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A polarisation rather than just an increase or a decrease: Exploring different approaches to measure the impact of the COVID-19 pandemic on alcohol consumption after one year

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Abstract

Background: Many studies on the impact of the COVID-19 pandemic have reported that significant proportions of drinkers have either increased or decreased their consumption as a result of the pandemic. These diverging trends may indicate a polarisation of drinking behaviours, suggesting that the same source of stress caused some people to drink more and others to drink less, among the same segment of the population. This study aims to explore the existence of such a polarisation by using standard statistical methods to assess data on drinking behaviour from March 2021, one year after the onset of the pandemic.

Methods: A representative sample of 1693 people in Switzerland were asked to retrospectively report their drinking behaviours during the year before the introduction of the measures to contain the COVID-19 pandemic (April 2019–March 2020) and during the first year of the pandemic (April 2020–March 2021), as well as multiple aspects of their living conditions.

Results: A polarisation of drinking behaviours was observed among many segments of the populations, particularly among young adults (15-24 years old), those with increased fear of COVID-19 for oneself or for their financial situation, and those who experienced a precarious work situation. Chi-squared test and regression models, using the absolute value of the change in drinking habits, were suitable for measuring polarisation effects.

Conclusions: The polarisation of drinking behaviours occurred in some segments of the population, regardless of their pre-pandemic drinking habits. However, polarisation can only be properly measured when non-linear trends are investigated.

Introduction

A large number of studies on the impact of the COVID-19 pandemic on alcohol consumption concur with the observation of limited change in overall consumption by the general population worldwide (Acuff et al., 2022; Kilian et al., 2021, 2022; R. A. Schmidt et al., 2021). Several reviews have shown that the percentage of people who either increased or decreased their consumption was generally even (Acuff et al., 2022; Sohi et al., 2022). This suggests that an increase among specific segments of the population (e.g., a given age or socio-economic group) was compensated by a decrease among others (Acuff et al., 2022). Such a *polarisation* of drinking behaviours (Bloomfield et al., 2022; Garnett et al., 2021; Labhart & Gmel, 2022), noticeable through an increase in the dispersion of the distribution (Rossow et al., 2021), was mainly reported at the extreme sides of the drinking-level continuum, with a decrease in drinking found to be more likely among pre-pandemic lighter drinkers and an increase among heavier drinkers (Rossow et al., 2021; R. A. Schmidt et al., 2021). However, given the intensity and the duration of the COVID-19-related measures, it is more likely that all types of drinkers have changed their drinking habits, and that this occurred in more diverse directions than a reinforcement of pre-existing patterns. For instance, an Australian study found that the reduction in reported consumption was larger among high-risk drinkers, especially those who drank more of their alcohol outside of the home (Callinan et al., 2021).

Two mechanisms are commonly used to explain the influence of a pandemic on drinking habits (de Goeij et al., 2015; Kilian et al., 2022). The first mechanism relates to increased levels of distress, notably associated with the policy measures taken to contain the spread of the virus and their consequences (e.g., social isolation, income insecurity, job loss; Wardell et al., 2020) and with COVID-19-specific stressors (e.g., working as an essential worker; for reviews see: Acuff et al., 2022; R. A. Schmidt et al., 2021). Other

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identified stress factors include the exposure, or the fear of exposure, to COVID-19 for oneself and one's relatives (Gonçalves et al., 2020; Marmet et al., 2021a; Pfefferbaum & North, 2020; Rehm et al., 2020), as well as home-schooling and caregiving (Fontenelle-Tereshchuk, 2021; Mojica-Perez et al., 2022; Petts et al., 2021). While some studies suggest that psychological stress is associated with heavier drinking (Rodriguez et al., 2021), life events and chronic stressors can also be related to decreased drinking amounts (Jose et al., 2000; Kristman-Valente et al., 2023). Given that a large majority of the population was impacted by the COVID-19 measures, regardless of their demographic characteristics, financial wealth, or drinking habits, a polarisation of drinking behaviours may be hypothesised in many segments of the population. Nevertheless, we hypothesise that the polarisation might be stronger among certain subgroups that experienced more distress during the pandemic.

The second mechanism suggests a decline in alcohol use in times of economic or health crisis, due to the reduced availability and affordability of alcoholic beverages (e.g., closure of drinking establishment; Callinan et al., 2021), as well as job or income losses (e.g., redundancies, temporary unemployment; de Goeij et al., 2015; Sohi et al., 2022). These sudden and radical changes in life circumstances, which are mostly outside of the person's control, might have a more direct impact on the possibility to drink or not, and do not necessarily support a reinforcement of a pre-existing drinking pattern. In this respect, while income losses were mostly related to increased consumption during the COVID-19 pandemic in one review (Acuff et al., 2022) findings were mixed in another (R. A. Schmidt et al., 2021). This again calls for studies looking at the possibility that both increases and decreases may have occurred in the same population segments.

The paucity of evidence on the polarisation of drinking behaviours might be explained by different circumstances related to the rapid onset of the pandemic. Firstly, while it was of critical public health interest to rapidly obtain insights on the ongoing changes in people's behaviours, early studies often shared the same limitation of lacking a quantitative pre-pandemic measure of alcohol use. In their 2022 review, Kilian and colleagues (2022) reported that the vast majority of studies on the impact of the pandemic (49 out of 56) measured the change in consumption as self-perceived changes in alcohol use (e.g. 'Has your consumption of alcohol changed?') with many having measured alcohol use quantitatively only after the onset of the pandemic. This raises concerns about the reliability of the measures of the pre-pandemic drinking level. In particular, conclusions that heavier drinkers were more likely to have increased their consumption, and lighter drinkers have decreased it, during the pandemic (as found for e.g. England and Norway; Jackson et al., 2021; Rossow et al., 2021) may in fact be due to reversed causation. It is likely that some of the people, quantitively classified as heavy drinkers during the pandemic, would not have been classified as such prior to the pandemic onset. Rather, these people may have become heavy drinkers because of their increased alcohol consumption brought on by or during the pandemic. The same mechanism could apply to people who became lighter drinkers because they decreased their alcohol consumption during the pandemic but were not necessarily light drinkers in the first place. To avoid this pitfall, it is important to assess the evolution of drinking using two comparable measures, such as a pre-post design.

