NAVIGATING CANNABIS AND WINE: COMPLEMENTARY OR SUBSTITUTE RECREATIONAL CHOICES

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Navigating cannabis and wine:
Complementary or substitute recreational choices

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Abstract

Understanding the intricate relationship between wine and cannabis usage is essential for crafting effective substance use policies and interventions. This study adopts an innovative approach to explore whether cannabis and wine act as substitutes or complements. Through an online survey targeting wine drinkers under 60, we collected 523 completed responses, including 215 from cannabis consumers. Our findings reveal that socializing and enhancement are primary motivators for both substances. Frequent cannabis use correlates with increased wine consumption, indicating complementarity for cannabis users. However, wine consumption frequency alone doesn't determine concurrent or separate cannabis use. Individuals consuming cannabis frequently tend to use both substances together, indicating complementarity for cannabis users. Yet, those who drink wine for socializing and enhancement and cannabis for socializing and coping are more likely to separate their consumption. These insights highlight the complexity of substance use dynamics, suggesting that policies or interventions aimed at reducing alcohol and cannabis consumption may have differing impacts across various segments of wine and cannabis consumers.

Keywords

Cannabis, wine, substitute, complement, consumption, consumption motives

1   Introduction

Recent data indicate a decline in wine consumption in Germany since the last seven years (DAVIES, 2022). Concurrently, there has been a significant increase in cannabis use among young adults in Germany over the past fifteen years, with efforts towards legalization underway (LOGAN, 2023). Proponents of legalization posit that cannabis use might serve as a substitute for the misuse of alcohol and other substances, potentially yielding positive outcomes and cost savings, particularly if cannabis has fewer adverse public health effects compared to alcohol and other drugs (SMART and PACULA, 2019). However, it is also conceivable that cannabis and alcohol could be complementary, suggesting that the legalization of nonmedical cannabis among adults could lead to increased alcohol consumption (WEN et al., 2015). This scenario could give rise to additional public health and safety concerns (GUTTMANNOVA et al., 2021; HALL, 2017).

For nearly more than three decades, economists have debated whether alcohol and cannabis serve as substitutes or complements to each other. In a substitute relationship, restrictions on one substance, such as increased price or legal constraints, lead to an upsurge in using the other. On the other hand, in a complementary relationship, changes in the availability of one substance have a corresponding impact on the use of the other substance (O'HARA et al., 2016).

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These hypotheses about alcohol and cannabis usage behaviours stem from differing perspectives. The substitution hypothesis posits that individuals opt for more accessible substances driven by motives like self-medication or stress relief (GREELEY and OEI, 1999; SHER et al., 2007). Conversely, the complement hypothesis suggests the simultaneous use of alcohol and cannabis, often during social interactions, for combined effects such as euphoria. Consequently, restricting one substance's availability inadvertently affects the accessibility and desirability of the other (O'HARA et al., 2016).

Investigating the connection between cannabis and wine consumption is a crucial area necessitating thorough quantitative examination. Understanding the dynamic between alcohol and cannabis holds significant implications for predicting the broader public health impacts stemming from shifts in substance use policies, especially in light of the increasing acceptance of cannabis legalization (O'HARA et al., 2016). Despite existing support for both substitute and complementary relationships between cannabis and alcohol, empirical evidence drawn from individual-level data remains notably scarce, primarily relying on broader macro-level economic or epidemiological data (O'HARA et al., 2016).

Furthermore, research explicitly exploring the substitutability or complementarity of cannabis and alcohol, particularly concerning wine consumption, is lacking. Hence, this study aims to contribute to this underexplored area by analyzing the relationship between the usage of these two potentially addictive substances, specifically investigating conditions under which wine and cannabis act as substitutes or complements. Moreover, we explore the drivers of complementary consumption of wine and cannabis in the sample of wine and cannabis users.

Investigating these nuanced questions by delving into consumers' motivations for substance use would be a valuable extension of current research on complement and substitution hypotheses (GUTTMANNOVA et al., 2021).

While many studies (STEVENS et al., 2021; 2022; BOYLE et al., 2021; O'HARA et al., 2016) on cannabis use motivations have focused on college students or individuals in emerging adulthood, this study extends beyond this specific demographic.

