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ORIGINAL ARTICLE

Differences in Medication Prescribing for Tobacco and Alcohol Dependence Before, During, and After the Recent Pandemic: Age and Sex Effects

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Abstract
Several studies have been published on how the recent pandemic negatively affected mental health and addictive behaviors. Nonetheless, further research is needed into potential differences in tobacco and alcohol use that occurred over the course of the pandemic. Towards this end, we examined changes in prescribing patterns of drugs used in nicotine and alcohol addictive disorders (DUAD) to evaluate the long-term effect of the pandemic on population behavior regarding the use of tobacco and alcohol. New prescriptions for DUAD were analyzed over 6 years, divided into three periods of 2 years each: pre-pandemic, pandemic, and post-pandemic, from March-2018 to February-2024. New prescriptions were studied considering sex and age groups. New nicotine-related DUAD prescriptions increased significantly during the pandemic and also in the post-pandemic, mainly in women. During the pandemic, the increase was driven by individuals over 20 years old, and in the post-pandemic by those aged 40 and over. New alcohol-related DUAD prescriptions decreased significantly during the pandemic, driven by men over 60 years old, and remained stable during the post-pandemic. In general, men received more than twice as many new alcohol-related DUAD prescriptions as women. Results provide population-based data to draw attention to the extent of harmful alcohol consumption during a lockdown, as occurred during the pandemic. However, during and after the pandemic, attempts to quit smoking increased. Stepping up information campaigns about the risks of excessive alcohol or tobacco consumption and about the resources available to those who wish to reduce their alcohol or tobacco consumption may prove useful in future unprecedented events.

Keywords Alcohol use disorder · Smoking cessation · Prescription patterns · Drugs for addictive disorders · Sex differences · COVID-19 pandemic

The coronavirus disease 2019 (COVID-19) pandemic increased stress and social isolation, which had a negative impact on mental health (Marel et al., 2021; Martinez-Cengotitabengoa et al., 2025) and addictions (Czeisler et al., 2020). It led to changes in the use of addictive substances, including tobacco and alcohol (Marel et al., 2021), whose consumption is

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among the main causes of illness and premature death worldwide (GBD, 2015 Tobacco Collaborators, 2017; GBD 2016 Alcohol Collaborators, 2018).

The imposition of social distancing and the difficulty in accessing health systems could have favored a relapse into the consumption of such substances in people who were in the process of tackling their dependence. The pandemic also made meetings of peer-support groups and other sources of social connection difficult (Canadian Centre on Substance Use and Addiction "Impacts of the COVID-19 Pandemic on People Who Use Substances: What We Heard" 2025). This could have favored changes in the usual prescription patterns.

"New prescriptions" are used as a proxy for quitting attempts or help-seeking, yet prescribing is determined by both demand-side (e.g., risk perceptions, motivation, self-efficacy) and supply-side (e.g., access to clinicians and pharmacies, telemedicine triage, reimbursement changes, drug shortages, clinical guideline shifts) factors. This omission weakens the explanatory power of the narrative and allows for alternative, non-behavioural explanations.

Tobacco use is a major risk factor for premature death worldwide (GBD, 2015 Tobacco Collaborators, 2017). In Spain, approximately 19.8% of the population aged 15 and over smokes daily. By sex, the percentage of daily smokers is 23.3% for men and 16.4% for women (Ministry of Health of Spain, 2024)**.** According to data from a survey conducted by the Spanish Observatory on Drugs and Addictions, part of the Ministry of Health, smoking in Spain decreased during the first year of the pandemic compared to pre-pandemic levels, it having been estimated that 2.6% of smokers quit smoking completely, while 8.1% reduced their tobacco consumption (Llorens et al., 2021).

On the other hand, alcohol misuse is already a public health concern in many countries, including Spain (GBD 2016 Alcohol Collaborators, 2018). Notably, 1.3% of the population aged 15 and over engage in risky alcohol consumption, the rate is higher among men (1.5%) than among women (1.0%), and 11.3% of young people aged 15 to 24 report at least one episode of binge drinking per month (Ministry of Health of Spain, 2024). During the pandemic, there was a general trend towards increased alcohol consumption. In general population samples, the percentage of people who consumed alcohol during the pandemic ranged from 21.7% to 72.9%. (Roberts et al., 2021), with a 33% of young adults meeting the criteria for risky consumption (Federico et al., 2022; Zapata et al., 2022).