Secondly, literature reviews (e.g., Acuff et al., 2022; R. A. Schmidt et al., 2021) include a large number of early studies that only focused on the first weeks and months after the onset of the pandemic, despite some pandemic measures continuing for almost two years. While the early measures taken to limit the spread of COVID-19, such as travel restrictions, generalised home-office, or school shutdown had an immediate impact on people's life conditions (Studer et al., 2021), individuals' adaptations during the first few months may not reflect the changes of behaviours over a longer time span. It may therefore be that, after a first few months of increased consumption, the consumption may have decreased or polarised in a longer-term perspective.

To address these issues, the present study focuses on the longer-term impact of the pandemic on drinking habits using retrospective data referring to two non-overlapping one-year-periods, i.e. the year before and the year following the onset of the pandemic in Switzerland (Labhart & Gmel, 2022). On 16 March 2020, Switzerland's government took drastic measures to halt the spread of the coronavirus as observed in Italy the previous weeks (Gili et al., 2023) such as closing schools, restaurants, non-essential shops and borders, and introducing social distancing measures. While more severe restrictions on individual freedom were not made obligatory, staying at home, working from home, and avoiding public transport were strongly recommended. Therefore, Switzerland was never subject to a stay-at-home mandate (Marmet et al., 2021a). During the summer of 2020, the rate of new infections declined, and several restrictive measures were loosened (e.g. opening of terraces of restaurants and pubs), but a second pandemic wave in the autumn of 2020 prompted the reintroduction of restrictive measures which remained until the next summer. This study will explore different approaches to measure the impact of the COVID-19 pandemic on alcohol consumption after one year.

First, three variations of the measure of change in the average number of drinks per month and the number of heavy episodic drinking (HED) occasions per month will be compared. Besides the original (untransformed) variable, modulus-transformation (similar to a log transformation for both positive and negative values, which limits the influence of extreme values and better approximates a normal distribution; John & Draper, 1980) and trichotomisation (decrease, no change, and increase) will be used to compare bivariate associations of alcohol use changes with COVID-19-related stress factors.

Second, using the modulus-transformed version of the measure of change, different approaches will be used to model the direction and shape of the change of alcohol use associated with COVID-19-related stress factors. Besides the standard measure (including both negative and positive values to test for monotonic associations), regressions will

be estimated for decreasing change only (negative value and zero), increasing change only (zero and positive values) and a polarised change, using the absolute value of the variable (Evans, 2003; Maggino & Fattore, 2019), to test for polarised associations. Stress factors, entered as independent variables included those most commonly identified in the literature, namely, exposure to and fear of COVID-19 for oneself and for others, being a frontline worker, a precarious financial situation, and having parental obligations (Acuff et al., 2022; Garnett et al., 2021; R. A. Schmidt et al., 2021).

Methods

Sample

A representative sample of 2022 people from the Swiss resident population aged 15 years and older were interviewed by means of CAWI (Computer Assisted Web Interview) in summer 2021. People were selected to reflect the marginal distribution of age and sex. Since the structure of the sample was very close to the Swiss population structure, no post-weighting of the data was applied. From the total sample, 47 (2.3%) individuals were removed due to poor plausibility of their answers. In addition, four people who indicated no gender, 167 (8.3%) lifetime alcohol abstainers and 111 (5.5%) past 12 months non-drinkers in both investigated time periods were excluded for this study focusing on changes in alcohol use patterns, resulting in a final sample of 1693 people.

Data were collected among a pre-existing panel of volunteers by a market institute following ethical norms of Swiss marketing organisations and the collected data were completely anonymised. The study therefore did not require prior ethics review board approval according to the Swiss Federal Act on Research involving Human Beings (Fedlex, 2014).

Measures

Alcohol Use (Dependent Variables)

Alcohol use was measured for two one-year reference periods. The first period (called T1) refers to the year before the introduction of the first measures to limit the spread of COVID-19, namely April 2019 to March 2020. The second period (T2) refers to the year since the introduction of the first measures (April 2020 to March 2021).

For both T1 and T2, the usual number of drinks consumed were assessed by multiplying, separately for weekdays and weekend-days (Friday to Sunday), the mean number of drinking days (range: 'never' to 'the 3 weekend days') by the number of drinks consumed on average per drinking day (range: '0' to '12 or more'). Both measures were then combined to reflect the total monthly consumption (Gmel et al., 2014). An illustration of different drink types of the size of one standard drink (i.e., containing about 10g of pure alcohol, e.g., 25cl of beer, 10cl of wine) was shown alongside the questions. The *change in the number of drinks consumed per month* was obtained by subtracting the amounts consumed at T2 from those at T1. A positive number indicated the extent of the increase, and vice versa. In addition to this 'original' (untransformed) measure, a modulus transformation was applied (sign(x)*log((abs(x)+1); John & Draper, 1980) to limit the influence of extreme values and better approximate a normal distribution of the change (before transformation: skewness = -0.43; kurtosis = 18.79; after: skewness = 0.13; kurtosis = -0.05).

