How much cannabis do Mexicans use?

To the extent of the author's knowledge, there is no rigorous effort to estimate the size of the cannabis market in Mexico. A study indicated that the surface of marijuana production eradicated from 2007 and 2015 was of 114,360 hectares, pointing Sinaloa as the major productor (36%), followed by Chihuahua (19.5%), and Durango (16.4%) (Resa Nestares, 2016). This number was taken then by the firm New Frontier data as the estimate for the total surface marijuana production in Mexico (New Frontier Data, n.d.). That same report estimated that Mexico had a potential market of 1.3 million of users and highlighted the economic potential of the Mexican production given the already existing price differential with the United States. Currently, the average production cost of a pound of marijuana in legal producer countries is 400-800 dollars, 300-600 greenhouse and 200-300 dollars exterior in Mexico de exterior production costs about 10 dollars. Lastly, another company, Juicy Land, reported that the Mexican market might have a value of 250 million dollars and could create 45,000 employments (Garduño, 2021) although the methodology is not public.

Part of this misinformation problem is that Mexico has not conducted a survey about drug use since 2016 when the government rolled out the National Survey of Alcohol, Tobacco and Drugs Consumption (Encuesta Nacional de Consumo de Alcohol, Tabaco y Drogas ENCODAT) on a one-time basis. This was a probabilistic household survey aimed at population between 12 and 65 years old and representative at the national and state level (Conyemr et al., 1990).

The study will use a confirmatory approach to answer the questions: 1) What is the size of the cannabis market in Mexico in metric tons and profits? and 2) What is the average price paid by consumers? It will combine the use of survey data, following the methodology of studies developed at RAND such as Kilmer et al. did for the US (Kilmer et al., 2011) and Caulkins and Kilmer for the European Union. (European Commission. Directorate General for Justice., 2013). For doing so, the study will use the ENCODAT 2016 information to develop a methodology to use the inforamtion gathered by other sources to answer the research questions.

This first memo intends to analyze the information obtained from ENCODAT.

Preparing the data we need

For preparing the data set, we upload ENCODAT_2016_2017 and the PPD survey data as well. We make sure to rename the variables with the same labels in both surveys. E.g., gender, region, pm (past-month use), etc.

We create age groups and regions according to the 2015 Census to compare Encodat information with population statistics, and to facilitate the survey comparison.

Age groups are: 12 to 21, 22 to 32, 33 to 43, 44 to 54, and 55 to 65.

Region are Centro (CDMX, Guerrero, Hidalgo, Mexico, Morelos, Oaxaca, Puebla and Tlaxcala), Centro Occidente (Aguascalientes, Colima, Guanajuato, Jalisco, Michoacan, Nayarit, Queretaro, San Luis Potosi and Zacatecas), Norte (Baja California, Baja California Sur, Coahuila, Chihuahua, Durango, Nuevo Leon, Sinaloa, Sonora and Tamaulipas) and Sureste (Campeche, Chiapas, Quintana Roo, Tabasco, Veracruz and Yucatan)

For this analysis, we are using the survey weights for Encodat 2016, as given by the Comision Nacional contra las Adicciones. PPD data is unweighted.

ENCODAT and PPD survey gender comparison

According to the 2015 Census, about 48.3% of Mexico's population was male, and 51.7% was female, which aligns with the ENCODAT. PPD respondents, on the other side, were mainly male (57%). Only PPD survey captures non-binary information which totals about 3% of the sample.

Characteristic	N = 85,262,058	N = 707
gender		
female	52%	40%
male	48%	57%
non-binary		3.1%

ENCODAT and PPD survey comparison: age

The distribution of the population aged 12 to 65 in Encodat also matches the Census: from 12 to 21 yrs (27.4%), 22 to 32 (25.3%), 33 to 43 (18.8%), 44 to 54 (16.3%) and 55 to 65 (12.2%).

As far as the PPD survey, the results show that respondents from this survey are older, mostly falling within the 22-32 age group, followed by the 33-43 group.

