



Investigating the Associations Between Alcohol Consumption and Prevalence of Anxiety Using Multiple Correspondence Analysis

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Abstract

The prevalence of a specific link between alcohol consumption and anxiety is the basis of this study. The primary aim is to identify how different types of alcohol link with different levels of anxiety disorder. This study is based on secondary data spanning two decades from 1990 to 1999 and 2010 to 2019. Before the primary analysis, the variables were categorised relative to their maximum and minimum values to identify countries with high anxiety prevalence. The MCA (multiple correspondence analysis) included four different types of alcohol and the prevalence of anxiety as variables. This methodology was utilised to determine the associations across 189 countries. The results reveal that anxiety rates are rising worldwide, with 17 countries identified to have prevalent high levels of anxiety. Most countries that exhibited a high prevalence of anxiety were based in the European region. The study emphasises a bi-directional association between anxiety and alcohol disorders, with diverse associations for various alcohol categories. Lower levels of consumption of alcoholic drinks with a high percentage of alcohol are associated with a greater incidence of anxiety, except beer, where consuming more beer is associated with a higher anxiety incidence. Similarly, a reciprocal relationship can be identified between these variables. The study emphasises that the consumption of alcohol can be detrimental to mental health and advises anxiety-prone individuals to exercise caution and restraint when imbibing.

Keywords Alcohol consumption · Anxiety · Multiple correspondence · Association analysis

Anxiety and consumption of alcohol are two serious public health issues that frequently coexist and are linked to one another (Mäkelä et al., 2014; Mocanu & Wood, 2022; Smith & Randall, 2012). Anxiety occurs when a person experiences excessive and ongoing fear, worry, and physical symptoms. It can be found prevalent in many individuals (Munir & Takov, 2023). Anxiety is a comprehensive term encompassing several distinct conditions, including social anxiety disorders, generalised disorders, phobias, and panic disorders. Excessive and uncontrollable worry about ordinary events and thoughts is a common

Extended author information available on the last page of the article

characteristic of anxiety disorders and can cause physical and psychological symptoms. Some of the symptoms are shortness of breath, racing heartbeat, trembling, sweating, restlessness, sleeplessness, trouble focusing, and irritability. Anxiety disorders can profoundly impact an individual's daily functioning and relationships. They can hinder work, social interactions, and school performance, which lowers one's quality of life. These types of social and psychological factors can result from an individual indulging in the consumption of alcohol (Mann et al., 2004).

Alcohol consumption is the act of consuming alcoholic beverages that contain ethanol or ethyl alcohol that is produced by the fermentation or distillation of various sources, including fruits, vegetables, and cereals (Britannica, 2023). Over centuries, alcohol has expanded across multiple communities worldwide. Alcohol is commonly consumed for its psychoactive effects, which include relaxation, exhilaration, and lowered inhibitions (Abbey et al., 1993). On the other hand, excessive or careless consumption of alcohol can be harmful to both physical and mental health. It may result in addiction, liver damage, poor judgment, a higher chance of accidents, and unfavourable social repercussions (Rehm, 2011). Alcohol use by anxious persons as a maladaptive coping strategy to lessen their social inhibitions and distress may temporarily lessen their anxiety, but in the long run, their anxiety will continue to worsen (Sayette, 2017). A bidirectional relationship can be identified between excessive consumption of alcohol and anxiety disorders, with symptoms of anxiety contributing to alcohol addiction and heavy alcohol consumption raising anxiety levels (S. A. Ummels et al., 2022a, 2022b). The idea of a bidirectional interaction within the study will be probed deeper.

The study's primary intent is to investigate the association between the consumption of alcohol and the prevalence of different levels of anxiety within individuals. Three key aspects set this study apart from earlier research examining the association between these two parameters. First, this study focuses on nations with the highest prevalent proportion of anxious persons from 1990 to 1999 and 2010 to 2019. This encompasses two decades of data into account to produce accurate, instructive findings. Second, using multiple correspondence analysis (MCA), it clearly determines whether variables are associated or independent. This allows for a comprehensive analysis, enabling the research to focus better on the association between different alcoholic beverages and anxiety prevalence. Third, the results of this paper have been generated by incorporating data from 189 countries. However, only 17 countries with the highest anxiety outcomes over the selected period were rendered for further discussion.

Obtaining a sound understanding of the association between alcohol consumption and anxiety disorder is very important to individuals with anxiety disorder, alcohol disorders, and mental health professionals. Individuals that encounter these difficulties may find this research paper insightful, as it highlights the patterns of association across countries and time. A mental health professional in this field can recognise the different patterns of alcohol consumption and anxiety prevalence to create efficient treatment plans and provide their clients with evidence-based advice for at-risk populations. This development enables better decisions to be taken about their drinking habits and effectively managing their anxiety symptoms.