2 Literature Background

The literature presents divergent perspectives on the relationship between alcohol and cannabis use, particularly regarding their potential as substitutes or complements. While some studies suggest a complementary relationship, indicating that alcohol and cannabis often reinforce each other's consumption patterns, others propose a substitution effect, implying that cannabis may replace alcohol in certain contexts, potentially reducing alcohol-related risks (GUNN ET AL., 2022; KAROLY et al., 2023). Policy changes restricting one substance have shown mixed effects, with some studies indicating increased use of the other substance while others observe a decrease (O'HARA et al., 2016; WEINBERGER et al., 2020).

The legalization of cannabis, whether for medical or recreational purposes, has yielded varied effects on usage patterns. While medical cannabis legalization has been associated with increased adult usage, its impact on adolescent consumption remains inconclusive (BAE and KERR, 2020). Conversely, recreational cannabis legalization consistently correlates with heightened adolescent and young adult usage (PASCHALL et al., 2021).

Studies examining the substitution effect among young adults have found mixed evidence, with some suggesting reduced alcohol consumption in areas with liberal cannabis policies (SUBBARAMAN, 2016), while others report increased co-use of cannabis and alcohol following legalization (GARCÍA-RAMÍREZ et al., 2021). Existing evidence on the relationship between cannabis use and other addictive substances, especially regarding substitution or complementarity, remains inconclusive (GUTTMANNOVA et al., 2021). Studies consistently show a positive correlation between cannabis and alcohol use among adolescents and adults (FLEMING et al., 2016). Young adults who use cannabis are more likely also to consume alcohol (YURASEK et al., 2017),

and daily cannabis use is linked to higher daily alcohol intake (GUNN et al., 2018). Furthermore, frequent cannabis users tend to consume alcohol more frequently on average (GUTTMANNOVA et al., 2021). However, recent research by WEINBERGER et al. (2021) suggests complementarity among young adults who use cannabis, with a faster decline in alcohol consumption over 16 years compared to non-cannabis users, supporting the substitution hypothesis.

Alcohol and cannabis use share both physiological and social factors that reinforce their complementary nature (HALL and LYNSKY, 2005). Studies on animal models suggest that these substances activate similar reward pathways in the brain, potentially heightening sensitivity to other addictive substances and fostering a pattern of complementary use (O'HARRA et al., 2016). STEVENS et al. (2021) investigated how motives such as enhancing effects, socializing, responding to offers, and coping influence negative consequences in students who consume both alcohol and cannabis. They found that motives related to enhancing effects, socializing, and responding to offers indirectly contributed to adverse impacts through the use of multiple alcohol products but not cannabis. Conversely, coping motives were associated with using various cannabis products but not alcohol.

Furthermore, their follow-up study (STEVENS et al., 2022) revealed that planned simultaneous use of alcohol and cannabis was primarily driven by socializing and enhancement motives, while unplanned use was more likely motivated by offers or the need to cope with stress. Research suggests that individuals who turn to alcohol and cannabis as coping mechanisms for negative emotions are more likely to substitute one for the other. Both substances are commonly sought after for their ability to alleviate discomfort, attracting those seeking relief (O'HARA et al., 2016).

College students, in particular, are prone to using substances as coping tools, which heightens their risk of substance-related issues (COOPER et al., 1995; SIMONS et al., 2005). O'HARA et al. (2016) discovered that among college students who primarily consume alcohol and cannabis for social purposes, there was a positive correlation between their usage of these substances. Conversely, those who used alcohol and cannabis to cope with stress showed a negative association between the two, indicating substitution. This suggests that the more alcohol they consumed during an event, the less likely they were to turn to cannabis. In a study by BOYLE et al. (2021) involving college students, beyond the conventional motives like socializing and conformity, additional reasons for using cannabis and alcohol were uncovered. Some students engaged in "crossfading," aiming to experience both intoxication and euphoria simultaneously. Others utilized cannabis to reduce alcohol consumption and its associated harm. Furthermore, some students used substances reactively or situationally, often due to their ready availability or being offered to them.

Overall, the literature underscores the multifaceted nature of alcohol and cannabis consumption, influenced by various physiological, social, and contextual factors. While some studies suggest substitution or complementarity between the two substances, the findings remain heterogeneous, highlighting the need for further research to understand these complex dynamics better (RISSO et al., 2020).

