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ALCOHOLISM CLINICAL & EXPERIMENTAL RESEARCH

Convicted drinking and driving offenders: Comparing alcohol use before and after the pandemic outbreak

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Abstract

Background: Before the COVID-19 pandemic, very little was known about the impact of social isolation on individuals' alcohol use and misuse. This study examines how socially isolated individuals with a history of heavy drinking used alcohol during the pandemic.

Methods: Data for this study came from an add-on to the Managing Heavy Drinking (MHD) longitudinal study of drivers convicted of DWI that was conducted in Erie County, New York. Pre-COVID information (October 2019–March 2020) was augmented with a COVID-19 questionnaire collected between July and August 2020. A total of 92 participants completed the COVID-19 survey.

Results: The sample of problem drinkers showed a significant increase after the pandemic outbreak in the average number of drinking days from 1.99 to 2.49 per week ($p = 0.047$), but a significant decrease in the average number of drinks per drinking day, from 3.74 to 2.74 ($p = 0.003$). The proportion of individuals who drank more frequently was greater among those who, before the outbreak had an Alcohol Use Disorders Identification Test (AUDIT) score <8 (26% increase) compared with those with an AUDIT score of ≥8 (13%). Alcohol treatment was also associated with the frequency of drinking, with individuals who were not in alcohol treatment showing a 16% increase in frequency compared with a 10% increase among those in treatment. Further, individuals who, after the outbreak worried about their health (30%) or finances (37%) reported greater increases in the frequency of drinking than those who did not worry about their health (17%) or finances (10%).

Conclusions: Overall, the individuals in our sample showed small changes in the frequency andheaviness of drinking after the outbreak of COVID-19, effects that opposite in direction from one another and thus resulted in no overall change in drinks consumed. Nonetheless, we identified factors that influenced the effects of the pandemic on drinking behavior among individuals convicted of DWI, which emphasizes the need to individualize these individuals' treatment, particularly in the context of dramatic environmental change.

KEYWORDS
alcohol consumption, COVID-19, problem drinkers

INTRODUCTION

Large-scale disasters, whether natural or man-made, can have a significant impact on the mental health and substance use behaviors of those who experience the event (Kessler & Wittchen, 2008) (Blendon et al., 2004; DeWolfe et al., 2000). Even before the "severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)" (as the COVID-19 pandemic has been called by the International Committee on Taxonomy of Viruses (ICTV)) (WHO, 2020), research had already shown that individuals facing social isolation tend to display elevated rates of alcohol use and misuse (Niño et al., 2016; Osgood et al., 2014; Williams et al., 2015). The impact of extended isolation periods such as those imposed by the COVID-19 pandemic on alcohol use and misuse is less clear (Clay & Parker, 2020). Rehm and colleagues posited two possible scenarios, one predicting an increase in alcohol consumption for some populations, particularly men, due to the need to cope with the pandemic stress, while others postulated a reduction in drinking based on the decreased physical access to alcohol and financial resources to purchase alcohol (Rehm et al., 2020). A better understanding of this phenomenon is emerging. Data showed that Americans were increasingly buying and consuming alcohol, although not in public settings such as bars and restaurants, as these were shuttered due to the pandemic in many states (Wagner et al., 2020). Recent studies in the United States are showing an increase in alcohol use and abuse among adults since the outbreak (Lechner et al., 2020; Pollard et al., 2020; Thomas et al., 2020), with such behavior increasing with the duration of the isolation policies (Weerakoon et al., 2020).

The impact of the pandemic on people's mental and physical health varies across population groups according to their occupation (Gupta & Sahoo, 2020; Kumar & Nayar, 2020; Pappa et al., 2020), their age (Armitage & Nellums, 2020; Loades et al., 2020), gender (Dana et al., 2020; Gausman & Langer, 2020), and socioeconomic status (Naylor-Wardle et al., 2021; Thayer & Gildner, 2020). A group that may be facing specific challenges during the pandemic is composed of individuals with alcohol use disorders. These individuals were already facing alcohol-related problems even before the pandemic outbreak. Isolation and anxiety may have exacerbated mental health challenges and affected alcohol use during the pandemic. Some may have been receiving alcohol treatment before the outbreak and possibly at risk of suffering symptoms of withdrawal if they are forced to stop or reduce alcohol consumption (Marsden et al., 2020). Compounding these uncertainties are the individuals' attitudes and perceptions regarding the medical risks associated with the disease and the necessity of the COVID-19 containment measures, as they could affect their levels of anxiety, stress, depression, and subsequently alcohol use during the pandemic. Currently, there is little or no information on how these individuals manage/deal with their alcohol problems during the pandemic outbreak.

This study adds clarity to this picture by examining whether and how the COVID-19 outbreak induced changes in the drinking patterns in a group of individuals with a history of alcohol problems: Convicted DWI (Driving While Intoxicated) or DWAI (Driving while Ability Impaired) offenders in Erie County, New York. Individuals arrested for a DWI offense are convicted usually because of aggravating circumstances such as a high blood alcohol concentration (BAC) level or being repeated offenders; circumstances that tend to reveal drinking problems (Cavaiola et al., 2003; Fell et al., 2010; Lapham et al., 2012). The characteristics of DWI offenders and the severity of their alcohol problems vary, as DWI enforcement efforts and mandatory remedial programs vary across the country (Downs et al., 2017; Lapham et al., 2004; McCartt et al., 2018; Voas & Fell, 2011). By examining a population of convicted offenders, we aim to assess the behaviors of a group of individuals with a history of heavy drinking and alcohol problems as they transitioned to the constraints on access to alcohol and treatment imposed by the pandemic outbreak. In conducting this evaluation, this study accounts for elements and factors the literature suggests may have influenced individuals' drinking during the pandemic, including individuals' demographics and socioeconomic characteristics, the severity of the alcohol problem, being under alcohol treatment, and individuals' attitudes and perceptions toward the pandemic risks and its containment policies.

