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Marijuana and Depression

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Background

As the country struggles to address an epidemic of alcohol and E-cigarettes, a wide-ranging category of natural substance ''marijuana'' have provoked a new sense of public urgency over the past decade. Notwithstanding the federal ban, selling and use of non-medical marijuana continues to escalate due to state legalization process.
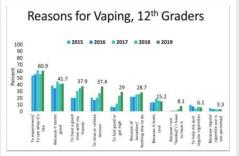

Reasons for Vaping, 12th Graders

Figure:1 Source: NIH, Health, United States, 2019, Table 2. Data from Monitoring the Future Survey: High School and Youth Trends.

- More than third American population is known to have used marijuana and about 7% of Americans are estimated as daily user. Since 2007, the perception of marijuana as harmful has decreased which reflect increase usage among young people [1] .

- The literature supports the role of medical marijuana in prevention of depression, albeit recent studies found discrepancies in the clinical guidelines for the use of marijuana to prevent depression [2,3].

Objective

Using a nationally representative sample, this study sought to examine relationship between the use of **marijuana** and **depression.**

Data and Methods

Sample:
NHANES 2013-2014, N=62,776

Data items:
Age, Race, education, income status, poor appetite, olfactory alteration, concentration ability, and Comorbidities

Statistical analyses:
- Descriptive statistics were used to the association between marijuana use, depression, and key confounding variables: age, race, education, income status, appetite, olfactory alteration, ability to concentrate, and comorbidities.
- Multivariable regression was used to test the relationship between marijuana use and depression while controlling for the confounding factors identified as significant during the bivariate analyses.

Results

UNIVARIATE AND BIVARIATE STATISTICS

Table 1. DESCRIPTIVE STATISTICS

Variables	Total N=30,416	Marijuana use Yes N=9,001	Marijuana use No N=6,194	χ^2/t	P
Age (years)	31.69 (24.6)	38.75 (11.9)	38.96 (11.8)	8.656	.003
Male (%)	50.1	54.6	43.6	178.57	<.001
Race (%)				458.187	<.001
Mexican American	10.3	7.1	15.0		
Other Hispanic	6.7	4.9	9.3		
Non-Hispanic White	62.5	69.8	52.0		
Non-Hispanic Black	11.9	11.8	12.0		
Non-Hispanic Asian	5.0	2.2	9.1		
Multi-Racial	3.4	3.9	2.6		
Education (%)				314.226	<.001
Less than 9th grade	7.4	1.9	7.4		
9-11th grade	10.4	11.1	10.4		
High school graduate/GED	20.6	22.5	20.6		
Some college or AA degree	29.6	35.5	29.6		
College graduate or above	32.0	28.9	32.0		
Income $ (%)				17.078	.004
Less than 10,000	4.3	4.2	4.4		
10,000-24,999	14.7	14.5	15.1		
25,000-54,999	27.2	26.5	28.2		
55,000-74,999	13.4	13.2	13.7		
75,000-99,999	13.3	13.2	13.5		
100,000+	27.1	28.4	25.1		
Depression (screening score)	23.1	25.5	23.1	74.62	<.001
Poor appetite (%)	25.3	27.6	21.9	62.383	<.001
Olfactory disturbance (%)					
Perception of smell	8.8	9.1	8.4	13.5	.025
Ability of smell	29.6	30.8	27.7	15.2	.030
Trouble in concentration (%)	17.5	19.8	14.3	75.88	<.001
Food insecurity (%)	36.6	40.1	31.4	23.03	<.001
Comorbidities (%)					
HIV positive	0.4	0.5	0.3	32.123	<.001
Sinus infection	43.3	45.7	39.7	8.75	.003
Arthritis	16.5	18.1	14.3	37.15	<.001
Emphysema	0.9	1.1	0.5	16.07	<.001
COPD	1.8	2.3	1.1	11.33	.003

Sample Characteristics

- Among 30,415 participants , 9001 (29.59%) were taking marijuana (mean age = 38.75 ± 11.97 years). Male have higher proportion in marijuana usage (54.6%) than female.

- There were increase in usage of marijuana in non-Hispanic white (69.8%) and black (11.8%). People with some college education (35.5%) and 25000-54999 salary (27.2%) have higher proportion in marijuana use than any other group.

- People who experience depression (25.5%), poor appetite (27,6%), change in olfactory ability (30.8%), trouble in concentration (19.8%) are more likely to be in the group who uses marijuana.

- Some comorbidities are associated with marijuana use, including: sinus infection (45.7%), arthritis (18.1%), emphysema (0.9%) and COPD (2.3%).

- A crosstabulation analysis found a significant association between marijuana and depression (χ^2 (1) = 74.625, p<.001); the group who used marijuana had higher proportion of people with depression symptoms.