3 Materials and Methods

3.1 Research Design

The survey was distributed through Trend Research's online panel, targeting wine drinkers under 60 years old to ensure representation of the German wine-drinking population regarding age and gender. Participants were required to be of legal drinking age (18 years old) and have consumed wine at least once in the past year. Through random sampling, cannabis consumers within the wine-drinking group were identified. The study focused on cannabis users over 18

years old who had used either medicinal or recreational cannabis within the past year. A total of 523 completed surveys were collected, including responses from 215 cannabis consumers.

A 24-item questionnaire based on Cooper's Drinking Motives Questionnaire (DMQ) (1994) was used to assess motives for wine consumption. For participants who reported cannabis use, questions from the Marijuana Motives Measure (MMM) (SIMONS et al., 1998) were included. The MMM is a widely used instrument in cannabis consumption research (O'HARA et al., 2016; SIMONS, 2005). Responses were measured on a scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Consumption frequency for wine and cannabis was evaluated using a 6-point ordinal scale ranging from several times per week (1) to never (6). Wine consumption data were collected separately for five types of wine - red, white, rose, sparkling, and sweet/dessert wines - and for other alcoholic beverages - beer, alcopops, and spirits.

3.2   Methodology

Firstly, a factor analysis using varimax rotation was conducted to reduce the number of variables and identify the underlying structure of the motivation constructs for wine and cannabis consumption. The reliability of the constructs was assessed using Cronbach's α.

Secondly, cross-tabulation, a statistical analysis tool, was utilized to investigate the relationship between cannabis and wine consumption frequencies.

Thirdly, we delve into the factors influencing the wine and cannabis consumed separately compared to a situation when cannabis and wine have ever been consumed simultaneously by estimating a logistic model written in a general functional form as:

$$(1) \qquad P(Y_i = 1) = g(X_i\beta) = \frac{\exp{(\alpha + X_i\beta)}}{1 + \exp{(\alpha + X_i\beta)}}$$

where $X = (X_1, \dots, X_p)'$ is the vector of covariates, $g(.)$ is a link function that ensure $0 \leq P(Y_i) \leq 1$. More specifically, we estimate logistic regression in the following functional form by the maximum likelihood estimator:

$$(2) \qquad log\left(\frac{P[Cont_i=1]}{1-P[Cont_i=1]}\right) = \beta_0 + \beta_1 Cons_{w,i} + \beta_2 Cons_{c,i} + \sum_{j=1}^{5}\delta_{1j}F_{w,ij} + \sum_{j=1}^{4}\delta_{2j}F_{c,ij} + \gamma Z_i + \epsilon_i$$

Where $Cont_i$ is a dependent binary variable, which equals one if an individual i, $i = 1, \dots, n$ has ever consumed wine and cannabis contemporaneously and zero otherwise. The explanatory variables $Cons_{w,i}$ and $Cons_{c,i}$ are dummy variables that measure consumption frequencies of wine and cannabis, respectively, ranging from 1 (at most once a year) to 4 (at least once per week).[4] From the factor analysis, $F_{w,ij}$ and $F_{c,ij}$ are factor scores characterizing the motivations for wine and cannabis consumption, respectively. Socio-demographic characteristics   , including gender, age, income, and education, are captured by a vector Zi.

The coefficients β_1 and β_2 indicate the association between wine and cannabis consumption frequency on the likelihood of consuming them, respectively. Estimated parameters of δ_{1j} and δ_{2j} measure the influence of various motivational factors of wine and cannabis consumption on the respondents' decision to consume wine and cannabis together or separately. Effects of Socio-demographic characteristics are provided in vector γ for gender, age, income and education. The ϵ_i errors are assumed to have a standard logistic distribution.

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[4] The variable wine consumption frequency is calculated as $Cons_{w,i} = max\{Wine_{ij}\}$, where $Wine_{ij}$ is the frequency of wine consumption for each individual i, $i = 1, \dots, n$, and wine category j, $j =$ white wine, red wine, rose, sparkling wine, sweet/dessert wine. Moreover, the original scale for $Cons_w$, I and $Cons_{c,i}$ is reversed to ensure the increasing level is associated with higher consumption frequency.

