




# Changes in smoking and alcohol consumption during COVID-19-related lockdown: a cross-sectional study in France

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**Background:** In many countries, lockdown measures were implemented to curb the COVID-19 pandemic. This situation may have an impact on mental health, tobacco smoking and alcohol consumption. The aim of this research report is therefore to describe changes in tobacco and alcohol consumption in the general French population during the first 2 weeks of lockdown and identify any associated factors. **Methods:** Self-reported changes in smoking and alcohol consumption following the lockdown implemented in France on 17 March 2020 were collected from 2003 respondents aged 18 years and older in an online cross-sectional survey carried out from 30 March to 1 April 2020. Anxiety and depression levels were assessed using the Hospital Anxiety and Depression Scale. **Results:** Among current smokers, 26.7% reported an increase in their tobacco consumption since lockdown and 18.6% reported a decrease, while it remained stable for 54.7%. The increase in tobacco consumption was associated with an age of 18–34 years, a high level of education, and anxiety. Among alcohol drinkers, 10.7% reported an increase in their alcohol consumption since lockdown and 24.4% reported a decrease, while it remained stable for 64.8%. The increase in alcohol consumption was associated with an age of 18–49 years, living in cities of more than 100 000 inhabitants, a high socio-professional category, and a depressive mood. **Conclusions:** The national lockdown implemented in France during the COVID-19 pandemic influenced tobacco and alcohol consumption in different ways according to sociodemographic group and mental health.

## Introduction

Tobacco smoking and alcohol use are among the leading preventable lifestyle risks for both premature death (i.e. 7.1 million for tobacco smoking and 2.8 million for alcohol use in 2017) and disease burden worldwide.<sup>1</sup> While the impact of tobacco smoking on SARS-CoV-2 infection remains largely unknown,<sup>2,3</sup> recent research suggests that it could increase disease severity and mortality in infected patients.<sup>4–6</sup> A recent meta-analysis of 19 studies, including a total of 11 590 confirmed COVID-19 patients, showed that current smoking was associated with a 2-fold increase in the risk of disease progression.<sup>7</sup>

In January 2020, the World Health Organization declared that the COVID-19 outbreak caused by the novel SARS-CoV-2 coronavirus was an international public health emergency with a strong risk of spreading to many countries around the world. The outbreak was subsequently reclassified as a pandemic on 11 March 2020. In many countries, including France, lockdown measures were implemented to curb the COVID-19 pandemic, with drastic limitations imposed on travel and social interactions, including for work. The lockdown was introduced in France from 17 March to 11 May 2020. All non-essential shops, restaurants and bars were closed. Residents were encouraged to stay at home. They had to sign a temporary permit to go out to work, buy food or do individual physical activity within 1 km from their home. Police officers could give a fine of 135 euros in the absence of the permit. Some people continued to travel to work, while others worked from home or became unemployed. The

media coverage of COVID-19 was immense, and health authorities gave an evening TV report with the rising number of cases, intensive care patients and COVID-19-related deaths.

This situation could have impacted the mental health of the population through an increase in depressive mood, anxiety, psychological distress or post-traumatic stress symptoms, among others.<sup>8–10</sup> The reasons could relate to loneliness due to the limited social interactions with family, friends and colleagues, financial stress, difficult working conditions, conflictual relationships within the household, anxiety about the health risks of becoming infected that was reinforced by the media coverage of the crisis and so on. Previous research showed that anxiety and depressive mood are associated with tobacco smoking<sup>11–14</sup> and alcohol use disorders,<sup>15,16</sup> as both substances are used to cope with stress or break boredom, for example. Furthermore, it has been shown that economic crises like the 2008 financial recession and unemployment are associated with a deterioration in mental health,<sup>17</sup> an increase in deaths from alcohol abuse<sup>18</sup> and an increase in binge drinking.<sup>19</sup> Finally, the epidemiological context itself and the perceived risk of infection with a respiratory disease could have motivated some smokers to quit or reduce their consumption, while others may have been encouraged to increase their consumption or relapse after the media reported scientific debates about the potential protective effect of nicotine against COVID-19 infection.

Previous research conducted in the first weeks of the crisis showed that substance use in the general population has been impacted by the epidemic and the subsequent political measures, including the

lockdown setting.<sup>20–22</sup> In this epidemic context and specifically during lockdown, the role played by lifestyle and socioeconomic status in behavioral changes linked to tobacco and alcohol use should be studied. Such studies are useful to adapt and target smoking cessation and alcohol use reduction programs and devices in the event that a second wave of the epidemic occurs and/or new population control measures are implemented. The purpose of this report is therefore to describe changes in tobacco and alcohol consumption during lockdown in the general French population and explore the sociodemographic and mental health factors associated with these changes.

