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## Maintaining recovery from alcohol use disorder during the COVID-19 pandemic: The importance of recovery capital

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### ABSTRACT

**Background:** The potential impact of the COVID-19 pandemic on recovery from alcohol use disorder (AUD) has received scant attention to date. In response, we investigated the stability of recovery and identified correlates of relapse, with particular interest in differences between women and men.

**Methods:** Data were obtained in a national survey of adults with resolved alcohol use disorder who were not drinking heavily ( $n = 1492$ ). We calculated summary statistics and modeled odds of mild relapse (i.e., resolved at the time of data collection), overall and stratified by gender.

**Results:** Equivalent large majorities of women and men reported that the COVID-19 pandemic had not affected their recovery at all (88.9% and 88.8%, respectively). Mild relapse events were infrequent, with only 45 participants (3.1%) reporting a resumption of drinking after being abstinent and 35 participants (2.7%) reporting an increase from previously moderated drinking, with no differences in prevalence between men and women. Recovery capital showed consistent and comparable protective effects for both women and men (adjusted odds ratio [aOR] 0.90; 95% confidence interval [95% CI] 0.84, 0.97; and aOR 0.93; 95% CI 0.88, 0.98, respectively). We did not find any effect of pandemic-related stressors; however, there were a number of distinct correlates of mild relapse for women and men.

**Conclusions:** Recovery capital showed a consistently protective effect and may serve as a highly suitable intervention target as it is modifiable. Given gender differences, assessments of other key factors and tailored interventions targeting women and men may be necessary to ensure stable recovery.

### 1. Introduction

Almost as soon as the COVID-19 pandemic was declared, alcohol researchers began raising concerns about its impact on drinking patterns and the potential for increased harms (Neufeld et al., 2020; Rehm et al., 2020). Although still limited, emerging evidence has shown that alcohol use increased during the COVID-19 pandemic in the United States (Barbosa et al., 2020; Killgore et al., 2020; Pollard et al., 2020), Australia (Biddle et al., 2020), Poland (Chodkiewicz et al., 2020), and New Zealand (Huckle et al., 2020), among other countries (Schmidt et al., 2021). However, changes in drinking behavior appear to have varied by gender. In the United States, at least two studies have found greater increases among women than men in both any drinking and heavy drinking (Barbosa et al., 2020; Pollard et al., 2020).

In response to the pandemic, a variety of restrictions and mandates intended to slow the transmission of the virus were enacted at the community, state, and federal levels in the United States. For example, physical distancing measures included shelter-in-place ordinances and bans of large gatherings (The Council of State Governments, 2021), multiple states issued statewide stay-at-home orders which restricted virtually all non-essential travel for residents (State of California-Health and Human Services Agency, 2020; State of Delaware, 2020), and some states restricted operations or closed non-essential businesses (State of New York, 2020). Of note, local and state government responses were highly variable, with some Southern and Midwestern states never issuing shelter-in-place orders or banning mask mandates (Mazzei, 2021; Mervosh et al., 2020).

The COVID-19 pandemic has also likely affected recovery from

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alcohol use disorders (AUD). Early commentaries warned that people in recovery may be at heightened risk of relapse and that necessary recovery services may be less available (Da et al., 2020; Dunlop et al., 2020; Melamed et al., 2020). Specifically, for those in recovery, the COVID-19 pandemic may create additional complications due to loss of structure in daily routines, decreased activities to keep preoccupied, and reduced in-person social support. One recent study found that approximately half of adults in recovery from a substance use disorder reported cravings during a pandemic isolation period and that craving was prompted by boredom, loneliness, lack of support, and financial stress, among other factors (Bonny-Noach and Gold, 2020). In addition, during the COVID-19 pandemic, access to mutual-help groups—which are the most commonly used informal recovery support service (Caetano et al., 1998; Cohen, Feinn et al., 2007; Substance Abuse and Mental Health Services Administration, 2020)—may have diminished due to the transition from in-person to virtual meetings and due to barriers related to technology (i.e., the digital divide), which could inhibit participation in online mutual-help groups. Regarding specialized services, an increase in demand for AUD treatment may coincide with decreased capacity to deliver said services as behavioral health resources could be reallocated to meet COVID-19 medical care needs (Rapoport, 2020).

It is well recognized that stressful events are associated with relapse, which underscores the current concern about the COVID-19 pandemic's effect on recovery. In particular, a recent U.S. study identified a potential mechanism linking stressors to relapse. Among adults in outpatient treatment for AUD, people were more likely to report cravings at night after having experienced a stressor during the day and those who experienced stressors throughout the day were more likely to drink the following day (Wemm et al., 2019). In addition, an analysis of a U.S. general population sample found that stressful life events were associated with higher odds of problematic use (i.e., one or more DSM-5 substance use disorder symptoms) among adults with a prior-to-past-year substance use disorder (McCabe et al., 2018). In one of the few studies of relapse during the COVID-19 pandemic, a biomarker analysis of a substance use treatment cohort in Spain found that patients had approximately twice the odds of a positive urine screen for alcohol use during the lock-down period as before (Barrio et al., 2021). In summary, it appears that stressors are associated with lower likelihood of successful resolution of an alcohol use disorder.