5

4 Results

4.1 Sample characteristics

All study participants are drinkers of at least one of the five wine types specified in the survey, with a slight majority being female (54.3%). They represent a range of adults aged between 20 and 60, with an average age of 38.3 years. A significant portion of the sample (43%) falls between the ages of 29 and 43; around one-fourth are under 28 years old, and 31.4% are over 44. Most respondents have vocational or upper secondary education (53.3%), and the majority are employed (83%). Regarding personal income, 43% earn less than €36,000 annually, while a quarter earns over €50,000.

Concerning wine consumption habits, over 40% of participants report drinking white wine at least once a week or several times a month. Wine is commonly enjoyed in familial settings (94.1%), at social gatherings and parties (93.1%), and with friends at home (92.9%). Similarly, about 40% of respondents' report using cannabis either frequently or occasionally, with approximately 22% using it several times a week and 18% using it several times a month. Finally, among cannabis and wine users, 53% (115 respondents) have consumed wine and cannabis together, whereas the remaining 100 respondents (47%) have always separated wine and cannabis consumption from each other.

4.2 Results Factor Analysis

Initially, we undertake an analysis to evaluate the variance and deviation of the items, leading to the elimination of those showing minimal deviation from the factor scales. Subsequently, the reliability of the scales and the efficacy of item differentiation is assessed. We evaluate item differentiation before and after removing specific items from the measurement scales. Items demonstrating low deviation, content redundancy, and limited effectiveness in distinguishing between factors are excluded from the final analysis. Consequently, we remove items such as 'I drink wine/consume cannabis because I believe it is healthy for me' and 'I drink wine/consume cannabis because I like the taste' from the final factor analysis of the wine and cannabis consumption motivation scales. Tables 1 and 2 present a comprehensive compilation of measurements detailing the means and standard deviations for each item associated with the respective constructs.

The high Cronbach's alphas for the five dimensions of wine consumption motives and four dimensions of cannabis use motives demonstrate robust internal consistency for each factor (Tables 1 and 2). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, yielding values of 0.95 and 0.94, and the significant Bartlett's sphericity test confirm the suitability of the motivation factor structure. This results in a five-factor solution for wine (Table 1) and a four-factor solution for cannabis (Table 2). All factor-loading scores surpass 0.5, indicating strong correlations between the items and their respective factor groups. With factor loadings and internal consistency (α) levels ranging from 0.82 to 0.94, composite measures for both wine and cannabis are reliably constructed. The five and four factors' solutions collectively explain 75.72% and 71.22% of the total variance for wine and cannabis, respectively, highlighting significant differences between the factors.

Additionally, factor analyses are conducted to examine the motives underlying wine and cannabis consumption, both with and without new items. This aims to validate the factor structure and confirm the suitability of five- and four-factor solutions. For wine consumption, the new items are excluded as the changes in the factor structure are caused by those additions. Notably, the analysis produces a five-factor solution akin to the original findings by SIMONS et al. (1998) (Table 1). Similarly, we perform factor analysis for cannabis consumption motives, excluding new items to ensure a four-factor solution.

Interestingly, this analysis also results in a four-factor solution. However, there are differences in the factor structure between this study and earlier research by SIMONS et al. (1998). The items concerning "expansion," which pertain to broadening awareness, self-confidence, and openness to new experiences, are loaded onto the factor labelled "social." Consequently, we designate the factor as "Social and Expansion." Likewise, items associated with creativity loaded onto the factor named "coping." Thus, we label the factor as "Coping and Creativity." Factor analysis is conducted excluding those items to verify the suitability of a four-factor solution without the expansion and creativity scales. Remarkably, this analysis produces a four-factor solution mirroring the original one. Therefore, it can be deduced that the differences in factor structure between this study and previous research (SIMONS et al., 1998) are likely not due to the additional items introduced here. Instead, these variances may be better explained by two factors: (1) differences in sample composition and (2) the notable correlations observed between social and expansion, as well as coping and expansion items (SIMONS et al., 1998).

In summary, socializing emerges as the primary motivation for wine consumption and enhancement for cannabis use ($\bar{x}$= 3.38; $\bar{x}$= 3.52), followed by enhancement for wine ($\bar{x}$= 3.32) and coping and creativity for cannabis ($\bar{x}$= 2.85). Coping and expanding creativity are more endorsed for cannabis ($\bar{x}$= 2.85) than for wine ($\bar{x}$= 2.83; ($\bar{x}$= 2.82). Conformity does not emerge as a significant factor for either substance.