## Methods

### Study design and sample

Self-reported evolution of tobacco and alcohol use following the complete lockdown in France on 17 March 2020 was collected through an online survey carried out from 30 March to 1 April 2020, i.e. 2 weeks after the start of lockdown. A national sample of 2003 respondents aged 18 years and older living in Metropolitan France (i.e. excluding overseas departments) was selected by the private company BVA Institute from a panel of internet users using the quota method for the following variables: sex, age, occupation, region and size of urban area, reflecting the structure of the population from the 2016 French National Institute for Statistics and Economic Studies (INSEE) census.<sup>23</sup> While the sample was similar to the general population structure according to quota variables, it differed from it in terms of level of education, as 44% of respondents reported being college graduate compared to 30% in the general population. Besides, the proportion of smokers (21.2%) and alcohol drinkers (66.7%) in the study sample was lower than that previously recorded in representative surveys in France (respectively, 28.7% among 18–85 years old in 2019 and 86.5% among 18–75 years old in 2017).<sup>24,25</sup>

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### Variables

#### Outcomes

Smoking status at the time of the survey was collected with the question: ‘Do you currently smoke?’ with three response options: ‘Yes, I smoke cigarettes, including roll-your-own cigarettes/Yes, but only other kinds of tobacco (cigars, pipes, waterpipes. . .)/No, I do not smoke’. Respondents who reported that they currently smoke manufactured cigarettes, roll-your-own tobacco, cigars, pipes or waterpipes were classified as smokers. Smokers were then asked about the number of cigarettes smoked per day (for cigarette users) as well as the evolution of their consumption with the question: ‘Compared to pre-lockdown, has your smoking consumption changed?’ Three possible responses were possible: ‘It has increased/it has remained stable/it has decreased’. Cigarette smokers who reported an increase were also asked about the number of cigarettes smoked per day before lockdown, which was dichotomized into <10 cigarettes per day vs. 10 or more cigarettes per day.

The evolution of alcohol consumption was directly reported for the entire sample with the question: ‘Compared to pre-lockdown, has your alcohol consumption, including beer, wine, cider, spirits, champagne, or other types of alcohol, changed?’ Four possible responses were possible: ‘It has increased/it has remained stable/it has decreased/I never drink alcohol’. Respondents who did not answer they never drank alcohol were considered as current drinkers and were asked their current frequency of use as well as the number of drinks per day using the two first questions of the AUDIT-C.<sup>26</sup> ‘How often do you currently drink alcoholic beverages, be it beer, wine, cider, hard liquor, champagne or any other type of alcohol?’ (daily/4–6 times a week/2–3 times a week/once a week/1 or several

times a month/less often/never) and ‘Currently, on the days you drink, how many drinks containing alcohol do you have, be it beer, wine, cider, hard liquor, champagne or any other type of alcohol?’ Respondents who reported an increase in alcohol consumption were asked the same two questions for the pre-lockdown period, introducing the questions by ‘And before the lockdown. . .’. Regular alcohol use was defined as at least 2–3 times a week; less frequent use was defined as non-regular use.

### Sociodemographic variables

Sociodemographic variables used in the analyses were: sex, age group, size of urban area, education level, living alone, parent of a child aged 16 years or younger, socio-professional category, perceived financial situation and overcrowded housing.

Size of urban area was recoded from the postal code indicated by the respondents for their place of residence, using data from INSEE.

Education level was obtained with the question: ‘What was the last degree you obtained?’, and recoded in ‘less than high school graduate/high school graduate/college graduate’.

The interviewee’s occupation was categorized according to INSEE socio-professional classification as follows: (i) farmers (0.9% of the sample); (ii) craftspeople, retailers, business owners (4.9%); (iii) managers, senior-level professional occupations (20.8%); (iv) professional workers (22.3%); (v) clerical workers (25.1%); (vi) manual workers (14.0%); (vii) inactive persons (12.0%). For this study, categories (i)–(iv) were classified together as ‘high socio-professional category,’ while categories (v) and (vi) were grouped under ‘low socio-professional category’. Retired respondents were coded as their last occupation category.

Perceived financial situation was assessed with the question: ‘How would you describe the current financial situation of your household/family?’ Five possible answers were provided: ‘(i) I’m comfortable; (ii) I manage easily; (iii) I need to be careful; 4) I manage with difficulty; 5) I cannot survive without debt’.<sup>27</sup> The first two answers were rated as ‘good financial situation’ and the last two as ‘difficult financial situation’, along with ‘need to be careful’.

