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Executive Summary: A Comprehensive Report on Marijuana: Focus on the Paso Del Norte Region

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A Comprehensive Report on Marijuana: Focus on the Paso Del Norte Region

Executive Summary

The present executive summary highlights topics discussed within a comprehensive and extensive report on marijuana. This condensed summary discusses the chemical compounds within marijuana, the various methods of consuming marijuana, the therapeutic effects and health consequences associated with marijuana use, and repercussions that have emerged as a result of the legalization of marijuana in many states within the United States. Additionally, the impact of marijuana in communities within the Paso del Norte Region are discussed.

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Description of Active Ingredients

Marijuana contains over 400 chemicals (Lusk & Rutherford, 2017) and approximately 104 of these chemicals are cannabinoids (ElSohly and Gul, 2014). Cannabinoids are molecules that can bind to cannabinoid receptors in cells (NASEM, 2017). There are two primary cannabinoid receptors: 1) CB₁ which is primarily expressed in the central nervous system (Matsuda, Lolait, Brownstein, Young, & Bonner, 1990), and 2) CB₂ which is primarily expressed in the immune system (Galiègu et al., 1995). Research on marijuana has largely focused on examining CB₁ and CB₂ receptors in response to two popular cannabinoids, Delta-9 Tetrahydrocannabinol (THC) and Cannabidiol (CBD).

Δ⁹ Tetrahydrocannabinol (THC). THC is the psychoactive compound within marijuana that produces the intoxicating state often referred to as “feeling high.” This intoxicating state has been described as “a pleasant euphoria and sense of relaxation” (National Institute on Drug Abuse [NIDA], 2018). Furthermore, many individuals experience increases in appetite, increases in laughter, heightened sensory perception (e.g., brighter colors), and altered perceptions of time (NIDA, 2018). Importantly, the intoxicating state accompanying the consumption of THC is not always pleasant. For example, some individuals report experiencing heightened anxiety, panic, and fear. The latter effects are more common when the individual is inexperienced or has consumed large or unexpectedly high potency doses of marijuana (NIDA, 2018).

Cannabidiol (CBD). CBD is a cannabinoid that is gaining a great deal of attention in the last decade because it contains many of the same therapeutic

properties of THC, however, does not include the psychoactive components (Izzo, Borrelli, Capasso, Di Marzo, & Mechoulam, 2009). Thus, individuals can consume CBD as a treatment without the intoxicating side-effects; research on CBD has proliferated for this reason. CBD contains the same chemical formula as THC but has a minor difference in the atom arrangement (ElSohly and Gul, 2014). Scientists believe that the differences in the atom arrangement prevents CBD from binding to the receptors that THC binds to, making CBD non-psychoactive (ElSohly and Gul, 2014). Notably, THC and CBD can be extracted from marijuana and used to create a number of products such as tinctures/oils (e.g., liquid substance), topicals (e.g., lotions), and even edibles (e.g., “weed” brownies).

Methods of Consuming Marijuana

Smoking marijuana is the most common method of consumption. Marijuana is typically inserted into a pipe (commonly referred to as a “bowl”) or rolled cigarette (commonly referred to as a “joint”) and a flame is applied so that the marijuana combusts and releases smoke; the smoke contains the active ingredients and is subsequently inhaled. Schauer et al., (2016) examined a national sample ($N = 4,269$) of adults over the age of 18 and reported the methods of consuming recreational marijuana in current users (as indexed by use in past 30 days) was a pipe (49.5%), joint (49.2%), a bong, water pipe, or hookah (21.7%), a blunt (20.3%), edibles (16.1%), and vaporizers (7.6%).

Combusted vs. Ingested THC.

Importantly, combusted (i.e., smoked) THC affects the body differently than ingested THC. Specifically, the potency, onset, and duration of the effects differs depending on the method in which marijuana is consumed

(Carter, Weydt, Kyashna-Tocha, & Abrams, 2004; Ashton, 2001). For example, combusted THC is absorbed into the pulmonary circulation and reverted from the pulmonary vein back to the heart (Benjamin & Fossler, 2016). The combusted THC is subsequently distributed through the bloodstream systematically, without passing through the liver (Benjamin & Fossler, 2016). Combusted THC affects the brain within seconds or minutes and thus psychoactive effects occur instantaneously and typically last for one to three hours (Ashton, 2001).