Table 1:   factor analysis results based on wine consumption motives

Wine consumption motives	Mean	Variance Explained %	α
Socializing	3.38	6.23	.87
Enhancement	3.32	3.20	.82
Coping	2.23	48.98	.92
Expansion	2.22	3.91	.91
Conformity	1.87	13.40	.91
Total variance			75.72

Source: authors' estimations. Notes: All factor loadings are significant at p<.001: How often do you drink wine for the following reasons? 1 = "never" 5 = "always". N=523

Table 2:   factor analysis results based on cannabis consumption motives

Cannabis consumption motives	Mean	Variance Explained %	α
Socializing & Expansion	2.73	49.49	.93
Enhancement	3.52	4.27	.86
Coping & Creativity	2.85	11.55	.90
Conformity	2.01	5.93	.94
Total variance			71.22

Source: authors' estimations. Notes: All factor loadings are significant at p<.001: How often do you consume cannabis for the following reasons? 1 = "never" 5 = "always". N=215

4.3   Results Cross-Tabulation

We conduct further analysis to examine the correlation between cannabis and wine consumption frequencies, employing a cross-tabulation approach. Table 3 displays the percentage of respondents by wine and cannabis usage frequencies. Descriptive statistics reveal a non-linear rise in wine consumption among non-cannabis users. Interestingly, there appears to be a simultaneous increase in the percentage of more frequent cannabis users alongside increasing wine

consumption. However, a clear pattern in wine consumption frequency with increasing cannabis use frequency is not evident, except for a slight decline in infrequent wine consumption (x/year) as cannabis usage becomes more frequent. The largest subgroup comprises individuals who are frequent wine drinkers but have never used cannabis, constituting 26% of the sample. Moreover, there seems to be no discernible association between frequent wine consumption and the frequency of cannabis usage among cannabis users (as indicated in the column "x/week").

Table 3: Percentage of wine and cannabis users by their frequency of use.

Cannabis Use	Wine Consumption				Total
	less often	x/year	x/month	x/week	
Never	4.4%	19.3%	9.6%	25.6%	58.9%
less often	0.4%	3.8%	1.3%	5.0%	10.5%
x/year	0.8%	3.1%	4.0%	6.5%	14.3%
x/month	0.0%	1.9%	0.6%	4.8%	7.3%
x/week	0.6%	2.3%	1.0%	5.2%	9.0%
Total	6.1%	30.4%	16.4%	47.0%	100.0%

Source: authors' estimations. N=523.

4.4   Estimation Results

Results of the logistic regression analysis (Table 4, Figure 1) suggest that the more frequent consumption of cannabis increases the probability of consuming wine and cannabis together (β_1=0.47). However, the frequency of wine consumption is irrelevant for deciding to consume wine and cannabis together or separately, as the estimated parameter for wine consumption frequency is highly statistically significant (β_2=0.03).

To provide a disaggregated view of the relationship between the frequency of wine and cannabis consumption and the likelihood of consuming them simultaneously, we plot predictive margins in Figure 1. In particular, the probability of contemporaneous consumption steadily increases with the cannabis consumption frequency, whereas for wine, we do not observe a strong association between the two. Those results are confirmed by the test of coefficient equality, which indicates that the null hypothesis of equality of parameters is rejected for cannabis consumption frequencies ($\chi^2(1) = 4.65$, p-value = 0.03) and cannot be rejected for wine consumption frequencies ($\chi^2(1) = 0.54$, p-value = 0.46). That implies that the contemporaneous consumption of wine and cannabis is common among the frequent consumers of cannabis, whereas frequent wine consumers are "not interested" in the contemporaneous consumption of wine and cannabis.

In addition, estimation results in Table 4 indicate that individuals consuming wine for socializing and enhancement reasons (δ_{13}= -0.350 δ_{15}= -0.846, respectively) and cannabis for social & expansion and coping (δ_{21}= -0.367 δ_{23}= -0.331, respectively) are less likely to opt for the contemporaneous consumption and prefer to consume them separately. On the other hand, we find that conformity may positively drive contemporaneous consumption of wine and cannabis (δ_{12}= 0.141 for wine and δ_{22}= 0.076 for cannabis); however, results are highly statistically insignificant at conventional significance levels. Results also suggest that the likelihood of contemporaneous consumption is not influenced by wine factors for coping and expansion and cannabis factors for enhancement.