Overcrowded housing was defined as living in a house or apartment measuring <25 m<sup>2</sup> for one person living alone or <18 m<sup>2</sup> per person in other cases following the definition of INSEE.<sup>28</sup>

### Mental health variables

Anxiety and depression levels were assessed using the 14-item Hospital Anxiety and Depression Scale (HADS), with seven 4-point (0–3) items for each of anxiety and depression and scores ranging from 0 to 21. A score between 8 and 10 indicates possible anxiety or depression, while a score above 10 suggests probable anxiety or depression.<sup>29</sup>

### Analyses

Sociodemographic characteristics, anxiety and depression levels, smoking intensity and alcohol use frequency were compared between males and females using Pearson chi-square tests. Bivariate analyses between reported changes in tobacco and alcohol consumption, sociodemographic variables and anxiety and depression levels were conducted. Post-stratification weights were computed for the adjustment of percentages across the structure of the whole population from the 2016 INSEE census.<sup>23</sup> Pearson chi-square tests of independence were used to compare the reported changes in tobacco and alcohol use according to sociodemographic and mental health variables. Every difference reported in the text corresponds to a significant difference at the 5% level.

Two multinomial logistic regressions were performed to disentangle the effects of the explanatory variables significantly associated with changes in tobacco or alcohol use at the 5% level in bivariate analyses (0: stable consumption; 1: increased consumption; 2:

decreased consumption). Adjusted relative risk ratios (aRRR) as well as the 95% confidence intervals were computed.

The hypothesis according to which 'light' consumers are mechanically more likely to have increased their consumption can be made. Thus, in sensitivity analysis, the reported increase in tobacco and alcohol consumption (compared with stable consumption) was cross-tabulated with the pre-lockdown number of cigarettes smoked and the pre-lockdown frequency of alcohol use.

All statistical analyses were performed using Stata SE, version 14.

## Results

### Sample description

The sociodemographic characteristics, anxiety and depression levels, smoking intensity and alcohol use frequency of the whole sample ( $n=2003$ ), males ( $n=954$ ) and females ( $n=1049$ ) are shown in [table 1](#). Females included in the study were younger than males ( $P<0.001$ ), were more often inactive or in a low socio-professional category ( $P<0.001$ ), had a higher level of anxiety ( $<0.001$ ) or depression ( $P=0.026$ ), and were less frequently regular alcohol users ( $P<0.001$ ). There was no significant difference between males and females on smoking status, however, male smokers smoked slightly more cigarettes per day [12.6, standard deviation (SD) =10.1,  $n=178$ ] than female smokers (10.1, SD=7.0,  $n=196$ ) ( $P=0.008$ ).

The sociodemographic characteristics, anxiety and depression levels, evolution of tobacco and alcohol consumption in smokers ( $n=422$ ) and alcohol drinkers ( $n=1344$ ) are shown in [table 2](#). Anxiety was probable for 29.0% of smokers and 20.3% of alcohol drinkers, while 24.6% of smokers and 17.4% of alcohol drinkers had probable depression according to the HADS.

Among current smokers, 26.7% reported an increase in their tobacco consumption since the beginning of lockdown (i.e. during the 2 weeks before the survey) and 18.6% reported a decrease, while it remained stable for 54.7%. Those reporting an increase in tobacco consumption since lockdown smoked 5.4 additional cigarettes per day on average (SD=4.7,  $n=93$ ).

Among alcohol drinkers, 10.7% reported an increase in their alcohol consumption since the beginning of lockdown and 24.4% reported a decrease, while it remained stable for 64.8%. Among alcohol drinkers who reported an increase in consumption ( $n=143$ ), 74.2% reported more frequent use and 33.5% an increase in the number of drinks per day of consumption (23.1% reported both changes). Alcohol drinkers reporting an increase in the number of drinks per day of consumption drank 1.9 additional drinks per day on average (SD=1.2,  $n=49$ ).

### Bivariate analyses comparing sociodemographic characteristics, mental health variables and outcomes

#### Smoking behavior

Bivariate analyses for smoking behavior are shown in [table 3](#). Increased tobacco consumption was most frequent among individuals aged 18–34 years, college graduates, respondents living in overcrowded housing, those with high anxiety levels or depressed mood.

Decreased tobacco consumption was most frequent among individuals aged 65 years and older or high school graduates.

#### Alcohol use

Bivariate analyses for alcohol use are shown in [table 4](#). Increased alcohol consumption was most frequent among people aged under 50 years, people living in an urban area with more than 100 000 inhabitants, respondents living in overcrowded housing, parents of children aged 16 years or younger, respondents with high anxiety levels or depressive mood.