Recovery from AUD has been studied extensively, and there does not appear to be a single—or simple—mechanism underlying stable remission. Broad trends by age, gender, and race/ethnicity are well recognized. For example, adult role transitions, such as marriage and parenthood, appear to prompt untreated resolution of problem drinking (Lee et al., 2015; Lee and Sher, 2018; Staff et al., 2010), while female gender and minority race/ethnicity have been associated with decreased likelihood of recovery due to lower utilization of treatment services (Alvanzo et al., 2014; Gilbert et al., 2019; Ilgen et al., 2011; Tucker et al., 2020; Zemore et al., 2014). Studies of general population samples using prospective designs have found a wide variety of behavioral, psychological, and demographic factors associated with recovery, with considerable variation by gender and recovery type, such as abstinence versus moderated drinking (Dawson et al., 2012; Edens et al., 2008; Fan et al., 2019; Schuckit and Smith, 2011).

Research has found that some of the key gender differences in relapse risk are related to psychological states, exposure to stressors, and characteristics of interpersonal relationships. For example, both Walitzer and Dearing (2006) and Zywiak et al. (2006) noted that women were more likely than men to relapse when experiencing negative affect and interpersonal conflict. On the other hand, men were more likely than women to relapse in reaction to isolation and certain personality traits (e.g., extraversion). Among other findings, depression levels in women and anxiety levels in men each predicted relapse for the respective gender (Oliva et al., 2018), whereas higher lifetime trauma experiences and current trauma symptoms were associated with higher risk of relapse in women only (Heffner et al., 2011). Moos et al. (2006) found

that lower depression levels, fewer chronic stressors, and more overall social resources predicted stable remission from AUD for men. Interestingly, being married has been identified as a relapse risk factor for women but a protective factor for men (Walitzer and Dearing, 2006).

Despite growing recognition of the impact of the COVID-19 pandemic on drinking patterns and its potential effect on recovery from AUD, there has been scant attention to recovery outcomes in this context. To address this gap, we took advantage of a national survey that sought to understand recovery processes and successful strategies among adults with resolved AUD and that was already in development when the COVID-19 pandemic occurred. In the current study, we sought to investigate the stability of recovery and to identify correlates that may inform future supportive responses. Based on the extant literature showing differences in drinking changes and relapse risks by gender, we were particularly interested in contrasting men and women; however, as an exploratory study there were no a priori hypotheses.

## 2. Materials and methods

### 2.1. Sample

This study used a pre-existing national cohort, KnowledgePanel, to recruit adults with resolved AUD. KnowledgePanel has been described in detail elsewhere (<https://www.ipsos.com/en-us/solutions/public-affairs/knowledgepanel>). Briefly, it is a probability-based sample of non-institutionalized adults that is designed to be representative of the United States and that is maintained by Ipsos Public Affairs for ongoing internet-based research. All KnowledgePanel members are assigned geodemographic weights (i.e., controlling for gender, age, Census region, metropolitan status, education, and income within race/ethnicity group) so that the panel is representative of the U.S. adult population following benchmark distributions from the March 2020 Current Population Survey and the 2018 American Community Survey.

Our survey was fielded in Fall 2020, was available in English or Spanish, and included over-sampling of racial/ethnic minorities. We recruited adults with a resolved past alcohol problem who were currently abstinent or drinking below risk thresholds. Eligibility criteria included being age 18 or older and self-identifying as a person in recovery or with a resolved alcohol problem. Specifically, the eligibility screener asked “Did you used to have a problem with alcohol but no longer do? Some people describe this as being in recovery. Other people just say that they’ve taken care of, gotten over, or resolved a previous drinking problem: Yes or No.” Treatment or other services use was not required; nor was abstinence required, however, current drinkers were screened for hazardous drinking using the three-item AUDIT-C (Bush et al., 1998; Dawson et al., 2005). As hazardous drinking would be incompatible with the study’s focus on understanding successful recovery, potential participants with AUDIT-C scores above recognized thresholds (i.e.,  $\geq 4$  for men;  $\geq 3$  for women) were excluded as they would constitute a contrasting population that had not achieved recovery. In total, 31,386 KnowledgePanel members were invited to participate, of whom 17,622 completed an eligibility screening (56% response rate). Of those respondents, 3285 self-identified as being in recovery or having resolved a past alcohol problem; however, 1648 (50%) of those same respondents had AUDIT-C scores indicative of current hazardous drinking and were excluded. Of the remaining participants, 1637 met eligibility criteria and completed the survey questionnaire. During data preparation, we discovered erroneous or inconsistent responses from 145 respondents and subsequently excluded them because of low data quality. The final analytic sample consisted of 1492 adults with resolved AUD. As compensation, participants received 20,000 KnowledgePanel points, worth approximately \$20, which they could redeem for prizes from Ipsos. Study materials and procedures were reviewed and approved by the University of Iowa Institutional Review Board.

## 2.2. Measures

The outcome of interest was relapse during the COVID-19 pandemic, a binary variable (any vs. none). Participants were asked if they had been abstinent but drank alcohol again since January 2020 or if they had previously controlled their drinking but increased their alcohol consumption since January 2020. An endorsement of either option was coded as a relapse event; however, as the study's eligibility criteria excluded current heavy drinkers, we refer to these events as mild relapse (i.e., resolved at the time of data collection). We identified a set of candidate predictor variables a priori to examine in multivariate models, which fell into the following groups: lifetime AUD problem characteristics; recovery threats; recovery supports; and demographic characteristics.

