion of the majority of law enforcement is that its use presents the least threat to society.

The cost of substance abuse treatment and hospitalizations may also present a valid concern regarding legalization. The NDIC report indicated that in 2009, there were 1.1 million admissions to “publically funded facilities” of which 36.8% were to address opiate addictions and 31% were due to cannabis abuse that “represents an increase for opiates and marijuana between 2005 and 2009” (p.6). What the report does not specify is the taxpayer cost of substance abuse counseling for cannabis abusers. Treatment admission data obtained from research accessed at the SAMHSA website via a “Treatment Episode Data Set 2002-2012 (TEDS)” indicated a two percent increase in admissions for cannabis abuse in that ten-year period. The data also indicated the mean age of admission to be twenty-five and that those counseling

referrals were “most likely to be referred by a criminal justice/DUI source (52 percent)” (pp.19-20). An interpretation of this data is the possibility that the only problematic abuse criteria that presented in those individuals were their involvement in the criminal justice system pursuant to their arrest. In other words, absent of an arrest, it is possible that those individuals experienced little or no other detrimental effects from their cannabis use and would not have sought counseling if not court ordered to do so; therefore, the cost of that treatment would be directly due to legal status.

The TEDS data set also differentiated between types of substance abuse treatment from what is labeled “ambulatory,” meaning either outpatient or intensive outpatient services, to the more costly “detoxification” or “residential” services. These inpatient facilities consist of providing services typically reserved for the two drug classes in which withdrawal can be life threatening; alcohol and benzodiazepines. Although not life threatening, opiate addiction also results in high percentages of inpatient referrals, due to the severity of withdrawal symptoms and the high likelihood of relapse both of which are mitigated with medical assistance. The data set indicated that in 2012, there were 1,749,767 substance abuse counseling admissions in the U.S., as reported by agencies that receive public funding and required to submit data. In comparing ambulatory treatment admissions between alcohol and cannabis, the data represented 38.5% to 25.6% respectively (mean of both outpatient and intensive outpatient services). Conversely, more costly detoxification and residential programs represented mean admissions of 47.73% (alcohol) to 5.54% (cannabis). Again, the reason for this large disparity in treatment services is that alcohol withdrawal can be life threatening in the form of seizure activity requiring medical supervision, whereas cannabis withdrawal presents as insomnia and appetite disruption that from an insurance and medical standpoint, do not warrant costly inpatient services.

The actual cost to society regarding treatment is debatable. McVay, Shiraldi, and Ziedenberg (2004) compared the cost of providing subsidized substance abuse counseling with the cost of incarceration, and found that “dollar for dollar, treatment reduces the societal cost of substance abuse more effectively than incarceration does...[representing] \$3.30 of benefit for every dollar spent” (p.6). In reviewing the associated costs in Maryland and California, they found that in those two states, the annual average incarceration costs per offender were \$20,000 and \$27,000 respectively, whereas the costs of treatment were \$4,000 and \$4,500. These figures represent a savings to taxpayers of approximately 80%. This data does not present data specific to cannabis, and as previously noted, cannabis possession alone rarely results in immediate incarceration; however, there are offenders incarcerated post-conviction for cannabis related behaviors, such as positive drug screens while on probation or parole.

There is a federally funded substance abuse treatment program “Access to Recovery” (ATR) that per the Indiana website was a four-year grant program implemented by SAMHSA in 2010 that provided over \$13 million to assist almost 11,000 adult clients in paying for treatment. The average cost per person for completion based on these figures was approximately \$1196. However, the criteria to qualify for that subsidized treatment was notably stringent including requirements of recent release from incarceration, methamphetamine use within the past 90 days, pregnant women with substance abuse issues, and veterans with PTSD resulting in substance abuse issues. According to the National Registry of Evidenced Based Practices and Programs website, a federally funded program exists that has also provided “no cost” counseling to adolescents; the “Adolescent Community Reinforcement Approach.” The program cost to taxpayers ranges from \$1,273- \$1668 per “completed treatment episode,” representing an average cost of \$1470.50 per juvenile. Although juvenile incarceration for cannabis use is rare,

this figure represents a substantial savings compared to detention, especially if successful completion results in a reduction of recidivism as an adult.

The TEDS data from 2012 indicated 305,560 treatment admissions of individuals “12 and older” specifically for cannabis issues and as previously noted the majority of those admissions are self-pay as cannabis abusers typically do not fit under criteria for financial assistance. “Fall Creek Counseling” a for-profit counseling agency in Indianapolis, IN that does not accept insurance, but provides all services on a sliding scale fee based on income provided additional insight regarding the costs of counseling. Staff reported that individuals at the highest end of the scale (no reduction in costs), pay \$710 for outpatient counseling (one session per week), and \$865 for intensive outpatient counseling (multiple sessions each week). It is unlikely that an occasional cannabis user would fit the criteria for intensive outpatient services that are intended more for individuals in the dependence phase of addiction (demonstrate both tolerance and withdrawal). The agency also offers a five-week education program specifically for first time cannabis offenders at a cost of \$150. Additionally, it was reported that “less than one percent” of the counseling participants were not court ordered as the result of a conviction, providing additional validation to the notion that legal status and the resultant court involvement, may have more of an adverse consequence than use itself (S. Leonard, personal communications, September 26, 2014 and October 3, 2014). A possible solution to address any increased cost of subsidized treatment would be earmarking a percentage of tax revenue specifically to offset that cost increase, similar to the percentage of tobacco sales revenue that go directly toward offsetting associated health care costs.