Decreased alcohol consumption was most frequently reported by 18–34 year-olds, people living in an urban area with more than 100 000 inhabitants and respondents living in overcrowded housing.

## Results of multinomial logistic regressions

### Smoking behavior

After adjustment for confounding factors, compared to stable consumption, the increase in tobacco consumption was associated with young age (aRRR=0.43 [0.22–0.84] for 50–64 year-olds compared to 18–34 year-olds,  $P=0.014$ ), high level of education (aRRR=1.91 [1.10–3.35] for college graduates compared to less than high school graduates,  $P=0.023$ ) and anxiety (aRRR=1.94 [1.02–3.67],  $P=0.043$ , for possible anxiety, and aRRR=2.81 [1.42–5.57],  $P=0.003$ , for probable anxiety, compared to normal levels).

The decrease in tobacco consumption was associated with education level (aRRR=2.04 [1.05–4.00],  $P=0.037$ , for high school graduates compared to less than high school graduates).

### Alcohol use

Multinomial logistic regression revealed that, compared to stable consumption, the increase in alcohol consumption was associated with young age (aRRR=0.45 [0.25–0.78],  $P=0.004$ , for 50–64 year-olds, and aRRR=0.23 [0.12–0.47],  $P<0.001$ , for those aged 65 years and older, compared to 18–34 year-olds), living in an urban area with more than 100 000 inhabitants (aRRR=1.71 [1.17–2.50],  $P=0.006$ , compared with other respondents), high socio-professional category (aRRR=0.67 [0.44–1.00],  $P=0.05$ , for low socio-professional category compared to high socio-professional category) and depressive mood (aRRR=2.08 [1.29–3.34],  $P=0.003$ , for possible depression, and aRRR=2.60 [1.53–4.43],  $P<0.001$ , for probable depression, compared to normal levels).

The decrease in alcohol consumption was also associated with young age (aRRR=0.50 [0.33–0.75],  $P=0.001$ , for 35–49 year-olds, aRRR=0.55 [0.38–0.81],  $P=0.002$ , for 50–64 year-olds and aRRR=0.54 [0.36–0.82],  $P=0.003$ , for those aged 65 years and older, compared with 18–34 year-olds), and living in an urban area with more than 100 000 inhabitants (aRRR=1.41 [1.08–1.84],  $P=0.012$ ), compared with stable consumption.

### Sensitivity analysis

Among cigarette smokers who reported higher or stable tobacco consumption ( $n=303$ ), there was no significant difference in the proportion of those who increased their consumption in terms of the number of cigarettes smoked before lockdown: 34.1% of smokers of <10 cigarettes per day reported an increase in consumption vs. 31.7% of those smoking at least 10 cigarettes ( $P=0.669$ ).

Among alcohol drinkers who reported higher or stable alcohol consumption ( $n=1021$ ), there was no significant difference in the proportion of those who increased their consumption in terms of their frequency of use before lockdown: 14.6% of non-regular alcohol drinkers reported an increase in consumption vs. 13.8% of regular alcohol drinkers ( $P=0.720$ ).

## Discussion

In France, lockdown during the COVID-19 pandemic has influenced tobacco and alcohol consumption. In this study, even if the consumption of both remained stable for the majority of respondents, a quarter of smokers reported higher tobacco consumption, with this proportion being similar to that observed in a previous study of a population of workers in the USA.<sup>20</sup> Changes in alcohol consumption were more favorable, with around 1 in 10 drinkers reporting higher consumption and 1 in 5 lower consumption, which could be due to the restrictions placed on social interactions. The results of this study in France differ from previous research conducted in other countries, especially concerning alcohol use, for which more negative changes

**Table 1** Sociodemographic characteristics, anxiety and depression levels, smoking intensity and alcohol use frequency, in the whole sample and by sex