Five sections make up the framework of this research study, briefly summarised thus: The first section is an introduction. A thorough assessment of the literature on the two research variables and associated topics is included in the second section. The third provides an in-depth description of the research technique used for this research. The fourth interprets and analyses comprehensively the research findings included in the results and discussion. The final section summarises significant findings and notes the study's

limitations. Additionally, it makes recommendations for policies that should be implemented to reduce the adverse consequences found in the study.

Literature Review

Many believe that mental illnesses such as anxiety result from chronic alcohol consumption. By considering the bodies of available literature and earlier studies on the cause and effect of anxiety on alcohol use, a deeper understanding of the subject can be achieved.

Everyday use of alcohol to reduce anxiety and alcohol dependency is more likely to occur in individuals that have depression or anxiety (Puddephatt et al., 2022; Rudenstine et al., 2020; Torvik et al., 2019). While alcohol can reduce social anxiety, this can also cause the development of an alcohol dependency, as this responsive effect works as fuel for each other (Buckner et al., 2006; Kushner et al., 2000; Thomas et al., 2003). Similarly, the existence of social-anxiety syndrome in an individual can be a cause for developing a future alcohol dependency (Goodwin & Stein, 2013; Schmidt et al., 2007). Conversely, the expectations and beliefs individuals have on the positive effects of alcohol, allowing them to cope better when paired with peer pressure, can increase the chances of developing alcohol dependencies (Buckner & Matthews, 2012; Cooper et al., 2014; Lemyre et al., 2019; Leonard & Blane, 1988; Morris et al., 2005; Stewart et al., 2006). The association between alcohol and anxiety has been explored previously; however, while alcohol has been generalised into one category, this leads to speculation that each type of alcohol may have a different effect on a person's response to anxiety.

Alcohol does not always provide benefits, and depending on the scenario, alcohol can also increase anxiety in an individual (Clerkin & Barnett, 2012; Meade Eggleston et al., 2004). Similarly, individuals with lower social anxiety tend to drink more than individuals with higher social anxiety (Buckner et al., 2011). Alcohol consumption can create unwarranted anxiety in individuals, highlighting the importance of considering contextual factors (Caumiant et al., 2023; Ham et al., 2011). This aspect highlights the controversial nature of this issue, where results are tilted in both directions. However, this further outlines the need to consider the global factors influencing this association.

Several other factors can influence the association between anxiety and alcohol. A prominent factor for influence is sex. Women are more likely than men to develop a dependence on excessive drinking for anxiety (Lee et al., 2020; Ribadier & Varescon, 2019). Another significant factor is age, where, depending on the individual's age, the effects of alcohol may vary. Adolescents exposed to alcohol and drugs develop anxiety and dependence, leading to conduct disorder and anxiety disorders in teenagers (Clark et al., 1994). Similarly, familial influence can be a prominent cause of the early onset of alcohol dependence, even more so than anxiety or depression (Preuss et al., 2002). A global study can consider how each country faces anxiety, where the investigation will determine if each country reacts to alcohol differently.

Alcohol abuse is consistently associated with a higher prevalence of mental disorders (Wiener et al., 2018). Similarly, studies identify that students tend to be more at risk for negative influences when they have indications of dependence and social anxiety disorder together (Villarosa-Hurlocker & Madson, 2020). Social anxiety needs practical methods since environmental settings and incentives can affect alcohol use.

While many motives and influences can influence how alcohol and anxiety interact, studies have identified this relationship to be dissimilar for everyone: Anxiety's effect on

alcohol dependence and consumption, although not formalised and consistent, exists. It can significantly impact an individual's well-being and quality of life.

Methods

Study Design

The association between the level of alcohol consumption and anxiety in two decades, 1990–1999 and 2010–2019, among 17 countries was determined using an MCA. Data was utilised from two credible databases, OurWorldinData (OurWorldInData, 2019) and the World Health Organization (WHO, 2023). The compiled datasets were curated and converted from continuous data into categorical multinominal data. Variables considered included prevalence of anxiety, beer consumption, wine consumption, and spirit consumption. Categories were assigned to each variable based on the relative maximum and minimum and were classified as very low, low, moderate, high, and very high.