For both T1 and T2, the number of HED occasions was investigated using the following question: 'How often have you had six or more standard alcoholic drinks on one occasion?' for the given reference period. The eight answer options, ranging from 'Never' to 'Almost every day' (coded as 25.5), were rescaled into number of occasions per month. The *change in the number of HED occasions per month* was obtained by subtracting the frequency at T2 from the one at T1. The modulus transformation was also applied to better approximate a normal distribution of the change measure (before transformation: skewness = -1.43; kurtosis = 9.20; after: skewness = -0.10; kurtosis = 1.59).

Exposure to COVID-19 and Living Conditions (Independent Variables)

Participants were considered as having been *infected by COVID-19* (coded as 1) if they had tested positive at any point. Those who experienced symptoms but tested negative, were not tested, or did not experience any symptoms, were coded as 0.

Participants were considered as having one or more *relatives hospitalised or dead* (coded as 1 vs. 0) if one or more people from their household or a relative was either 'hospitalised for complications related to COVID-19' or 'died from COVID-19'.

The level of *fear of COVID-19 for oneself* was measured by selecting the maximum score to the two following items: 'I was afraid of contracting a severe form of COVID-19' and 'I was afraid to die from COVID-19', both introduced by the statement 'During the first 12 months after the introduction of the COVID-19 measures …' Response options were: 'Not at all' (coded as 0), 'A little bit' (1), 'Moderately' (2), 'A lot' (3), and 'Extremely' (4). The level of *fear of COVID-19 for others* was measured using the same procedure as for the fear for oneself using the following items: 'I was afraid of passing on the coronavirus to another person', 'I was afraid that a relative might contract a severe form of COVID-19', and 'I was afraid that a relative might die from COVID-19'. The level of *fear of negative financial impact* was measured using the same procedure as for the fear for oneself using the following items: 'I was afraid of not being able to maintain my income or not having enough money', and 'I was afraid of losing my job or not being able to get a job in the near future'.

Participants were considered as having a *precarious work situation* due to COVID-19 if they experienced at least one of the following situations: 'I have been or was currently unemployed because of COVID-19', 'My working time has been reduced because of COVID-19', and 'I am self-employed and have lost money because of COVID-19'.

Participants were considered as being *frontline health workers* if, during the first 12 months since the introduction of the first measures, they worked (including part-time) in

the health sector and were 'often' in contact with people potentially infected by the coronavirus (coded as 1). Participants were considered as *frontline service workers* if, during the same period, their work (e.g., employees in food shops, in public transport, police officer) required them to be 'often' in contact with people potentially infected by the coronavirus. People who were less frequently in contact with potentially infected people or not working in those sectors were coded as 0.

Lastly, participants reported with whom they currently live in the household. For the analysis, we used the following categories: 'one or more children aged 0 to 6 years', 'one or more children aged 7 to 12 years', and 'one or more children aged 13 to 17 years'. The age groups matched school-age categories, as children and parents experienced different challenges during the COVID-19 pandemic, depending on whether they were pre-schoolers, primary or secondary school students (S. J. Schmidt et al., 2021). Each age group of children was compared against all other groups.

Analytic Strategy

The following analyses were done separately for changes in drinking volume and for number of HED occasions per month. Descriptive statistics were first used to examine the bivariate associations of the changes in drinking habits (T2 minus T1) with exposure to COVID-19 and living conditions. Three variations of the alcohol use measures were prepared: (a) original (i.e., untransformed) version, (b) modulus-transformed version, and (c) trichotomised version, using the three categories: decrease, no change, and increase. Pearson correlations examined possible linear monotonic associations with alcohol use. Chi-squared tests (conducted only on the trichotomised version) served as indicators of other types of associations, including U-shapes which are typical of a polarisation effect (Evans, 2003; Maggino & Fattore, 2019).

A series of linear regression models was then used to examine the contribution of exposure to COVID-19 and living conditions to the change of drinking habits over and above alcohol use at baseline (T1) in three ways.

First, we used linear regressions over the whole range of values of the dependent variables to identify overall monotonic associations.

Second, we ran two regressions in parallel, the first focusing on decreased use (ranging from negative change to zero), and the second on increased use (ranging from zero to positive change). This was done to investigate the joined associations for decreased and increased use as follows: for instance, negative coefficients for decreased use coupled with positive coefficients for increased use would indicate polarisation (U-shape curve), significant coefficients for decreased use coupled with null or non-significant coefficients for increased use would indicate an effect only among those who have decreased their consumption (L-shape curve), whereas positive coefficients for both models would indicate a monotonic increase over the whole range of changes.

Third, regression models were estimated using the absolute values (Baumann et al., 2020; Evans, 2003; Maggino & Fattore, 2019) of the dependent variables to identify the presence of U-shape associations, as it should be expected in the case of polarisation of drinking behaviours for a given factor (i.e., some people increased while others decreased their alcohol use in response to an increase of the same stress factor).

All models used the modulus-transformed version of the alcohol measures, to limit the influence of extreme values and better approximate a normal distribution of the change, all the independent variables described above, as well as baseline alcohol use adjustment. The 45- to 64-year-old group was chosen as the reference category since it was the group with the least change between T1 and T2 (see Tables 1 and 2). Reported outcomes are B (unstandardised coefficients) and p-values. All analyses were conducted with SPSS 25. Significance was set at the conventional level of $p < 0.05$.

Results

Overall, 40% of the population decreased their number of drinks consumed per month between T1 and T2, 25.3% increased, and 34.7% remained stable (Table 1). The proportion of those who have decreased their consumption (called 'decreasers') was larger than the proportion of increasers in all subgroups. Consequently, the mean number of drinks consumed per month decreased for both the original (-2.6 drinks) and modulus-transformed measures in general and in all subgroups, except among the youngest age group. Correlation coefficients with independent variables were of about the same magnitude for original and modulus-transformed measures, but were mostly non-significant. Some of the significant associations between change in alcohol use and contextual stressors followed either a typically linear form (i.e., significant correlation with being infected by COVID-19, fear of COVID-19 for oneself, or fear of financial impact) but most associations were of another form (i.e. significant chi-squared tests with age, gender, fear of COVID-19 for oneself and others, and fear of negative financial impact, precarious work situation, living with very young children or teenagers). Figure 1 provides an illustration of different association forms.