	Whole sample (n=2003)		Males (n=954)		Females (n=1049)		P-value <sup>b</sup>
	Unweighted n	Weighted %	Unweighted n	Weighted %	Unweighted n	Weighted %	
Sex							
Male	954	47.6					
Female	1049	52.4					
Age group							
18–34 year-olds	467	25.6	163	18.8	304	31.8	<0.001
35–49 year-olds	533	25.5	268	27.4	265	23.8	
50–64 year-olds	523	25.1	292	29.7	231	21.0	
65 years and older	480	23.8	231	24.2	249	23.5	
Size of urban area							
<100 000 inhabitants	1071	53.5	513	53.9	558	53.2	0.738
≥100 000 inhabitants	932	46.5	441	46.1	491	46.8	
Socio-professional category <sup>a</sup>							
High	974	49.0	547	57.6	427	41.1	<0.001
Low	794	39.0	346	35.9	448	41.9	
Inactive	235	12.0	61	6.5	174	17.1	
Living alone							
No	1540	76.9	728	76.4	812	77.4	0.623
Yes	463	23.1	226	23.6	237	22.6	
Parent of children aged ≤16 years							
No	1417	71.0	681	71.7	736	70.3	0.514
Yes	586	29.0	273	28.4	313	29.7	
Education level							
Less than high school graduate	600	29.9	307	32.4	293	27.7	0.065
High school graduate	509	25.7	231	24.4	278	26.9	
College graduate	894	44.4	416	43.3	478	45.5	
Perceived financial situation							
Good financial situation	1053	52.1	521	54.2	532	50.3	0.211
Need to be careful	562	28.2	254	26.7	308	29.5	
Difficult financial situation	388	19.7	179	19.1	209	20.2	
Overcrowded housing							
No	1863	92.6	897	93.8	966	91.5	0.057
Yes	140	7.4	57	6.2	83	8.5	
Anxiety level (HADS)							
Normal (0–7)	1121	55.8	592	62.0	529	50.3	<0.001
Possible (8–10)	452	22.7	202	21.4	250	23.8	
Probable (11–21)	430	21.5	160	16.6	270	26.0	
Depressive mood (HADS)							
Normal (0–7)	1152	57.6	579	60.7	573	54.7	0.026
Possible (8–10)	452	22.6	198	20.8	254	24.2	
Probable (11–21)	399	19.9	177	18.5	222	21.1	
Smoking status							
Non-smoker	1581	78.8	748	78.4	833	79.2	0.077
Smoke only cigars, pipes or waterpipes	48	2.5	28	2.9	20	2.0	
<10 cigarettes per day	151	7.7	61	6.5	90	8.7	
At least 10 cigarettes per day	223	11.0	117	12.2	106	10.0	
Mean (SD) (among cigarettes users)		11.3 (8.7)		12.6 (10.1)		10.1 (7.0)	0.008
Alcohol use							
No alcohol use	659	33.3	208	22.0	451	43.5	<0.001
Non-regular alcohol user	636	31.6	302	31.6	334	31.7	
Regular alcohol user	708	35.1	444	46.5	264	24.8	

HADS, hospital anxiety and depression scale; SD: standard deviation.

a: Retired respondents were coded as their last occupation.

b: Chi-square independence test between sex and each variable in the table.

have been observed elsewhere.<sup>21,22</sup> Such differences may be due to cultural factors and drinking patterns in different countries, as well as the political measures implemented to manage the epidemic, not to mention the methodological differences in the sampling and recruitment strategy that could lead to various profiles of respondents.

Increased tobacco consumption was associated with higher anxiety levels, age of 18–34 years, and a higher level of education (i.e. college graduates), while decreased tobacco consumption was associated with an intermediate level of education (i.e. high school graduates). Compared to stable consumption, increased alcohol consumption was associated with depressive mood, age of <50 years, living in urban areas and high socio-professional category. Being aged under 50 years and living in urban areas were also associated with a decrease in alcohol consumption, which shows

the heterogeneous behaviors within sociodemographic groups. Associations between mental health and smoking and alcohol use are in line with the available knowledge<sup>11,15,16</sup> as well as previous research on the impact of the COVID-19 epidemic.<sup>22</sup> However, this study conducted during the first weeks of the French lockdown suggests a closer relationship between tobacco and anxiety on the one hand, and alcohol use and depression on the other hand. Moreover, the observed increase in tobacco and alcohol use appears to be more frequent among young people, city dwellers and individuals from a high socio-professional category or with a high level of education. This cannot be fully explained by lower levels of substance use before lockdown, since the increase in tobacco and alcohol use was not related to pre-lockdown consumption levels in the sensitivity analysis. This could partly be due to the inequalities that



**Table 2** Sociodemographic characteristics, anxiety and depression levels, and evolution of tobacco and alcohol consumption, among smokers and alcohol drinkers