An MCA can analyse and present categorical data in massive, complicated datasets (Greenacre & Blasius, 2006; Methlagl, 2022; Sivasankaran & Balasubramanian, 2020). The main advantage of implementing MCA is to evaluate and visually display multivariate categories, allowing for more accessible visualisations of relationships and patterns among categorical variables within a dataset (Alhuzali et al., 2022; Natarajan et al., 2020; Sączewska-Piotrowska, 2021; Thibenda et al., 2022). The data analysis tool utilised in this study to conduct the MCA is STATA 17. Within an MCA, observations are classified by variables of various levels or categories (Natarajan et al., 2020). MCA detects and represents the underlying structures of a dataset utilising a low-mediational space when analysing two categorical variables (Ali et al., 2018; Thibenda et al., 2022). Based on the resulting correlation values, the variables that are not related to each other are drawn far away from the variables that are related. This allows for easy identification of associations that may exist between categorical variables.

Comparable to the eigenvalues of principal component analysis, the eigenvalue of MCA represents the volume of variance captured in each dimension (Natarajan et al., 2020). The variance in the data is typically best explained by the first two or three dimensions with the highest eigenvalues. “Inertia” is a term similar to eigenvalues, which explains the total difference between the groups in the dataset that the analysis can explain. It is used to evaluate relationships and patterns between categorical variables.

MCA involves a contingency table, an indicator matrix, built by paired cross tabulation of every variable (Champahom et al., 2022; Sączewska-Piotrowska, 2021). It uses an $I \times J$ indicator matrix, where I represents a set of I records, and J represents the number of variable categories (Sivasankaran & Balasubramanian, 2020). The dataset is converted into a contingency table in this manner, with rows representing individuals and columns representing distinct categories.

Burt's matrix:

$$B = Z'Z$$

B is an indicator matrix of Z which is commonly used to perform an MCA (Greenacre & Blasius, 2006; Sączewska-Piotrowska, 2021). The Burt matrix displays categorical data using diagonal blocks to show how often the data occurs symmetrically and clearly. A Burt matrix is usually a two-way contingency table displayed within a matrix. Comparatively,

the Burt matrix has several benefits; one such significant benefit is the utilisation of less complicated mathematical calculations compared to other methods. Researchers can also use two-dimensional surfaces to analyse complex data in a graphical approach.

Results

To identify the associations between alcohol consumption and anxiety, an analysis was undertaken based on consumption patterns of 189 countries. To better illustrate the data, two maps were constructed. To avoid data inaccuracies, the sourced data was averaged into two periods, 1990–1999 and 2010–2019. The individuals with anxiety were classified into five categories based on both maps' standard maximum and minimum levels. Utilising the maps, countries that displayed prevailing high death rates were identified and selected for further analysis. Figure 1 presents the average number of individuals with anxiety from 1990 to 1999, and Fig. 2 represents 2010–2019.

The maps immediately highlight an increase in the worldwide trend of anxiety over the past 29 years, with fluctuations being prominent within Western communities. Countries not marked within the map either show no notable change or do not signify a morbid incidence of anxiety. A visible, increasing trend can be observed among the highlighted countries. The highest anxiety recorded for a country in 2010–2019 was 2.9% higher than the highest recorded in 1990–1999. Similarly, the worldwide average change in anxiety shows an overall increase of 7.2%.

Anxiety is biased towards the European region, with European countries displaying considerably elevated anxiety levels. Additionally, the majority of the countries with high anxiety can be seen appearing near each other. A continuous and prevalent increase in anxiety levels suggests a pre-existing underlying problem within these countries. The

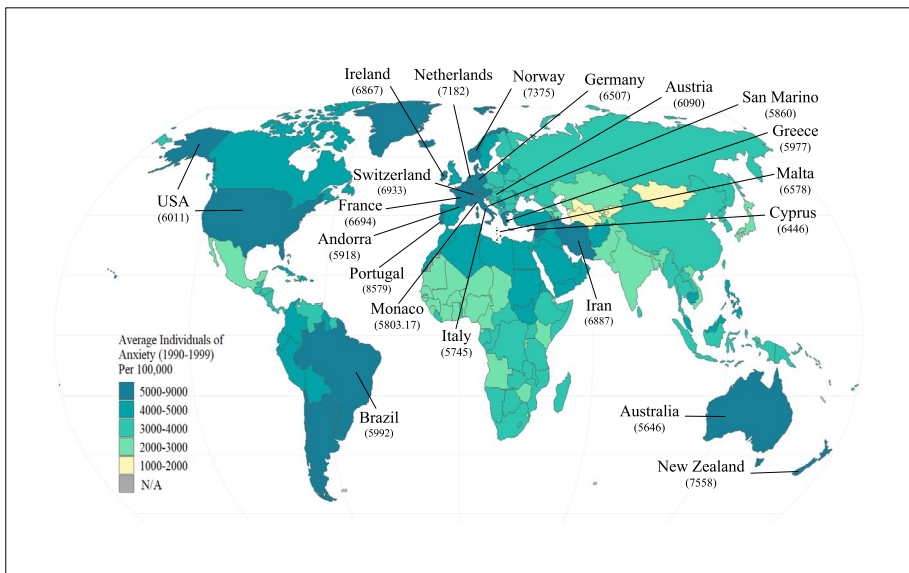


Fig. 1 Map of average individuals with anxiety per 100,000 for 1990–1999. Source: Authors' illustration based on Our World in Data