METHODS

Data

Data for this study came from an add-on survey of participants in the Managing Heavy Drinking (MHD) study conducted in Erie County, New York. The MHD is a 3-wave study of drivers convicted of a DWI or DWAI (Driving while ability impaired) with a focus on assessing the behavior of those sentenced to an interlock ignition device (IID) to prevent them from driving after consuming alcohol (Voas et al., 2010; Voas, 2020; Voas et al., 1999). Data collection for the MHD began in 2015 and was completed in March 2020. Participants in the main study responded to fliers specifically targeting DWI offenders. Recruitment fliers were distributed at impaired driving classes, victim impact panels, alcohol IID installation centers, substance abuse treatment facilities, and health centers. Participants were interviewed by trained research assistants at a university research center or in a mobile office, where computer surveys and interviews were completed. Three waves of surveys and interviews were conducted. The first interview was as close to conviction and IID installation as possible (for those who installed an IID), the second wave was approximately 12 months later (IID sentences are 12 months in New York State, although an early removal is possible at 6 months, and those participants were interviewed at removal). The final wave of interviews was collected 6–9 months after the second wave interview. Wave three data collection started in November 2017 and concluded in March 2020 just as New York State was entering into the pandemic lockdown.

After obtaining IRB approval, data for the current effort came from an online survey conducted in July–August 2020 from participants who had previously agreed to be contacted for additional studies. Participants are located in Erie County, New York, which

experienced initial COVID-19 statewide school closures on March 16, 2020, and on March 20, 2020, nonessential business shutdown with New York State on PAUSE (New_York_State, 2020). By leveraging information already collected by the MHD study before the pandemic outbreak with the additional information collected after the outbreak, this study presents a unique view of the impact of the pandemic on known heavy drinkers. A total of 184 MHD eligible participants were invited to complete a short 15-minute Survey Monkey survey for a $15 Amazon gift code. A total of 92 MHD participants completed a COVID survey. The survey asked participants to report on their experiences from the beginning of the shutdowns (Mid-March 2020) through the time they took the survey (July/August 2020).

Measures

COVID-19 Experience and Attitudes toward COVID-19 containment policies

We asked whether either the participant and/or a friend or family member had experienced the virus, as well as their opinion about the necessity of the following containment policies (the closing of nonessential business, wearing a mask in public, keeping social distance in public). Participants were asked to indicate whether they thought each of these policies was necessary but excessively strict; necessary and fair; neither necessary nor unnecessary; unnecessary because too strict; and completely unnecessary. For analytical purposes, we collapsed the three variables into a single variable denoting whether they believed the three containment policies were "necessary," or whether at least one of them was too strict or unnecessary.

Concerns about health

Participants were asked whether because of COVID-19, they were concerned about their health, as well as the health of their family or friends. A dichotomous variable was used, indicating whether participants responded "Yes" or "No" to this question.

Concerns about finances

A dichotomous variable denoting whether COVID-19 has increased participants' concern about their finances.

Working status after the pandemic outbreak

The following questions were used to create this variable: Are you currently working? To those who responded "Yes," we asked to indicate whether they were working from home; at their regular worksite; at an alternative worksite; at a hospital; at a medical facility; at an essential store (e.g., grocery); or at an essential business. To those who responded "No," we asked to indicate whether they had been laid off; furloughed; or had not been working even before the stay-at-home order. The answers to these questions were used to create a four-level variable denoting whether the participant: (1) had been unemployed or on disability since before the outbreak; (2) was furloughed or laid off; (3) worked from home; or (4) worked in some other location.

Alcohol use

Both at wave 3 of the MHD and for this study, participants were asked: (a) In the past 30 days, on about how many days did you have a drink containing alcohol? and (b) How many beverages do you have on average on each drinking day? The resulting participants' *mean number of drinking days per week* and *mean number of drinks per drinking day* were multiplied to compute the participants' *mean number of drinks per week*.

Drinking location before the outbreak

For those who used to drink at bars, shifting their drinking to at home may have had been more stressful than those who had already been doing most of their drinking at home. To account for this possibility, we created a dichotomous variable indicating whether before the outbreak, most of the participants' drinking had been done at home or elsewhere.

Severity of the alcohol problem before the outbreak

At wave 3 of the MHD study, participants were assessed by the Alcohol Use Disorders Identification Test, or AUDIT (Saunders et al., 1993). As indicated by Saunders and colleagues, scores of 8 and above indicate harmful use. Thus, we operationalized this variable by grouping individuals in two groups: those with a score <8 and with a score of 8+.

Alcohol treatment during the outbreak

A dichotomous variable denoting whether participants were receiving any form of alcohol treatment during the pandemic.

Analyses

We first conducted bivariate analyses comparing the preoutbreak and postoutbreak mean number of drinking days per week; the number of drinks per drinking day; and the number of drinks per

week. We made these comparisons for each of the factors listed above (e.g., sex, age, AUDIT score). Repeated-measures ANOVA was used to assess these comparisons, for this procedure accounts for the repeated measurement of the alcohol measures (i.e., each measure was collected from each participant at two times, before and after outbreak). We also conducted paired t-tests to assess changes in the alcohol measures at each level of the contributing factor. To account for the multiple comparisons, a Bonferroni correction was applied to assess the significance of the resulting *p* values. Next, we conducted regression analyses (generalized linear model, GLM) to model the contribution of the variables identified by the bivariate analyses as potential contributors to changes in the dependent variables: (1) the number of drinking days, (2) the number of drinks per drinking day, and (3) the total number of drinks per week before and after the pandemic. Each dependent variable in the GLM models was operationalized as a change, obtained by subtracting the value of the variable before the outbreak from the value of the variable after the outbreak. As such, a positive/negative value in the alcohol measure denotes an increase/decrease after the outbreak. Main effects as well as dual interactions were estimated. Main effects included in the model are all factors that tested as significant in the bivariate analyses. The relatively small sample size made it unadvisable to include all possible dual interactions in each model. Hence, to preserve degrees of freedom, the interactions that were included in the model were selected after running a separate stepwise regression. To assess the relative contribution of each factor and interactions to the dependent variable, we estimated both statistical significance and effect size (partial Eta).