Among problem characteristics, participants' lifetime AUD symptoms were assessed via 11 items drawn from the National Epidemiological Survey on Alcohol and Related Conditions, which conformed to DSM-5 diagnostic criteria (<https://www.niaaa.nih.gov/research/nesarc-iii/questionnaire>). Affirmative responses were summed to create a count of symptoms (range 1–11). In turn, we created a four-level classification of lifetime AUD severity: sub-clinical (1 symptom); mild (2–3 symptoms); moderate (4–5 symptoms); and severe (6 or more symptoms). Length in recovery was reported by participants as a categorical variable: early recovery (<1 year); intermediate recovery (1–5 years); or long-term recovery (>5 years). We classified participants into three recovery groups based on self-reported lifetime use of 14 different services. The groups consisted of treated recovery (any use of specialty services, such as in-patient or out-patient rehabilitation), assisted recovery (any use of lay services, such as mutual-help groups and no use of specialty services), and independent recovery (no use of specialty nor lay services).

In terms of threats to recovery, we derived a count variable of COVID-related stressors by summing affirmative responses to a choose-all-that-apply list of possible sources of stress (range 0–12). The list was adapted from the Environmental Influences on Child Health Outcomes survey, available on the Public Health Emergency and Disaster Research Response website (<https://dr2.nlm.nih.gov>). Based on findings of greater increases in drinking by women than men (Barbosa et al., 2020; Pollard et al., 2020), we included a binary indicator of the presence of minor children in the household (any vs. none) as a second recovery threat. We posited that it could serve as a gender-specific stressor given women's traditional childcare responsibilities. In contrast, there were two measures of recovery supports. First, the questionnaire included the 10-item Brief Assessment of Recovery Capital (BARC-10), which provided a global measure of individual and interpersonal assets that could be leveraged to initiate and sustain recovery (Vilsaint et al., 2017). In addition, participants completed the 12-item Multidimensional Scale of Perceived Social Support, which assessed perceived general support from family, friends, and a significant other (Dahlem et al., 1991; Zimet et al., 1990). Participants responded to both scales using five-point Likert-type responses (strongly disagree to strongly agree) with higher scores indicating greater levels of recovery capital and social support, respectively. We examined several additional sociodemographic variables that may be associated with mild relapse: age (18–29 years; 30–44 years; 45–59 years; ≥60 years); race/ethnicity (White, non-Hispanic; Black, non-Hispanic; Hispanic, any race; multiple or other races); educational attainment (less than high school; high school diploma; some college; Bachelor's degree or higher); employment status (employed full- or part-time; unemployed; out of the labor force); and relationship status (married or cohabitating; formerly married; never married). In addition, we calculated participants' poverty status based on self-reported household size and income following 2020 federal guidelines (e.g., \$26,200 for a family of four in the contiguous US and District of Columbia; (Department of Health and Human Services, 2020).

## 2.3. Analysis

First, we calculated summary statistics, such as frequency distributions of categorical variables or means and standard deviations of numeric variables, to describe the sample and characterize their COVID-19 experiences. In addition to overall frequencies and summaries, we produced stratified estimates by gender and tested for bivariate associations. Where possible, analyses were adjusted using the geodemographic survey weights described above in the survey package (Lumley, 2021) for R version 4.0.3 (R Core Team, 2020). In circumstances where small expected cell counts made survey adjustment unreliable, unadjusted tests used Fisher's exact test. We then performed a survey weighted logistic regression, modelling the log-odds of relapse overall and stratified by gender. Collinearity was assessed using (generalized) variance inflation factors provided by the *car* package (Fox and Weisberg, 2019), which were all less than 2.1 for the largest model, compared to a typical cutoff for problematic multicollinearity of 10. Final estimated coefficients were also graphically assessed for stability through comparison to the result from unweighted penalized logistic regression (specifically, a LASSO model) implemented with the *glmnet* package (Friedman et al., 2010). Penalized regression techniques like the LASSO are expected to be more robust than unconstrained models, and the estimated coefficients remained qualitatively consistent between techniques. This indicated that the chosen set of parameters was not unstable. We have presented our full collection of tests and used unmodified p-values, assessing statistical significance at the 0.05 level. As an exploratory study, we made no corrections for multiple tests.

## 3. Results

To describe our sample, Table 1 shows the raw (i.e., unweighted) demographic characteristics in total and by gender. Overall, majorities of the sample met criteria for severe lifetime AUD (73%), were classified in the independent recovery group (i.e., having used neither specialty services nor mutual-help groups; 60%), and reported being in recovery more than five years (76%). In addition, majorities of the sample were male (69%), middle aged or older (74%), White (65%), had some college or a college degree (68%), were currently employed full or part-time (54%), were married or cohabitating (60%), and had household incomes greater than twice the federal poverty limit (63%). We did not detect any significant gender differences in the distributions of educational attainment, recovery group, and recovery length; however, women and men differed on all other demographic variables. A relatively small number of participants completed the survey in Spanish ( $n = 63, 4\%$ ).

Table 2 shows unweighted frequencies and weighted percentages for recovery-related experiences during the COVID-19 pandemic in total and by gender. Weighted percentages allowed for inferences about the population of adults in recovery from AUD. We found that nearly equivalent, large majorities of women and men reported that the COVID-19 pandemic had not at all affected their relationship with alcohol or drugs and their recovery (88.9% and 88.8%, respectively). Similarly large and equivalent majorities of women and men reported that the COVID-19 pandemic had not made it more difficult to resist alcohol or drugs (94.2% and 92.8%, respectively). Indeed, mild relapse events were infrequent in our sample, with only 45 participants (3.1%) reporting a resumption of drinking after being abstinent and 35 participants (2.7%) reporting an increase from previously moderated drinking, with no significant differences in prevalence between men and women.