Studies in the United States and other countries suggest that many people increased their use of alcohol and other substances during lockdown, especially people with clinical anxiety and depression, as well as those experiencing COVID-19-related stress (Llorens et al., 2021; National Institute on Drug Abuse (NIDA)Abuse, 2023). To date, several studies have been published on how the COVID-19 pandemic affected tobacco and alcohol consumption patterns in the general population, as well as on attempts to tackle these addictive behaviors. (Jackson et al., 2021; Reynolds et al., 2021). Nonetheless, further research is needed into prescribing patterns of drugs used in addictive disorders (DUAD) during the pandemic and post-pandemic period, taking into account gender and age (McKee & McRae-Clark, 2022), to evaluate the long-term effect of the pandemic on population behavior regarding the use of tobacco and alcohol (Jackson et al., 2021).

The objective of the study was to analyze the variations in new nicotine- or alcohol-related DUAD prescriptions in the population during the COVID-19 pandemic and the post-pandemic period, exploring age and gender differences. Based on the study results, recommendations are made to intensify information campaigns about the risks of excessive alcohol and tobacco consumption and the necessary resources that could be useful in future unprecedented events.

Methods

Setting

A retrospective population study was carried out in a healthcare setting in Barakaldo-Sestao, which serves an approximate population of 130,000 people in the Basque Country in the north of Spain. The public health system in Spain is a tax-financed universal system that covers all or part of the costs of the medications prescribed to patients depending on their income (patients paying between 0 and 60% of the costs). Drug treatments for addictive disorders related to alcohol and tobacco are only dispensed in a community pharmacy on presentation of a medical prescription.

Data Collection

To evaluate possible variations in the behaviors of quitting smoking and reducing alcohol consumption that have arisen around the COVID-19 pandemic, we analyzed new nicotine- or alcohol-related DUAD prescriptions, in the entire population of Barakaldo-Sestao Health Area (Spain) over 6 years. This timeframe was divided into three periods of 2 years: pre-pandemic (PRE) from 1 March 2018 to 28 February 2020, pandemic (PAN) from 1 March 2020 to 28 February 2022, and post-pandemic (POST) from 1 March 2022 to 29 February 2024. These dates were chosen because March 2020 was when the virus started to spread rapidly in Spain. Only new prescriptions were selected to assess whether the pandemic period had influenced the initiation of new treatments. New prescriptions (presented as %) for DUAD are defined as the number of persons per hundred people in the study population who received a prescription for a DUAD for the first time (not having received it in the previous year). A change in the drug dosage was not considered a new prescription.

Nicotine- and alcohol-related DUAD were defined according to the WHO categories and comprised the following subgroups of the Anatomical Therapeutic Chemical (ATC) classification: drugs used in nicotine dependence (N07BA: varenicline, bupropion, and nicotine) and drugs used in alcohol dependence (N07BB: disulfiram, naltrexone, and nalmefene). The ATC classification system, controlled by the World Health Organization Collaborating Centre for Drug Statistics Methodology, divides active substances into different groups according to the organ or system on which they act and their therapeutic, pharmacological, and chemical properties ("Anatomical Therapeutic Chemical (ATC) Classification," 2024).

Population data were extracted from the electronic prescribing system of the Basque Health System, Osakidetza, which documents all the pharmacological prescriptions issued in primary care centers, non-hospital mental health facilities, and hospital outpatient clinics, all of which are public services. Each patient was counted only once in each period, regardless of the number of new prescriptions received throughout the study period.

Statistical Analysis

The information on all new prescriptions of nicotine and/or alcohol-related DUAD according to the ATC classification level subgroups (N07BA and N07BB, respectively) was downloaded and presented both raw and as a percentage of the reference population. A univariate analysis was conducted with the main objective of describing and summarizing the data to find patterns in study variables.

To analyze variability in new prescriptions of DUAD based on the chosen period, odds ratios (ORs) with 95% confidence intervals (CI) and Z statistics were calculated, setting the significance level at 5% ($p < 0.05$). To ensure the validity of the results, the Bonferroni correction was applied to correct for multiple testing bias ($p = 0.05/n$, where n is the number of comparisons). To detect variability in the influence of the pandemic on different subgroups, analyses were carried out on the samples stratified by sex, age, and both factors (sex and age). IBM SPSS statistical software version 29.0 was used for the analyses.

Ethics Statement

The study complied with European data protection regulations ("Data protection—European Commission,"2025), and all data were extracted anonymized from the electronic prescribing system. Accordingly with STROBE guidelines for observational studies, the research proposal was approved by the local ethics committee.

Results

Table 1 shows the distribution of the study population by age and sex during the three time periods analyzed.