RESULTS

Most participants (78.3%) had no experience with COVID-19 (i.e., no personal experience or knowledge of friends or family having either the symptoms or tested positive for COVID-19). The large majority of participants viewed the COVID-19 isolation policies as necessary (closing of nonessential business, 68.5%; wearing masks in public, 72.8%; social distancing, 80.2%). However, a sizable number of participants considered these three policies as unnecessary (22.8%, 18.5%, and 9.9%, respectively). Participants' age ranged between 22 years old and 71 years old, with a mean of 38.4 years old. Of the 92 participants, 88 provided information on their sex. Of them, about 49% (N = 43) were female and 51% (N = 45) males. About 23.1% of the sample report being laid off or furloughed after the outbreak; another 25.3% worked from home, and 41.8% had to work outside their homes. These percentages become 25.6%, 28.0%, and 46.3%, if only individuals who were employed at the time the pandemic started were considered. Of the 86 participants who provided information about their race and ethnicity, the large majority (83%, N = 71) reported being White, and the remaining (17%, N = 15) were of different racial/ethnic groups. Approximately half of the participants had earned an associate or bachelor's degree (N = 46, about 50%). About 79% (N = 70) of the participants were employed for wages before the pandemic outbreak, 9% (N = 8) were self-employed, 6% (N = 5) were unemployed, and 5% (N = 4) were retired or on disability. To assess the representativeness of the sample, we compared these variable distributions with those based on the full sample of the MHD study population and found no significant difference. To further assess the representativeness of the sample, we compared percentage of individuals with an 8+ AUDIT score in the sample and the whole MHD study population and no significant difference was found.

Alcohol use: bivariate analyses

Table 1 shows that for our sample of problem drinkers there was no significant overall change in their drinking after the outbreak, as the average number of drinks per week remains between 9.46 and 9.83 per week, $F(1) = 0.23$; $p = 0.65$. However, hidden in this overall finding is that the two components of this measure worked in opposite directions: There was a significant increase in the participants' average number of drinking days per week after the outbreak, from 1.99 to 2.49, $F(1) = 4.06$; $p = 0.047$, but a significant decrease in the average number of drinks on drinking days, from 3.74 to 2.74, $F(1) = 9.47$; $p = 0.003$.

The results of the ANOVA analyses show that number of drinking days was not significantly different between males and females, $F(1) = 0.5$; $p = 0.48$, with the increase in drinking days being significant for participants of both sexes, $F(1) = 4.01$; $p = 0.048$. The ANOVA results also show that compared with females, males had more drinks per drinking day, although this difference was significant only at, $F(1) = 3.48$; $p = 0.066$. There was an overall association between participants' sex and a reduction in drinking days, $F(1) = 9.6$; $p = 0.003$, after the outbreak, but this reduction was significant only among males, from 4.36 to 3.07, $t(40) = -1.39$; $p = 0.005$, at the Bonferroni-corrected $\alpha = 0.01/2 = 0.005$. Reflecting once more the opposite direction of the increase in drinking days and the decrease in drinks per drinking day, there was no significant association between the resulting number of drinks per week and participants' sex.

The number of drinking days, drinks per drinking day, and drinks per week did not vary significantly among three age-groups, ages 22–9, ages 30–39, and 40+), $F(2) = 0.32$, $p = 0.69$; $F(2) = 1.96$, $p = 0.150$; and $F(2) = 0.63$, $p = 0.53$, respectively. However, the increase in drinking days was significant only among participants aged 22–29, from 1.89 to 3.11, $t(18) = -3.49$, $p = 0.003$, and those aged 30–39, from 1.52 to 2.36, $t(4) = -3.06$, $p = 0.005$. Participants aged 40+ showed no significant change in the number of drinking days after the outbreak. Those in the age-group 40+ also showed a significant decrease in the number of drinks per drinking day, from 3.79 to 2.39, $t(37) = 2.82$. $p = 0.008$. The resulting number of drinks per week showed no significant change.

Those who used to do most of their drinking at home before the outbreak reported significantly more drinking days (1/2 (2.85 + 3.11) = 2.98) than those who did most of their drinking outside their home (1.70), $F(1) = 12.3$, $p = 0.001$. After the outbreak, the

TABLE 1 Mean Number of Drinking Days (per week), Mean Number of Drinks (on drinking days), and Mean Number of Drinks (per week) before and during the pandemic outbreak

				Before		After		ANOVA		*P t*-test
								Factor	Before–After	Before–After
Factor		*N*	Outcome	Mean	SD	Mean	SD	*p* value	*p* value	*p* value
All Participants		82	Drinking Days (week)	1.99	1.76	2.49	2.35		0.0471	
			Number Drinks (day)	3.74	2.81	2.74	2.53		0.0029	
			Total Drinks (week)	9.46	14.16	9.83	13.42		0.6351	
Sex	Females	41	Drinking Days (week)	2.12	1.97	2.63	2.36	0.4819	0.0485	0.1723
	Males	41		1.87	1.54	2.34	2.35			0.1543
	Females	41	Number Drinks (day)	2.83	1.66	2.41	1.92	0.0657	0.0027	0.2575
	Males	41		4.36	3.44	3.07	3.01			0.0048
	Females	41	Total Drinks (week)	7.26	9.69	9.49	11.53	0.3782	0.6228	0.0758
	Males	41		11.60	17.31	10.17	15.22			0.6668
Age	Age 22–29	15	Drinking Days (week)	1.89	1.33	3.11	2.28	0.6947	0.0075	0.0026
	Age 30–39	25		1.52	1.33	2.56	2.31			0.0054
	Age 40+	38		2.36	2.11	2.13	2.40			0.5999
	Age 22–29	15	Number Drinks (day)	4.42	3.54	3.84	2.39	0.1480	0.0068	0.1479
	Age 30–39	25		3.13	1.73	2.44	2.08			0.1839
	Age 40+	38		3.79	2.93	2.39	2.77			0.0076
	Age 22–29	15	Total Drinks (week)	10.63	13.84	13.68	12.59	0.5351	0.3741	0.2185
	Age 30–39	25		6.18	9.79	9.44	12.29			0.0293
	Age 40+	38		11.03	16.57	8.16	14.44			0.4194
Before the outbreak: most frequent drinking location	Home	36	Drinking Days (week)	2.85	2.05	3.11	2.57	0.0008	0.0603	0.5714
	Other	45		1.36	1.12	2.04	2.06			0.0091
	Home	36	Number Drinks (day)	3.71	2.58	2.72	2.46	0.8689	0.0027	0.0525
	Other	45		3.60	2.99	2.82	2.61			0.0194
	Home	36	Total Drinks (week)	12.66	17.45	12.78	17.62	0.0502	0.6502	0.8753
	Other	45		7.08	10.45	7.69	8.41			0.5058