Characteristic	N = 85,262,058	N = 707
age		
12-21	27%	4.8%
22-32	25%	35%
33-43	19%	32%
44-54	16%	18%
55-65	12%	11%
Unknown		16

Lastly, the distribution of the sample across regions in the Encodat also aligns to the 2015 Census:

Central region - 37.7% North region - 22.7% West - 23% Southwest - 16.6%

In the PPD sample, on the other hand, it´s visible the high percentage of respondents from the southeast region.

Characteristic	N = 85,262,058	N = 707
region		
central	38%	23%
north	23%	7.9%
southeast	17%	48%
west	23%	21%
Unknown		1

Analysis about marihuana use

Now that we check that ENCODAT results match important socio-demographic characteristics in Mexico (gender, age, and regions), and how does the PPD survey differ from Encodat, we can analyze the information about marijuana use.

We start with the question: Could you tell me if you have taken, used, tried Marijuana, also called hashish, pot, coffee, yerba, etc. to get high. We present statistics by the overall population, and disaggregated by gender, race and region.

Based on the Encodat, about 8.8% or 7.5 million indicated that they had tried marijuana at least once in their lifetimes. Because all PPD survey respondents indicated having used marijuana, which was a condition to continue answering the survey, this section will only include Encodat-based results.

Characteristic	N = 85,262,058
Ever tried	8.8%
Unknown	311,011

Men are 3 times more likely to have used marihuana than women.

Characteristic	**female**, N = 44,093,441	**male**, N = 41,168,617	**p-value**
Ever tried	3.8%	14%	<0.001
Unknown	172,790	138,221	

Younger people are more likely to have used marijuana, especially those in the 21-32 subgroup, followed by the 12-21 and the 32-43 groups.

Characteristic	**12-21**, N = 23,372,489	**22-32**, N = 21,538,196	**33-43**, N = 16,045,431	**44-54**, N = 13,888,546	**55-65**, N = 10,417,396	**p-value**
Ever tried	9.7%	12%	8.2%	6.4%	4.9%	<0.001

Characteristic	12-21, N = 23,372,489	22-32, N = 21,538,196	33-43, N = 16,045,431	44-54, N = 13,888,546	55-65, N = 10,417,396	p-value
Unknown	146,188	77,793	56,051	16,111	14,867	

Lastly, people located in the west and north of the country were slightly more likely to ever used marijuana than those is the center and southeast.

Characteristic	central, N = 32,102,424	north, N = 19,329,178	southeast, N = 14,145,490	west, N = 19,684,966	p-value
Ever tried	8.0%	9.7%	8.1%	9.8%	0.002
Unknown	71,603	82,197	74,288	82,923	

How many times in your life have you used marijuana?

This question was included only in Encodat. Results show that approximately 44% of individuals who reported having used marijuana indicated that they did so only once, while 19% said they did it twice, 13% did it three times, 9% did it four times, and 15% did it five or more.

Characteristic	N = 85,262,058
# times	
1	44%
2	19%
3	13%
4	8.8%
5	15%
Unknown	77,887,863

Men tend to have used more times. Half of women used just once, versus 42% of men. On the contrary, 16% of men have used at least five time versus 9% of women. The following table shows more details.

Characteristic	female, N = 44,093,441	male, N = 41,168,617	p-value
# times			0.003
1	52%	42%	
2	21%	18%	
3	11%	14%	
4	7.4%	9.2%	
5	8.8%	16%	
Unknown	42,469,292	35,418,571	

Youth indicated using more times than elder people. In fact, 1 of every 2 individuals aged 32 or older have only used it once.