New Nicotine- or Alcohol-Related DUAD Prescriptions in the Entire Sample

In the case of treatments for smoking cessation, new prescriptions increased significantly not only in the pandemic (PAN) (0.94% vs 0.68%, OR = 1.37, $p < 0.001$) but also in the post-pandemic period (POST) compared to PAN (1.30% vs 0.94%, OR = 1.39, $p < 0.001$). In contrast, new alcohol-related DUAD prescriptions decreased significantly during the pandemic (PAN) (0.11% vs 0.16%, OR = 0.69, $p < 0.001$), while new prescriptions of these drugs remained stable from PAN to POST periods (0.12% vs 0.11%, OR = 0.10, $p = 0.418$) (Fig. 1).

Table 1 Distribution of the population by sex and age in the periods compared: pre-pandemic (PRE), pandemic (PAN), and post-pandemic (POST)

	PRE ($N = 131,300$)		PAN ($N = 129,260$)		POST ($N = 130,126$)	
Age group (years)	*N*	*%*	*N*	*%*	*N*	*%*
0–20	23,495	17.89	23,016	17.80	23,070	17.73
21–40	28,527	21.73	26,832	20.76	26,744	20.55
41–60	42,510	32.38	42,239	32.68	42,540	32.69
61–80	27,761	21.14	28,316	21.91	28,981	22.27
> 80	9,007	6.86	8,857	6.85	8,791	6.76
Sex						
Female	67,677	51.54	66,586	51.51	67,007	51.49
Male	63,623	48.46	62,674	48.49	63,119	48.51

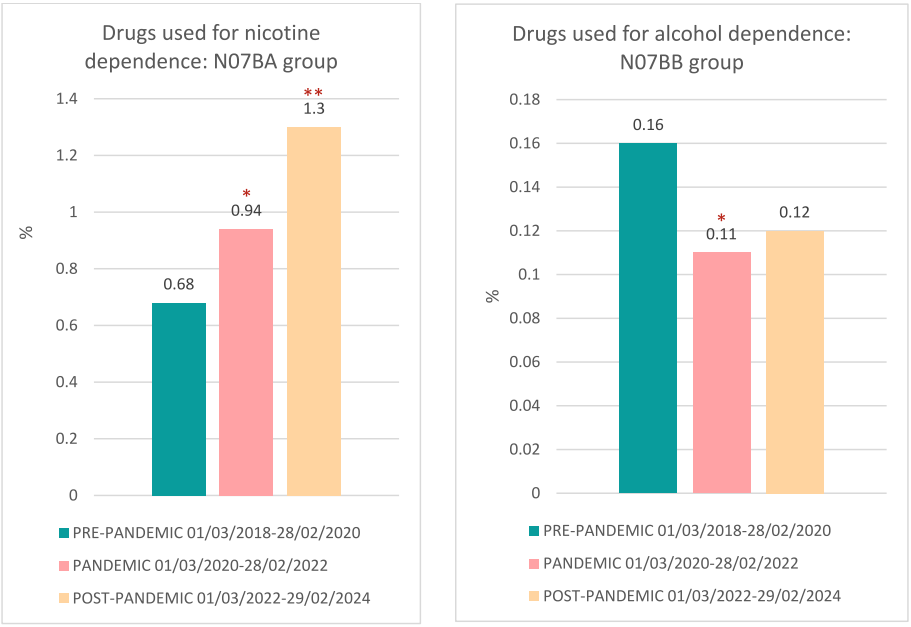


Fig. 1 Population (%) with new nicotine- or alcohol-related DUAD prescriptions showing changes across the study period

New Nicotine- or Alcohol-Related DUAD Prescriptions by Sex

Stratifying **by sex,** we observed that the increases in new nicotine-related DUAD prescriptions was statistically significant in men and women both from PRE to PAN (OR ♂ = 1.38, $p < 0.001$; OR ♀ = 1.38, $p < 0.001$) and from PAN to POST (OR ♂ = 1.32, $p < 0.001$; OR ♀ = 1.46, $p < 0.001$) (Fig. 2).

In all the periods studied, the percentage of men and women who received a new prescription for a nicotine-related DUAD was similar. On the other hand, men received more than twice as many new alcohol-related DUAD prescriptions as women. We also observed a statistically significant decrease in new alcohol-related DUAD prescriptions in both men and women from PRE to PAN (OR ♂ = 0.72, $p = 0.009$; OR ♀ = 0.61, $p = 0.021$), but no change in prescriptions from PAN to POST (OR ♂ = 1.06, $p = 0.677$; OR ♀ = 1.23, $p = 0.374$) (Table 2).