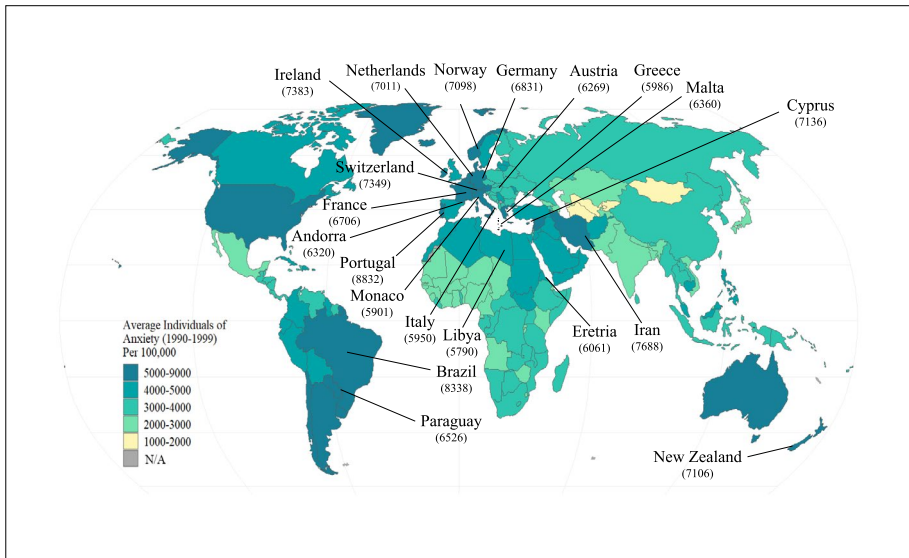


Fig. 2 Map of average individuals with anxiety per 100,000 in 2010–2019. Source: Authors' illustration based on Our World in Data

overall anxiety levels within the European region exhibit a growth of 3% over the considered period.

Within Fig. 2, Ireland, Netherlands, Norway, Germany, Switzerland, and Portugal appear to exhibit high anxiety levels. At the same time, Norway and Netherlands show reduced anxiety levels at -3.8% and -2.4% , respectively. Ireland, Germany, Switzerland, and Portugal exhibit steadily increasing anxiety levels at 7.5% , 5% , 6% , and 3% , respectively. While Asia does not appear to face a high impact from anxiety, Iran and Cyprus display prominent anxiety levels, with both countries showing increasing anxiety levels over time—Iran with an increase of 11.6% and Cyprus with a rise of 10.7% . New Zealand continues to deliver high anxiety levels throughout the 29 years, while Australia has managed to reduce its anxiety levels to an acceptable level. New Zealand shows an existing elevated level of anxiety; it has a steady declining rate of 6% . They reveal that anxiety is not prevalent in the Oceania region.

The North American and South American continents show relatively high rates of anxiety throughout the 29 years. While anxiety levels in the USA have been foreshadowed by countries that have higher values, Brazil has seen an alarmingly vigorous increase in anxiety levels at 39.1% over the past 29 years. Similarly, Paraguay also boasts an alarmingly increasing rate of 20.4% . Higher precautions should be undertaken within these countries' consequent to the rapid increase in anxiety levels. An overall increase can be observed across both maps, with many countries experiencing a growing rate of anxiety.

The selected countries' data, using the above maps, were used in an MCA. An additional step is required before visualising the results of the MCA. The eigenvalues of the MCA must be considered to decide on the number of dimensions and comprehend how much information was captured in each size. Detailed MCA dimensions and eigenvalues results are found in Table 1. Results are limited to the first five dimensions, of which only the first two substantially contribute to the initial inertia.

Table 1 Eigenvalues of MCA

Dimensions	Principal inertia	%	Cumulative %
Dim 1	0.2167439	45.25	45.25
Dim 2	0.0794418	16.59	61.84
Dim 3	0.036552	7.63	69.47
Dim 4	0.0154191	3.22	72.69
Dim 5	0.0081246	1.70	74.38

The resulting two dimensions account for 45.25% and 16.59% of the variation, respectively, amounting to a collective 61.84% of total inertia. The division of the inertias to their respective dimensions can be visually portrayed by a Scree plot diagram, as depicted in Fig. 3. The remaining dimensions are not considered as they represent only a tiny fraction of the total inertia of the analysis. The two dimensions' correspondence analysis describes approximately 61.84% of the association between the four categorical variables.

