Background/Motivation for the Study

The expectations of legalization are to reduce social inequalities through the unequal enforcement of criminal penalties for using cannabis (Caulkins, 2017). Upon some research, it appears that homelessness has increased in states that have legalized marijuana, but it is not definite if this is the result of legalizing recreational use (Moore, 2018). In the state of New Mexico, there are over 22 dispensaries for every 100,000 residents (Jones, 2022). Governor Michelle Lujan Grisham announced on April 20, 2023, that the state saw $300 million in adult-use cannabis sales in its first year (Press Release, 2023). Similarly, in early 2023, New Mexico's homelessness increased to 48%, according to a report given to lawmakers on the Legislative Finance Committee (LFC). It is claimed that the legalization of cheaper and more potent forms of cannabis products may increase the number of daily cannabis users in poorer communities to the economic detriment of users and their communities (Chan et al., 2018).

Research Question and Hypothesis

Do people with lower poverty rates tend to have higher marijuana use? Based on the initial findings, it is suspected that there will be a correlation between a high trend amongst communities in terms of poverty and marijuana usage, especially among males. The correlation between poverty rates associated with marijuana usage and whether there is a major difference between the two reported genders will be investigated. Therefore, the null hypothesis is that across communities of various poverty levels, marijuana use will be similar for individuals who use and do not use marijuana.

Data Description and Exploratory Data Analysis

The variables in exploration are Marijuana use, Gender, and Poverty.