Overall, twice as many people decreased the number of HED occasions per month between T1 and T2 than those who increased it (30.2% vs. 15.1%), while the majority remained stable (54.6%; see Table 2). The mean number of HED occasions per month decreased for all versions of the measure (-0.8 occasions [untransformed measure]) and in all subgroups. Few bivariate significant associations were found with individual and COVID-related factors. For most variables, neither the correlations nor chi-squared tests were significant. The few exceptions were age with the trichotomised variable (significant chi-squared test, but not the correlation, suggesting a non-linear association), fear of COVID-19 for oneself (significant correlation, but not the chi-squared test, suggesting a monotonically decreasing HED frequency with increasing fear), fear of negative financial impact and precarious work situations (significant chi-squared tests and correlations, suggesting mixed associations).

Table 1

Bivariate Associations of the Change of Alcohol Use with Exposure to COVID-19 and Living Conditions (Number of Drinks Consumed per Month)

		Original (untransformed)				Modulus transformed				Trichtomised variable						
		Mean	SD	Correlation		Mean	SD	Correlation		Decrease	Stable	Increase	Chi-squared test			Correlation
				r	*p*			*r*	*p*				X^2	df	*p*	*r*	*p*
All		-2.6	29.3			-0.3	2.1			40.0%	34.7%	25.3%				
Gender	Women	-1.2	24.5	-0.05	.054	-0.2	1.9	-0.04	.088	37.6%	38.9%	23.4%	13.96	2	.001	0.15	<.001
	Men	-4.0	33.4			-0.4	2.2			42.5%	30.3%	27.2%					
Age group	15-24	2.4	34.4	-0.03	.243	0.1	2.4	-0.04	.077	39.3%	21.9%	38.8%	53.23	6	<.001	-0.18	<.001
	25-44	-4.6	35.6			-0.4	2.3			44.6%	28.2%	27.2%					
	45-64	-1.3	25.2			-0.3	1.9			36.9%	41.5%	21.6%					
	65+	-4.0	19.4			-0.4	1.7			38.1%	41.0%	20.9%					
Infected by COVID	No	-2.0	28.6	-0.06	.014	-0.3	2.0	-0.04	.096	39.6%	35.1%	25.2%	1.82	2	.402	0.05	.025
	Yes	-8.3	35.4			-0.6	2.3			44.4%	29.9%	25.7%					
Relatives hospitalised or dead	No	-2.5	28.4	0.00	.883	-0.3	2.0	0.00	.912	40.4%	33.9%	25.7%	1.68	2	.432	0.00	.979
	Yes	-2.8	32.6			-0.3	2.1			38.8%	37.6%	23.6%					
Fear of COVID-19 for oneself	Not at all	-1.7	26.9	-0.05	.048	-0.3	1.9	-0.04	.096	36.9%	40.9%	22.2%	19.86	8	.011	0.14	<.001
	A little bit	-1.4	24.9			-0.2	2.0			36.8%	34.7%	28.4%					
	Average	-2.8	31.8			-0.4	2.1			43.9%	31.0%	25.1%					
	A lot	-4.7	32.1			-0.4	2.2			44.5%	30.4%	25.1%					
	Extremely	-7.7	42.7			-0.6	2.6			46.3%	26.3%	27.5%					
Fear of COVID-19 for others	Not at all	-4.8	31.2	0.01	.825	-0.6	1.8	0.03	.234	43.1%	40.3%	16.7%	16.67	8	.034	0.10	<.001
	A little bit	-1.0	23.4			-0.2	1.9			35.8%	38.3%	25.9%					
	Average	-1.6	31.6			-0.3	2.1			41.3%	33.9%	24.8%					
	A lot	-4.3	28.1			-0.3	2.1			40.5%	33.0%	26.4%					
	Extremely	-1.4	32.1			-0.2	2.3			40.1%	29.9%	29.9%					
Fear of negative financial impact	Not at all	-1.7	23.3	-0.01	.766	-0.3	1.8	-0.02	.396	36.4%	40.7%	22.9%	33.92	8	<.001	0.17	<.001
	A little bit	-3.3	25.9			-0.2	2.0			36.1%	37.1%	26.9%					
	Average	-5.6	32.9			-0.6	2.2			47.5%	27.9%	24.5%					
	A lot	-1.8	40.6			-0.3	2.5			45.6%	25.9%	28.6%					
	Extremely	-1.3	31.8			-0.3	2.3			43.3%	27.0%	29.8%					
Frontline health worker	No	-2.2	29.1	-0.05	0.037	-0.3	2.0	-0.04	.116	39.7%	34.9%	25.4%	1.69	2	.429	0.03	.171
	Yes	-8.4	31.6			-0.6	2.2			46.1%	30.4%	23.5%					
Frontline service worker	No	-2.6	27.9	0.00	.998	-0.3	2.0	0.00	.856	39.8%	34.9%	25.3%	0.25	2	.881	0.04	.096
	Yes	-2.6	37.0			-0.3	2.2			41.5%	33.5%	25.0%					
Precarious work situation	No	-2.4	25.7	-0.01	.694	-0.3	1.9	0.00	.982	39.6%	36.2%	24.2%	7.69	2	.021	0.15	<.001
	Yes	-3.1	40.6			-0.3	2.5			41.8%	28.7%	29.6%					
Live with children 0-6 years old	No	-2.1	27.7	-0.05	.047	-0.3	2.0	-0.03	.172	39.3%	35.7%	25.0%	6.38	2	.041	0.09	<.001
	Yes	-6.5	39.2			-0.5	2.4			45.8%	26.6%	27.6%					
Live with children 7-12 years old	No	-2.4	27.9	-0.02	.419	-0.3	2.0	-0.01	.758	39.6%	35.6%	24.8%	4.39	2	.111	0.09	<.001
	Yes	-4.1	37.4			-0.4	2.4			43.4%	28.3%	28.3%					
Live with children 13-18 years old	No	-0.4	36.5	0.03	.271	-0.3	2.4	0.00	.842	46.6%	26.9%	26.4%	6.23	2	.044	0.08	.001
	Yes	-2.9	28.2			-0.3	2.0			39.2%	35.7%	25.1%					