The detailed results of all the variables used for the analysis are found in Table 2. The variables include four types of alcohol, their individual consumption levels, individuals with anxiety, and their respective groups. Each category's contribution to the Biplot's total inertia and principal coordinates is displayed within the fourth column. The quality of each type within the country variable is shown in the third column. This represents how much information about each category has been captured within the two selected dimensions.

Dimension 1 is primarily associated with moderate levels of alcohol consumption and higher anxiety prevalence. Specifically, very low and very high beer consumption, very low and low wine consumption, low and very low spirit consumption, and high to very

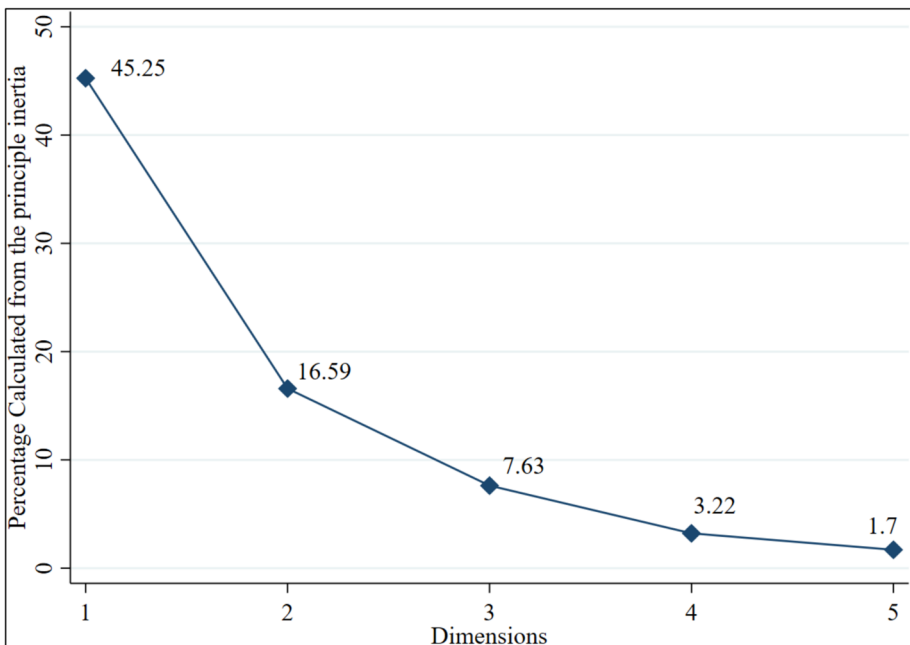
**Fig. 3** Scree plot of eigenvalues. Source: Authors' illustration using Stata 17

Table 2 Results of MCA

Categories	Overall			Dimension 1			Dimension 2		
	Mass	Quality	% inertia	Coordinate	Squarecorrelation	Contribution	Coordinate	Squarecorrelation	Contribution
	Types of alcoholic beverages and consumption levels								
Beer consumption									
Very low consumption	0.015	0.722	0.129	-3.737	0.722	0.205	0.051	0.000	0.000
Low consumption	0.074	0.626	0.063	0.307	0.050	0.007	1.725	0.576	0.219
Moderate consumption	0.118	0.408	0.051	-0.268	0.075	0.008	-0.932	0.333	0.102
Very high consumption	0.044	0.656	0.066	1.449	0.637	0.093	-0.406	0.018	0.007
Wine consumption									
Very low consumption	0.044	0.839	0.125	-2.280	0.828	0.229	-0.448	0.012	0.009
Low consumption	0.103	0.658	0.034	0.627	0.534	0.040	-0.498	0.124	0.026
Moderate consumption	0.029	0.511	0.052	1.036	0.277	0.032	1.577	0.235	0.073
High consumption	0.044	0.304	0.030	0.060	0.002	0.000	1.106	0.302	0.054
Very high consumption	0.029	0.130	0.026	0.100	0.005	0.000	-0.820	0.125	0.020
Spirit consumption									
Very low consumption	0.044	0.649	0.099	-1.440	0.419	0.092	1.764	0.230	0.137
Low consumption	0.176	0.732	0.031	0.480	0.602	0.041	-0.370	0.131	0.024
Moderate consumption	0.029	0.127	0.061	-0.720	0.113	0.015	-0.428	0.015	0.005
Individuals with anxiety									
Moderate	0.044	0.539	0.082	-0.601	0.087	0.016	2.254	0.452	0.224
High	0.147	0.846	0.049	0.780	0.832	0.089	-0.167	0.014	0.004
Very high	0.059	0.736	0.103	-1.499	0.582	0.132	-1.273	0.154	0.095

high anxiety prevalence categories contribute most strongly to this dimension, as indicated by their high squared cosine values. Dimension 2, in contrast, reflects stronger patterns, including low and moderate beer consumption, high and very high wine consumption, moderate spirit consumption, and moderate anxiety prevalence.