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Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union
```

The data investigates the relationship between poverty rates and marijuana consumption. Marijuana use is investigated across gender communities to determine if there are such

disparities. According to the NHANES dataset, the variables in question are defined as follows:

Gender (sex) of study participant coded as male or female.

Poverty is the ratio of family income to poverty guidelines. Smaller numbers indicate more poverty.

Marijuana indicates the participant has tried marijuana. Reported for participants aged 18 to 59 years as Yes or No.

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      Marijuana     Gender       Poverty

 No :1897    female:2207    Min.    :0.000

 Yes:2736    male  :2426    1st Qu.:1.340

                            Median :2.970

                            Mean    :2.928

                            3rd Qu.:4.960

                            Max.    :5.000

[1] 1.678392

                Df Sum Sq Mean Sq F value  Pr(>F)
Marijuana        1     23  23.163   8.232 0.00413 **
Gender           1      0   0.301   0.107 0.74382
Marijuana:Gender 1      0   0.376   0.134 0.71472
Residuals       4629  13024   2.814
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

There are more reported marijuana users (2736) and more reported males in the sample (2426), with a sample size of 4,633 individuals who reported their marijuana status. The poverty index rate ranges from 0 to 5.0, with smaller numbers indicative of more poverty. The mean poverty index representative of the U.S. population is 2.93, and the standard deviation of the poverty index is 1.68, indicative of a larger distribution. The p-value of marijuana and gender was investigated to explore significant differences between male and female marijuana status and was found to be 0.72, entailing that the interaction of gender and marijuana use as predictors of where individuals may fall on the poverty scale is statistically not significant.