New Nicotine- or Alcohol-Related DUAD Prescriptions by Age

A comparison of data across different periods by age group revealed that new nicotine-related DUAD prescriptions increased most in the PAN and POST periods among individuals between 41 and 60 years old, but there were statistically significant increases in these prescriptions in both periods in all except the youngest and oldest age groups (Fig. 3).

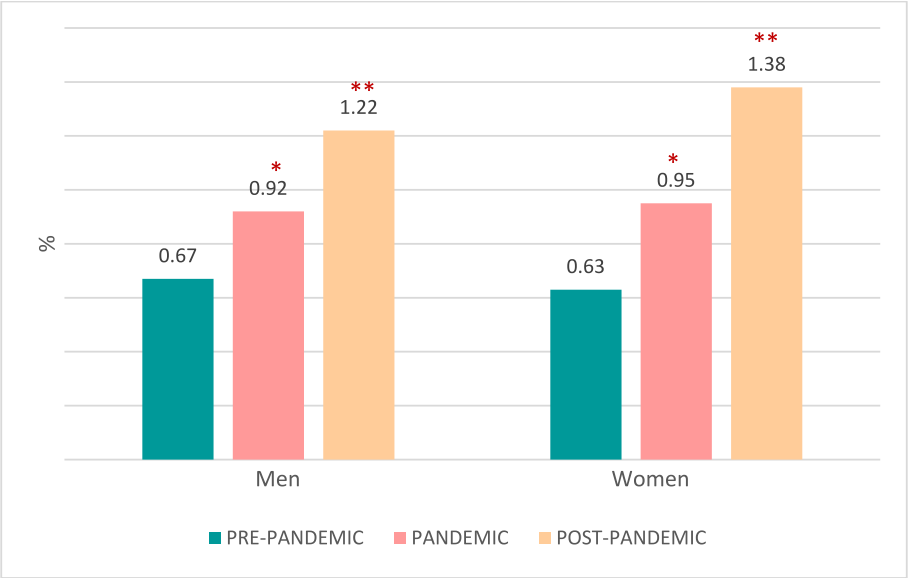


Fig. 2 Population (%) with new nicotine-related DUAD prescriptions by sex in each study period

On the other hand, new alcohol-related DUAD prescriptions generally decreased, though only significantly among individuals aged 61 to 80 during the PAN period (Fig. 4).

New Nicotine- or Alcohol-Related DUAD Prescriptions by Age and Sex

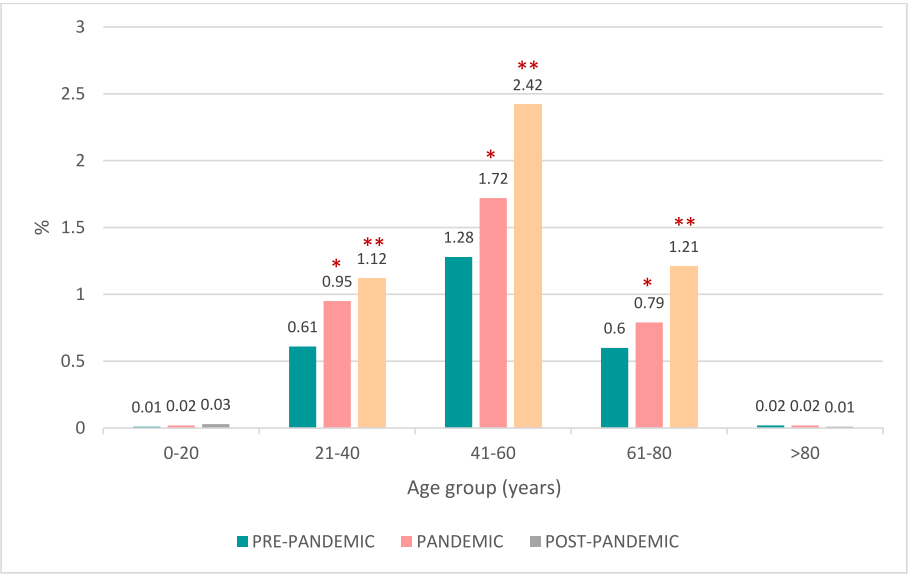
Comparing across the periods by age and sex subgroup, it was observed that the increase in new nicotine-related DUAD prescriptions during the **PAN** period was primarily driven by prescriptions among individuals over 20 years old (21–80 years) in both men and women. In contrast, in the POST period, the number of prescriptions increased significantly in women aged 40 to 80 years, while in men, the growth occurred mainly in the 41 to 60 age group (Table 3). The youngest (≤20 years) and oldest (>80 years) groups did not show any changes in new nicotine-related DUAD prescriptions over the three periods considered.