Together, these dimensions display associations among alcohol types and anxiety prevalence, enabling the identification of country profiles based on the proximity of categories in the multidimensional space. These profiles provide insight into how different patterns of alcohol consumption relate to varying levels of anxiety across the selected countries.

Table 3 presents the descriptive results of how each country that was considered contributed to the total inertia and principal coordinates. The coordinates generated from the MCA are then plotted onto a Biplot. Iran and Italy demonstrate the highest quality within the MCA, where these countries are best represented within the Biplot generated the association between anxiety and alcohol consumption.

Figure 4 presents the Biplot generated using the statistics presented beforehand using the software STATA 17. However, only three types of alcohol were used in the analysis, as OAC displayed no change within all of the countries utilised. Similarly, specific sub-categories within the variables were also dropped, as none of the countries considered exhibited them.

The Biplot presents all the categories that were run using MCA. By delving into the backgrounds of the countries under consideration, the Biplot can be used to determine how each category is associated with each other in practice. Each cluster of points represents categories that show close associations with each other. The distance every country has

Table 3 Supplementary variable of MCA

Category	Overall			Dimension 1		Dimension 2	
	Mass	Quality	% inertia	Coordinate	Square correlation	Coordinate	Square correlation
Country ID							
1. Andorra	0.059	0.018	0.522	0.564	0.016	-0.322	0.002
2. Austria	0.059	0.212	0.522	2.011	0.206	0.562	0.006
3. Brazil	0.059	0.321	0.522	-1.915	0.187	-2.681	0.134
4. Cyprus	0.059	0.063	0.522	0.225	0.003	-1.796	0.060
5. France	0.059	0.043	0.522	0.895	0.041	0.326	0.002
6. Germany	0.059	0.194	0.522	1.791	0.164	-1.279	0.031
7. Greece	0.059	0.418	0.522	0.657	0.022	4.600	0.396
8. Iran	0.059	1.180	0.522	-4.809	1.179	0.084	0.000
9. Ireland	0.059	0.194	0.522	1.791	0.164	-1.279	0.031
10. Italy	0.059	0.731	0.522	-0.899	0.041	6.075	0.690
11. Malta	0.059	0.078	0.522	1.178	0.071	0.612	0.007
12. Netherlands	0.059	0.095	0.522	0.869	0.039	-1.745	0.057
13. New Zealand	0.059	0.145	0.522	-0.355	0.006	-2.725	0.139
14. Norway	0.059	0.118	0.522	0.147	0.001	2.505	0.117
15. Paraguay	0.059	0.223	0.522	-2.077	0.220	0.396	0.003
16. Portugal	0.059	0.190	0.522	-0.637	0.021	-3.011	0.169
17. Switzerland	0.059	0.018	0.522	0.564	0.016	-0.322	0.002

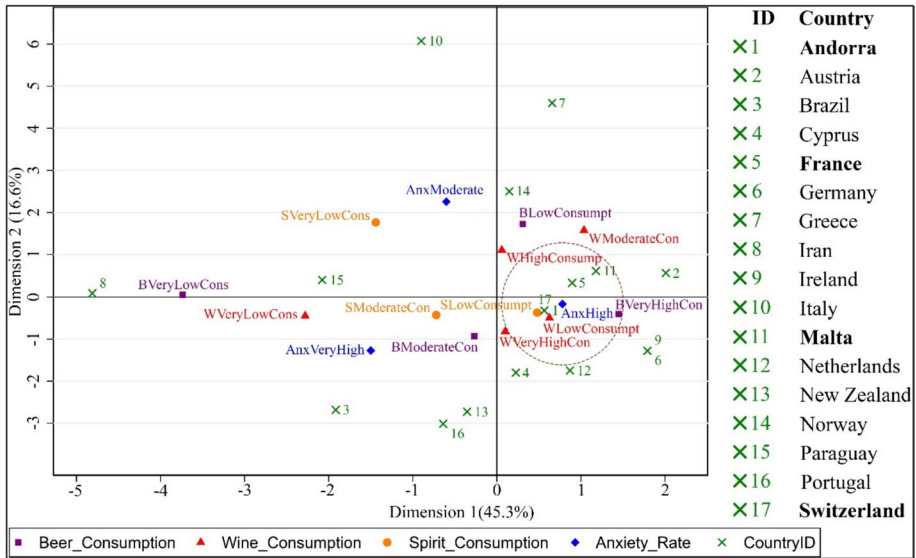


Fig. 4 Biplot of MCA

to each type represents the categories with which they are strongly associated. The two dimensions explained 61.9% of the total inertia (45.3% and 16.6%, respectively).