(Continues)

TABLE 1 (Continued)

				Before		After		ANOVA		P t-test
								Factor	Before–After	Before–After
Factor		N	Outcome	Mean	SD	Mean	SD	p value	p value	p value
Before the outbreak: audit score	<8	67	Drinking Days (week)	1.75	1.59	2.30	2.20	0.0161	0.2209	0.0335
	8+	15		3.10	2.09	3.33	2.85			0.7535
	<8	67	Number Drinks (day)	2.69	1.47	2.13	1.73	<0.0001	<0.0001	0.0380
	8+	15		7.53	3.72	5.47	3.64			0.0323
	<8	67	Total Drinks (week)	5.38	5.79	7.33	8.42	<0.0001	0.3619	0.0240
	8+	15		26.87	23.77	21.00	23.33			0.4150
After the outbreak: in alcohol treatment	Yes	10	Drinking Days (week)	3.30	3.06	1.40	2.95	0.8351	0.1231	0.1468
	No	72		1.81	1.44	2.64	2.23			<0.0001
	Yes	10	Number Drinks (day)	4.00	3.89	1.10	2.33	0.5261	0.0001	0.1259
	No	72		3.56	2.69	2.97	2.49			0.0106
	Yes	10	Total Drinks (week)	21.13	28.99	7.70	16.32	0.1690	0.0630	0.3607
	No	72		8.14	11.04	10.13	13.08			0.0561
After the outbreak: job status	Retired//Unemployed/Dis	8	Drinking Days (week)	3.63	2.72	2.38	3.16	0.2197	0.3617	0.4011
	Work from home	22		1.50	1.26	2.55	2.34			0.0298
	Work outside home	33		1.62	1.58	2.21	2.13			0.0040
	Furloughed/Laid off	18		2.44	1.65	3.06	2.48			0.3313
	Retired//Unemployed/Dis	8	Number Drinks (day)	4.25	2.68	1.63	2.07	0.2510	0.0006	0.0480
	Work from home	22		2.80	1.67	2.09	1.72			0.0750
	Work outside home	33		3.39	2.81	3.06	2.91			0.2897
	Furloughed/Laid off	18		4.59	3.65	3.22	2.56			0.1487
	Retired//Unemployed/Dis	8	Total Drinks (week)	18.42	12.73	6.50	9.74	0.1476	0.4854	0.1588
	Work from home	22		4.57	3.69	8.23	9.42			0.0404
	Work outside home	33		7.27	11.17	10.12	16.74			0.0382
	Furloughed/Laid off	18		15.56	22.68	12.89	12.77			0.7447

(Continues)

TABLE 1 (Continued)

				Before		After		ANOVA		*P t*-test
								Factor	Before–After	Before–After
Factor		*N*	Outcome	Mean	SD	Mean	SD	*p* value	*p* value	*p* value
After the outbreak: perceived need of COVID containment measures	Not Necessary	15	Drinking Days (week)	1.54	1.33	1.77	1.96	0.2212	0.1050	0.1204
	Necessary	77		2.10	1.79	2.62	2.46			0.1014
	Not Necessary	15	Number Drinks (day)	3.73	2.99	2.50	2.35	0.9174	0.0137	0.1451
	Necessary	77		3.54	2.75	2.65	2.50			0.0098
	Not Necessary	15	Total Drinks (week)	6.96	7.24	6.38	9.71	0.3759	0.7024	0.7328
	Necessary	77		9.85	14.84	10.12	13.56			0.6935
After the outbreak: worried about health	No	48	Drinking Days (week)	1.94	1.57	2.43	2.46	0.9378	0.0482	0.0644
	Yes	44		2.10	1.91	2.56	2.37			0.3260
	No	48	Number Drinks (day)	3.65	3.00	2.77	2.79	0.5395	0.0027	0.0431
	Yes	44		3.49	2.54	2.47	2.05			0.0287
	No	48	Total Drinks (week)	9.86	13.28	9.78	14.80	0.6566	0.6379	0.6624
	Yes	44		8.90	14.72	9.35	11.15			0.7992
After the outbreak: worried about finances	No	41	Drinking Days (week)	1.79	1.38	2.66	2.41	0.6477	0.0146	0.0034
	Yes	46		2.18	1.91	2.50	2.47			0.3892
	No	41	Number Drinks (day)	3.61	3.29	3.00	2.93	0.5934	0.0061	0.0683
	Yes	46		3.41	1.84	2.52	1.99			0.0385
	No	41	Total Drinks (week)	9.07	13.04	10.50	15.58	0.7936	0.1181	0.3296
	Yes	46		8.36	9.65	9.65	11.25			0.2155

Note: "N" shows only participants with full information for the paired analyses (i.e., both before and after the outbreak). ANOVA estimates were based on a repeated observations model, where the repeated measures were those taken before the outbreak and after the outbreak on each participant. Paired t-test (paired within participant) was used to test differences at each factor level. Because paired t-tests were conducted after the repeated-measures ANOVA test, significance of the paired t-test were assessed by comparing the p values in the table with Bonferroni-adjusted significance levels (e.g., by using $\alpha = 0.05 / 2$; or $\alpha = 0.05 / 3$ rather than $\alpha = 0.05$ when comparisons are made within a two-level or three-level factor, respectively).