Notes: SD = Standard deviation; df = degrees of freedom

Table 2

Bivariate Associations of the Change of Alcohol Use with Exposure to COVID-19 and Living Conditions (HED Occasions per Month)

		Original (untransformed)				Modulus transformed				Trichtomised variable							
		Mean	SD	Correlation		Mean	SD	Correlation		Decrease	Stable	Increase	Chi-squared test			Correlation	
				r	*p*			*r*	*p*				X^2	df	*p*	*r*	*p*
All		-0.8	5.2			-0.03	1.1			30.2%	54.6%	15.1%					
Gender	Women	-0.5	4.5	-0.05	.027	0.01	1.0	-0.04	.132	30.1%	55.2%	14.7%	0.35	2	.838	0.10	<.001
	Men	-1.1	5.7			-0.07	1.2			30.4%	54.0%	15.6%					
Age group	15-24	-0.5	5.8	-0.05	.040	0.05	1.2	0.01	.807	31.1%	43.9%	25.0%	29.95	6	<.001	-0.02	.506
	25-44	-0.9	4.7			-0.10	1.1			32.5%	52.2%	15.3%					
	45-64	-0.3	4.1			0.01	1.0			26.0%	59.8%	14.3%					
	65+	-1.6	6.5			-0.02	1.2			32.6%	56.4%	11.0%					
Infected by COVID	No	-0.8	5.2	0.01	.686	-0.02	1.1	-0.03	.225	30.5%	54.6%	15.0%	0.59	2	.745	0.01	.629
	Yes	-0.6	4.9			-0.14	1.1			27.8%	55.6%	16.7%					
Relatives hospitalised or dead	No	-0.8	5.2	0.00	.872	-0.01	1.1	-0.03	.154	30.6%	54.8%	14.7%	1.25	2	.536	0.01	.833
	Yes	-0.9	5.1			-0.11	1.1			29.0%	54.0%	17.0%					
Fear of COVID-19 for oneself	Not at all	-0.6	4.8	-0.03	.235	0.07	1.1	-0.06	.011	29.4%	55.6%	15.1%	5.29	8	.727	0.06	.009
	A little bit	-0.9	5.2			-0.08	1.0			29.1%	56.6%	14.3%					
	Average	-0.9	4.9			0.005	1.1			33.1%	52.2%	14.7%					
	A lot	-0.9	6.0			-0.10	1.2			29.6%	55.1%	15.4%					
	Extremely	-1.3	5.9			-0.30	1.3			31.3%	47.5%	21.3%					
Fear of COVID-19 for others	Not at all	-1.4	5.0	0.01	.591	-0.04	1.2	-0.02	.458	32.9%	54.6%	12.5%	9.64	8	.291	0.01	.627
	A little bit	-0.6	5.0			-0.01	1.1			28.0%	57.5%	14.5%					
	Average	-0.6	5.2			0.04	1.1			29.5%	53.8%	16.7%					
	A lot	-0.9	4.8			-0.08	1.1			32.2%	55.1%	12.8%					
	Extremely	-0.8	5.9			-0.05	1.2			28.9%	51.8%	19.4%					
Fear of negative financial impact	Not at all	-0.7	5.2	-0.01	.583	0.06	1.1	-0.06	.013	27.5%	59.7%	12.8%	29.03	8	<.001	0.09	<.001
	A little bit	-0.6	4.0			-0.10	0.9			27.2%	58.5%	14.3%					
	Average	-1.3	5.5			-0.09	1.2			36.6%	49.1%	14.3%					
	A lot	-0.7	5.8			-0.10	1.3			34.0%	45.9%	20.1%					
	Extremely	-0.9	5.3			-0.11	1.2			31.9%	46.8%	21.3%					
Frontline health worker	No	-0.7	5.0	-0.06	.008	-0.02	1.1	-0.02	.524	29.9%	54.7%	15.4%	2.28	2	.320	0.03	.179
	Yes	-2.1	6.9			-0.10	1.3			35.3%	53.9%	10.8%					
Frontline service worker	No	-0.9	5.3	0.02	.336	-0.03	1.1	0.00	.974	31.2%	53.7%	15.1%	4.96	2	.084	-0.05	.064
	Yes	-0.5	4.4			-0.03	1.0			24.1%	60.7%	15.2%					
Precarious work situation	No	-0.8	5.0	-0.01	.769	-0.01	1.1	-0.03	.252	29.9%	56.1%	14.0%	8.80	2	.012	0.09	<.001
	Yes	-0.9	5.7			-0.09	1.3			31.6%	48.7%	19.7%					
Live with children 0-6 years old	No	-0.8	5.2	0.01	.777	-0.02	1.1	-0.03	.222	30.4%	54.8%	14.8%	1.13	2	.568	0.00	.953
	Yes	-0.7	5.0			-0.12	1.1			29.2%	53.1%	17.7%					
Live with children 7-12 years old	No	-0.8	5.1	-0.02	.512	-0.02	1.1	-0.03	.212	30.2%	55.0%	14.8%	1.22	2	.543	0.04	.101
	Yes	-1.0	5.4			-0.12	1.2			30.7%	51.9%	17.5%					
Live with children 13-18 years old	No	-0.2	5.3	0.04	.083	-0.08	1.2	-0.02	.484	25.9%	53.4%	20.7%	5.94	2	.051	0.02	.457
	Yes	-0.9	5.1			-0.02	1.1			30.8%	54.8%	14.4%					