Fig. 1 Marijuana use in relation to Poverty Index

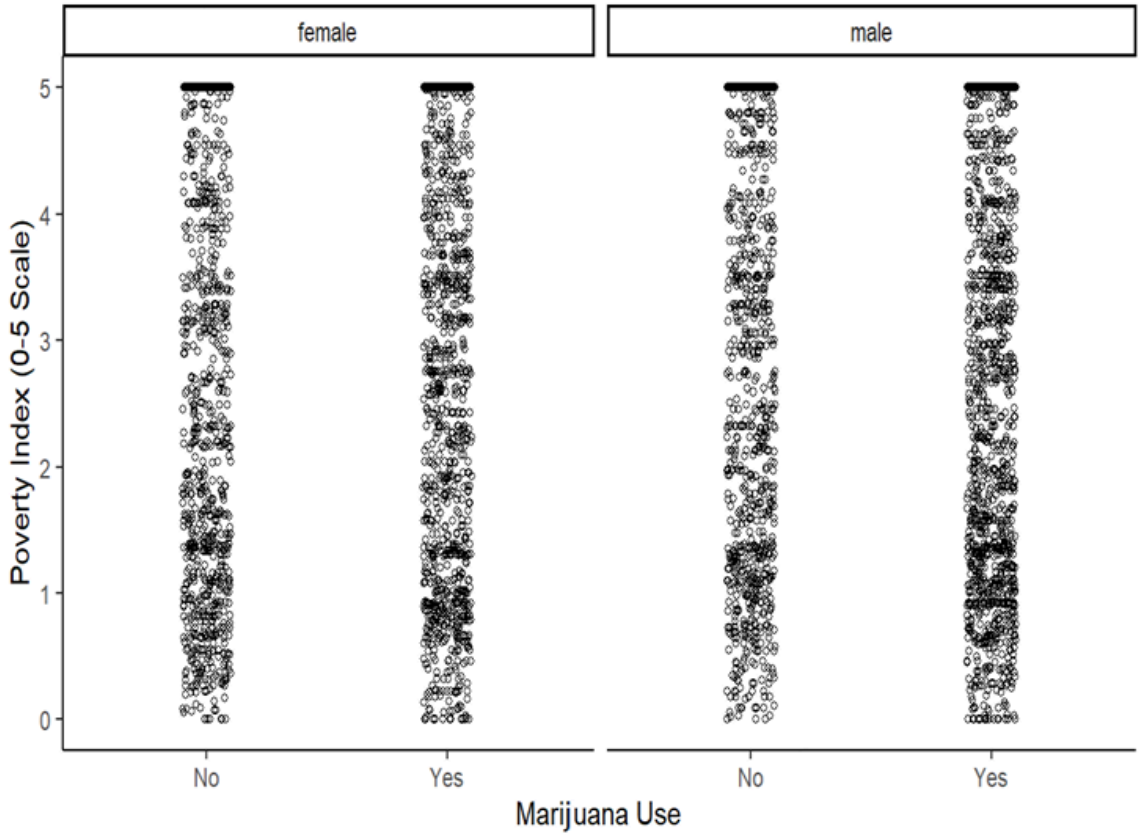


Fig. 2 Marijuana use between genders across Poverty Levels

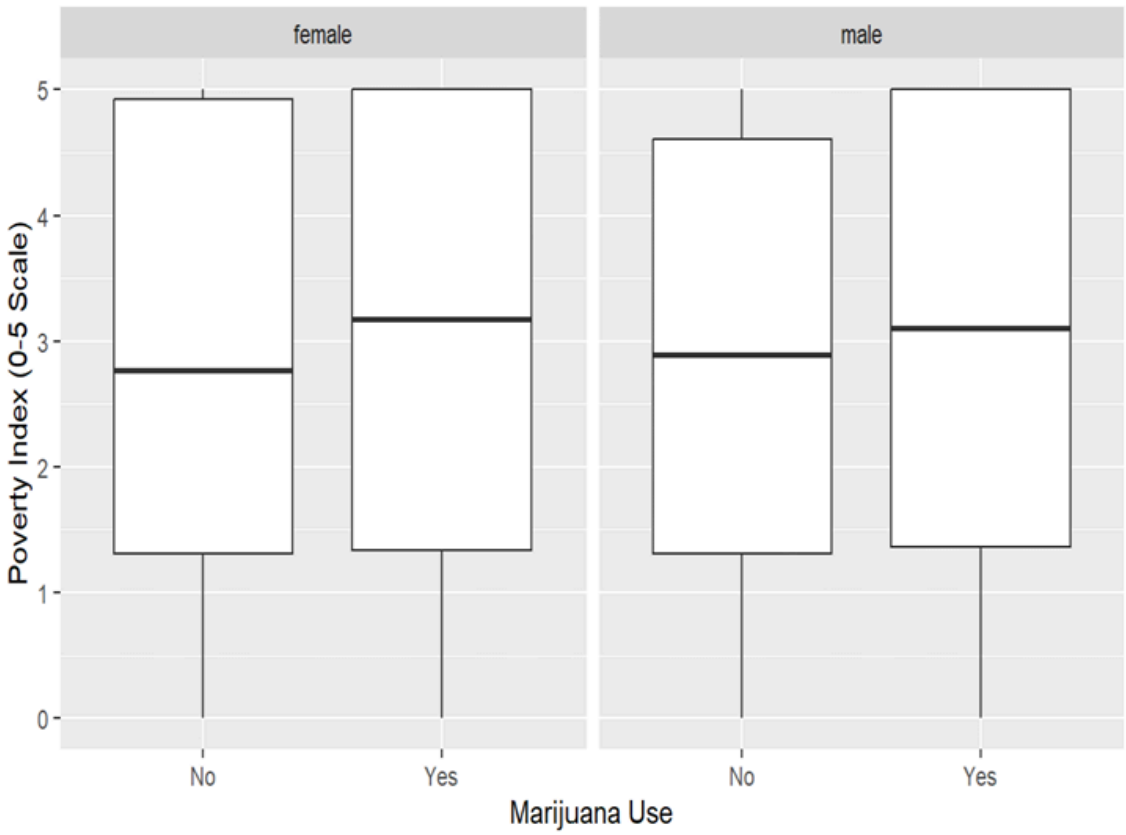
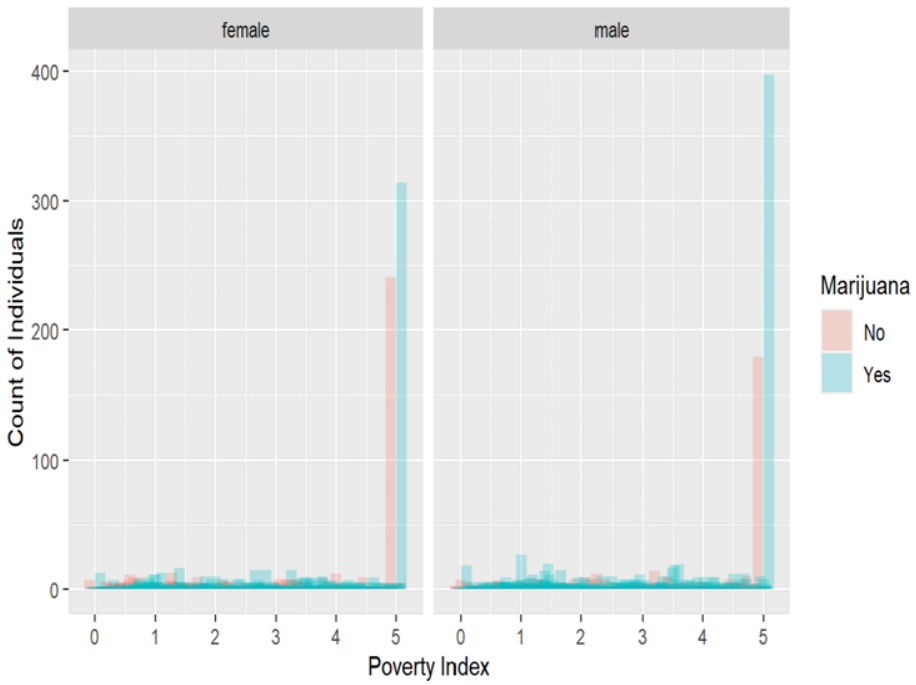


Fig 3. Marijuana users between genders across Poverty Levels



In order to determine if people in more poverty tend to have higher use of marijuana, the variance of the mean for two groups—female and male—for all levels of poverty was observed. ANOVA was used to model marijuana use as a function of gender and poverty levels. A split-up scatter plot allowed visualization of the distribution of marijuana use and indicated a large distribution. The plot displays higher densities around 0.5–1.5 for both males and females who use marijuana, but it is difficult to determine if there is a correlation between marijuana use and poverty rates. To visualize this further, a box plot was constructed, and as evidenced, the medians for both genders who use and do not use marijuana are estimated to be similar, falling close to the 3.0 poverty index. There is a similarly large distribution for both groups that engage in marijuana use across poverty levels; there are more females who do not participate in marijuana use compared to their male counterparts that do. There are also more outliers in the male sample above the poverty index of 4.0 that reported "no" for marijuana use.

Side-by-side bar plots were additionally constructed to observe the count of individuals in both the female and male groups to determine at what poverty index marijuana use is most likely to happen. Based on the graph, there is more reported marijuana use for both groups, with most reported marijuana users at the poverty index of 5, where there is a larger disparity between males that do not smoke and those that do at the poverty index of 5. The distribution is quite large for both groups, signifying similar distributions of marijuana use across poverty levels, with most marijuana users being male.

Analysis