TABLE 2 Outcome of the general linear model regressions modeling change in drinking days (model 1), change in drinks per day (model 2), and change in number of drinks per week after the outbreak.

	Model 1 = Drinking Days			Model 2 = Drinks per Drinking Day			Model 3 = Number of Drinks per Week		
	Coefficient	Pr > |t|	Partial Eta-Square	Coefficient	Pr > |t|	Partial Eta-Square	Coefficient	Pr > |t|	Partial Eta-Square
Main effects									
Intercept	1.617	0.126		−0.363	0.687		2.046	0.705	
Sex: Female	0.430	0.403	0.011	1.031	0.024	0.035	2.184	0.408	0.011
Sex: Male (Ref)									
Age: 22–29	0.329	0.637	0.014	0.062	0.922	0.056	0.260	0.942	0.005
Age: 30–39	0.511	0.359		0.119	0.810		1.488	0.596	
Age: 40+ (Ref)									
Before the Outbreak: Most drinking at home	0.007	0.988	0.000	0.382	0.404	0.000	2.318	0.366	0.014
Before the Outbreak: Most drinking outside home (ref)									
Before the Outbreak: AUDIT Score 8+	0.584	0.376	0.012	−0.465	0.422	0.001	1.983	0.554	0.010
Before the Outbreak: AUDIT Score <8 (ref)									
After the outbreak: in alcohol treatment	−2.503	0.009	0.105	−1.745	0.076	0.010	−4.263	0.438	0.000
After the Outbreak: Not in Alcohol Treatment (Ref)									
After the Outbreak: COVID Containment Policies Unnecessary	−0.037	0.961	0.000	−0.101	0.878	0.004	−0.444	0.908	0.120
After the Outbreak: COVID Containment Policies: Necessary (Ref)									
After the Outbreak: Unemployed (Since Before the Outbreak)	−2.199	0.022	0.108	−1.650	0.077	0.079	−13.080	0.015	0.281
After the Outbreak: Work (from home)	−0.375	0.609		−0.614	0.341		0.335	0.928	
After the Outbreak: Work (outside home)	−1.178	0.089		−0.181	0.761		−1.186	0.735	
After the Outbreak: Furloughed/laid off (Ref)		.			.			.	
After the Outbreak: Worried about Finances	−0.520	0.271	0.019	−0.308	0.477	0.170	−1.138	0.638	0.004
After the Outbreak: Not worried about Finances (Ref)		.			.			.	
After the Outbreak: Worried about Health	−0.337	0.500	0.007	−0.278	0.542	0.039	0.064	0.980	0.000

(Continues)

TABLE 2 (Continued)

	Model 1 = Drinking Days			Model 2 = Drinks per Drinking Day			Model 3 = Number of Drinks per Week		
	Coefficient	Pr > |t|	Partial Eta-Square	Coefficient	Pr > |t|	Partial Eta-Square	Coefficient	Pr > |t|	Partial Eta-Square
After the Outbreak: Not worried about Health (Ref)		.			.			.	
Significant Interactions									
Age: 22–29 * Work (from home)	4.034	0.040							
Age: 22–29 * Work (outside home)	3.809	0.010	0.241						
Age: 30–39 * Work (from home)	4.928	<0.0001							
Age: 30–39 * Working (outside home)	2.790	0.031							
Worried about Finances * Unemployed (Since Before the Outbreak)				−5.078	0.003				
Worried about Finances * Work (from home)				−4.848	<0.0001	0.282			
Worried about Finances * Work (outside home)				−4.503	<0.0001				
Worried about Healthcare* Before the Outbreak: Most drinking at home							−12.893	0.009	0.112

Note: Main effects and interactions were estimated in separate models (a model with only main effects, another with main effects and interactions). Only significant interactions are shown The term (ref) denotes the reference level. Partial Eta square indicates the effect size associated with each factor.

number of drinking days increased only for those who used to drink outside their homes, from 1.36 to 2.04, $t(44) = -2.73$, $p = 0.009$, likely because those who before the outbreak did most of their drinking at home were already drinking more days a week than those who used to drink outside the home.

Compared with those who scored 8 or less in the AUDIT assessment, those who scored 8+ reported more drinking days, 3.22 vs. 2.02, $F(1) = 6.04$, $p = 0.02$, more drinks per drinking day, 6.50 vs. 2.41, $F(1) = 56.3$, $p < 0.001$, and more drinks per week, 23.93 vs. 6.35, $F(1) = 37.7$, $p < 0.001$. Although both groups showed a reduction in the number of drinks per drinking day ($p < 0.001$), those with an AUDIT score less than 8 showed a larger increase in drinking days after the outbreak, from 1.75 to 2.30, $t(66) = -2.17$, $p = 0.035$, although the difference was not significant after the Bonferroni collection (corrected $\alpha = 0.05/2 = 0.025$).

Only 12% of participants ($N = 10$) were in alcohol treatment after the outbreak. Before the outbreak and compared with those who were not in treatment, those in alcohol treatment had a larger number of drinking days (3.30 vs. 1.81), drinks per drinking day (4.00 vs 3.56), and number of drinks per week (21.13 vs. 8.14). After the outbreak however, the direction of these comparisons reversed, with those in treatment showing fewer drinking days (2.30 vs. 3.33), drinks per drinking day (2.13 vs. 5.47), and number of drinks per week (7.70 vs. 10.13) than those who were not in treatment. These reversals occurred largely because after the outbreak, those who were not in treatment showed an increase in drinking days (from 1.81 to 2.64, $t(73) = 2.79$, $p < 0.001$) while those in treatment showed no significant change after the outbreak, $t(9) = 1.59$, $p = 0.15$. Both, those in treatment and those who were not in treatment showed a decrease in the number of drinks per drinking day after the outbreak, but none of these changes were statistically significant. The lack of significance involving before–after comparisons for those in treatment may reflect the small sample size ($N = 10$). A post hoc power analysis indicated a power = 19% to detect a 5% significance in these comparisons.