Further, a comparison of data across the periods by age and sex subgroup reveals that the decrease in new alcohol-related DUAD prescriptions during the PAN period was exclusively driven by prescriptions among men aged 61 to 80. In contrast, in the POST period, the number of new prescriptions compared to the PAN period remained nearly constant across all groups (Table 4).

Table 2 Distribution of new alcohol-related DUAD prescriptions by sex in each study period: pre-pandemic (PRE), pandemic (PAN), and post-pandemic (POST) (% of the population)

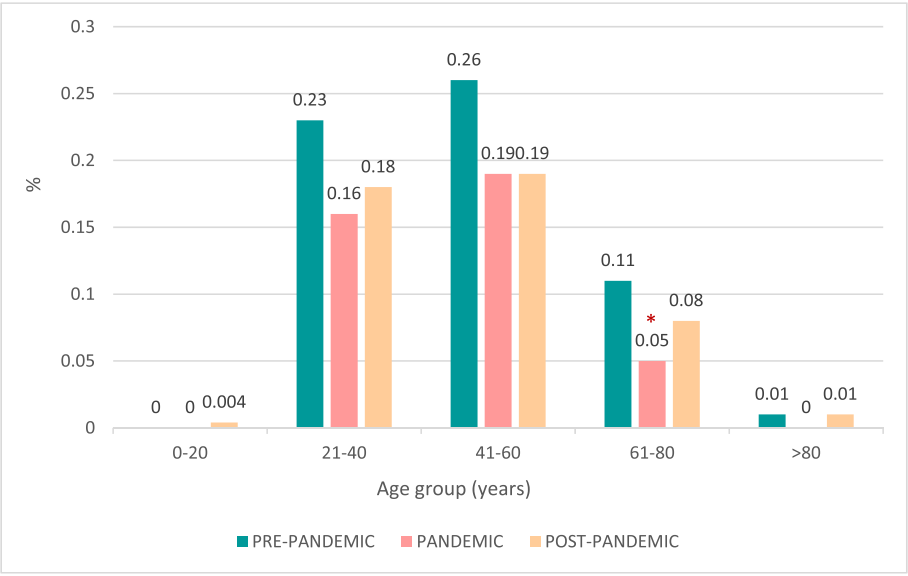
Sex	PRE 01/03/2018–28/02/2020		PAN 01/03/2020–28/02/2022		POST 01/03/2022–29/02/2024		PAN vs PRE	POST vs PAN
	N	%	*N*	%	*N*	%	OR[a] (95% CI[b]), Z (p)	OR (95% CI), Z (p)
	209		142		157			
Men	152	0.22	108	0.16	115	0.17	0.72 (0.56–0.92) Z = 2.599 (p = 0.009)	1.06 (0.81–1.38) Z = 0.416 (p = 0.677)
Women	57	0.09	34	0.05	42	0.07	0.61 (0.40–0.93) Z = 2.310 (p = 0.021)	1.23 (0.78–1.93) Z = 0.889 (p = 0.374)

[a]*OR* odds ratio, [b]*CI* confidence interval



Statistically significant difference between * PANDEMIC and PRE-PANDEMIC periods; ** POST-PANDEMIC AND PANDEMIC periods (* and ** indicate p-values < 0.05).

Fig. 3 Population (%) with new nicotine-related DUAD prescriptions by age group in each study period



Statistically significant difference between * PANDEMIC and PRE-PANDEMIC periods (*indicate p-values < 0.05).

Fig. 4 Population (%) with new alcohol-related DUAD prescriptions by age group in each study period

Table 3 Distribution of new nicotine-related DUAD prescriptions by sex and age subgroup in each study period: pre-pandemic (PRE), pandemic (PAN), and post-pandemic (POST) (% of population)