In contrast, ingested THC is metabolized by the liver and converted into a chemical

that is much more psychoactive than delta-9 THC, referred to as 11-hydroxy-THC (Carter, Weydt, Kyashna-Tocha, & Abrams, 2004). Ingested THC may take approximately 30 minutes to a couple of hours before the psychoactive effects occur and the duration of psychoactive effects lasts longer (Ashton, 2001). Importantly, cannabinoids are extremely lipid soluble and thus they accumulate in fatty tissues; the tissue elimination half-life of THC is approximately seven days and the complete elimination of a dose could take up to 30 days (Ashton, 2001). See Table 1 below for more information about the various methods of consuming marijuana.

Table 1.
Methods of Consuming Marijuana

Brief Description	Product Description
<p>Smoking marijuana is the most common method of consumption.</p> <p>Involves applying a flame to burn the dry leaves of marijuana and inhaling the smoke.</p>	<p>Pipe: Glass, wood, or metal device that marijuana can be inserted into and used to inhale smoke.</p> <p>Bong or bubbler: Glass or plastic device that uses water-filtration to filter smoke prior to entering the lungs.</p> <p>Joint: Unfiltered cigarette filled with marijuana.</p> <p>Blunt: Cigar filled with marijuana.</p>
<p>Vaporizing marijuana is an emerging method of consuming marijuana and involves heating dry cannabis leaves or concentrated THC/CBD oil to a level high enough to transmit the THC/CBD without the full combustion that results in smoke. Vaporizing marijuana has gained popularity because it is believed to be a healthier option for consuming marijuana without emitting the carcinogens, tars, and toxins from combusted smoke.</p>	<p>Desktop Vaporizer: Device that connects to an electrical wall outlet and allows for the temperature of the heating device to be adjusted precisely.</p> <p>Portable Vaporizer: A battery operated device that allows for mobile use. THC /CBD oils can be combined with flavors (e.g., cherry) to provide a pleasant taste and aroma to the vapor that is inhaled and exhaled. Electronic cigarettes are becoming the most common portable vaporizer due to their sleek size and discreet appearance.</p>
<p>Ingesting marijuana edibles involves extracting THC/CBD from the dry leaves of cannabis and creating a butter that can be used for cooking or baking.</p>	<p>Candy: Examples of THC/CBD infused candy include lollipops, gummy bears, and chocolates.</p> <p>Baked Goods: Common baked goods include brownies, cookies, and cupcakes. However, it is important to note that marijuana infused butter can be used to cook/bake any food or snack that includes butter as an ingredient.</p>
<p>Other marijuana pharmacological derivatives: capsules, spray, tinctures, and topicals are designed to be absorbed orally or through one's skin.</p>	<p>Capsule: Cannabis extract of THC/CBD inserted into a capsule to be consumed orally.</p> <p>Tincture: Concentrated THC or CBD cannabis extract that is applied to specific area of body and absorbed through one's skin.</p>

Therapeutic Effects and Health Consequences

Therapeutic Effects. The National Academies of Sciences, Engineering and Medicine (NASEM) released a committee review in January 2018 examining the health effects of cannabinoids and concluded that there is “substantial evidence” suggesting that marijuana is effective for treating the following health afflictions: 1) marijuana is associated with significant reduction in chronic pain symptoms, 2) oral cannabinoids are effective antiemetics for treating chemotherapy-induced vomiting, and 3) oral cannabinoids are an effective treatment for multiple sclerosis spasticity symptoms. Importantly, the NASEM (2017) committee review concluded that there is “insufficient or no evidence” that cannabinoids are associated with reductions in seizure activity in epileptic patients. Following the NASEM (2017) committee review, new studies have emerged suggesting that cannabinoids are effective at reducing epileptic seizures. For example, Devinsky et al., (2017) found that CBD significantly reduced drug-resistant seizures by 42% in epileptic patients. Devinsky et al., (2018) found that CBD reduced the median number of seizures in epileptic patients by approximately 51% in 12 weeks and 59% in 48 weeks. Tzadok et al. (2016) examined seventy-four young children and adolescents (ages 1-18) with epilepsy who were resistant to 7 or more antiepileptic drugs and found that nearly 9 out of 10 (89%) patients reported reductions in seizure activity. These findings demonstrate unequivocal evidence that marijuana was not only effective, but also superior to many of the antiepileptic drugs currently on the market.