ANOVA also shows that overall, participants' job status after the outbreak was not significantly associated with changes in the number of drinking days, $F(1) = 0.84$, $p = 0.36$) or number of drinks per week, $F(1) = 0.49$, $p = 0.48$).

Most participants ($N = 77$, 84%) viewed the pandemic containment and mitigation policies as necessary. About 16% ($N = 15$) viewed them as unnecessary or too strict. Those who viewed these policies as necessary showed a steeper decrease in the number of drinking days after the outbreak, from 3.54 to 2.65, $t(68) = 2.66$,

$p = 0.009$, Bonferroni-corrected $\alpha = 0.025$) than those who considered the containment polices as too strict and/or unnecessary.

There was a balanced proportion of participants who worried about their health as a result of the pandemic (52%, $N = 48$) and those who did not worry (48%, $N = 44$). No clear association between participants' concern about their health and changes in the number of drinking days or in number of drinks per drinking day after the outbreak was detected.

There also was a balanced proportion of participants who were worried about their financial health as a result of the pandemic (53%, $N = 46$), and those who were not (47%, $N = 41$). Compared with those who after the outbreak became concerned for their finances, those who were not concerned about their finances reported a lower number of drinking days per week before the outbreak (1.79 vs. 2.18), but a larger increase after the outbreak (from 1.79 to 2.66, $t(35) = -3.14$, $p = 0.003$, Bonferroni-corrected $\alpha = 0.025$), compared with from 2.18 to 2.50, $t(41) = -0.87$, $p = 0.39$.

Changes in alcohol use: multivariate regression

Table 2 shows the outcome of the regression modeling changes in drinking days, in the number of drinks per drinking day, and in the number of drinks per week from before the outbreak to after the outbreak.

Individuals in alcohol treatment were less likely to increase the number of drinking days ($p = 0.009$) after the outbreak. Changes in the number of drinks per drinking day after the outbreak were not significant. Compared with participants with were furloughed or laid off after the outbreak, those who had been unemployed or retired since before the outbreak showed a reduced number of drinking days ($p = 0.02$) and number of drinks per week ($p = 0.015$) than after the outbreak.

Females who were worried about finances were more likely to increase the number of drinks per drinking day after the outbreak than males who did not worry about finances ($p < 0.001$). Those who were laid off and worried about finances were more likely to increase the number of drinks per drinking day after the outbreak than individuals who were worried by their finances but had been unemployed or retired before the outbreak ($p = 0.003$), worked from home ($p < 0.001$), or worked outside their homes ($p < 0.001$).

With regard to the total number of drinks per week, only two interactions but no main effect tested as significant ($p < 0.01$). This result reflects the crossover effect of the two components of this measure, with the change in the number of drinking days going up, and the number of drinks per drinking day going down after the outbreak. Being in alcohol treatment was particularly effective in preventing increases in total number of drinks per week among individuals who already had not been working when the outbreak started ($p < 0.001$). Those who were worried about their health and worked from home were less likely to increase the total number of drinks per week than their counterparts who were not concerned for their health and were furloughed or laid off ($p = 0.009$).

Finally, by estimating variables' effect size, the partial Eta^2 statistic helps identify the main factors behind the observed changes in the alcohol measure. The variables identifying participants' job status and participants worried about their finances showed the largest effect size. The interaction between participants' job status and participants' age showed the largest effect size ($Eta^2 = 0.24$) among the factors explaining the number of drinking days. Job status showed the largest effect size ($Eta^2 = 0.28$) among the factors explaining the number of drinks per week.

DISCUSSION

To our knowledge, this is one of the first studies that looks at the impact of the COVID-19 pandemic on the use of alcohol by a group of individuals who have already shown problems associated with alcohol use. Furthermore, this study is the first to assess how the pandemic has impacted the alcohol use of individuals arrested and convicted for DWI. As such, the population under study is a sample similar to the more than 1.4 million Americans (based on 2010 data) who are arrested annually for DWI/DUI in the United States (Chambers et al., 2017).

Recent reports are showing that due to the stress caused by the pandemic risks and the isolation policies, many Americans have increased their consumption of alcohol after the pandemic outbreak (Lechner et al., 2020; Pollard et al., 2020; Thomas et al., 2020; Wagner et al., 2020; Weerakoon et al., 2020). One of the main findings of this study is that our sample of problem drinkers did not alter the number of drinks they consumed each week after the outbreak. They kept drinking an average of between 9.46 drinks/week and 9.83 drinks/week. Hidden behind this, overall results are variations in patterns of alcohol use; although the mean number of drinks per week remained unchanged, participants increased the number of days they drank, but drank less per drinking day. The reasons for these behaviors are unclear. The increase in drinking days after the outbreak could be related to participants spending more time at home, with less need to drive, and the stress associated with social isolation (Niño et al., 2016; Osgood et al., 2014; Williams et al., 2015), but it is unclear why the number of drinks per drinking day decreased after the outbreak.

It is possible that the noted decrease in the number of drinks per drinking day relates to financial hardship, with participants rationing their beverages over an extended number of days. This possibility however is highly speculative and in need of examination. Our analyses showed that worries about finances and job status after the outbreak are two of the variables explaining most of the changes in the number of drinks per drinking day. The interaction between these two factors had the largest effect size in our models. Based on these findings, we speculate that for our sample of individuals with a history of problem drinking, the stress caused by the pandemic and isolation induced them to augment the number of days they drink, but the stress caused by the financial hardships after the outbreak limited their access to alcohol or ability to increase the amount of alcohol purchased. This resulted in our sample of problem drinkers

continuing to consume the same amount of alcohol weekly as they were consuming before the outbreak.

