

Rapid Communication

Loneliness and Daily Alcohol Consumption During the COVID-19 Pandemic

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Abstract

Aims: This pilot study aimed to identify associations of loneliness and daily alcohol consumption among US adults during the Coronavirus Disease-2019 pandemic.

Method: Participants completed daily assessments for 30 days.

Results: Results suggest people who feel lonelier on average drink more alcohol, however, people who feel lonelier than usual drink less.

Conclusion: Findings highlight the need to disaggregate within- and between-person components of alcohol use.

INTRODUCTION

Before Coronavirus Disease-2019 (COVID-19) reached the USA, the USA was facing another epidemic—excessive alcohol consumption. National rates from a 2019 survey indicated that, in the past month, 54.9% of adults reported drinking and 25.8% reported binge-drinking (NIAAA, 2020). Factors associated with excessive alcohol consumption include depression, stress and negative affect (Conner *et al.*, 2009). Protective factors include social support and religiosity (Groh *et al.*, 2007; Meyers *et al.*, 2017). Despite evidence that loneliness is positively associated with depression and negatively associated with social support (Ingram *et al.*, 2020), the relationship between loneliness and alcohol consumption is not well understood (Rhew *et al.*, 2021). Conflicting findings may be due to the lack of disaggregation of between- and within-person effects. That is, a person's average loneliness (between-person) may have a different effect on alcohol consumption when compared to the within-person effect of feeling lonelier than usual. Another explanation is that loneliness predicts increased solitary alcohol consumption but decreased social alcohol consumption (Arpin *et al.*, 2015). It is believed that COVID-19 restrictions reduced social alcohol consumption and increased solitary alcohol consumption (Pakdaman and Clapp, 2021).

After alcohol sales rose by 54% during initial stay-at-home orders, health organizations warned that increased alcohol consumption as a result of isolation and stress could exacerbate negative health outcomes (Grossman *et al.*, 2020). National surveys indicated that, compared with the same period in 2019, adults consumed more alcohol between May–June 2020 (Pollard *et al.*, 2020). Loneliness was identified as a health concern during the pandemic due to social distancing and community closures. Increases in loneliness were salient among low-income individuals, people with chronic health conditions and young women (Luchetti *et al.*, 2020).

The nature of the within- and between-person associations between loneliness and daily alcohol consumption are unknown in the context of widespread social isolation. The purpose of this pilot study was to examine the daily fluctuations of loneliness and alcohol consumption across 30 days of ecological momentary assessments (EMA). Our aim was to explore these associations within a small pilot sample before conducting a replication with a larger-scale, more generalizable sample:

H1: Increases in daily loneliness beyond a person's average loneliness (within-person) and higher

average loneliness across 30 days (between-person) would both predict increased alcohol consumption that day.

MATERIALS AND METHODS

Seventy-eight participants were recruited through Facebook advertisements between June and July 2020. Eligible participants were US residents aged 18 years or older. The baseline survey was hosted online on Qualtrics between June and August 2020. All but one participant completed at least one EMA assessment and were included in the final sample. Each daily EMA assessed mood, activities and substance use (19 items). Participants received \$30 for the baseline survey and \$1 for each EMA (\$60 total).

Measures

At baseline, participants reported age, gender, race, ethnicity, political orientation, religion, education, income, number of children, romantic partner, living situation and frequency of socially distancing.

Loneliness

Loneliness was measured daily with a single item, 'How lonely were you today?', which was adapted from the negative scale of the Positive Affect Negative Affect Schedule (PANAS) (Watson and Clark, 1994). Response options ranged from 1 (not at all) to 5 (all the time). Single-item loneliness measures have been shown to have comparable validity to the UCLA Loneliness scale, and EMA researchers recommend the use of single-item mood measures to reduce participant burden (Russell, 1996; Arpin *et al.*, 2015; Kuerbis *et al.*, 2018).

Satisfaction with social support

Satisfaction with social support was measured daily with the item, 'How satisfied with social support received from family and friends were you today?' Responses ranged from 1 (not at all) to 5 (all the time).

Face-to-face conversations

Face-to-face conversations were measured daily on a continuous scale, 'About how many people did you have face-to-face (in-person) conversations with today?'