Age group (years)	Sex	PRE		PAN		POST		PAN vs PRE	POST vs PAN
		N	%	*N*	%	*N*	%	OR[a] (95% CI[b]) Z (p)	OR (95% CI) Z (p)
0–20	♂	1	0.01	2	0.02	1	0.01	2.03 (0.18–22.44) Z = 0.580 (p = 0.562)	0.49 (0.05–5.50) Z = 0.567 (p = 0.571)
	♀	1	0.01	3	0.03	6	0.05	3.08 (0.32–29.57) Z = 0.973 (p = 0.331)	1.99 (0.49–7.98) Z = 0.976 (p = 0.329)
21–40	♂	92	0.64	129	0.96	162	1.20	1.50 (1.15–1.96) Z = 2.950 (p = 0.003)	1.26 (0.99–1.59) Z = 1.937 (p = 0.053)
	♀	82	0.58	125	0.93	138	1.04	1.62 (1.23–2.15) Z = 3.399 (p < 0.001)	1.11 (0.87–1.42) Z = 0.863 (p = 0.388)
41–60	♂	267	1.25	359	1.69	495	2.32	1.36 (1.16–1.59) Z = 3.752 (p < 0.001)	1.38 (1.20–1.58) Z = 4.610 (p < 0.001)
	♀	282	1.33	366	1.75	535	2.53	1.31 (1.12–1.54) Z = 3.417 (p < 0.001)	1.46 (1.28–1.67) Z = 5.519 (p < 0.001)
61–80	♂	92	0.72	125	0.96	157	1.18	1.33 (1.02–1.75) Z = 2.078 (p = 0.038)	1.22 (0.97–1.55) Z = 1.677 (p = 0.094)
	♀	75	0.50	100	0.65	194	1.24	1.31 (0.97–1.77) Z = 1.770 (p = 0.076)	1.91 (1.50–2.44) Z = 5.254 (p < 0.001)
> 80	♂	2	0.06	1	0.03	1	0.03	0.51 (0.05–5.61) Z = 0.552 (p = 0.581)	1.02 (0.06–16.28) Z = 0.013 (p = 0.990)
	♀	0	0	1	0.02	0	0	1.02 (0.02–51.26) Z = 0.008 (p = 0.993)	3.01 (0.12–73.83) Z = 0.674 (p = 0.500)

[a]*OR* odds ratio, [b]*CI* confidence interval

Table 4 Distribution of new alcohol-related DUAD prescriptions based on sex and age group according to the study period (% of population)

Age group (years)	Sex	PRE		PAN		POST		PAN vs PRE	POST vs PAN
		N	%	*N*	%	*N*	%	OR[a] (95% CI[b]) Z (p)	OR (95% CI) Z (p)
0–20	♂	0	0	0	0	0	0	1.02 (0.02–51.27) Z = 0.009 (p = 0.993)	0.99 (0.02–50.32) Z = 0.001 (p = 0.999)
	♀	0	0	0	0	1	0.01	1.02 (0.02–51.65) Z = 0.012 (p = 0.990)	2.99 (0.12–73.43) Z = 0.671 (p = 0.502)
21–40	♂	52	0.36	38	0.28	36	0.27	0.78 (0.51–1.18) Z = 1.177 (p = 0.239)	0.95 (0.60–1.49) Z = 0.235 (p = 0.814)
	♀	14	0.10	5	0.04	13	0.10	0.38 (0.14–1.05) Z = 1.863 (p = 0.062)	2.62 (0.93–7.35) Z = 1.830 (p = 0.067)
41–60	♂	78	0.36	60	0.28	59	0.28	0.77 (0.55–1.08) Z = 1.502 (p = 0.133)	0.98 (0.68–1.40) Z = 0.118 (p = 0.906)
	♀	33	0.16	24	0.11	24	0.11	0.73 (0.43–1.24) Z = 1.158 (p = 0.247)	0.99 (0.56–1.75) Z = 0.032 (p = 0.974)
61–80	♂	21	0.17	10	0.08	20	0.15	0.47 (0.22–0.99) Z = 1.99 (p = 0.046)	1.95 (0.91–4.16) Z = 1.718 (p = 0.086)
	♀	0	0	5	0.03	3	0.02	0.49 (0.17–1.44) Z = 1.298 (p = 0.194)	0.59 (0.14–2.46) Z = 0.726 (p = 0.468)
> 80	♂	1	0.03	0	0	0	0	0.34 (0.01–8.32) Z = 0.663 (p = 0.508)	1.02 (0.02–51.32) Z = 0.009 (p = 0.993)
	♀	0	0	0	0	1	0.02	1.01 (p = 0.02–51.26) Z = 0.008 (p = 0.993)	3.01 (0.12–73.83) Z = 0.674 (p = 0.500)

[a]*OR* odds ratio, [b]*CI* confidence interval

Discussion

The findings reported in this paper provide preliminary evidence on how the COVID-19 pandemic and the post-pandemic period may have influenced new nicotine- or alcohol-related DUAD prescriptions within the public health system, although such effects are likely to have occurred to different extents. However, these results should be interpreted with caution, as it was not possible to control for multiple other factors that may have contributed to the observed trends. Specifically, our data suggest that during the peak of the pandemic, attempts to quit smoking increased compared to the pre-pandemic period, whereas alcohol-related DUAD prescriptions decreased significantly.