Conclusion

Cannabis legalization has obviously produced additional income for states in terms of newly realized tax revenue. The revenue issue and controversy concerning the issue is comparable to the debate decades ago as states began implementing lotteries and expanding legal gambling for revenue. What was viewed as controversial soon became a relied upon form of income. As more states adopted those forms of income and the novelty wore off, the result was a corresponding decrease in revenue for each individual state. It is likely that an expansion of legalization will result in the same decrease in each individual state's tax revenue. Of more significance than the tax issue, legalization has resulted in a drastic reduction in expenditures regarding local law enforcement, the criminal court system, and the costs of incarceration. This criminal justice savings, estimated by Miron to be in the billions annually if nationwide, represents substantial savings to taxpayers. It is unclear at this time in the legalization experiment if law enforcement will continue to target cannabis dealers outside of the retail industry; however, a valid assumption is that targeting these types of offenses will not be high on the list of priorities. The existing literature indicated that not only will legalization result in no increase in most forms of crime, but it may also result in a reduction in certain types of crime, specifically violent crimes such as robberies and homicides. The reviewed academic research also indicated that an increase in cannabis use because of legalization might correlate with a decrease in alcohol use. If that relationship does occur, then it can be presumed that another result would be a decrease in alcohol related criminal issues such as driving while under the influence of alcohol, and alcohol related cases of domestic violence.

Conversely, the available literature suggests that driving under the influence of cannabis may become more of an issue; however, driving under the influence of cannabis is

approximately half as dangerous as driving under the influence of alcohol. The reviewed research also indicated that the brain is able to compensate for cannabis intoxication by relying more heavily on other regions of the brain and the two legal models that exist now in Colorado and Washington do not permit public consumption, in an attempt to mitigate increased traffic fatalities. Additionally, cannabis legalization may result in increased use by both adolescents, and the public in general. Research indicated that this increased use will be amongst certain age groups as well as more significant in males, and that the majority of increased use after legalization would be amongst occasional users. Legal status alone does not affect use frequency as much as price decreases after legalization, which governments can offset by imposing additional taxes to discourage use, especially amongst young users, whose use patterns are more reliant on cost. Several of the reviewed researchers presented an interesting theory that legalization may eventually result in a decrease in use amongst youth, as there will no longer be a “forbidden fruit” aspect to cannabis. If the state were to remove the illegal status of cannabis, it may no longer present an exciting form of rebellion for adolescents.

The revenue aspect of the equation correlates with the short-term analysis, reliant upon current observations. It is possible that once the novelty wears off, the slightly higher price of taxed, retail cannabis will result in a reduction of sales in lieu of black market cannabis. It will fall upon localities to make policy determinations regarding the extent of resources to allot to enforcement of tax evasion or sales of illicit cannabis. It is possible this increase in black market cannabis will be an effect only demonstrated amongst locals and some of these areas such as Colorado and Washington will begin to experience a “green” tourism such as the one seen in Amsterdam. If so, it would only serve to further support the legalization model as that would result in an influx of “outside” revenue. The question then becomes whether it would then

translate into a sustainable business model or a passing trend that will eventually dissipate in terms of revenue.

In November 2014, the voters of Alaska will make a determination regarding cannabis legalization in their state. If Alaska becomes the third state to legalize recreational cannabis use, will that pressure Congress to reconsider the CSA Schedule 1 designation of cannabis as a drug with “no known medical properties and a high potential for abuse?” If not addressed by Congress, will the current trends of liberalized cannabis policies end with the next change in Presidential administration? The Obama administration has adopted a policy of non-interference with state legislation; however, that liberal policy can change with one election leading to a conflict of states’ rights. In 2015, several states will address legalization; with speculation either California or Oregon will be the next state to legalize recreational use. The long-term effects of cannabis legalization are unknown at this time due to the relatively new nature of the phenomena; however, what is certain is that the century old model of prohibition has had little effect on use in terms of acting as a deterrent, with a corresponding disastrous effect on local and state budgets.

Utilizing a cost-benefit comparison of legal models, it is evident cannabis legalization is more likely to produce overall benefit to society than the current model of prohibition. Certain caveats exist to the working assumption that cannabis legalization benefits society. In a cost-benefit analysis, what is typically of primary consideration is the benefit to the majority as opposed to the individual. An influx of new revenue into the school systems is arguably of future benefit to society; however, if one were to experience addiction themselves or within their immediate family, then there is a personal detrimental effect to liberalized laws regarding cannabis. Furthermore, the dependence on a previously unknown revenue source may be more

dangerous than cannabis abuse. As observed with state run lotteries and other forms of gambling revenues, once a locality has become accustomed to those revenue sources, it is unlikely to let that revenue go regardless of negative effects on individuals. Similarly, a more detailed analysis would include not only short-term costs and benefits to legalization, but also long-term results. Cannabis continues to be the most widely used illegal drug and only additional research regarding the newer models of legalization will demonstrate the long-term effects of such changes on society.

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