Daily alcohol consumption

A single item was adapted from the Alcohol Use Disorders Identification Test-Concise (AUDIT-C) (Bush *et al.*, 1998), a widely used measure of hazardous alcohol use. Participants were first asked whether they drank alcohol yesterday. Participants who indicated they had not consumed alcohol were coded as 0. Participants who responded positively were shown a graphic with examples of a standard drink of alcohol (beer, wine and liquor) and were asked to indicate the number of drinks they had had the previous day. Options ranged from 0 (no drinks) to 6 (10 or more). Daily alcohol use was adjusted by 1 day such that the outcome variable referred to alcohol use the same day as reports of loneliness, social support and face-to-face conversations.

Analytic plan

Multilevel models (MLMs) with daily measures (Level 1; L1) nested within persons (Level 2; L2) were estimated in IBM SPSS Mixed. The intraclass correlation (ICC) was estimated to assess the proportion

of variance in alcohol use due to between-person differences and to calculate the proportion of within-person variability (Bolger and Laurenceau, 2013). Time-varying covariates were separated into within-person (L1) and between-person (L2) components. Daily loneliness, satisfaction with social support and face-to-face conversations were person-mean-centered by subtracting each person's mean score across 30 days from their daily raw scores. These L1 measures contain only within-person variability. To model between-person variability in daily alcohol use, we calculated the L2 person-means of each time-varying covariate. The autoregressive lag-1 covariance structure was used to model random effects.

RESULTS

Table 1 is a summary of the sample. We conducted MLM to test the following two research questions: (a) Do people who feel lonelier than usual drink more alcohol that day (within-person effect)? (b) Do people who are lonelier on average tend to drink more alcohol (between-person effect)? The ICC and grand means are reported in Table 2. In preliminary analyses of covariates of alcohol consumption, only satisfaction with social support, face-to-face conversations, the weekend and religion were significant and included. In Model 1, we tested the unconditional means model. In Model 2, loneliness was entered as L1 and L2 predictors. In Model 3, significant covariates were entered: satisfaction with social support (L1 and L2), face-to-face conversations (L1 and L2), weekend (L1; 0 = Mon–Thurs, 1 = Fri–Sun) and religion (L2; 0 = no religion, 1 = identified with a religion). The Model 3 reduced-form equation is given as follows:

$$\begin{aligned} \text{DAILYALCOHOL}_{ti} = & \gamma_{00} + \gamma_{10}\text{LONELY}_{ti}^{(\text{PMC})} \\ & + \gamma_{01}\text{MLONELY}_i + \gamma_{20}\text{SUPPORT}_{ti}^{(\text{PMC})} \\ & + \gamma_{02}\text{MSUPPORT}_i + \gamma_{30}\text{FACE}_{ti}^{(\text{PMC})} + \gamma_{03}\text{MFACE}_i \\ & + \gamma_{40}\text{WEEKEND}_{ti} + \gamma_{04}\text{RELIGIOUS}_i + [\text{residuals}]. \end{aligned}$$

Daily alcohol consumption (DAILYALCOHOL_{ti}) is predicted by person-mean-centered loneliness ($\text{LONELY}_{ti}^{(\text{PMC})}$), satisfaction with social support ($\text{SUPPORT}_{ti}^{(\text{PMC})}$) and face-to-face conversations ($\text{FACE}_{ti}^{(\text{PMC})}$); the person-level averages of loneliness (MLONELY_i), satisfaction with social support (MSUPPORT_i) and face-to-face conversations (MFACE_i); time-varying weekend (WEEKEND_{ti}) and between-person religion (RELIGIOUS_i). Multicollinearity tests indicated low correlation. The most complex model with all covariates had the lowest Akaike Information Criterion (AIC), suggesting this model was a better fit.

The within-person effect of loneliness on daily alcohol consumption was marginally significant in the opposite direction to our hypothesis. Feeling lonelier than usual predicted reduced alcohol consumption that day. The between-person effect of loneliness on alcohol use was consistent with our hypothesis. Participants who felt lonelier on average consumed more alcoholic drinks each day. The within- and between-person effects of loneliness on daily alcohol use were in opposite directions. The within-person effects of satisfaction with social support, weekend and the between-person effect of religion were also significant.