The added supplementary variable, country, provides further insights into these patterns. Iran (ID 8), located on the far side of the negative side of dimension 1, is strongly associated with very low alcohol consumption levels and high anxiety prevalence. Similarly, Brazil (ID 3) and Paraguay (ID 15) cluster in the lower-left quadrant, displaying low-to-moderate beer and spirit consumption with elevated anxiety rates, signifying that the underlying reason behind the elevated anxiety is less a factor of alcohol consumption, but rather other external factors. Similarly, Brazil (ID 3) and Paraguay (ID 15) clustered in the lower-left quadrant indicate low-to-moderate beer and spirit consumption with relatively elevated anxiety rates. Countries like Germany (ID 6) and Ireland (ID 9) occupy positions closer to higher beer consumption and high anxiety, reinforcing the beer–anxiety association.

The findings of this study reinforce the complexity of the bidirectional association between alcohol consumption and anxiety disorders. The MCA results showed that beer consumption was positively associated with higher anxiety prevalence, while wine consumption clustered more closely with moderate or lower anxiety levels. Spirits, in contrast, revealed an inverse association, where higher consumption tended to align with lower anxiety prevalence. These beverage-specific differences provide nuance to earlier research that often treated alcohol as a single category, suggesting both self-medication and exacerbation mechanisms (Buckner et al., 2006; Kushner et al., 2000; Thomas et al., 2003).

The strong clustering of beer with high anxiety prevalence in countries such as Germany and Ireland is consistent with prior evidence that socially anxious individuals are prone to drinking as a coping strategy, which exacerbates long-term anxiety outcomes (Buckner et al., 2011; Caumiant et al., 2023). Conversely, the association of Mediterranean countries with higher wine consumption and lower anxiety aligns with cultural perspectives suggesting that moderate wine intake, embedded in traditional drinking patterns,

may buffer against harmful psychological effects (Goodwin & Stein, 2013; Puddephatt et al., 2022). These results support the bidirectional nature of alcohol–anxiety interactions identified in longitudinal studies, where alcohol is used initially to relieve symptoms but ultimately heightens anxiety over time (Smith & Randall, 2012; Sophie A. Ummels et al., 2022a, 2022b).

Recent multi-country evidence further strengthens these interpretations. A South American analysis revealed heterogeneous patterns, with some countries demonstrating bidirectional causality between alcohol consumption and anxiety, while others showed no significant links (Palliyaguru et al., 2024). Similarly, a comparative study of high-income countries highlighted that causal associations vary widely, with unidirectional, bidirectional, or absent relationships depending on cultural and socioeconomic contexts (De Silva et al., 2024). These observations resonate with our MCA findings, where beer-dominant nations clustered with high anxiety and wine-dominant nations clustered with lower anxiety.

The nuanced, and sometimes inverse, association between spirits' consumption and anxiety in our results parallels recent findings that emphasise beverage-specific effects. For example, Senarathne et al. (2025) noted that spirits may not universally increase anxiety prevalence, with outcomes strongly mediated by cultural norms and drinking motives. This reinforces the need to distinguish between types of alcohol when analysing mental health outcomes.

Beyond mental health, global evidence has also linked alcohol consumption to wider public health risks. Kolonne et al. (2025) demonstrated that very high alcohol intake was associated with increased stroke mortality across several countries, while moderate beer consumption showed a potential protective effect. Although their study addressed physical health, the parallel with our findings is clear: alcohol consumption exerts different risks depending on the type and amount consumed, making it a multidimensional determinant of health outcomes.

Taken together, our study extends the literature by showing that alcohol–anxiety associations are heterogeneous and beverage-specific. While previous research has confirmed the existence of a bidirectional link (Sayette, 2017; S. A. Ummels et al., 2022a, 2022b), this study highlights that not all forms of alcohol contribute equally to anxiety prevalence. By applying MCA across a large cross-country dataset, the analysis provides new evidence that differentiating alcohol types is critical to understanding the mental health risks of consumption patterns.