Also hidden in this global result is that there are variations in patterns of alcohol use among study participants. Our sample of problem drinkers is not homogeneous in their responses to the stress caused by the pandemic. One of the main findings of this study is that being in alcohol treatment ameliorates the influence that the pandemic outbreak may have on increasing alcohol use. This finding is particularly interesting given the characteristics of the population under study. Because they have experienced a DWI-related arrest, the population under study not only has demonstrated having alcohol-related problems, but also has experienced some of the consequences caused by their alcohol use. For many, being arrested and convicted of a DWI offense triggers a positive response per se, inducing an immediate reduction in alcohol use after the arrest and conviction (Voas et al., 2020). The effectiveness of this phenomenon (i.e., the reduction in alcohol use caused by the DWI arrest and conviction) however, does not apply equally to all DWI offenders. For many, such a decrease in alcohol use after the arrest does not occur. Most individuals in the sample were subject to other alcohol interventions after the arrest, including the imposition of an IID. Although on average, IID interventions do not alter the users' amount of drinking (Marques et al., 2010; Voas, 2014), some IID users do reduce their drinking while under IID-imposed restricted driving (Scherer et al., 2020). Furthermore, some convicted DWI offenders were also mandated (or decided) to enroll in some form of alcohol treatment while on an IID, with some of such treatments proven effective to reduce DWI recidivism even after the IID is removed (Voas et al., 2016). Thus, our finding that those in alcohol treatment were the most likely to avoid increases in alcohol use after the outbreak emphasizes the importance for this group of problem drinkers to receive proper treatment for their addiction. This is highly relevant to ongoing debates about the need for developing and implementing effective telehealth approaches that could be delivered under severe restrictions such as those imposed by the COVID-19 pandemic, as well as in situations in which those in need of treatment face extreme access impediments.

Despite being informative and novel, this study faces several limitations. Data were collected electronically under prevailing social distance containment protocols. The impact of this approach on the veracity of the data collected is unclear. All information was self-reported. It is possible that some participants were not truthful or had recollection errors in their responses. However, all participants had previously participated in several waves of the MHD study and had already experienced and received assurances of privacy and confidentiality of their data, which we believe should have induced participants to be truthful in their responses.

Another limitation of this study is its generalizability, in particular regarding the validity of the study findings to other types of problem drinkers than the group of DWI offenders that we analyzed. At a minimum however, the findings of this study should be useful for researchers and policy makers interested in increasing the effectiveness of interventions directed to DWI offenders in general, and in particular for situations in which access to those interventions is difficult. Similarly, this study focuses on the events that occurred during the initial and crucial stages of the COVID-19 pandemic, and therefore, the results may not be generalizable to other situations. The findings of this study however would not only be relevant to any future pandemic occurrence, but also to situations in which a group of heavy drinkers find restrictions in their access to proper treatment.

CONFLICT OF INTEREST

The authors have no conflicts of interest.

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REFERENCES

Armitage, R. & Nellums, L.B. (2020) COVID-19 and the consequences of isolating the elderly. *The Lancet Public Health*, 5, e256.

Blendon, R.J., Benson, J.M., Desroches, C.M., Raleigh, E. & Taylor-Clark, K. (2004) The public's response to severe acute respiratory syndrome in Toronto and the United States. *Clinical Infectious Diseases*, 38, 925–931.

Cavaiola, A.A., Strohmetz, D.B., Wolf, J.M. & Lavender, N.J. (2003) Comparison of DWI offenders with non-DWI individuals on the MMPI-2 and the Michigan Alcoholism Screening Test. *Addictive Behaviors*, 28, 971–977.

Chambers, M., Liu, M. & Moore, C. (2017). Drunk driving by the numbers [Online]. https://www.bts.gov/archive/publications/by_the_numbers/drunk_driving/index#:~:text=An%20estimated%204%20million%20U.S.,million%20alcohol%2Dimpaired%20driving%20episodes.&text=Among%20major%20crimes%2C%20driving%20under,million%20DUI%20arrests%20in%202010. [Accessed November 20, 2020 2020].

Clay, J.M. & Parker, M.O. (2020) Alcohol use and misuse during the COVID-19 pandemic: A potential public health crisis? *The Lancet Public Health*, 5, e259.

Dana, P.M., Sadoughi, F., Hallajzadeh, J., Asemi, Z., Mansournia, M.A., Yousefi, B. et al. (2020) An insight into the sex differences in COVID-19 patients: What are the possible causes? *Prehospital and Disaster Medicine*, 35, 438–441.

Dewolfe, D.J., Nordboe, D. & Center for Mental Health Services (2000) *Training manual for mental health and human service workers in major disasters*. Rockville, MD: U.S. Dept. of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services.

Downs, J., Shults, R. & West, B. (2017) Attitudes toward mandatory ignition interlocks for all offenders convicted of driving while intoxicated. *Journal of Safety Research*, 63, 99–103.

Fell, J.C., Tippetts, S. & Voas, R. (2010) Drinking characteristics of drivers arrested for driving while intoxicated in two police jurisdictions. *Traffic Injury Prevention*, 11, 443–452.

Gausman, J. & Langer, A. (2020) Sex and gender disparities in the COVID-19 pandemic. *Journal of Women's Health*, 29, 465–466.

Gupta, S. & Sahoo, S. (2020) Pandemic and mental health of the front-line healthcare workers: a review and implications in the Indian context amidst COVID-19. *General Psychiatry*, 33, e100284.

Kessler, R.C. & Wittchen, H.U. (2008) Post-disaster mental health need assessment surveys - the challenge of improved future research. *International Journal of Methods in Psychiatric Research*, 17, 1–5.

Kumar, A. & Nayar, K.R. (2020) COVID 19 and its mental health consequences. *Journal of Mental Health*, 180, 817–818.

Lapham, S.C., C'De Baca, J., Mcmillan, G. & Hunt, W.C. (2004) Accuracy of alcohol diagnosis among DWI offenders referred for screening. *Drug and Alcohol Dependence*, 76, 135–141.