We conducted exploratory analyses with face-to-face conversations and satisfaction with social support as moderators to facilitate interpretation of the opposite within- and between-person effects of loneliness on alcohol use. For individuals having fewer face-to-face conversations than usual and on average, feeling lonelier than usual was associated with higher alcohol consumption that day (Table 2). For individuals reporting more face-to-face interactions than usual

Table 1. Descriptive statistics of demographics and missing data

<i>N</i> = 78	<i>M</i>	<i>SD</i>
Age	33.81	9.97
	<i>n</i>	%
Participants with more than 7 days missing assessments	14	17.9
Participants with more than 14 days missing assessments	7	9.0
Gender		
Female	57	73.1
Male	21	26.9
Race/ethnicity ^a		
American Indian or Alaska Native	2	2.6
Asian or Asian American	11	14.1
Black or African American	5	6.4
White	55	70.5
Middle Eastern	2	2.6
Multi-racial	3	3.8
Hispanic/Latinx		
Political orientation		
Very conservative	1	1.3
Conservative	4	5.1
Moderately conservative	9	11.5
Moderate	17	21.8
Moderately liberal	11	14.1
Liberal	16	20.5
Very liberal	18	23.1
Apolitical	2	2.6
Religion ^b		
Protestant/other Christian	30	38.5
Catholic	6	7.7
Mormon	1	1.3
Jewish	3	3.8
Muslim	1	1.3
Hindu	2	2.6
Other non-Christian religion	3	3.8
None/atheist/agnostic	30	38.5
Education ^c		
High school degree or diploma	5	6.4
Technical/vocational school	1	1.3
Some college—college, university or community college—but no degree	13	16.7
2-year associate's degree from a college, university or community college	2	2.6
4-year bachelor's degree from a college or university	36	46.2
Postgraduate or professional degree, including masters, doctorate, medical or law degree	21	26.9
Household income		
Less than \$19,999	6	7.7
\$20,000–39,999	13	16.7
\$40,000–59,999	15	19.2
\$60,000–79,999	15	19.2
\$80,000–99,999	13	16.7
\$100,000–149,99	12	15.4
More than \$150,000	4	5.1
Frequency of social distancing behaviors		
Occasionally, in about 30% of the chances when I could have	1	1.3
Sometimes, in about 50% of the chances when I could have	2	2.6
Frequently, in about 70% of the chances when I could have	18	23.1
Usually, in about 90% of the chances I could have	31	39.7
Every time	26	33.3
Participants with a romantic partner	52	66.7
Participants who live with a romantic partner	40	51.3
	<i>M</i>	<i>SD</i>
Number of children	0.87	1.13

SD, standard deviation.

^aIn subsequent analyses, race and ethnicity were combined and recoded as three groups (Hispanic/Latino/a, non-Hispanic White and non-Hispanic person of color).

^bReligion was recoded as a binary variable indicating any religious identification.

^cEducation level was recoded as a binary variable indicating whether or not participants had completed a 4-year bachelor's degree.

Table 2. MLMs for the within- and between-person effects of loneliness, satisfaction with social support, face-to-face conversations, religious identification and the weekend on daily alcohol consumption

	M (SD)	Model 1 (UM)		Model 2		Model 3		Model 4	
		Est (SE)	p	Est (SE)	p	Est (SE)	p	Est (SE)	p
DAILYALCOHOL _{it}	0.36 (0.60)								
Fixed effects									
Intercept (γ_{00})	0.57 (0.10)	<.001	0.56 (0.09)	<.001	0.38 (0.23)	.097	0.38 (0.23)	.104	
LONELY _{it} (γ_{10})			-0.09 (0.03)	.003	-0.05 (0.03)	.095	0.17 (0.07)	.018	
MLONELY _{it} (γ_{01})	1.00 (0.85)		0.17 (0.09)	.072	0.29 (0.12)	.022	0.29 (0.12)	.021	
SUPPORT _{it} (γ_{20})					0.07 (0.03)	.017	0.08 (0.03)	.012	
MSUPPORT _{it} (γ_{02})	3.34 (0.93)				0.13 (0.13)	.316	0.13 (0.13)	.314	
FACE _{it} (γ_{30})					0.01 (0.01)	.243	0.01 (0.01)	.398	
MFACE _{it} (γ_{03})	3.08 (2.40)				0.13 (0.07)	.053	0.13 (0.07)	.052	
WEEKEND _{it} (γ_{40})					0.12 (0.04)	.003	0.12 (0.04)	.003	
RELIGIOUS _{it} (γ_{50})					-0.46 (0.13)	.001	-0.46 (0.13)	.001	
LONELY _{it} (γ_{10}) \times FACE _{it} (γ_{30})							-0.03 (0.01)	.025	
LONELY _{it} (γ_{10}) \times MFACE _{it} (γ_{03})							-0.07 (0.02)	<.001	
Random effects									
τ_{00}	0.57 (0.10)	<.001	0.64 (0.11)	<.001	0.52 (0.10)	<.001	0.52 (0.10)	<.001	
σ^2			0.71 (0.02)	<.001	0.71 (0.02)	<.001	0.70 (0.02)	<.001	
AIC		5098.35		4607.58		4599.33		4595.35	
ICC						46.8%			