Limitations

This study has several limitations. First, the absence of complete data on illicit or unrecorded alcohol consumption constraints restricts the scope of the analysis, as such consumption may be a significant factor in certain contexts. Second, data collection was discontinued globally after 2019 due to the COVID-19 pandemic, which prevented the inclusion of more reasons potentially excluding shifts in drinking behaviours and anxiety prevalence. Another limitation concerns the methodological approach: while the MCA Biplot enables the identification of associations and clustering patterns, we were unable to estimate 95% confidence ellipses to delineate mutually exclusive subgroups objectively.

In addition to these, methodological constraints, the analysis did not incorporate broader contextual variables such as cultural norms, economics status, and national alcohol policies. These factors may influence both patterns of alcohol consumption and the prevalence

of anxiety, and their omission limits the ability to fully explain cross-country differences. Similarly, the lack of demographic controls such as gender, age, and income level further restricts the interpretation of findings. Future studies would benefit from incorporating these contextual and demographic variables to provide a more holistic understanding of the alcohol–anxiety relationship.

Policies Implication

Although many countries have introduced alcohol control measures, their effectiveness has often been limited by cultural acceptance of drinking, insufficient enforcement, and the lack of integration with broader mental health strategies. As a result, several potentially impactful interventions remain underimplemented, especially those addressing the psychological consequences of alcohol use.

To address these gaps, broad education programmes should be organised to raise public awareness of the potential mental health risks of alcohol, particularly its link to anxiety disorders. Labelling requirements could be expanded to include clear warnings about the mental health consequences of alcohol consumption complementing existing physical health warnings. Education campaigns should also target individuals prone to anxiety, discouraging reliance on alcohol as a coping mechanism and promoting healthier alternatives.

The government should restrict the policy promotion of alcoholic beverages while ensuring greater accessibility and affordability of non-alcohol options in bars and restaurants. Integrating mental health professionals, community organisations, and health care providers into alcohol policy frameworks would strengthen the link between prevention and treatment. Finally, raising taxes on alcoholic beverages that cause heightened risks to mental health could further reduce demand while generating resources for mental health support systems.

Conclusion

This study builds upon the notion that a linkage between alcohol and anxiety exists. It is further solidifying the basis for the claims made by previous studies. The main objective of this study is to investigate the association between alcohol consumption and anxiety disorder. Using MCA on 17 countries across two decades of data indicates that the type of alcohol consumed plays a critical role in shaping this association. Beer consumption was positively associated with higher anxiety prevalence, whereas wine consumption tended to align with lower anxiety rates, and spirits displayed an inverse relationship, with lower anxiety linked to higher consumption. These findings highlight that not all alcoholic beverages carry the same mental health risk profile.

The country-level patterns that are visible in the results further reinforce the conclusions, where Mediterranean countries were aligned with wine consumption and lower levels of anxiety, and beer-dominant nations were linked with higher prevalence of anxiety. This clustering also reflects the effects of different cultures and drinking patterns while emphasizing on the importance of policy interventions.

Consumption of alcohol and anxiety disorders are linked in both directions. Anxiety disorders can result in individuals gravitating towards increased alcohol consumption as a form of self-medication, while alcohol consumption intensifies the effects of anxiety over

time. Although alcohol may offer a temporary sense of relief, it cannot cure or get rid of anxiety. Instead, excessive and continuous alcohol consumption can harm mental health, damage physical health, and, in some cases, pose a risk not only to the individual but to those around them (Beck & Heinz, 2013). The study highlights the importance of confronting the misconception of alcohol as a coping mechanism and to recognise its role in causing harm. Further studies can confirm the effect healthcare, socioeconomic, and cultural factors can have on the association between alcohol and anxiety.

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Author Contribution RJ conceptualised the study. TK, KM, GD, KR, LR, CW, and UP contributed to the design and conduction of the study. TK, KM, GD, and KR curated the data. TK, KM, GD, and RJ LR undertook data analysis and interpreted the data. TK, KM, and RJ drafted the first manuscript. All authors critically reviewed, edited, and approved the final manuscript.

Availability of Data and Materials The datasets generated and analysed during the current study are publicly available at Our World in Data database: <https://ourworldindata.org/grapher/stroke-death-rates> and WHO (<https://www.who.int/news-room/fact-sheets/detail/alcohol>) databases. All data generated or analysed during this study are included in this published article and its supplementary information files.

Declarations

Ethical Approval and Consent to Participate This study was approved by the Sri Lanka Institute of Information Technology, Sri Lanka (PVC/RI/EC/2023/03).

Consent for Publication Not applicable (N/A).

Competing Interests The authors declare no competing interests.

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