	Smokers (n=422)		Alcohol drinkers (n=1344)	
	Unweighted n	Weighted %	Unweighted n	Weighted %
Sex				
Male	206	48.6	746	55.7
Female	216	51.4	598	44.4
Age group				
18–34 year-olds	113	29.9	276	22.6
35–49 year-olds	139	31.6	359	25.6
50–64 year-olds	123	27.7	362	26.0
65 years and older	47	10.9	347	25.9
Size of urban area				
<100 000 inhabitants	241	57.5	738	55.1
≥100 000 inhabitants	181	42.5	606	44.9
Socio-professional category <sup>a</sup>				
High	176	42.0	724	54.3
Low	186	43.7	512	37.5
Inactive	60	14.3	108	8.2
Living alone				
No	325	77.0	1053	78.4
Yes	97	23.0	291	21.6
Parent of children aged ≤16 years				
No	275	65.5	960	71.8
Yes	147	34.5	384	28.2
Education level				
Less than high school graduate	169	40.1	366	27.2
High school graduate	102	24.6	331	25.0
College graduate	151	35.2	647	47.8
Perceived financial situation				
Good financial situation	180	42.1	761	56.2
Need to be careful	120	28.7	353	26.4
Difficult financial situation	122	29.2	230	17.4
Overcrowded housing				
No	385	90.9	1267	93.9
Yes	37	9.1	77	6.1
Anxiety level (HADS)				
Normal (0–7)	195	45.6	770	57.0
Possible (8–10)	105	25.4	301	22.7
Probable (11–21)	122	29.0	273	20.3
Depressive mood (HADS)				
Normal (0–7)	206	48.7	794	59.1
Possible (8–10)	112	26.7	314	23.5
Probable (11–21)	104	24.6	236	17.4
Reported change in tobacco use				
Increase	112	26.7		
Stable	231	54.7		
Decrease	79	18.6		
Reported change in alcohol use				
Increase			143	10.7
Stable			878	64.8
Decrease			323	24.4

HADS, hospital anxiety and depression scale.

a: Retired respondents were coded as their last occupation.

emerged regarding working conditions: for the ‘essential workers’ who mostly belonged to the lower socioeconomic groups and continued to travel to work, the lockdown may have had a more limited impact on their everyday lives.<sup>30</sup> On the contrary, some workers in the more advantaged groups may have benefited from remote working, leading to more dramatic changes in their lifestyle habits, and perhaps more opportunities to smoke and/or drink alcohol at home compared with the workplace. While remaining cautious about this assumption, this could have led to more unfavorable changes in smoking and alcohol behaviors among the most socially advantaged groups, compared with less advantaged ones, excluding those from the most vulnerable populations (e.g. homeless, incarcerated or illicit drug users) that are usually not included in internet surveys.<sup>31,32</sup>

Further research is needed to confirm these findings, including the role of specific mental health disorders as well as working conditions: a previous study suggested that telecommuting could be beneficial for health, including smoking and alcohol use, in a non-

pandemic context.<sup>33</sup> Further studies should therefore assess the effect of lockdown on post-lockdown tobacco and alcohol use in order to detect whether the observed changes persist in the long term.

### Strengths and limitations

The limitations of the present analysis include the use of a non-probabilistic sample and the cross-sectional design of the study. The sample included respondents with a high level of education compared with the general population. The limited statistical power of this research report did not allow us to study the relations with working conditions, in particular telecommuting. As no pre-lockdown assessment could be conducted, the validity of the data may have been influenced by recall bias. Finally, it is likely that the smokers and especially alcohol drinkers most at risk were not included in the survey, as such individuals are usually underrepresented in general population surveys.<sup>34,35</sup> Further, the coverage error

**Table 3** Factors associated with an increase or decrease in tobacco consumption compared to stable consumption: row percentages from bivariate analyses and results of a multinomial logistic regression ( $n=422$ )