Results of gender-stratified bivariate and multivariate models of mild relapse are shown in Tables 3a and 3b. Recovery capital had effects of similar magnitudes in bivariate and multivariate models for both women and men. In the final model, each one unit increase in the recovery capital scale was associated with a 10% reduction in odds of mild relapse among women (adjusted odds ratio [aOR] 0.90; 95% CI 0.84, 0.97) and

**Table 1**  
Demographic characteristics of a national sample of adults with resolved alcohol use disorder, n (%) or mean (SE).

	Full sample (n = 1492)	Women (n = 463)	Men (n = 1029)	p
<b>Age</b>				
18–29 years	89 (6.0%)	40 (8.7%)	49 (4.8%)	0.01
30–44 years	294 (19.7%)	99 (21.4%)	195 (19.0%)	
45–59 years	439 (29.4%)	134 (28.9%)	305 (29.6%)	
≥ 60 years	670 (44.9%)	190 (41.0%)	480 (46.6%)	
<b>Race/ethnicity</b>				
White, non-Hispanic	970 (65.0%)	311 (67.2%)	659 (64.0%)	0.01
Black, non-Hispanic	165 (11.1%)	61 (13.2%)	104 (10.1%)	
Hispanic, any race	245 (16.4%)	56 (12.1%)	189 (18.4%)	
Multiple or other races	112 (7.5%)	35 (7.6%)	77 (7.5%)	
<b>Educational attainment</b>				
Less than high school	110 (7.4%)	40 (8.6%)	70 (6.8%)	0.07
High school diploma	373 (25.0%)	129 (27.9%)	244 (23.7%)	
Some college	560 (37.5%)	173 (37.4%)	387 (37.6%)	
Bachelor's degree or higher	449 (30.1%)	121 (26.1%)	328 (31.9%)	
<b>Employment status</b>				
Employed full- or part-time	805 (54.0%)	218 (47.1%)	587 (57.0%)	<0.001
Unemployed	67 (4.5%)	28 (6.0%)	39 (3.8%)	
Out of the labor force <sup>a</sup>	620 (41.6%)	217 (46.9%)	403 (39.2%)	
<b>Relationship status</b>				
Married or cohabitating	890 (59.7%)	244 (52.7%)	646 (62.8%)	<0.001
Formerly married <sup>b</sup>	346 (23.2%)	141 (30.5%)	205 (19.9%)	
Never married	256 (17.2%)	78 (16.8%)	178 (17.3%)	
<b>Household poverty status</b>				
< 100% federal poverty level	262 (17.6%)	114 (24.6%)	148 (14.4%)	<0.001
100%–200% federal poverty level	291 (19.5%)	98 (21.2%)	193 (18.8%)	
> 200% federal poverty level	939 (62.9%)	251 (54.2%)	688 (66.9%)	
<b>COVID-19 related stressors</b>				
Minor children in household				
No	1163 (77.9%)	341 (73.7%)	822 (79.9%)	<0.01
Yes	329 (22.1%)	122 (26.3%)	207 (20.1%)	
<b>Survey language</b>				
English	1429 (95.8%)	448 (96.8%)	981 (95.3%)	0.21
Spanish	63 (4.2%)	15 (3.2%)	48 (4.7%)	
<b>Lifetime AUD severity</b>				
Sub-clinical (1 symptom)	52 (3.5%)	15 (3.2%)	37 (3.6%)	0.04
Mild (2–3 symptoms)	146 (9.8%)	60 (13.0%)	86 (8.4%)	
Moderate (4–5 symptoms)	207 (13.9%)	58 (12.5%)	149 (14.5%)	
Severe (6 or more symptoms)	1087 (72.9%)	330 (71.3%)	757 (73.6%)	
<b>Recovery group</b>				
Independent <sup>c</sup>	891 (59.7%)	295 (63.7%)	596 (57.92%)	0.12
Assisted <sup>d</sup>	226 (15.1%)	61 (13.2%)	165 (16.0%)	

**Table 1 (continued)**

	Full sample (n = 1492)	Women (n = 463)	Men (n = 1029)	p
Treated <sup>e</sup>	375 (25.1%)	107 (23.1%)	268 (26.1%)	
<b>Recovery length</b>				
< 1 year	66 (4.4%)	19 (4.1%)	47 (4.6%)	0.38
1–5 years	289 (19.4%)	99 (21.4%)	190 (18.5%)	
> 5 years	1127 (75.5%)	340 (73.4%)	787 (76.5%)	
<b>Recovery capital</b>	40.84 (0.15)	40.85 (0.18)	40.81 (0.26)	<0.001
<b>Social support</b>	44.02 (0.28)	43.95 (0.33)	44.18 (0.52)	<0.001

Note: Both frequency counts and percentages are unweighted.

<sup>a</sup> Out of the labor force = retired, homemaker, full-time student, or disabled/unable to work.

<sup>b</sup> Formerly married = widowed, divorced, or separated.

<sup>c</sup> Independent recovery = no lifetime use of treatment services and no lifetime use of mutual-help groups

<sup>d</sup> Assisted recovery = any lifetime use of mutual-help groups (e.g., Alcoholics Anonymous) and no lifetime use of treatment services.