Notes: SD = Standard deviation; df = degrees of freedom

Figure 1

Comparison of the Evolution of the Number of Drinks Consumed per Month, Depending on the Level of Different Types of Fear

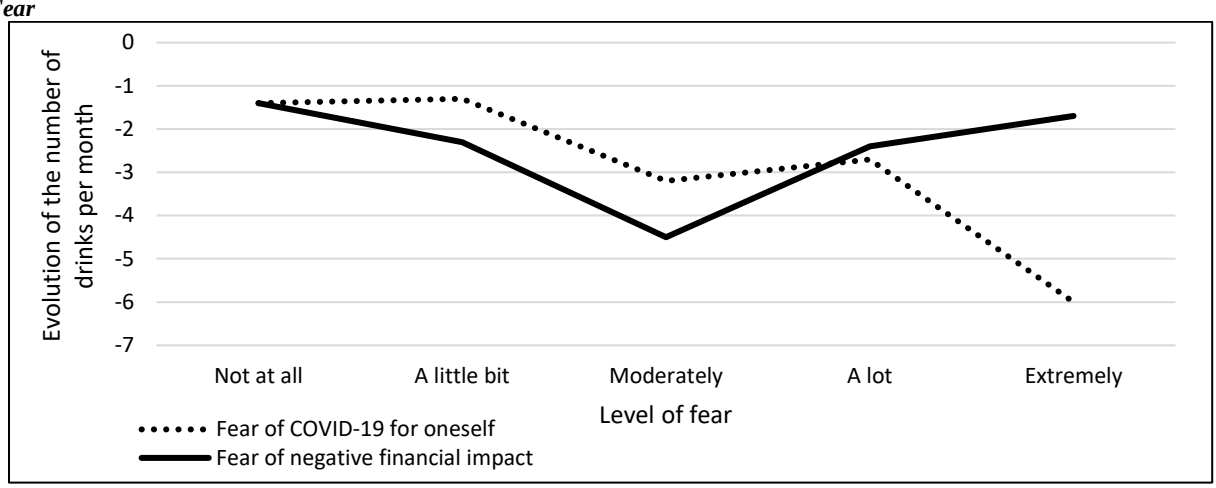

Table 3 shows the directions and strengths of the associations between all independent variables (demographic characteristics, exposure to COVID-19 and living conditions) and change in number of drinks consumed per month for three modelling approaches (monotonic, increase/decrease only, and polarised). The overall monotonic model indicated decreasing consumption with increasing pre-pandemic drinking levels (B = -0.007, $p < 0.001$). However, this overall trend is composed of opposite trends among increasers and decreasers, typical of a polarisation effect. Among increasers, those with heavier pre-pandemic drinking levels tended to further increase their consumption (B = 0.005; $p<.001$) while, among decreasers, the decrease was stronger with increasing pre-pandemic drinking levels (B = -0.010; $p < 0.001$). Hence, the overall linear decreasing effect was only due to the fact that decreasers have decreased their drinking levels more strongly with increasing pre-pandemic levels than increasers have increased it. Results for the polarised model, using absolute values of increases and decreases, confirmed these findings.

Regarding demographics, exposure to COVID-19, and living conditions, results can be grouped into different patterns. First, evidence of polarisation was found for several variables in the decreasing/increasing only models and the polarised model. This could be found for men compared with women, for the two age groups of 15- to 24-year-olds and 25- to 44-year-olds (compared with 45- to 64-year-olds), for fear of negative financial impact, and for having children aged 13 to 18 years. Second, fear of COVID-19 for oneself was associated with a change in only one direction (L-shape association), namely a significant negative effect for decreases in consumption but a non-significant positive effect for increases, resulting in a significant decrease in the overall model. Third, several variables appeared totally unrelated to changes in alcohol use. For instance, no association in any of the models were found for age 65 years and older compared with 45- to 64-year-olds, having been infected with COVID-19, having had relatives hospitalised or dying from COVID-19, fear of COVID-19 for others, being front line health workers and frontline service workers, precarious work situation, and having children aged 12 years or less compared with having no child or children of another age group.

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Regarding the regression models for HED (Table 4), besides the slight decrease of HED frequency associated with higher pre-pandemic drinking levels, no significant monotonic association was found for sociodemographic and risk factors. However, as for drinking volume above, separate models for either decreasing or increasing change showed evidence of a polarisation of HED (U-shape association). In particular, increasing pre-pandemic HED levels were associated with an increase of HED among increasers and a decrease of HED among decreasers. A polarisation of HED frequency was also evidenced among the youngest age group (15 to 24 years). Results showed a few significant effects

only in the decreasing model, while the effects were non-significant in the increasing model. This was the case for fear of a negative financial impact and fear of COVID-19 for oneself, suggesting an L-shape association between an increase in these variables and the change of HED frequency. Results of the polarised model using absolute values of change of HED frequency confirmed the polarisation for the youngest age group and the fear of financial impact.