	Bivariate analyses				Multinomial logistic regression (ref=stable consumption)							
	<i>n</i>	Reported increase in tobacco consumption (%)	Reported decrease in tobacco consumption (%)	Chi-square <i>P</i> -value <sup>a</sup>	Reported increase in tobacco consumption ( $n=112$ )				Reported decrease in tobacco consumption ( $n=79$ )			
					aRRR	95% CI <sup>-</sup>	95% CI <sup>+</sup>	<i>P</i> -value <sup>b</sup>	aRRR	95% CI <sup>-</sup>	95% CI <sup>+</sup>	<i>P</i> -value <sup>b</sup>
Sex				0.052								
Male	206	22.4	16.9									
Female	216	30.8	20.3									
Age group				0.009								
18–34 year-olds	113	36.7	13.4		1.00		Ref.		1.00		Ref.	
35–49 year-olds	139	28.1	20.4		0.75	0.42	1.34	0.331	1.48	0.71	3.10	0.292
50–64 year-olds	123	16.7	18.4		0.43	0.22	0.84	0.014	1.14	0.53	2.45	0.743
65 years and older	47	20.7	28.4		0.60	0.24	1.46	0.257	1.77	0.71	4.38	0.218
Size of urban area				0.130								
<100 000 inhabitants	241	27.0	15.4									
≥100 000 inhabitants	181	26.2	23.0									
Socio-professional category <sup>c</sup>				0.911								
High	176	26.4	18.8									
Low	186	26.7	19.9									
Inactive	60	27.8	14.2									
Living alone				0.911								
No	325	27.0	18.9									
Yes	97	25.6	17.7									
Parent of children aged ≤16 years				0.264								
No	275	24.2	19.5									
Yes	147	31.5	17.0									
Education level				0.029								
Less than high school graduate	169	24.9	14.1		1.00		Ref.		1.00		Ref.	
High school graduate	102	20.5	25.6		0.86	0.45	1.65	0.656	2.04	1.05	4.00	0.037
College graduate	151	33.1	18.9		1.91	1.10	3.35	0.023	1.67	0.88	3.18	0.117
Perceived financial situation				0.154								
Good financial situation	180	23.1	16.5									
Need to be careful	120	25.8	23.8									
Difficult financial situation	122	32.8	16.6									
Overcrowded housing				0.030								
No	385	25.3	20.0		1.00		Ref.		1.00		Ref.	
Yes	37	40.9	5.2		1.05	0.49	2.27	0.898	0.28	0.06	1.26	0.097
Anxiety level (HADS)				<0.001								
Normal (0–7)	195	16.1	22.8		1.00		Ref.		1.00		Ref.	
Possible (8–10)	105	30.7	13.5		1.94	1.02	3.67	0.043	0.75	0.37	1.51	0.417
Probable (11–21)	122	39.9	16.6		2.81	1.42	5.57	0.003	1.15	0.54	2.47	0.713
Depressive mood (HADS)				0.016								
Normal (0–7)	206	18.9	21.2		1.00		Ref.		1.00		Ref.	
Possible (8–10)	112	34.2	15.4		1.31	0.70	2.45	0.395	0.89	0.44	1.82	0.758
Probable (11–21)	104	33.9	17.1		1.42	0.71	2.83	0.324	1.03	0.47	2.25	0.936

HADS, hospital anxiety and depression scale; aRRR, adjusted relative risk ratio; 95% CI<sup>-</sup>, lower limit of 95% confidence interval; 95% CI<sup>+</sup>, upper limit of 95% confidence interval.

a: Chi-square independence test for bivariate analyses between change in tobacco consumption (stable, increase, decrease) on the one hand, and the sociodemographic characteristics and mental health variables on the other.

b: *P*-values for relative risk ratio.

c: Retired respondents were coded as their last occupation.

could be larger when the sample is drawn from an access panel.<sup>36</sup> Thus, the proportion of smokers and alcohol drinkers in the study sample is lower than that previously recorded in representative surveys in France.<sup>24,25</sup>

The strengths of this study include the joint analysis of socio-demographic and mental health factors associated with behavioral changes. Moreover, the analysis of factors associated with both higher and lower smoking and alcohol consumption can be used as a lever to better target the populations most at risk of adopting harmful practices but also encourage users who adopted positive behaviors to pursue their efforts. The initial trends observed in smoking habits were used to justify maintaining a smoking prevention campaign scheduled on World No Tobacco Day on 31 May 2020. Public health messages intended for smokers and at-risk alcohol drinkers were adapted, encouraging them to remotely use help services to stop smoking or reduce drinking in the context of the

general lockdown. Even more so than usual, the use of a benevolent and supportive tone was necessary. In this specific context in which anxiety and stress related to the health and social situation reinforced consumption, it was crucial not to make consumers feel guilty. These study results could be used again in the event of subsequent waves of the epidemic and/or a new lockdown in order to adapt the targeting and contents of smoking cessation and alcohol use reduction programs and devices.

## Conclusion

As shown in this study, the COVID-19-related lockdown in France gave rise to important changes in tobacco and alcohol consumption among the general population, with the trend being more unfavorable for tobacco than for alcohol. Changes are associated

**Table 4** Factors associated with an increase or decrease in alcohol use compared to a stable consumption: row percentages from bivariate analyses and results of a multinomial logistic regression (*n*=1344)