<sup>e</sup> Treated recovery = any lifetime use of treatment services (e.g., in-patient or out-patient rehabilitation).

**Table 2**

Experiences related to the COVID-19 pandemic in a national sample of adults with resolved alcohol use disorder, n (%).

	Full sample (n = 1492)	Women (n = 463)	Men (n = 1029)	p
<b>How much has the coronavirus/COVID-19 outbreak affected your relationship with alcohol or drugs and your recovery?</b>				
Not at all	1326 (88.8%)	406 (88.9%)	920 (88.8%)	0.16
A little	105 (7.7%)	39 (8.5%)	66 (7.3%)	
Moderately	31 (2.2%)	12 (2.3%)	19 (2.1%)	
A lot	20 (1.3%)	3 (0.3%)	17 (1.8%)	
<b>Has the coronavirus/COVID-19 outbreak made it more difficult for you to resist alcohol or drugs?</b>				
No	1388 (93.3%)	429 (94.2%)	959 (92.8%)	0.37
Yes	96 (6.7%)	32 (5.8%)	64 (7.2%)	
<b>Have any of the following happened to you since January 2020?</b>				
I had been abstinent but drank alcohol again (slip, relapse)	45 (3.1%)	15 (2.5%)	30 (3.5%)	0.68
I had controlled my drinking but started drinking more than usual	35 (2.7%)	6 (2.4%)	29 (2.9%)	
Neither of these apply to me	1407 (94.2%)	440 (95.1%)	967 (93.7%)	

Note: frequency counts are unweighted; percentages are weighted.

a 7% reduction in odds of relapse among men (aOR 0.93; 95% CI 0.88, 0.98). Among women, lifetime AUD symptom count and recovery length had similarly consistent effects in bivariate and multivariate models. In the final model, each additional lifetime AUD symptom was associated with 37% higher odds of relapse (aOR 1.37; 95% CI 1.06, 1.77), and being in early (<1 year) recovery was associated with 10-fold higher odds of relapse compared to peers in long-term (>5 years) recovery (aOR 10.62; 95% CI 1.71, 66.13). Among men, however, there was no significant effect of lifetime AUD symptom count in either bivariate or multivariate models, and the bivariate association of recovery length became non-significant in the multivariate model.

Several other differences between women and men emerged in the final multivariate model. Among women, being out of the labor force was associated with nearly five-fold higher odds of mild relapse compared to employed peers (aOR 4.90; 95% CI 1.20, 19.95). Similarly, never having married was associated with five-fold higher odds of mild

**Table 3a**  
Predictors of mild relapse during the COVID-19 pandemic among women with resolved alcohol use disorder (n = 463).

Variable	Bivariate			Multivariate		
	OR	(95% CI)	p	OR	(95% CI)	p
<b>Problem characteristics</b>						
Lifetime AUD symptom count	1.20	(1.02, 1.41)	0.03	1.37	(1.06, 1.77)	0.02
Recovery group Independent <sup>a</sup>	0.80	(0.23, 2.76)	0.73	2.59	(0.68, 9.9)	0.16
Assisted <sup>b</sup>	0.30	(0.05, 1.77)	0.19	0.51	(0.06, 4.48)	0.54
Treated <sup>c</sup>	ref.	–	–	ref.	–	–
Recovery length <1 year	7.83	(1.90, 32.36)	0.01	10.62	(1.71, 66.13)	0.01
1–5 years	0.33	(0.08, 1.33)	0.12	0.21	(0.04, 1.1)	0.07
More than 5 years	ref.	–	–	ref.	–	–
<b>Recovery threat</b>						
COVID stressors count	1.07	(0.87, 1.31)	0.52	1.23	(0.96, 1.58)	0.10
<b>Minor children in household</b>						
No	ref.	–	–	ref.	–	–
Yes	1.06	(0.33, 3.46)	0.92	0.56	(0.14, 2.30)	0.43
<b>Recovery support</b>						
Recovery capital	0.90	(0.84, 0.96)	<0.01	0.90	(0.84, 0.97)	<0.01
Social support	0.99	(0.96, 1.03)	0.71	1.03	(0.98, 1.08)	0.27
<b>Demographic characteristics</b>						
<b>Age</b>						
18–29 years	ref.	–	–	ref.	–	–
30–44 years	4.57	(0.67, 30.99)	0.12	6.09	(0.88, 41.95)	0.07
45–59 years	1.0	(0.14, 7.37)	0.99	0.97	(0.1, 9.8)	0.98
≥60 years	1.0	(0.14, 6.92)	0.99	0.79	(0.08, 8.22)	0.84
<b>Race/ethnicity</b>						
White, non-Hispanic	2.04	(0.64, 6.48)	0.23	1.27	(0.4, 4.02)	0.69
Black, non-Hispanic	2.29	(0.38, 13.6)	0.36	1.49	(0.33, 6.68)	0.60
Hispanic, any race	0.25	(0.03, 2.12)	0.20	0.17	(0.01, 3.93)	0.27
<b>Educational attainment</b>						
Less than high school	2.43	(0.44, 13.44)	0.31	1.80	(0.33, 9.89)	0.50
High school diploma	1.55	(0.49, 4.91)	0.46	2.82	(0.55, 14.47)	0.21
Some college	0.93	(0.26, 3.31)	0.91	0.81	(0.16, 4.04)	0.79
Bachelors or higher	ref.	–	–	ref.	–	–
<b>Employment status</b>						
Employed	ref.	–	–	ref.	–	–
Unemployed	2.03	(0.34, 12.03)	0.44	3.83	(0.35, 41.62)	0.27
Out of labor force <sup>d</sup>	0.89	(0.28, 2.84)	0.84	4.90	(1.20, 19.95)	0.03
<b>Relationship status</b>						
Married/cohabitating	ref.	–	–	ref.	–	–
Formerly married	1.34	(0.38, 4.75)	0.65	1.43	(0.27, 7.68)	0.68
Never married	2.75	(0.69, 10.93)	0.15	5.59	(1.53, 20.47)	0.01
<b>Household poverty status</b>						