Among the socio-demographic characteristics, results indicate that men are much more likely than women to consume wine and cannabis together than separately. We do not identify a statistically significant effect of age, income and education on the decision to consume wine and cannabis together or separately. As results suggest, those socio-demographic indicators do not determine the likelihood of consuming wine and cannabis together.

Table 4.   Estimation results, logistic regression

Dependent variable = contemporaneous consumption	Estimated parameter	Standard error	P-value
Wine consumption frequency	0.035	0.221	0.875
Cannabis consumption frequency	**0.468** ***	0.199	0.018
Factors, wine			
Socializing	**-0.350** *	0.190	0.065
Enhancement	**-0.846** ***	0.214	<0.001
Coping	-0.125	0.202	0.536
Expansion	-0.055	0.182	0.764
Conformity	0.141	0.216	0.514
Factors, cannabis			
Socializing & Expansion	**-0.367** **	0.182	0.044
Enhancement	-0.034	0.186	0.854
Coping & Creativity	**-0.331** †	0.217	0.127
Conformity	0.076	0.260	0.771
Socio-demographics			
Female	**-0.644** *	0.339	0.058
Age group	-0.027	0.240	0.910
Income	-0.007	0.007	0.291
Education	-0.036	0.260	0.889
Intercept	-0.542	1.063	0.610
Number of observations	215		
Pseudo R^2	0.17		
Log pseudo likelihood	-122.85		

Source: Authors' estimations. Notes: *** p<0.01. ** p<0.05. * p<0.10. † p-value equals 0.13. Robust standard errors in parenthesis. At least, parameter estimates significant at the 13% level are marked in bold.

Figure 1:   Predictive margins of cannabis and wine consumption frequencies
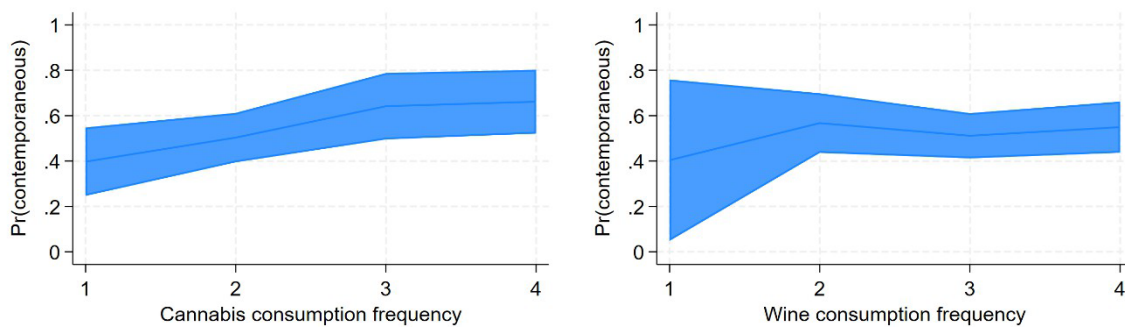
Source: authors' estimations and illustrations. Note: shaded area plots 95% confidence intervals. Wine and cannabis consumption frequencies increase in an ascending order from low to high.

5   Discussion and Conclusion

Understanding the dynamic interplay between alcohol and cannabis use is crucial for formulating effective policies and interventions to address substance use (O'HARA et al., 2016). Adopting a novel perspective, this study explores the potential for substitution or complementarity between cannabis and wine. The motivations and pathways underlying the consumption of these substances vary widely. Initially, the study explored the consumption motives for wine and cannabis. Furthermore, the study investigated the substitution and complement relationship by examining the correlation between frequencies of wine and cannabis consumption. A com-

plement relationship suggests that the high frequency of consumption of one substance is associated with the high usage of another. Oppositely, the substitute relationship implies that the high use of the substance is related to less consumption of another substance. Furthermore, the complementarity was explored by identifying the factors influencing contemporaneous consumption of wine and cannabis among respondents who have used cannabis at least once. Additionally, we analyzed differences between wine drinkers who consume wine and cannabis separately and those who use both substances simultaneously.

Our results of factor analysis suggest that socializing and enhancement are the primary motivations for wine and cannabis use, whereas coping and expanding creativity are more endorsed for cannabis than for wine use. Those results are consistent with earlier studies indicating that both substances, wine and cannabis, are frequently utilized to reinforce positive experiences, to improve social interactions and cultivate positive emotions, enjoyment, and overall well-being (FLEMING et al., 2022).