Characteristic	12-21, N = 23,372,489	22-32, N = 21,538,196	33-43, N = 16,045,431	44-54, N = 13,888,546	55-65, N = 10,417,396	p-value
# times						0.031
1	38%	42%	51%	52%	53%	
2	23%	19%	16%	14%	12%	
3	14%	15%	9.4%	12%	15%	
4	8.6%	8.7%	10%	9.9%	5.5%	
5	17%	15%	13%	12%	15%	
Unknown	21,154,848	18,993,857	14,769,626	13,028,894	9,940,637	

Differences by region show that in all regions, between 4 and 5 of every 10 people have used just once. However, the group that has used marijuana more than 5 times is twice as large in the north than in the center.

Characteristic	central, N = 32,102,424	north, N = 19,329,178	southeast, N = 14,145,490	west, N = 19,684,966	p-value
# times					0.004
1	46%	41%	48%	43%	
2	20%	17%	17%	19%	
3	16%	11%	14%	12%	
4	8.4%	11%	6.5%	8.6%	
5	9.1%	20%	14%	17%	
Unknown	29,596,809	17,469,479	13,018,662	17,802,913	

Did you start using marijuana in the last 12 months?

As in the previous question, these results are only from Encodat. Out of those who have used marijuana, 14% started during the last year of answering the survey.

Characteristic	N = 85,262,058
Started in the past year	14%
Unknown	77,887,863

Women are more likely to have started using in the previous year of answering the survey.

Characteristic	**female**, N = 44,093,441	**male**, N = 41,168,617	**p-value**
started_py	20%	12%	<0.001
Unknown	42,469,292	35,418,571	

And those in the 12-21 group are almost three and six times more likely to have started using in the previous year of answering the survey those in their 20s, and in their 30s. Those less likely to have started using in last year were the 43 to 65 year old group.

Characteristic	**12-21**, N = 23,372,489	**22-32**, N = 21,538,196	**33-43**, N = 16,045,431	**44-54**, N = 13,888,546	**55-65**, N = 10,417,396	**p-value**
started_py	29%	9.8%	5.5%	3.6%	3.8%	<0.001
Unknown	21,154,848	18,993,857	14,769,626	13,028,894	9,940,637	

There are no significant differences by region between those who started using in the year before answering the survey.

Characteristic	**central**, N = 32,102,424	**north**, N = 19,329,178	**southeast**, N = 14,145,490	**west**, N = 19,684,966	**p-value**
started_py	12%	15%	13%	16%	0.38
Unknown	29,596,809	17,469,479	13,018,662	17,802,913	

Have you used marijuana in the last 12 months?

We can compare the past year's users in both surveys. Out of those who have used marijuana, according to Encodat, around 13% used in the previous year of answering the survey. In other words, about 975,600 Mexicans indicated having used marijuana in 2015.

In the case of the PPD survey, about 73% indicated having used it in the past 12 months. In fact, 55% used in the last 30 days, ~7% used between 1 and 3 months ago, 9% between 3 and 12 months ago, ~7% between 1 and 3 years ago, and 20% more than 3 years ago.

Characteristic	N = 7,504,623	N = 707
Used in the past year	13%	73%
Unknown	1,143,820	15

Characteristic	N = 7,504,623	N = 707

Characteristic	N = 707
Last time used	
Last 30 days	55%
More than 3 yrs	20%
Between 3 and 12 mos	9.1%
Between 1 and 3 mos	6.8%
Between 1 and 3 yrs	6.6%
IDK_Prefer not to say	2.1%

Males are twice as likely to have started using in the previous year of answering the survey, according to the Encodat. PPD respondents have fewer differences by gender.

Characteristic	female, N = 1,677,134	male, N = 5,827,489	p-value	female, N = 284	male, N = 401	non-binary, N = 22	p-value
Used in the past year	6.0%	14%	<0.001	67%	75%	95%	0.003
Unknown	375,573	768,247		9	6	0	

From the Encodat survey, we can gather that the youngest group is the one with the higher likelihood of having used in the previous year of the survey, up to five times more likely than the oldest group (54-65 yrs). PPD young respondents have also a higher tendency to have used in the past year, more than their peers in older groups.