**Table 3a (continued)**

Variable	Bivariate			Multivariate		
	OR	(95% CI)	p	OR	(95% CI)	p
<100% federal poverty level	0.83	(0.21, 3.34)	0.79	0.25	(0.04, 1.44)	0.12
100%–200% federal poverty level	0.82	(0.23, 2.88)	0.75	1.09	(0.21, 5.62)	0.92
>200% federal poverty level	ref.	–	–	ref.	–	–

<sup>e</sup> Formerly married = widowed, divorced, or separated.

<sup>a</sup> Independent recovery = no lifetime use of treatment services and no lifetime use of mutual-help groups.

<sup>b</sup> Assisted recovery = any lifetime use of mutual-help groups (e.g., Alcoholics Anonymous) and no lifetime use of treatment services.

<sup>c</sup> Treated recovery = any lifetime use of treatment services (e.g., in-patient or out-patient rehabilitation).

<sup>d</sup> Out of labor force = retired, homemaker, full-time student, or disabled/unable to work.

relapse compared to peers who were married or cohabitating (aOR 5.59; 95% CI 1.53, 20.47). Among men, those who had completed high school or had some college education but no degree had approximately two-thirds lower odds of mild relapse compared to peers with a bachelor's degree or higher (aOR 0.33; 95% CI 0.14, 0.80; and aOR 0.34; 95% CI 0.15, 0.79, respectively). In contrast, men whose households were below the federal poverty level had three-times higher odds of mild relapse than peers in households above 200% of the federal poverty level (aOR 3.44; 95% CI 1.59, 7.46).

Following the multivariate model, we sought to better understand the lack of an association for COVID-19 related stressors by exploring endorsement of the stressor checklist by gender (Appendix A). Larger proportions of women than men had financial concerns and concerns about the pandemic's impact on children (36.2% versus 28.6%, p = 0.01; and 30.4% versus 24.0%, p = 0.03, respectively). In contrast, a larger proportion of men than women were not stressed about the COVID-19 pandemic (33.1% versus 21.7%, p < 0.001). There were no other differences between women and men in levels of COVID-19 related stressors. Similarly, we explored responses to recovery capital items to better understand the consistently protective association (Appendix B). Among results, there was only one significant difference by gender; a larger proportion of men than women had enough energy to complete their tasks (77.7% versus 69.9%, p < 0.01). There were no differences between women and men in responses to other recovery capital items.

#### 4. Discussion

The present study sought to investigate the stability of recovery from AUD during the COVID-19 pandemic and to identify correlates of mild relapse. It benefited from several notable strengths, such as a timely approach, a comprehensive definition of recovery that included moderated drinking as well as abstinence, a large national sample, and a predominantly non-clinical sample. Our overarching goal with this research is to guide future efforts to support recovery from AUD in the population at large, and we are particularly interested in gender differences.

The most robust finding was that recovery capital showed consistent and comparable protective effects for both women and men. In contrast, generalized social support had no effect, which suggests that recovery capital is a distinctively protective factor. Notably, recovery capital has been theorized to improve coping ability, which is particularly important given the biological, psychological, and social stressors encountered when ceasing alcohol use and developing a new, non-drinking social identity. Coping skills may be especially important during periods of increased stressors and uncertainty, such as the COVID-19 pandemic. Consistent with other research, we conceptualized recovery capital as

**Table 3b**  
Predictors of mild relapse during the COVID-19 pandemic among men with resolved alcohol use disorder (n = 1029).