Table 3

Contribution of Exposure to COVID-19 and Living Conditions to the Evolution of the Drinking (Modulus-Transformed Number of Drinks Consumed per Month)

	Overall monotonic model (negative → positive values)		Decreasing only model (negative values → 0)		Increasing only model (0 → positive values)		Polarised model (absolute values)	
	B	***p***	**B**	***p***	**B**	***p***	**B**	***p***
Alcohol use at T1	-0.007	<.001	-0.010	<.001	0.005	<.001	0.010	<.001
Gender	-0.005	.964	-0.217	.003	0.201	.018	0.205	.002
Age : 15-24	0.309	.072	-0.538	<.001	0.786	<.001	0.603	<.001
Age : 25-44	-0.055	.680	-0.364	<.001	0.430	<.001	0.383	<.001
Age : 65+	-0.096	.503	-0.064	.529	0.000	.998	0.026	.778
Infected by COVID-19	-0.312	.081	-0.244	.060	-0.038	.804	0.111	.333
Relatives hospitalised or dead	-0.024	.846	0.077	.394	-0.113	.280	-0.085	.293
Fear of COVID-19 for oneself	-0.135	.017	-0.127	.003	0.038	.417	0.091	.013
Fear of COVID-19 for others	0.146	.006	0.075	.056	0.051	.243	-0.013	.697
Fear of negative financial impact	-0.043	.338	-0.095	.003	0.075	.051	0.078	.006
Frontline health worker	-0.363	.107	-0.218	.183	-0.304	.124	-0.044	.764
Frontline service worker	0.032	.839	0.004	.974	0.164	.219	0.109	.283
Precarious work situation	0.194	.168	0.022	.836	0.181	.132	0.089	.327
Live with children 0-6 years old	-0.033	.848	0.034	.791	-0.118	.428	-0.069	.529
Live with children 7-12 years old	0.081	.605	0.019	.870	0.104	.441	0.040	.693
Live with children 13-18 years old	-0.005	.974	-0.240	.041	0.341	.018	0.233	.025

Discussion

Long-Term Impact of the Pandemic on Drinking Habits

Measures to contain the spread of COVID-19 have impacted the daily lives of billions of people since early 2020. Focusing on the effects during the first full year (April 2020 to March 2021) of the pandemic on drinking habits, the present results from Switzerland are in line with an overall trend towards a slight decrease in drinking volume and heavy drinking in Europe (Kilian et al., 2022). The analyses confirmed the existence of monotonic linear associations between changes in consumption and some risk factors. For instance, whereas the fear of COVID-19 for oneself was associated with a decrease in volume of drinking (and less strongly with decreased HED), the fear of COVID-19 for others could be better explained by increases in drinking (again more strongly for volume than for HED).

However, this study shows that looking only at either monotonic decreases or increases in alcohol use is insufficient, since the same risk factors may be related simultaneously with increases and decreases in alcohol use. This polarisation effect implies that in reaction to the same situational stressor one part of the population will increase its consumption, while another part will decrease it. Evidence of polarisation was found for instance for pre-pandemic drinking levels, fear of financial impact and among the youngest age group of 15- to 18-year-olds. Therefore, while previous studies have shown that increases and decreases in alcohol use due to COVID-19 related measures may occur within different population segments (Acuff et al., 2022; Garnett et al., 2021; Sohi et al., 2022), and that polarisation may occur at the end of the consumption spectrum (i.e., mainly among heavier drinkers further increasing; Meyers et al., 2023; Rossow et al., 2021), the present study adds to this by showing that polarisation may occur even within the same risk groups. In addition, the

present study shows that the overall monotonic linear decreasing association between pre-pandemic drinking levels and change, for both drinking volume and HED, was only due to decreasers having decreased their drinking levels more strongly with increasing pre-pandemic levels than increasers having increased it. In this case, the overall monotonic association appears only as a statistical artefact due to one side of the consumption spectrum rather than being a reality for all people.

Table 4

Contribution of Exposure to COVID-19 and Living Conditions to the Evolution of the Drinking (Modulus-Transformed HED Frequency)

	Overall monotonic model (negative → positive values)		Decreasing only model (negative values → 0)		Increasing only model (0 → positive values)		Polarised model (absolute values)	
	B	***p***	**B**	***p***	**B**	***p***	**B**	***p***
Alcohol use at T1	-0.018	<.001	-0.043	<.001	0.027	<.001	0.052	<.001
Gender	-0.034	.542	-0.036	.401	0.007	.874	0.038	.363
Age : 15-24	0.055	.558	-0.163	.030	0.193	.008	0.200	.005
Age : 25-44	-0.078	.282	-0.102	.068	0.030	.595	0.069	.205
Age : 65+	-0.038	.630	-0.121	.043	0.063	.297	0.108	.067
Infected by COVID-19	-0.099	.312	-0.035	.632	-0.069	.368	-0.011	.886
Relatives hospitalized or dead	-0.095	.170	-0.070	.187	-0.036	.506	0.020	.703
Fear of COVID-19 for oneself	-0.058	.063	-0.052	.033	-0.008	.724	0.029	.211
Fear of COVID-19 for others	0.042	.146	0.047	.038	-0.006	.801	-0.034	.121
Fear of negative financial impact	-0.040	.103	-0.053	.005	0.018	.362	0.043	.018
Frontline health worker	-0.042	.731	-0.127	.175	0.098	.309	0.136	.141
Frontline service worker	0.008	.928	0.098	.136	-0.089	.175	-0.116	.075
Precarious work situation	0.050	.518	-0.023	.697	0.080	.193	0.059	.309
Live with children 0-6 years old	-0.007	.936	0.102	.150	-0.082	.265	-0.106	.130
Live with children 7-12 years old	-0.013	.877	-0.029	.659	0.007	.919	0.013	.844
Live with children 13-18 years old	-0.072	.416	-0.061	.363	0.014	.847	0.046	.493

The acknowledgement of the polarisation of drinking behaviours challenges the identification process of at-risk (sub)populations and consequently complexifies the development of targeted measures. From the present findings, it appears difficult to anticipate within a given group of persons (e.g. experiencing a more precarious financial situation), who will increase or decrease their consumption. The identification of risk factors might include psychological states or traits, which can constitute points of personal fragility or reinforce contextual difficulties (e.g., combination of depression or anxiety with financial instability; Magri et al., 2023). However, the phenomenon of polarisation has also positive implications for public health because it suggests that some people will decrease their consumption even among those most at-risk.

