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Are Magic Mushrooms the Magic to Healing?

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INTRODUCTION

"Magic mushrooms" produce a naturally occurring psychedelic called psilocybin. The public opinion about psilocybin mushrooms is generally that they are primarily taken for recreational use, leading to the widespread prohibition in the United States. Prior studies have shown success with psilocybin usage in treating depression, anxiety, PTSD, migraines, and end-of-life mental issues. The need for further advocacy of research on "magic mushrooms" as a legitimate medicine is clearly identified.

Using a data set from DRYAD, an open-source data network, the psilocybin usage of 7139 United States adults in 2021 was investigated. Of the people using psilocybin, 61% did so with the "specific intention of improving general mental health and well-being." Statistical analyses below paint a compelling story supporting the usage of psilocybin mushrooms as a medicine rather than a recreational drug.

METHODS

- **Logistic Regression (Table 1.):** Used to identify variables that predict whether an individual uses psilocybin.
- **ROC Curve (Table 1):** Used to calculate the accuracy of the logistic model. Accuracy measure is under the logistic title.
- **Chi Square Test of Independence (Tables 2 – 4):** Used to determine relationships between (1) a person's age group and awareness of benefits, (2) a person having migraines and awareness of benefits, and (3) a person having migraines and using psilocybin.
- **ANOVA and Stratified Confidence Intervals (Figures 1 – 3):** Used to determine and display the relationship between a person's awareness of benefits and their (1) anxiety, (2) depression, and (3) Veterans RAND Mental Health Composite Score (Mental Health).
- **Two Mean T-Test (Tables 5 – 7):** Used to determine the relationship between psilocybin usage and a person's (1) anxiety, (2) depression, and (3) Veterans RAND Mental Health Composite Score (Mental Health).
- **Difference of Proportions (Tables 8 – 10):** Used to determine if there was a relationship between (1) the person having health insurance, (2) the person using urgent healthcare services, and (3) the person using alternative healthcare services.

CONCLUSIONS

Model Predicting Users of Psilocybin. Individuals most likely to use psilocybin mushrooms are male, either between the ages of 20 to 30 or 40 to 60, have migraines, have awareness of psilocybin benefits, as well as have moderate to severe anxiety. This model is able to differentiate a psilocybin user from a non-user with 83.28% accuracy.

Age and Awareness of Benefits. Young adults (20 to 30) and adults (30 to 40) have more awareness of benefits than the other age groups. In contrast, seniors (60+) and adult teens (18 and 19) have less awareness of benefits.

Migraines. Individuals with migraines are more likely to have awareness of benefits than individuals without migraines. In addition, individuals with migraines are more likely to use psilocybin.

Mental Health and Awareness of Benefits. The mental health measures of moderate to severe anxiety, depression, and poor overall mental health were associated with awareness of psilocybin benefits.

Mental Health and Psilocybin Use. A person's mental health measures of moderate to severe anxiety, depression, and poor overall mental health were associated with whether the person used psilocybin.

Using Psilocybin and Healthcare. People who use psilocybin mushrooms are less likely to have health insurance but are more likely to utilize urgent care and alternative health resources.

ACTIONS

- **Publicity of Psilocybin Research and Benefits**
- **Advocacy for At-Risk Individuals**
- **Government Reform**

Table 1. Logistic Regression Predicting Psilocybin Mushroom Use
Area Under ROC Curve = 0.8328

Odds Ratio Estimates			
Effect	**Point Estimate**	**95% Wald Confidence Limits**	
Sex Male vs Female	2.037	1.364	3.042
Age Group Adult Teen (18 and 19) vs Senior (60+)	3.187	0.563	18.035
Age Group Young Adult (20 < 30) vs Senior (60+)	5.405	1.863	15.678
Age Group Adult (30 < 40) vs Senior (60+)	3.061	1.058	8.853
Age Group Middle Age (40 < 60) vs Senior (60+)	4.530	1.606	12.778
Migraines Has Migraines vs No Migraines	1.760	1.175	2.635
Awareness of Benefit Agree vs Disagree	10.828	5.681	20.636
Awareness of Benefit Neutral vs Disagree	2.770	1.354	5.667
Anxiety Diagnosis	1.785	1.228	2.595