Variable	Bivariate			Multivariate		
	OR	95% CI	p	OR	95% CI	p
<b>Problem characteristics</b>						
Lifetime AUD symptom count	1.09	(0.98, 1.21)	0.10	1.09	(0.97, 1.24)	0.14
<b>Recovery group</b>						
Independent <sup>a</sup>	0.56	(0.28, 1.13)	0.11	0.69	(0.30, 1.54)	0.36
Assisted <sup>b</sup>	0.60	(0.23, 1.52)	0.28	0.6	(0.21, 1.71)	0.34
Treated <sup>c</sup>	ref.	–	–	ref.	–	–
<b>Recovery length</b>						
<1 year	3.77	(1.32, 10.76)	0.01	2.66	(0.89, 7.92)	0.08
1–5 years	2.48	(1.25, 4.92)	0.01	1.86	(0.87, 3.95)	0.11
More than 5 years	ref.	–	–	ref.	–	–
<b>Recovery threat</b>						
COVID stressors count	1.03	(0.91, 1.17)	0.62	1.03	(0.90, 1.18)	0.67
<b>Minor children in household</b>						
No	ref.	–	–	ref.	–	–
Yes	1.15	(0.59, 2.26)	0.69	0.77	(0.38, 1.56)	0.47
<b>Recovery support</b>						
Recovery capital	0.95	(0.92, 0.98)	0.01	0.93	(0.88, 0.98)	< 0.01
Social support	1	(0.98, 1.03)	0.86	1.01	(0.97, 1.05)	0.58
<b>Demographic characteristics</b>						
<b>Age</b>						
18–29 years	ref.	–	–	ref.	–	–
30–44 years	0.97	(0.31, 3.09)	0.96	1.08	(0.29, 4.09)	0.91
45–59 years	0.86	(0.27, 2.69)	0.79	1.09	(0.25, 4.88)	0.91
≥60 years	0.27	(0.08, 0.93)	0.04	0.51	(0.10, 2.63)	0.42
<b>Race/ethnicity</b>						
White, non-Hispanic	ref.	–	–	ref.	–	–
Black, non-Hispanic	1.25	(0.38, 4.05)	0.71	1.18	(0.45, 3.09)	0.74
Hispanic, any race	1.41	(0.66, 3.01)	0.37	1.49	(0.64, 3.44)	0.35
Other, multiple races	1.52	(0.49, 4.73)	0.47	0.90	(0.20, 3.98)	0.89
<b>Educational attainment</b>						
Less than high school	0.66	(0.21, 2.12)	0.49	0.36	(0.09, 1.39)	0.14
High school diploma	0.67	(0.31, 1.47)	0.32	0.33	(0.14, 0.80)	0.02
Some college	0.45	(0.21, 0.96)	0.04	0.34	(0.15, 0.79)	0.01
Bachelors or higher	ref.	–	–	ref.	–	–
<b>Employment status</b>						
Employed	ref.	–	–	ref.	–	–
Unemployed	0.90	(0.28, 2.89)	0.85	0.72	(0.20, 2.64)	0.62
Out of labor force <sup>d</sup>	0.42	(0.19, 0.93)	0.03	0.53	(0.22, 1.28)	0.16
<b>Relationship status</b>						
Married/cohabitating	ref.	–	–	ref.	–	–
Formerly married <sup>e</sup>	1.20	(0.58, 2.50)	0.63	1.04	(0.45, 2.37)	0.93
Never married	1.19	(0.54, 2.61)	0.67	0.64	(0.20, 2.00)	0.44
<b>Household poverty status</b>						
<100% federal poverty level	2.31	(1.00, 5.30)	0.05	3.44	(1.59, 7.46)	< 0.01
100%–200% federal poverty level	0.92	(0.42, 2.00)	0.83	1.29	(0.54, 3.06)	0.57

**Table 3b (continued)**

Variable	Bivariate			Multivariate		
	OR	95% CI	p	OR	95% CI	p
>200% federal poverty level	ref.	–	–	ref.	–	–

<sup>e</sup> Formerly married = widowed, divorced, or separated.

<sup>a</sup> Independent recovery = no lifetime use of treatment services and no lifetime use of mutual-help groups.

<sup>b</sup> Assisted recovery = any lifetime use of mutual-help groups (e.g., Alcoholics Anonymous) and no lifetime use of treatment services.

<sup>c</sup> Treated recovery = any lifetime use of treatment services (e.g., in-patient or out-patient rehabilitation).

<sup>d</sup> Out of labor force = retired, homemaker, full-time student, or disabled/unable to work.

the set of individual attributes (e.g., lived experiences, self-efficacy) and interpersonal resources (e.g., social relationships, recovery-oriented cultural contexts) that a person may draw upon to initiate and maintain recovery from a substance use disorder—with or without use of treatment or other services. Our findings for the protective effects of recovery capital are consistent with this conceptualization and mirror previous reports of beneficial effects, notably that recovery capital is associated with decreased cravings (Sterling et al., 2008), improved treatment completion (Sánchez et al., 2020), and sustained abstinence (Vilsaint et al., 2017). We believe this finding is noteworthy because recovery capital is modifiable and may be a particularly efficient intervention target.

We also recognize that further methodological work is needed. There has been considerable inconsistency in how recovery capital has been conceptualized and measured (Hennessy, 2017). It is possible that distinct aspects of recovery capital (e.g., internal attitudes or behaviors; interpersonal relationships) are more or less salient. Although we found few differences by gender, we look forward to future studies that confirm its validity across other dimensions (e.g., racial/ethnic and age groups) and that identify the most salient aspects that could be leveraged in interventions to support recovery.

We found that other correlates of mild relapse differed substantially by gender. For example, middle levels of education (e.g., high school diploma, some college) appeared to be protective for men, but there was no effect of educational attainment for women. Similarly, poverty status was associated with increased risk of mild relapse among men, but not for women. In contrast, women had a greater number of distinct risk factors compared to men, including greater lifetime AUD symptom count, being out of the labor force, and being never married. This suggests that tailored assessments of key factors and gender-appropriate supportive interventions may be necessary. However, some factors may not be easily addressed through individual-level interventions. For example, higher-level efforts to increase socio-economic status, such as workforce development interventions or educational policy changes, may improve likelihood of sustained recovery as well as enhance other health outcomes in a given community.