Overall, significantly fewer medications were prescribed for alcohol dependence even than before the pandemic, a pattern that continued in the 2 years following the pandemic.

Analyzing by age and sex, during the pandemic, an increase in new nicotine-related DUAD prescriptions was observed among 21- to 80-year-old men, while among women, the increase occurred in somewhat younger groups (21–60 years). During the post-pandemic period, new nicotine-related DUAD prescriptions continued to increase among men (41–60 years of age) and women (41–80 years of age). These data are in line with the survey conducted by the Spanish Observatory of Drugs and Addictions, according to which the consumption of tobacco, the second most consumed addictive substance in the country, decreased during the pandemic: 29.1% of respondents reported smoking before COVID-19 and 27.7% during the pandemic. (Llorens et al., 2021). This may be partly attributable to the increase in new nicotine-related DUAD prescriptions during the pandemic.

These patterns can be interpreted in light of existing literature indicating that older adults were more aware of their elevated health risks during the pandemic, especially concerning respiratory outcomes. This heightened risk perception may have encouraged smoking cessation initiatives, contributing to the observed increase in nicotine-related DUAD prescriptions among middle-aged and older adults. Conversely, younger groups may have experienced less risk perception or higher psychosocial stress, potentially limiting their engagement in quitting efforts.

Similarly, a study in England, which examined changes in smoking at the start of the pandemic using surveys in adults, found that there was a significant increase in the proportion of smokers who quit or tried to quit during lockdown (Jackson et al., 2021). This increase in new nicotine-related DUAD treatments may have been related to smokers' fear of the risk of developing severe COVID-19 symptoms due to smoking (Gülsen et al., 2020; Reddy et al., 2021), since contracting COVID-19 posed an added risk to the already known risks of tobacco use (Hernández-Pérez et al., 2021). Indeed, increased perceived susceptibility during the pandemic has also been associated with smoking cessation behaviors in other populations (Li et al., 2021), which is consistent with the constructs of the Health Belief Model. According to this theoretical framework, individual health behaviors are explained by people's beliefs about potential health threats and their perceptions of the benefits and barriers related to preventive actions. The model includes key constructs such as perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action (Rosenstock, 1966). This change in attitude towards tobacco could also be due to the lockdown encouraging healthy behaviors or changes in usual daily routines and social activities, providing an opportunity to change smoking behaviors (Reynolds et al., 2021).

The observed increase in demand for smoking cessation support may have led to a rise in new nicotine-related DUAD prescriptions, driven by the reduced availability of

face-to-face counseling and the limited access to community-based interventions and non-pharmacological therapies during the pandemic (Davies et al., 2022).

Some other studies have observed decreases in smoking during the first years of the COVID-19 pandemic in other populations (Koyama et al., 2021; Siddiqi et al., 2021), but until now, it has not been investigated whether this trend has continued over the years, as observed in our study. Notably, in 2024, when data collection for this study ended, tobacco consumption in Spain reached its lowest level ever, with 27.7% of the population having smoked in the last 12 months, a 32.3% decrease compared to 2020 (Brime et al., 2025, p. 20).

In the case of alcohol-related DUAD, it is noteworthy that men received more than twice as many new prescriptions as women in all three periods analyzed. This is consistent with the fact that a higher percentage of men drink alcohol than women (Ministry of Health of Spain, 2025), which explains their greater need for treatment for alcohol misuse.

During the pandemic, there was a significant decrease in new alcohol-related DUAD prescriptions, figures remaining stable in the post-pandemic period. The decline occurred primarily among older men (aged 61–80). This indicates that there was greater high-risk alcohol consumption during the pandemic in this population group, which is in line with the consumption patterns described by other authors concerning the pandemic (Ayyala-Somayajula et al., 2025; Capasso et al., 2021).

These data are in line with those of other authors who indicate an increase in the prevalence of high-risk alcohol consumption in the population during the lockdown and a reduction in efforts to tackle alcohol dependence (Sohi et al., 2022). Possible causes of this lack of interest in reducing alcohol consumption include stress and social isolation experienced during the pandemic (Tucker et al., 2022), an inability to access detoxification treatments due to the lockdown (Czeisler et al., 2020), as well as a greater stigma to ask for help. Other authors have also suggested that increases in alcohol consumption during the lockdown may be due to social distancing and isolation, as well as financial stress related to the pandemic (Nindenshuti & Caire-Juvera, 2023).