Characteristic	12-21, N = 2,244,793	22-32, N = 2,561,111	33-43, N = 1,304,494	44-54, N = 886,648	55-65, N = 507,577	p-value	12-21, N = 33	22-32, N = 241	33-43, N = 220	44-54, N = 124	55-65, N = 73	p-value
Used in the past year	20%	13%	10%	7.0%	3.7%	<0.001	87%	85%	78%	52%	53%	<0.001
Unknown	672,042	266,011	98,813	57,808	49,146		2	2	6	4	1	

From the regional analysis, we can gather that people in the central and northern cities are more likely to have used in the previous year to the Encodat survey, than those in the west and the southeast. This is not the same with PPD sample, where people in central cities are the less likely to have used in the past year, while the highest are the ones in the north.

Characteristic	central, N = 2,573,881	north, N = 1,875,724	southeast, N = 1,133,315	west, N = 1,921,703	p-value	central, N = 161	north, N = 56	southeast, N = 341	west, N = 148	p-value
Used in the past year	15%	15%	5.5%	12%	0.010	68%	89%	71%	75%	0.018
Unknown	369,218	287,507	151,226	335,868		7	1	6	1	

In the last 30 days, how many days have you used marijuana?

Lastly, we concentrate on the days used in the past month and observe important differences between surveys. We can notice that less frequent users are more common than heavy users in the Encodat sample. Out of those who answered this question, about 30% indicated having used it between one and five days during the month before answering the survey. Heavy users (over 20 days) represent about half of those low frequent users. The PPD survey shows the inverse trend reflecting perhaps a self-selection bias of heavy users, as about 28% of respondents used more than 20 days, almost half of the low frequent users.

Characteristic	N = 7,504,623	N = 707
Used in the past month		
1-5 days	30%	15%
6-19 days	9.5%	12%
more than 20 days	15%	28%
No	45%	45%
Unknown	5,683,002	8

Men are about three and two times more likely to be heavy users than women, based on the Encodat and PPD survey, respectively.

Characteristic	female, N = 1,677,134	male, N = 5,827,489	p-value	female, N = 284	male, N = 401	non-binary, N = 22	p-value
Used in the past month			<0.001				<0.001
1-5 days	25%	32%		18%	12%	14%	
6-19 days	3.6%	11%		8.8%	14%	24%	
more than 20 days	5.6%	17%		18%	34%	48%	
No	65%	40%		54%	41%	14%	
Unknown	1,276,570	4,406,433		1	6	1	

Differences by age groups are not statistically significant. However, statistics show that those between 33 to 43 years, and those between 55 and 65 years have the higher distribution of heavy users. In the case of the PPD sample, heavy users mainly concentrate on ages between 33-43 and 22-32.

Characteristic	12-21, N = 2,244,793	22-32, N = 2,561,111	33-43, N = 1,304,494	44-54, N = 886,648	55-65, N = 507,577	p-value	12-21, N = 33	22-32, N = 241	33-43, N = 220	44-54, N = 124	55-65, N = 73	p-value
Used in the past month						0.42						<0.001
1-5 days	29%	32%	28%	31%	32%		28%	21%	11%	12%	4.2%	
6-19 days	8.4%	12%	6.9%	16%	2.8%		25%	16%	12%	6.5%	5.6%	
more than 20 days	13%	13%	27%	19%	26%		16%	31%	39%	11%	25%	
No	50%	43%	38%	34%	40%		31%	33%	38%	70%	65%	
Unknown	1,292,311	2,010,971	1,109,712	797,584	472,425		1	4	2	0	1	