	Bivariate analyses			Multinomial logistic regression (ref=stable consumption)								
	<i>n</i>	Reported increase in alcohol use (%)	Reported decrease in alcohol use (%)	Chi-square <i>P</i> -value <sup>a</sup>	Reported increase in alcohol use ( <i>n</i> =143)				Reported decrease in alcohol use ( <i>n</i> =323)			
					aRRR	95% CI <sup>−</sup>	95% CI <sup>+</sup>	<i>P</i> -value <sup>b</sup>	aRRR	95% CI <sup>−</sup>	95% CI <sup>+</sup>	<i>P</i> -value <sup>b</sup>
Sex				0.708								
Male	746	10.1	24.3									
Female	598	11.5	24.6									
Age group				<0.001								
18–34 year-olds	276	14.5	35.6		1.00		Ref.		1.00		Ref.	
35–49 year-olds	359	16.5	18.2		0.77	0.47	1.26	0.294	0.50	0.33	0.75	0.001
50–64 year-olds	362	8.2	22.7		0.45	0.25	0.78	0.004	0.55	0.38	0.81	0.002
65 years and older	347	4.4	22.5		0.23	0.12	0.47	<0.001	0.54	0.36	0.82	0.003
Size of urban area				0.003								
<100 000 inhabitants	738	9.2	22.0		1.00		Ref.		1.00		Ref.	
≥100 000 inhabitants	606	12.6	27.4		1.71	1.17	2.50	0.006	1.41	1.08	1.84	0.012
Socio-professional category <sup>c</sup>				<0.001								
High	724	11.4	21.2		1.00		Ref.		1.00		Ref.	
Low	512	10.0	24.0		0.67	0.44	1.00	0.05	1.17	0.87	1.57	0.29
Inactive	108	10.0	48.1		0.79	0.37	1.70	0.552	2.83	1.76	4.55	<0.001
Living alone				0.197								
No	1053	10.2	23.7									
Yes	291	12.5	27.1									
Parent of children aged ≤16 years				<0.001								
No	960	8.0	26.3		1.00		Ref.		1.00		Ref.	
Yes	384	17.8	19.6		1.53	0.99	2.38	0.055	0.84	0.59	1.19	0.317
Education level				0.327								
Less than high school graduate	366	8.2	24.3									
High school graduate	331	10.2	24.5									
College graduate	647	12.5	24.4									
Perceived financial situation				0.324								
Good financial situation	761	10.5	23.4									
Need to be careful	353	9.9	23.8									
Difficult financial situation	230	12.6	28.7									
Overcrowded housing				0.006								
No	1267	10.1	24.0		1.00		Ref.		1.00		Ref.	
Yes	77	19.7	30.8		1.16	0.59	2.28	0.664	1.05	0.59	1.88	0.859
Anxiety level (HADS)				<0.001								
Normal (0–7)	770	7.7	24.5		1.00		Ref.		1.00		Ref.	
Possible (8–10)	301	12.5	26.8		1.39	0.86	2.26	0.183	1.22	0.87	1.70	0.249
Probable (11–21)	273	17.2	21.4		1.35	0.80	2.26	0.257	0.95	0.63	1.42	0.794
Depressive mood (HADS)				<0.001								
Normal (0–7)	794	6.7	24.4		1.00		Ref.		1.00		Ref.	
Possible (8–10)	314	14.6	26.8		2.08	1.29	3.34	0.003	1.17	0.84	1.64	0.354
Probable (11–21)	236	19.1	21.3		2.60	1.53	4.43	<0.001	1.00	0.66	1.54	0.982

HAD, hospital anxiety and depression scale; aRRR, adjusted relative risk ratio; 95% CI<sup>-</sup>, lower limit of 95% confidence interval; 95% CI<sup>+</sup>, upper limit of 95% confidence interval.

a: Chi-square independence test for bivariate analyses between change in alcohol consumption (stable, increase, decrease) on the one hand, and sociodemographic characteristics and mental health variables on the other.

b: *P*-values for relative risk ratio.

c: Retired respondents were coded as their last occupation.

with factors, such as anxiety and depression as well as age, socio-professional category and place of residence. Researchers are encouraged to continue monitoring smoking and alcohol use beyond the lockdown period through longitudinal studies in order to assess whether these changes are lasting or not. This could lead to exploring the relationships between lifestyle factors, mental health and substance use in the context of the COVID-19 pandemic. The impact of working conditions could also be better assessed using a cohort of workers. The characteristics of individuals who increased their alcohol consumption should be studied in greater detail. These results should finally encourage health professionals and decision-makers to continue promoting smoking cessation and alcohol reduction during lockdown periods and providing telephone or online help services at a time when face-to-face assistance services may be less accessible.

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## Key points

- In many countries, lockdown measures were implemented to curb the COVID-19 pandemic. This situation may have impacted tobacco smoking and alcohol consumption.
- In France, among current smokers, 26.7% reported an increase in tobacco consumption 2 weeks after lockdown and 18.6% reported a decrease.
- Among alcohol drinkers, 10.7% reported an increase in alcohol consumption since lockdown and 24.4% reported a decrease.
- Changes are associated with factors, such as anxiety and depression as well as age, socio-professional category and place of residence.
- Researchers are encouraged to continue monitoring smoking and alcohol use beyond the lockdown period through longitudinal studies in order to assess whether these changes are lasting or not.

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