Further, people may have felt a need for escape during the pandemic attributable to various factors such as forced family time, loss of income, and loss of loved ones (Acuff et al., 2022; Vindegaard & Benros, 2020), factors which were also seen to increase the presence of anxious-depressive symptoms in the general population (Martinez-Cengotitabengoa et al., 2025). In other contexts, stress has been identified as a significant risk factor for the initiation and persistence of alcohol misuse (José et al., 2000; Uhart & Wand, 2009). Furthermore, our results are also consistent with the considerable increase in sales of alcoholic beverages during the pandemic (Kyaw Hla et al., 2021; Moskatel & Slusky, 2023). Alcohol often served as a way of coping with the socioeconomic changes experienced at an individual level during this period, including feelings of loneliness, social abandonment, and perception of physical vulnerability (Roberts et al., 2021).

The difference in tobacco and alcohol consumption patterns during and after the COVID-19 pandemic, with more people trying to stop smoking than tackle from alcohol dependence, might have been influenced by social media campaigns aimed at reducing smoking (Jackson et al., 2021), while no equivalent campaigns were conducted for alcohol at these times. On the other hand, it could also be attributed to high-risk drinkers being unaware of the harmful effects of alcohol during COVID-19, while smokers were fearful of the greater severity of the disease associated with smoking.

Our results provide population-based data to draw attention to the extent of harmful alcohol consumption during a lockdown, as occurred during the pandemic. Therefore, in such situations, it would also be useful to conduct information campaigns about the risks of

excessive alcohol consumption and about the resources available to drinkers who wish to reduce their alcohol consumption.

Understanding shifts in these types of lifestyle indicators is essential for ensuring that interventions aimed at improving the population's health are well designed. Furthermore, these data could help public health policy-makers formulate strategies to prevent short-, medium-, and long-term health impacts of lifestyle changes caused by critical public health situations such as the COVID-19 pandemic.

The patterns observed in our study underscore the critical need for integrated mental health and addiction services that are adaptable during public health crises. Enhanced information campaigns and easier access to pharmacological and psychosocial support should be prioritized to address substance use disorders effectively, especially targeting vulnerable age and sex groups. Moreover, understanding these dynamics can inform the development of preventive strategies aimed at mitigating the mental health consequences of similar future events, ultimately contributing to improved population mental health outcomes.

Limitations

Comparisons between the periods analyzed for new nicotine- and alcohol-related DUAD prescriptions should be interpreted with caution, especially regarding data collected during the initial lockdown periods of the pandemic, when in-person healthcare provision was interrupted and replaced by telecare in some cases. Despite this, we consider our results valid since we detected both an increase (in the case of nicotine dependence) and a decrease (in the case of alcohol dependence) in new DUAD prescriptions.

Over the long period analyzed there may have been safety advisories and shortages, although we do not have any information on this. These data could have influenced the study.

The prescription of the analyzed drugs may have been influenced not only by patient demand but also by other factors, such as healthcare system accessibility and clinicians' decision-making processes. However, these factors could not be controlled due to the study design.

An additional important limitation that affects the generalizability of our findings is the inability to relate the results to prevalence data on alcohol and tobacco consumption, as such information was not available for the analyzed population.

Further, our study records drug prescriptions issued within the system, but we have no evidence that patients have collected the medication, taken it, and ultimately stopped the harmful habit. We can only consider these data to be indicative of a patient's intention to stop smoking or tackle alcohol dependence.

Recommendations

Based on the experience gained during the pandemic, to prevent an increase in various types of addictions in the event of a future situation similar to that of the pandemic, affected people should be given easier access to both pharmacological treatments and other therapies to relieve anxiety and stress and avoid harmful behaviors such as self-medication with alcohol.

Intensifying information campaigns about the risks of excessive alcohol or tobacco consumption and about the resources available to drinkers and smokers who wish to reduce their alcohol or tobacco consumption may prove useful in future unprecedented events.

Likewise, in situations like the pandemic-related lockdown, more attention should be paid to certain age groups within the population, as our data suggest that men and women of different age groups do not have the same needs regarding tackling harmful tobacco or alcohol use.

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Data Availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Conflict of Interest B Calvo, M Sánchez-Martínez, A Sánchez-Martínez, C González, E Echevarría and M Martínez-Cengotitabengoa declare that they have no conflict of interest.

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