Table 2. Age Group vs. Awareness of Benefits

Frequency / Expected / Cell Chi-Square / Row Pct

Table of Age Group by Awareness of Benefits						
Age Group	**Awareness of Benefits**					
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**
Adult Teen (18 and 19)	10 10.06 0.0004 7.94	18 18.338 0.0062 14.29	50 39.57 2.749 39.68	28 23.05 1.0629 22.22	20 34.981 6.416 15.87	126
Young Adult (20 < 30)	129 87.668 19.487 11.75	205 159.8 12.784 18.67	380 344.83 3.5878 34.61	181 200.87 1.9649 16.48	203 304.84 34.021 18.49	1098
Adult (30 < 40)	196 138.29 24.085 11.32	362 252.07 47.938 20.90	603 543.93 6.414 34.82	262 316.85 9.4951 15.13	309 480.86 61.42 17.84	1732
Middle Age (40 < 60)	192 184.76 0.2839 8.30	351 336.78 0.6007 15.17	715 726.71 0.1887 30.90	424 423.32 0.0011 18.32	632 642.44 0.1695 27.31	2314
Senior (60+)	43 149.23 75.617 2.30	103 272.01 105.01 5.51	494 586.96 14.722 26.43	411 341.91 13.96 21.99	818 518.89 172.42 43.77	1869
Total	570	1039	2242	1306	1982	7139

Statistic	DF	Value	Prob
Chi-Square	16	614.4077	<.0001

Table 3. Migraines vs. Awareness of Benefits

Frequency / Expected / Cell Chi-Square / Row Pct

Table of Migraines by Awareness of Benefits				
Migraines	**Awareness of Benefits**			
	Agree	**Neutral**	**Disagree**	**Total**
No Migraines	1260 1293.5 0.8658 21.96	1819 1802.3 0.1542 31.70	2660 2643.2 0.1067 46.35	5739
Has Migraines	349 315.53 3.5494 24.93	423 439.67 0.632 30.21	628 644.8 0.4375 44.86	1400
Total	1609	2242	3288	7139

Statistic	DF	Value	Prob
Chi-Square	2	5.7456	0.0565

Table 4. Migraines and Psilocybin Use

Frequency / Expected / Cell Chi-Square / Row Pct

Table of Migraines by Psilocybin			
Migraines	**Psilocybin**		
	No Use	**Use**	**Total**
No Migraines	5655 5640.9 0.0351 98.54	84 98.075 2.02 1.46	5739
Has Migraines	1362 1376.1 0.144 97.29	38 23.925 8.2804 2.71	1400
Total	7017	122	7139

Statistic	DF	Value	Prob
Chi-Square	1	10.4794	0.0012

Figure 1. Anxiety vs. Awareness of Benefits
(>10 moderate to severe anxiety)

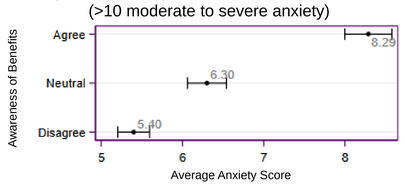

Figure 2. Depression vs. Awareness of Benefits
(>10 moderate to severe depression)

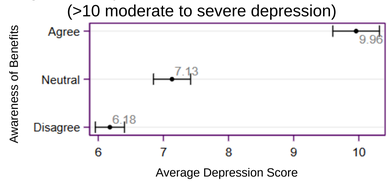

Figure 3. Mental Health vs. Awareness of Benefits
(<40 moderate to severe mental health issues)

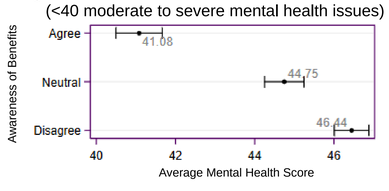

Table 5. Anxiety and Psilocybin Use
(>10 moderate to severe anxiety)

Psilocybin	Method	Mean	95% CL Mean	
Use		9.7459	8.7111	10.7807
No Use		6.2745	6.1369	6.4121
Diff (1-2)	Pooled	3.4714	2.4193	4.5236
Diff (1-2)	Satterthwaite	3.4714	2.4277	4.5152

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	7137	6.47	<.0001

Table 6. Depression and Psilocybin Use
(>10 moderate to severe depression)

Psilocybin	Method	Mean	95% CL Mean	
Use		11.5082	10.2496	12.7668
No Use		7.2578	7.0946	7.4210
Diff (1-2)	Pooled	4.2504	3.0022	5.4986
Diff (1-2)	Satterthwaite	4.2504	2.9814	5.5193

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	7137	6.68	<.0001

Table 7. Overall Mental Health and Psilocybin Use
(<40 moderate to severe mental health issues)

Psilocybin	Method	Mean	95% CL Mean	
Use		39.0947	37.0626	41.1267
No Use		44.7996	44.5062	45.0930
Diff (1-2)	Pooled	-5.7049	-7.9459	-3.4640
Diff (1-2)	Satterthwaite	-5.7049	-7.7576	-3.6522

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	7137	-4.99	<.0001

Table 8. Insurance and Psilocybin Use

Frequency / Expected / Cell Chi-Square / Row Pct

Table of Has Insurance by Psilocybin			
Has Insurance	**Psilocybin**		
	Use	**No Use**	**Total**
No	26 18.661 2.8859 2.38	1066 1073.3 0.0502 97.62	1092
Yes	96 103.34 0.5211 1.59	5951 5943.7 0.0091 98.41	6047
Total	122	7017	7139