Lapham, S.C., Skipper, B.J. & Russell, M. (2012) Life-time drinking course of driving-while-impaired offenders. *Addiction*, 107, 1947–1956.

Lechner, W.V., Laurene, K.R., Patel, S., Anderson, M., Grega, C. & Kenne, D.R. (2020) Changes in alcohol use as a function of psychological distress and social support following COVID-19 related University closings. *Addictive Behaviors*, 110, 106527.

Loades, M.E., Chatburn, E., Higson-Sweeney, N., Reynolds, S., Shafran, R., Brigden, A. et al. (2020) Rapid systematic review: The impact of social isolation and loneliness on the mental health of children and adolescents in the context of COVID-19. *Journal of the American Academy of Child & Adolescent Psychiatry*, 59, 1218–1239.e3.

Marques, P., Tippetts, S., Allen, J., Javors, M., Alling, C., Yegles, M. et al. (2010) Estimating driver risk using alcohol biomarkers, interlock blood alcohol concentration tests and psychometric assessments: initial descriptives. *Addiction*, 105, 226–239.

Marsden, J., Darke, S., Hall, W., Hickman, M., Holmes, J., Humphreys, K. et al. (2020) Mitigating and learning from the impact of COVID-19 infection on addictive disorders. *Addiction*, 115, 1007–1010.

McCartt, A.T., Leaf, W.A. & Farmer, C.M. (2018) Effects of Washington State's alcohol ignition interlock laws on DUI recidivism: An update. *Traffic Injury Prevention*, 19, 665–674.

Naylor-Wardle, J., Rowland, B. & Kunadian, V. (2021) Socioeconomic status and cardiovascular health in the COVID-19 pandemic. *Heart*, 107, 358–365.

NEW_YORK_STATE. (2020). New York State on PAUSE [Online]. https://coronavirus.health.ny.gov/new-york-state-pause [Accessed November 11, 2020 2020].

Niño, M.D., Cai, T. & Ignatow, G. (2016) Social isolation, drunkenness, and cigarette use among adolescents. *Addictive Behaviors*, 53, 94–100.

Osgood, D.W., Feinberg, M.E., Wallace, L.N. & Moody, J. (2014) Friendship group position and substance use. *Addictive Behaviors*, 39, 923–933.

Pappa, S., Ntella, V., Giannakas, T., Giannakoulis, V.G., Papoutsi, E. & Katsaounou, P. (2020). Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain, Behavior, and Immunity*, 88, 901–907.

Pollard, M.S., Tucker, J.S., & Green, H.D. Jr. (2020) Changes in adult alcohol use and consequences during the COVID-19 pandemic in the US. *JAMA Netw Open*, 3, e2022942.

Rehm, J., Kilian, C., Ferreira-Borges, C., Jernigan, D., Monteiro, M., Parry, C.D.H. et al. (2020) Alcohol use in times of the COVID 19: Implications for monitoring and policy. *Drug and Alcohol Review*, 39, 301–304.

Saunders, J.B., Aasland, O.G., Babor, T.F., de la Fuente, J.R. & Grant, M. (1993) Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption–II. *Addiction*, 88, 791–804.

Scherer, M., Marques, P., Manning, A.R., Nochajski, T.H., Romano, E., Taylor, E. et al. (2020) Potential for cannabis adaptation among participants in a drunk driving intervention. *Journal of Substance Use*, 25, 605–609.

Thayer, Z.M. & Gildner, T.E. (2020) COVID-19-related financial stress associated with higher likelihood of depression among pregnant women living in the United States. *American Journal of Human Biology*, e23508.

Thomas, F.D., Berning, A., Darrah, J., Graham, L., Blomberg, R., Griggs, C. et al. (2020). Drug and alcohol prevalence in seriously and fatally injured road users before and during the COVID-19 public health emergency. National Highway Traffic Safety Administration (NHTSA).

Voas, R.B. (2014) Enhancing the use of vehicle alcohol interlocks with emerging technology. *Alcohol Research: Current Reviews*, 36, 81–89.

Voas, R.B. (2020) Vehicle safety features aimed at preventing alcohol-related crashes. *Forensic Science Review*, 32, 55–81.

Voas, R.B. & Fell, J.C. (2011) Preventing impaired driving opportunities and problems. *Alcohol Research & Health*, 34, 225–235.

Voas, R.B., Marques, P.R., Tippetts, A.S. & Beirness, D.J. (1999) The Alberta Interlock Program: The evaluation of a province-wide program on DUI recidivism. *Addiction*, 94, 1849–1859.

Voas, R.B., Tippetts, A.S., Bergen, G., Grosz, M. & Marques, P. (2016) Mandating treatment based on interlock performance: Evidence for effectiveness. *Alcoholism: Clinical and Experimental Research*, 40, 1953–1960.

Voas, R.B., Tippetts, S.S., Fisher, D. & Grosz, M. (2010) Requiring suspended drunk drivers to install alcohol interlocks to reinstate their licenses: Effective? *Addiction*, 105, 1422–1428.

Wagner, E., Atkins, R., Berning, A., Robbins, A., Watson, C. & Anderle, J. (2020) Examination of the traffic safety environment during the second quarter of 2020: Special report. National Highway Traffic Safety Administration.

Weerakoon, S.M., Jetelina, K.K. & Knell, G. (2020) Longer time spent at home during COVID-19 pandemic is associated with binge drinking among US adults. *American Journal of Drug and Alcohol Abuse*, 47, 98–106.

WHO (2020) Naming the coronavirus disease (COVID-19) and the virus that causes it [Online]. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it#:~:text=ICTV%20announced%20%E2%80%9Csevere%20acute,two%20viruses%20are%20different. [Accessed October 29, 2020].

Williams, C.L., Vik, P.W. & Wong, M.M. (2015) Distress tolerance in social versus solitary college student drinkers. *Addictive Behaviors*, 50, 89–95.

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