Health Consequences. Major findings reported within NASEM (2017) suggest that there is substantial evidence indicating that the frequency of marijuana use is associated with: 1) worsened respiratory symptoms and increases in bronchitis occurrences, 2) increases in the development of schizophrenia and other psychoses, and 3) lower birthrates in offspring exposed to marijuana while in the womb.

Marijuana Legislation Repercussions

Within the last two decades, more than half of the states in the U.S. have legalized medicinal marijuana use and nine states (*Colorado, Washington, Oregon, Alaska, California, Nevada, Massachusetts, Maine, and Vermont*) and the District of Columbia have legalized recreational marijuana use for individuals who are 21 years of age or older.

The legalization of marijuana has resulted in a number of unexpected outcomes. For example, reductions in opioid related deaths have been reported in states with liberal marijuana laws (Livingston, Barnett, Delcher, & Wagenaar, 2017; Powell, Pacula, and Jacobson, 2015; Hayes & Brown, 2014), reductions in prescription drugs that marijuana could serve as a clinical alternative have been documented in states that have legalized medicinal marijuana (Bradford & Bradford, 2017), reductions in crimes such as homicide and assault have been reported in states that have legalized recreational marijuana (Morris et al., 2014), increases in fatal motor vehicle accidents involving marijuana-positive drivers have been reported in Colorado (Salomonsen-Sautel et al., 2014).

Opioids. A national crisis currently exists in the U.S. due to opioid addiction or misuse. According to the National Institute on Drug Abuse (NIDA) more than 115 fatal over-doses occur daily in the U.S. (NIDA, 2018). Heroin is one of the most common contributors of fatal opioid related over-doses; however, prescription painkillers are also addicting and often misused. Powell, Pacula, and Jacobson (2015) compared states that have legalized medical marijuana with states that have not legalized medical marijuana. The authors reported that states that have legalized marijuana have also experienced decreases in both opioid addictions and opioid overdose deaths compared to states that have not legalized medical marijuana. Similarly, Shi (2017) examined state-level annual administrative records of hospital discharges during 1997–2014 and reported that medical marijuana legalization was associated with 23% ($p = 0.008$) and 13% ($p = 0.025$) reductions in hospitalizations related to opioid dependence/abuse and the prevalence of opioid pain reliever overdoses.

Doctors Prescriptions. Another repercussion following marijuana legalization is a decrease in prescription drugs for which marijuana could serve as a clinical alternative. Specifically, Bradford and Bradford (2017) examined the prescriptions filled by Medicare Part D enrollees from 2010 to 2013 and focused on prescriptions for health afflictions where marijuana could serve as a clinical alternative. Medicare Part D is also referred to as the Medicare prescription drug benefit program and was developed to help beneficiaries pay for prescription drugs (Medicare, 2018). Notably, after medical marijuana laws were implemented, there was a national overall reduction in Medicare program and enrollee spending estimated to be \$165.2 million per year in 2013. The authors of the study concluded that the

legalization of marijuana significantly impacts prescription patterns and spending in Medicare Part D. Bradford and Bradford (2017) reported that prescriptions for painkillers written by doctors reduced by approximately 1,826 fewer doses (on average) per year after legalizing marijuana.