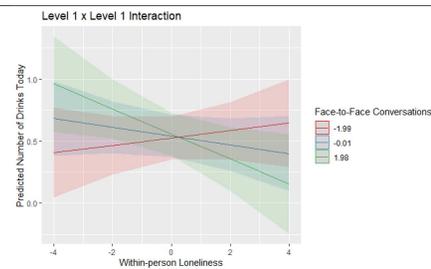
Note. UM = Unconditional means model. τ_{00} = Variance of intercept. σ^2 = Variance of the residuals. AIC = Akaike Information Criterion. ICC = Intra-class correlation.

and on average, feeling lonelier than usual was associated with less alcohol consumption. The interaction with satisfaction with social support was not significant.

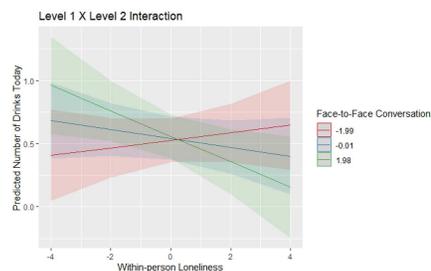
DISCUSSION

These results suggest that during the 2020 summer of the COVID-19 pandemic in which restrictions were in place across the USA, adults who felt lonelier on average across 30 days consumed more alcohol each day. By contrast, on days when adults felt lonelier than usual, they reported drinking less alcohol, although this association was only marginally significant. The opposite directions of these effects highlight the importance of disaggregating between-person and within-person effects in longitudinal models. Evidence of opposing between- and within-person trends of alcohol use is present in previous research (Levine *et al.*, 2020). For example, trait positive affect is negatively associated with alcohol consumption; however, state positive affect is positively associated with daily alcohol consumption (Simons *et al.*, 2014).

Another possible explanation for the negative within-person trend is that when participants felt less lonely than usual, they were engaging in more social drinking with cohabitants, virtual socializing or were in counties that reopened early, drinking at bars (Pakdaman and Clapp, 2021). Our exploratory moderation analyses support this explanation. For participants who had many face-to-face conversations, loneliness negatively predicted alcohol use. Although we did not ask whether they were drinking alone or in a social setting, this would align with previous findings of a negative association between loneliness and social alcohol consumption (Arpin *et al.*, 2015). The positive within-person association between satisfaction with social support and alcohol use also provides preliminary support as participants consumed more alcohol when they reported higher



Note. Simple slopes (-2SD, 0, 2SD above mean) illustrating LONELY_{it}(γ_{10}) \times FACE_{it}(γ_{30}) (Level 1 \times Level 1) interaction.



Note. Simple slopes (-2SD, 0, 2SD above mean) illustrating LONELY_{it}(γ_{10}) \times MFACE_{it}(γ_{03}) (Level 1 \times Level 2) interaction.

satisfaction with social support. The current study has implications for the prevention and treatment of excessive alcohol consumption as patients' baseline loneliness and daily fluctuations in loneliness differentially predict alcohol use.

The lack of diversity across age, race and gender limited the generalization to a wider population. This may be partly due to social media use eligibility criteria. Not all participants completed 30 daily assessments (90% completed at least half). Although MLM is robust to missing data, this may have biased the results if there were systematic reasons for not completing assessments. Furthermore, we did not disentangle the effects of the different social distancing guidelines across counties. The need to reduce participant burden in EMA studies requires short assessments, so we could not ask about social or solitary alcohol use. In future research, we will measure communication and mobility through passive mobile sensing data to gather insights about social interactions.

DATA AVAILABILITY STATEMENT

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

FUNDING

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CONFLICT OF INTEREST STATEMENT

None declared.

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