Regional differences in Encodat are not significant. However, the distribution shows that the center has the highest difference between less and more frequent users (30% vs 11%), than the north. In the PPD sample, the highest difference between low and high frequent users is in the west, followed by the nort, where the highest rate of heavy users are concentrated.
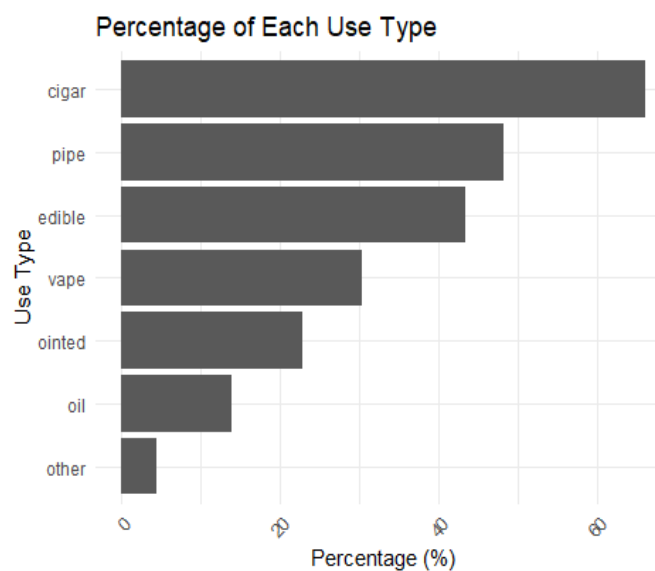
Characteristic	central, N = 2,573,881	north, N = 1,875,724	southeast, N = 1,133,315	west, N = 1,921,703	p-value	central, N = 161	north, N = 56	southeast, N = 341	west, N = 148	p-value
Used in the past month					0.26					<0.001
1-5 days	30%	36%	22%	28%		13%	13%	17%	11%	
6-19 days	9.2%	12%	5.8%	8.3%		5.7%	24%	14%	8.8%	
more than 20 days	11%	17%	16%	17%		27%	39%	23%	36%	
No	50%	34%	56%	46%		54%	24%	45%	45%	
Unknown	1,948,709	1,369,595	934,078	1,430,621		3	2	3	0	

Understanding behavior and preferences

Additional information from PPD survey PPD survey included other questions that are quite relevant to understand users´behavior and preferences, as well as market characteristics.

First, we analyze the question "How do you usually use marijuana" Answers show that respondents mostly use it in cigars (66%), pipe (48%), edibles (43%), vape (30%), ointments (23%), and oils (14%).

Characteristic	N = 707	95% CI
cigar, n (%)	373 (66)	62%, 70%
Missing	142	
pipe, n (%)	272 (48)	44%, 52%
Missing	142	
vape, n (%)	171 (30)	27%, 34%
Missing	142	
oil, n (%)	78 (14)	11%, 17%
Missing	142	
ointed, n (%)	129 (23)	19%, 27%
Missing	142	
edible, n (%)	245 (43)	39%, 48%
Missing	142	
other, n (%)	25 (4.4)	2.9%, 6.6%
Missing	142	

Percentage of Each Use Type

We then analyze the questions regarding the average quantity consumed on a typical day. Respondents answered this question in three different ways. They could answer in ounces, grams, or number of cigarettes. To present an estimate on gram, we converted the ounces to grams (1 oz= 28.35 g) and the joints (1 joint= 0.32g) according to Ridgewey and Kilmer, 2016).

On average, PPD respondents used 2.44 grams of marijuana (S.D= 5.9) on a typical day of use. We can analyze the quantities depending on the frequency of use. Non-frequent users consume 1.01 grams, regular users consume 2.14 grams, and heavy users consume 3.03 grams.

Characteristic	N = 707	95% CI
total, Mean (SD)	2.44 (5.90)	1.8, 3.1
Missing	355	
Characteristic	**N = 707**	
Total, Mean (SD)	2.44 (5.90)	
Missing	355	

Conclusion

In conclusion, both Encodat and PPD surveys are quite relevant for understanding better cannabis use in Mexico. While the PPD survey offers more information about the behavior of users, Encodat´s methodology has a robust external validity due to its probabilistic samplling. Future steps for this research include creating population weights based on Encodat so interpretation of PPD results can be more helpful.