Motor Vehicle Accidents. Motor vehicle crashes are the leading cause of death each year among young people ages 16-25 years in the United States (Azofeifa, Mattson, & Lyerla, 2015). The most frequently detected substances in fatal car crashes in the U.S. are alcohol (National Highway Traffic Safety Administration [NHTSA], 2013) and marijuana (Brady & Li, 2012). A number of studies suggest that marijuana use within a month of driving a motor vehicle is associated with 2 to 6 times higher risk of being involved in a motor-vehicle crash compared to unimpaired drivers (Asbridge, Hayden, & Cartwright, 2012; Li et al., 2011; Baldock, 2008; Beirness, Simpson, & Williams 2006; Ramaekers, Berhaus, van Laar, & Drummer, 2004; Bates & Blakely, 1999). Research examining the impact of marijuana legalization on motor vehicle accidents has yielded conflicting results. For example, Salomonsen-Sautel et al., (2014) examined the proportion of fatal motor vehicle accidents before and after legalizing marijuana in Colorado that involved alcohol-impaired (greater than the legal limit of 0.08 blood alcohol content) and marijuana-positive drivers. The results suggest that after legalizing marijuana in Colorado there was an increase in fatal motor vehicle accidents involving marijuana-positive drivers ($p < .0001$); there was no difference in the proportion of motor vehicle accidents involving marijuana-positive drivers in states that did not legalize marijuana.

Driving under the influence of marijuana is associated with decreases in

mean driving speeds, increases in weaving (within lanes), and increases in average distances headway to preceding vehicles (Hartman & Huestis, 2013; Downey et al., 2013; Bondallaz et al., 2016; Anderson et al., 2010). However, it is important to note that a review by Sewell, Poling, and Sofuoglu (2009) found marijuana use only had “modest” impairments on actual road tests. The authors also reported that experienced marijuana users demonstrated “almost no functional impairment” under the influence of marijuana “except when it is combined with alcohol.” The latter effects are explained in a number of studies, highlighting that drivers under the influence of alcohol tend to underestimate their degree of impairment; thus, they drive faster, increase attempts to overtake vehicles, and decrease their average distance headway to preceding vehicles (Robbe & O’Hanlon, 1993; Smiley, 1999; Sewell et al., 2009; Neavyn, Blohm, Babu, & Bird, 2014; Hartman & Huestis, 2013). In contrast, drivers under the influence of marijuana tend to overestimate their degree of impairment; thus, they driver slower, make fewer attempts to overtake, and increase their average distance headway to preceding vehicles (Robbe & O’Hanlon, 1993; Smiley, 1999; Sewell et al., 2009; Neavyn et al., 2014; Hartman & Huestis, 2013). Research suggests that alcohol and marijuana consumed independently at low doses does not yield sufficient driving impairments to rise to the level of a public health or safety concern, however, driving performance is dramatically impaired when low doses of the two substances are consumed simultaneously (Ramaekers, Robbe, & O’Hanlon, 2000; Hartman & Huestis, 2013; Sewell et al., 2009).

Regional Impacts of Marijuana

The Paso del Norte (PdN) region stretches across two countries and three states: El Paso and Hudspeth Counties in Texas, Doña Ana, Luna, and Otero counties in New Mexico, and the municipality of Ciudad Juárez, Chihuahua, México. The impact of legalization in either one of these states or countries will have consequences on the region. Currently, none of the constituents of the PdN region have legalized recreational marijuana. However, the national trend toward the legalization of marijuana may still impact non-legal marijuana states including those in the PdN region. For example, Texas has not legalized recreational or medicinal marijuana. However, in 2015, The Texas Compassion Use Act was enacted to allow patients with intractable epilepsy to access low-THC cannabis (Texas Department of Public Safety, 2016). New Mexico became the twelfth state to allow medical cannabis with the Lynn and Erin Compassionate Use Act in 2007 (New Mexico’s Indicator-Based Information System [NM-IBIS], 2015). The purpose is to allow the beneficial use of medical cannabis in a regulated system for alleviating symptoms caused by debilitating medical conditions. Most recently, México’s congress in 2017 approved medical marijuana use and its pharmaceutical derivatives (Secretaría de Gobernacion, 2017). La Secretaría de Salud is responsible for the development and enforcement of public policies to regulate the medical use and upon completion of this paper, no such plan has been finalized.

Texas and Border Region. The Texas School Survey of Drug and Alcohol Use (TSS) assessed current use and attitudes about licit and illicit drugs in 49,069 students in grades 7-12 from districts across the state (Texas Department of State Health Services; DSHS, 2016). The results suggest that marijuana remains the most widely used illicit drug among Texas youth, that is, approximately 20.8% students reported using marijuana in their lifetime and 12.2% reported using marijuana in the past-month preceding the survey. Furthermore, 21.4% of youth in the border region of Texas (the study included three districts in El Paso County) reported using marijuana in their lifetime and 12.8% reported using marijuana in the past month. In regards to frequency of marijuana use, 1.6% of the participants reported everyday use, 2.0% of the participants reported several times a week, 2.6% of the participants reported several times a month, 3.1% of the participants reported about once a month, and 3.3% of the participants reported about once a year.