LOGISTIC REGRESSION COEFFICIENTS

Unadjusted model (χ^2 (1) =131.86, p <.001)
- Explained 17.6% (Nagelkerke R^2) of the variation of having depression, and correctly classified 94.5% of cases. People who use marijuana are 1.51 times more likely to have had depression than those who don't.

Adjusted model (χ^2 (15) =429.782, p <.001)
- Reference Group (RG) are females, multi-racial, college graduates, with incomes of $100,000 or more, who have secure food, normal appetite, have no concentration problems, no olfactory disturbances, and no comorbidities
- explained 77.5% (Nagelkerke R^2) of the variation, and correctly classified 96.1% of cases.
- Those using marijuana are 1.43 times more likely to have depression than others. Males have 9.5 times higher odds to experience depression compare to women.
- Odds of having depression are significantly lower in Black (125 times) and Asian race (14 times) compare to other race groups.
- Education and income are associated with depression. College education (59.36 times) and income between 55k-75k (260.45 times) have higher odds for depression.
- Olfactory disturbances and trouble in concentration are significantly associated with depression. People with trouble in concentrating have 9.2 times higher odds of suffering from depression. Adults who cut the size or skip meals have 1.5 times higher odds for depression.
- People who suffer from sinus infections or emphysema are more likely to suffer from depression than people without these diseases.

Table 2. REGRESSION COEFFICIENTS

Variables	OR	Lower	Upper	P-value
UNADJUSTED MODEL				
Marijuana use	10.371	9.539	13.447	<.001
Constant	0.357			<.001
ADJUSTED MODEL				
Marijuana use (%)	1.431	1.228	5.558	.002
Male (%)	9.525	3.415	26.570	<.001
Race (%)				<.001
Mexican American	.797	.131	4.860	.806
Other Hispanic	.680	.100	.403	.007
Non-Hispanic White	.288	.800	1.033	.560
Non-Hispanic Black	.008	.001	.058	<.001
Non-Hispanic Asian	.070	.004	.689	.045
Education (%)				<.001
Less than 9th grade	.220	.001	.325	.006
9-11th grade	1.221	.121	12.319	.866
High school//GED	.202	.025	1.650	.136
Some college or AA	59.362	.320	1.915	.016
Income $ (%)				.003
Less than 10,000	2.619	.162	42.394	.498
10,000-24,999	2.947	.220	39.494	.414
25,000-54,999	2.343	.159	34.454	.535
55,000-74,999	260.458	5.552	1220.518	.005
75,000+	59.362	2.140	1646.746	.016
Poor appetite (%)	.073	.031	.175	<.001
Olfactory disturbance (%)				
Perception of smell	2.322	1.001	5.385	.040
Ability of smell	.144	.061	.339	<.001
Trouble in concentration (%)	9.288	4.652	18.306	<.001
Food insecurity (%)	1.590	.748	3.383	.228
Comorbidities (%)				
HIV positive	.019	.001	.242	.002
Sinus infection	15.546	5.232	46.189	<.001
Arthritis	.179	.074	.434	<.001
Emphysema	344.640	22.403	701.891	.001
COPD	.027	.004	.193	<.001
Constant	200.112			.318

Conclusions

- Our analysis suggests that those who use marijuana have higher chances to experience depression symptoms. This mechanism could be understand with help of dopaminergic pathway. Glutamate release considered as an essential step for dopamine release. Key substance in marijuana (THC) inhibits CB1 receptors in ventral tegmental area of brain which result in inhibition of glutamate. With subsequent intake of marijuana, this effect become more prominent and cause depression (due to less dopamine level).
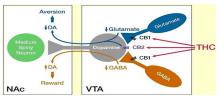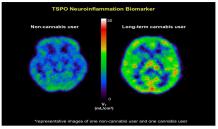

Figure:2. Mechanism of THC influence on dopaminergic pathway [5]

- Regression model showed an association between olfactory disturbances and depression, in people who use marijuana. THC in marijuana seem to modulate olfaction sense which result into change in perception of olfactory stimuli [5]. One possible explanation of this could be disruption of **olfactory neuronal disruption**. Nasal epithelium have abundance amount of CB1 receptors. Subsequent olfactory bulb activation could perturb gene regulatory network and its expression pattern which result into impaired smell perception.

TSPO Neuroinflammation Biomarker

Figure:3. PET scan indicates proinflammatory process with increased TPSO red dots represents areas with abundant TPSO protein [5]

- Cognitive functioning impairment, including difficulty in concentration, and depression were previously found to be associated [7] as confirmed by our study.

- TPSO protein is known biomarker for evaluation of neuroinflammation, which is expected to be elevated in people who suffer from depression and various cognitive diseases (i.e. Alzheimer's). Figure-3 reveled high TPSO amount in marijuana user which cause neuronal network disintegration.

- Various comorbidities are significantly associated with depression. Struggling with lung disease (i.e. emphysema) increases the risk of depression.

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IBM SPSS