Some unexpected findings also emerged when situated in the context of the wider alcohol literature (Acuff et al., 2022; R. A. Schmidt et al., 2021). For instance, the youngest group studied in the present paper did not decrease alcohol use but rather increased it, although a polarisation was simultaneously observed as in the study of Garnett and colleagues (2021). This may be mainly because the enculturation into the alcohol consuming society in this age group was not complete, and therefore normative increases in drinking were stronger than the expected decreases due to measures such as lockdowns and reductions of social encounters related to alcohol use. In Switzerland, in contrast to many other countries, alcohol use is not decreasing with age, but remains at high levels up to and beyond retirement (Gmel et al., 2017). This calls for studies looking at differences between cultures, particularly as regards cultural norms in alcohol use (Furlong & Finnie, 2020; Kilian et al., 2021).

Another unexpected finding is that stressors related to essential work were not significant predictors of changes in alcohol use behaviours. Essential or frontline workers are commonly seen to be exposed to higher stress levels (Thombs et al., 2020) and increased alcohol use (Sallie et al., 2020; Weerakoon et al., 2021). However, in line with studies that did not find increased levels of stress and fear among frontline essential workers (Rahman et al., 2020), it may be the case that such workers are better equipped to cope with

COVID-19-related fears, e.g., due to more tolerance of the unknown, low illness anxiety disorder, or better training for protective measures (Coelho et al., 2020).

Measuring the Impact of the Pandemic on Alcohol Consumption

Taking advantage of two quantitative measures of drinking behaviours referring to a full one-year period, the first referring to the pre-pandemic period (April 2019–March 2020) and the second to the first year of the pandemic (April 2020–March 2021), this study also explored different approaches to measure the impact of the COVID-19 pandemic on alcohol consumption after one year.

In terms of reliability of the measurement, as noted by Kilian and colleagues (2022), the vast majority of studies on the impact of the pandemic (49 out of 56 included in their review) measured the change in consumption as self-perceived changes in alcohol use (e.g. 'Has your consumption of alcohol changed?') with many having measured alcohol use quantitatively only after the onset of the pandemic. It is therefore possible that a seemingly increased use among post-pandemic heavier drinkers was due to light and moderate drinkers who became heavier drinkers, and not due to heavier drinkers having further increased their alcohol use. The use of two distinct quantitative assessments on non-overlapping intervals, as done in this study and more generally in longitudinal studies, appears in contrast as a more reliable approach to estimate the change in alcohol use after a major life-changing event, such as the COVID-19 pandemic. While the recall period for pre-pandemic drinking habits was long, the introduction of the COVID-19 measures was so sudden and radical that remembering how life was before this major change in everyone's life may be valid with a quantitative assessment.

The study also applied different standard statistical approaches to (a) obtain an appropriate measure of the change (i.e., T2 minus T1 standard difference vs. modulus transformation), (b) assess the structure and directions of the change at the bivariate level (i.e., correlation coefficients and chi-squared tests), and explore various regression models (i.e., monotonic change, increase or decrease only and absolute value). First, our results confirm that the modulus transformation is a valuable approach to prevent obtaining significant results due to outliers (John & Draper, 1980), especially for quantity-frequency measures that can have very large standard deviation values. Second, the computation of both chi-squared tests is recommended to identify different types of relationships, including U-shape associations. Third, in addition to traditional linear regression models to assess monotonic relationships, our results show that polarised associations can easily be identified using the absolute value of the dependent variable (Baumann et al., 2020; Maggino & Fattore, 2019). Moreover, while decreasing only and increasing only variables can be used jointly, this appears more labour-intensive and only a few L-shape associations were found. Overall, the identification of polarised associations does not require highly elaborated statistical models (chi-squared and absolute value) and we strongly recommend scholars to also consider U-shaped association types when assessing the impact of contextual changes on alcohol consumption, at least during the data exploration phase.

Limitations

Several limitations should be acknowledged. First, data for this study were collected only in one country, which had rather light confinement measures compared to other countries. While the results on specific Swiss at-risk groups might not be directly transposable to the reality of other countries, there is no reason that the polarisation of drinking behaviours might be limited to one country only. Second, the study has a retrospective pre-post design, since participants were requested to recall their pre-pandemic drinking behaviours more than one year after. The fact that our findings are in line with a longitudinal study in Switzerland (Marmet et al., 2021a, b; Studer et al., 2021), suggest that this approach was not biased by reverse causation as it could be the case with a retrospective subjective assessment of change, but it remains unclear whether the exact same results would have been seen with a true pre-post measurement. Third, no data was collected on psychological traits or states that could explain a higher vulnerability to stressors (Magri et al., 2023) or identify individual factors underlying the polarisation of drinking behaviours. Fourth, only standard statistical methods were used. More advanced modelling techniques might be used to better fit the shape for the association once research has a better understanding of the effects and implication of a polarisation effect.

Conclusions

With climate change, political instability and the depletion of non-renewable energy, the world is heading towards more global challenges that, like the COVID-19 pandemic, may put populations under stress, and consequently may induce a polarisation of drinking habits. Standard statistical approaches, such as chi-squared tests and regression models using the absolute value as the dependant variable, are easily and readily available to account for polarised associations. This should extend the identification and understanding of the most at-risk groups of heavier consumption when exposed to particular individual or contextual stressors, such as fear, financial consequences or health consequences.

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