```
                Df Sum Sq Mean Sq F value  Pr(>F)
Marijuana        1     23  23.163   8.232 0.00413 **
Gender           1      0   0.301   0.107 0.74382
Marijuana:Gender 1      0   0.376   0.134 0.71472
Residuals       4629  13024   2.814
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

        Gender
Marijuana female male  Sum
     No     991  906 1897
     Yes   1216 1520 2736
     Sum   2207 2426 4633


   Pearson's Chi-squared test with Yates' continuity correction

data:  NHANESnew$Marijuana and NHANESnew$Gender
X-squared = 26.984, df = 1, p-value = 2.052e-07
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ANOVA was used to compare group means of marijuana use across genders and determine if the means were similar throughout the distribution of poverty. The p-value of marijuana and gender was found to be 0.72, which is insufficient to reject the null hypothesis that the means for marijuana use in both gender groups are similar. This is supported by the high F value of 0.134, signifying that at the 0.05 level of significance, the group means do not differ from one another. The p value being larger than 0.05 also indicates that not much variation in the means can be explained by the interaction between marijuana and gender.

Pearson's Chi-squared test was implemented to test for the association between marijuana use and gender without considering poverty level. The p-value of 2.05e-07 indicates there is an association between marijuana use and gender and that the null hypothesis, that marijuana and gender are not associated, is sufficient to be rejected.

Conclusions

From the ANOVA test, it was found that the interaction of gender and marijuana use is not conducive to where individuals may fall on the poverty index and that the means of marijuana usage for both groups of genders were relatively similar. In investigating the associations between marijuana use and genders through the chi-squared test, it was found that the two variables were associated, which may be attributed to the higher reporting of marijuana use. Based on the data presented, the null hypothesis that across communities of

various poverty levels, marijuana use will be similar for individuals who use and do not use marijuana is correct. It was hypothesized that there would be major differences in marijuana usage between the two reported genders across poverty levels, which was not proven. In regards to individual communities and marijuana use, males were reported to have more marijuana use, and more overall marijuana use was reported for both gender groups.

Initial research motivated the prediction that there would be more marijuana users reported in the lower poverty levels; the reported findings contradict this prediction, as there were more reported marijuana users overall and the most individuals who were at the poverty index of 5 reported marijuana use (Figure 3). On the basis of this research, the poverty index may need supplemental variables to determine other associations with marijuana use, such as the age of marijuana participants and the ages individuals may have begun engaging in marijuana use. Initial research supports the findings that males use marijuana more frequently than females, but a low poverty index is not a significant predictor of more marijuana use.

Citations

1. (Caulkins JP. Recognizing and regulating cannabis as a temptation good. Int J Drug Policy. 2017;42:50–56.)

2. Moore, T. (2018). Homelessness effect of marijuana - reason foundation. Reason Foundation. https://reason.org/wp-content/uploads/2018/05/homelessness-effect-of-marijuana.pdf

3. Jones, C. (2022). Five months in, New Mexico has more dispensaries per capita than Colorado, Oregon. Bizjournals.com. https://www.bizjournals.com/albuquerque/news/2022/09/01/new-mexico-cannabis-dispensary-per-capita-adult-us.html.

4. Press Release. (2023). Home. Office of the Governor - Michelle Lujan Grisham. www.governor.state.nm.us/2023/04/03/new-mexico-cannabis-industry-marks-one-year-more-than-300-million-in-adult-use-sales/#.

5. Chan, G. C. K., Leung, J., Quinn, C., Weier, M., & Hall, W. (2018). Socio-economic differentials in cannabis use trends in Australia. Addiction (Abingdon, England), 113(3), 454–461.https://doi.org/10.1111/add.14010Links to an external site.).