The results of cross-tabulation support the notion of a complementary relationship between wine and cannabis. Notably, our analysis highlights a significant trend: among cannabis users, there is a simultaneous increase in the frequency of both wine and cannabis consumption. This suggests that frequent cannabis use is linked to more frequent wine consumption, indicating complementarity for cannabis users but not for wine users. However, it's important to note that this relationship doesn't necessarily imply causation. Instead, it suggests a correlation between the two behaviours.

As confirmed by the findings of logistic regression, more frequent cannabis consumption increases the likelihood of simultaneous use of wine and cannabis. In contrast, more frequent wine consumption does not necessarily lead to simultaneous consumption of wine and cannabis. This suggests that as cannabis consumption increases, there is a greater probability of simultaneous consumption of wine and cannabis. This observation aligns with the conclusions drawn by GUNN et al. (2019), who found that cannabis use was linked to higher levels of alcohol consumption among frequent recreational users on days when cannabis was used. Such frequent recreational cannabis users may be more susceptible to additional risks associated with co-use (GUNN et al., 2019), or may experience dopaminergic effects from both substances (HALL and LYNKSY, 2005).

Furthermore, the findings show that individuals who consume wine primarily for socializing and enhancement purposes and cannabis for social expansion and coping are inclined to separate their consumption of these substances rather than engage in contemporaneous use. This preference aligns with research findings from O'HARA (2016), PATRICK et al. (2019), and FLEMING et al. (2022), indicating that alcohol consumption is often associated with socializing in social contexts, while cannabis use is commonly linked to coping with stress, anxiety, and negative emotions, as well as addressing social isolation (BUCKNER et al., 2016). Additionally, respondents who reported a stronger inclination to use alcohol or drugs as a coping mechanism for stressful events exhibited a substitute relationship; as they consumed more alcohol on a given occasion, they were less likely to use cannabis (O'HARA et al., 2016). This suggests that when individuals satisfy their needs, such as coping with cannabis and socializing with wine, there is a reduced likelihood of engaging in simultaneous substance use (STONE and KENNEDY-MOORE, 1992; O'HARA et al., 2016).

In conclusion, the research indicates a higher propensity among men to consume wine and cannabis together, contrasting with women who typically use cannabis less frequently (CUTTLER et al., 2016). This result aligns with the findings that men may exhibit a greater inclination towards engaging in risky behaviours such as frequent cannabis use, bingeing, and simultaneous substance consumption, potentially exposing themselves to adverse health and social outcomes (WILKINSON et al., 2018).

The findings of the current study highlight the complexities of addressing substance use in wine consumers. Despite the lower risk of infrequent cannabis use compared to frequent use, simultaneous use of wine and cannabis elevates the likelihood of accidents, alcohol-related consequences, and health issues (LEE et al., 2022; PATRICK et al., 2021). Policies or interventions aimed at reducing alcohol and cannabis consumption may yield varied outcomes among different segments of wine and cannabis consumers. In particular, wine consumers, irrespective of their wine consumption frequencies, are not expected to engage in the simultaneous consumption of wine and cannabis. In contrast, frequent cannabis users, if consuming less cannabis, would reduce their consumption of wine and cannabis together. Therefore, interventions aimed at reducing contemporaneous consumption should target frequent cannabis users rather than frequent wine consumers.

6   Limitations and Future Research

In this study, understanding how wine and cannabis are used, whether as substitutes or complements, is challenging due to insufficient data on usage patterns such as timing and quantity consumed. More research is needed to clarify when and for whom these substances act as complements or substitutes. For instance, individuals may use them as substitutes or in tandem depending on various factors like context and reasons. Exploring these dynamics across different social settings is crucial (WEINBERGER et al., 2021).

With Germany poised for substantial regulatory shifts and potential legalization, it's prudent for forthcoming studies to integrate longitudinal surveillance. This would enable tracking changes in consumption patterns, motivations, and the interplay between wine and cannabis as substitutes or complements. Analyzing alterations in attitudes and perceived benefits regarding cannabis and wine post-legalization can offer insights into behavioural shifts and associated health outcomes. Such insights can inform public health initiatives to mitigate harm in the post-legalization landscape (TURNA et al., 2022).

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