Statistic	DF	Value	Prob
Chi-Square	1	3.4663	0.0626

Table 9. Urgent Care and Psilocybin Use

Frequency / Expected / Cell Chi-Square / Row Pct

Table of Urgent Care by Psilocybin			
Urgent Care	**Psilocybin**		
	Use	**No Use**	**Total**
Has not used urgent care	97 107.63 1.0495 1.54	6201 6190.4 0.0182 98.46	6298
Has used urgent care	25 14.372 7.8593 2.97	816 826.63 0.1366 97.03	841
Total	122	7017	7139

Statistic	DF	Value	Prob
Chi-Square	1	9.0636	0.0026

Table 10. Alternative Care and Psilocybin Use

Frequency / Expected / Cell Chi-Square / Row Pct

Table of Alternative Care by Psilocybin			
Alternative Care	**Psilocybin**		
	Use	**No Use**	**Total**
Has not used alternative care	87 96.52 0.939 1.54	5561 5551.5 0.0163 98.46	5648
Has used alternative care	35 25.48 3.5569 2.35	1456 1465.5 0.0618 97.65	1491
Total	122	7017	7139

Statistic	DF	Value	Prob
Chi-Square	1	4.5740	0.0325

RESULTS

Predictors of Psilocybin Use

ROC: In a ROC Curve referenced in Table 1, the area under the curve (concordance index) of .8328 means that the model is able to distinguish 83.28% of all possible pairs of users and non-users correctly. A correctly classified pair gives a higher probability of using to the individual who is using psilocybin out of the pair.

In Table 1, the following was found:

- **Sex**. The odds of males using psilocybin are 2.037 times higher than for females.
- **Age.** The odds of young adults (20 to 30 years old) using psilocybin are 5.405 times higher than seniors (60+ years old). The odds of middle-aged adults (40 to 60 years old) using psilocybin are 4.530 times higher than seniors (60+ years old).
- **Migraines**. The odds of people with migraines using psilocybin are 1.760 times higher than those without migraines.
- **Awareness of Benefits**. For people who are aware of benefits of psilocybin, the odds of them using psilocybin are 10.828 times higher than people who are not aware.
- **Anxiety**. The odds of people using psilocybin are 1.785 times higher for people with moderate to severe anxiety (GAD score ≥ 10) than for those with little to no anxiety (GAD score < 10), where GAD is Generalized Anxiety Disorder.

Age vs. Awareness of Benefits

- In Table 2, adults (20 to less than 40 years old) are significantly more likely to be aware of the benefits of psilocybin usage than the other age groups. In contrast, seniors (60+) and teens (18 and 19) are significantly less likely than the other age groups to be aware of the benefits of psilocybin usage.

Migraines vs. Awareness of Benefits and Psilocybin Use

- **Migraines vs. Awareness of Benefits.** In Table 3, individuals who have migraines are more likely to be aware of the benefits of psilocybin usage.
- **Migraines and Psilocybin Use.** In Table 4, individuals who have migraines are more likely to use psilocybin mushrooms than individuals who do not have migraines. Of the individuals who use psilocybin, 31% have migraines.

Mental Health vs. Awareness of Benefits and Psilocybin Use

- **Anxiety vs. Awareness of Benefits.** Figure 1 shows that the awareness of benefits of psilocybin usage is associated with higher anxiety scores (more severe anxiety) on average.
- **Depression vs. Awareness of Benefits.** Figure 2 shows that the awareness of benefits of psilocybin usage is associated with higher depression scores (more severe depression) on average.
- **Mental Health vs. Awareness of Benefits.** Figure 3 shows that the awareness of benefits of psilocybin usage is associated with lower mental health scores (worse mental health) on average.
- **Anxiety and Psilocybin Use.** Referencing Table 5, with 95% confidence, people who use psilocybin have Generalized Anxiety Diagnostic scores between 8.7 to 10.8 on average where greater than 10 indicates moderate to severe anxiety.
- **Depression and Psilocybin Use.** Referencing Table 6, with 95% confidence, people who use psilocybin have Patient Health Questionnaire scores between 10.2 to 12.8 on average where greater than 10 indicates moderate to severe depression.
- **Mental Health and Psilocybin Use.** Referencing Table 7, with 95% confidence, people who use psilocybin have Veterans RAND Mental Health Composite scores between 37.1 to 41.1 on average where less than 40 indicates moderate to severe mental health issues.

Healthcare and Psilocybin Use

- **Health Insurance.** In Table 8, people who do not have health insurance are more likely to use psilocybin.
- **Urgent Care.** In Table 9, people who have used urgent care services in the last 6 months are more likely to use psilocybin.
- **Alternative Care.** In Table 10, people who have used alternative health resources in the last 6 months are more likely to use psilocybin.

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