Reports for Region 10 (El Paso County included) from different law enforcement agencies report that marijuana and methamphetamine are the most trafficked drugs for this area. According to the West Texas High Intensity Drug Trafficking Areas (HIDTA), marijuana is currently priced between \$225-\$300 per pound in El Paso (Texas Prevention Resource Center [TPRC], 2018). Furthermore, CBD advertisements are proliferating across storefronts in El Paso. CBD is currently being sold as gummies, e-liquids, and oils at convenience stores, smoke shops, supermarkets with an emphasis on organic food, and even at pharmacies.

In 2014, there were a total of 30,088 solid pounds of marijuana seized in El Paso, TX (Texas Prevention Resource Center [TPRC], 2018). In 2015, there was

approximately 21,543 solid pounds of marijuana seized in El Paso, TX (TPRC, 2018). In 2016, there was approximately 13,299 pounds of marijuana seized in El Paso, TX (TPRC, 2018). The latter results may suggest that the amounts of marijuana seized in El Paso each year are decreasing.

El Paso County recently approved the First Chance Program, preventing individuals from being arrested if they are caught with less than 4 ounces of marijuana and it is the first offence (Claster, 2017). Under the First Chance Program, individuals who are caught with less than four ounces of marijuana will have the option to complete eight hours of community service and pay a \$100 fine. Importantly, if the first time offender does not complete the program within 60 days or declines the option to complete the program, they will be arrested.

New Mexico and Counties. The prevalence of marijuana use in New Mexico and surrounding counties is very high. According to a 2015 survey of 15,624 New Mexican youth from grades 9-12, approximately 1 out of 4 students (24.4%, CI: 23% to 25.9%) reported using marijuana within the 30 days preceding the survey (NM-IBIS, 2018). Furthermore, approximately 1 out of 5 (19.9%, CI: 17.1% to 23.1%) of youth in Doña Ana County (the county in closest proximity to El Paso, TX) reported using marijuana within the 30 days preceding the survey (NM-IBIS, 2018). In Otero and Luna Counties, it was reported that 30.7% and 23.3% of youth used marijuana in the past 30-days, respectively.

HIDTA reports as of 2018, marijuana prices range between \$240-300 per pound in Las Cruces, NM (TPRC, 2018). According to the New Mexico Department of Health (2018), as of March 31, 2018, there were 50,954 active patients in the Medical Cannabis Program, purchasing an average amount of 31.78 units (one unit of usable

cannabis consists of one gram of the dried leaves and flowers of the female cannabis plant, or 0.2 grams of THC for cannabis-derived products). At the same time point, Doña Ana County had 3,945 patients, Otero County had 1,457 patients, and Luna County 299 patients enrolled in the program.

Cd. Juárez, Chihuahua, Mexico. In a study published in 2016, the marijuana use among 7th – 12th graders in the state of Chihuahua was reported at 11.9% lifetime use (Villatoro Velazquez et al., 2016). In Cd. Juárez, 12.3% of students in 5th – 12th grade reported using marijuana, which is above that of the national rate (Fregoso Ito et al., 2015).

CONCLUSIONS

The full report includes a comprehensive review of marijuana to include its history, composition, methods of consumption, therapeutic effects and health consequences, legislation, and the impact of marijuana legalization in the Paso Del Norte region. Records indicate that marijuana has been used for medicinal purposes for thousands of years. Marijuana contains over 400 chemicals and approximately 104 of these chemicals are cannabinoids (ElSohly and Gul, 2014). There are numerous products created that include cannabinoids (e.g., THC and CBD) with various forms of consumption (e.g., edibles, topicals). Multiple studies support using marijuana or cannabis-based medications for the therapeutic effects, however, there are mixed opinions when addressing the health consequences. Legalization in some states have resulted in treatment for substance abuse, reduction in prescription medications, and mixed results on crime.

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