Among other results, we found that mild relapse was an infrequent event. This finding may be explained by the sample composition, which included a majority of people in long-term recovery who were not currently hazardous drinkers. Indeed, the study's eligibility criteria excluded any person reporting current heavy drinking. Persons experiencing ongoing, and perhaps more severe, relapse events were unable to participate. Thus, our study likely underestimates the prevalence of all relapse events during the COVID-19 pandemic. Nevertheless, there are some useful insights. For example, the results underscore that early recovery may be a particularly vulnerable time. Although our final multivariate models showed that recovery length was a significant correlate only for women, bivariate tests of recovery length were highly significant for both genders, and the marginally significant multivariate association for men was not inconsistent with that estimated for women.

The implication is that targeted supportive services for people in early recovery may be necessary during comparable large-scale stressors, such as natural disasters.

This study’s results also suggest directions for future research. Contrary to expectations, we did not find any evidence associating pandemic-related stressors with mild relapse, and our exploration of specific stressors found few differences between women and men. Given that a majority of the sample was in long-term recovery, it is possible that they had already developed robust coping responses that protected their recovery. Alternately, it is possible that our study design prevented us from detecting any association. As noted above, persons reporting current heavy drinking were excluded from the study. These may be the very people for whom an association exists between COVID-related stressors and relapse. Thus, this finding cannot be considered definitive. Studies using alternate designs are needed to test the relationship between COVID-19 stressors and relapse, including differential effects by gender.

Despite a number of strengths, our findings must be considered in light of several potential limitations. First, the study’s cross-sectional design only provides information at one moment in time. The effects of the COVID-19 pandemic on relapse risk and recovery stability may vary over time, particularly as local pandemic conditions changed. Second, the study’s measures may have constrained some insights. In our quest to minimize respondent burden, we limited the number of additional items added to the study’s original questionnaire. We may have omitted salient variables, such as local pandemic restrictions, mental health comorbidities, or coping style. Similarly, some of the COVID-19-related items were original questions. The lack of standardized variables may diminish comparability of our findings with other studies. Third, the large confidence intervals around some odds ratios for women suggest that these estimates should be interpreted with caution. They are likely the result of the relatively infrequent outcome and smaller proportion of women than men in the sample. This same limitation has implications for the power to detect other important correlates. Given the small number of relapse events, our ability to detect significant associations may be limited. This is particularly notable in cases where prior literature indicates a probable connection which was not detected in this study (i.e., COVID-related stressors). We look forward to other studies that can confirm our pattern of findings. Finally, the sample composition affects generalizability of our findings.

Following eligibility criteria, our sample included adults who self-identified as in recovery and who were abstinent or drinking below risk thresholds. As current heavy drinkers were excluded, we cannot estimate the true prevalence of relapse among adults in recovery. Nevertheless, the study’s findings contribute to the emerging empirical literature and may inform future efforts to support recovery from AUD during the COVID-19 pandemic and other catastrophic events.

### 5. Conclusions

The pattern of findings suggests several ways to support recovery during the COVID-19 pandemic and other catastrophic events (e.g., natural disasters). First, recovery capital showed a consistently protective effect and may serve as a highly suitable intervention target. Second, early recovery appears to be a vulnerable period, and targeted support may be necessary for those with less time in recovery. Third, tailored assessments of other key factors and gender-appropriate supportive interventions may be necessary for women and men to ensure stable recovery.

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### Contributors

PAG conceived of the study; SEZ, NM, and AHS helped refine the research question; and GB conducted the analyses. All authors assisted with interpretation of results. PAG, LS, and SK drafted the manuscript; SEZ, NM, AHS, and GB revised and finalized the paper. All authors have approved the final manuscript.

### Declaration of Competing Interest

No conflict declared.

## Appendix A. Endorsement of COVID-19 related stressors in a national sample of adults with resolved alcohol use disorder, n (%)

	Full sample (n = 1492)	Women (n = 463)	Men (n = 1029)	p
What have been your greatest sources of stress during the coronavirus/COVID-19 outbreak? (Check all that apply)				
Health concerns for myself and those I am close to	859 (56.2%)	282 (58.5%)	577 (55.0%)	0.31
Access to food	624 (41.1%)	214 (44.5%)	410 (39.2%)	0.11
Social distancing or being quarantined	594 (39.0%)	215 (41.0%)	379 (38.0%)	0.34
Financial concerns for myself and those I am close to	470 (31.2%)	177 (36.2%)	293 (28.6%)	0.01
Impact on my child(ren)	390 (26.2%)	140 (30.4%)	250 (24.0%)	0.03
Impact on my community	370 (22.8%)	132 (25.6%)	238 (21.4%)	0.12
Impact on my work	286 (21.2%)	93 (22.0%)	193 (20.9%)	0.69
Access to personal care products or household supplies	266 (17.8%)	96 (18.3%)	170 (17.6%)	0.79
Access to medical care, including mental health care	249 (16.2%)	92 (17.1%)	157 (15.8%)	0.58
Impact on family members	208 (13.9%)	79 (16.0%)	129 (12.7%)	0.16
Something else	97 (5.9%)	39 (7.4%)	58 (5.2%)	0.14
Access to baby supplies (for example, formula, diapers, wipes)	34 (2.8%)	14 (3.7%)	20 (2.3%)	0.22
I am not stressed about the coronavirus/COVID-19 outbreak	437 (29.2%)	97 (21.7%)	340 (33.1%)	< 0.001

Note: frequency counts are unweighted; percentages are weighted.

## Appendix B. Endorsement of recovery capital items in a national sample of adults with resolved alcohol use disorder, n (%)



	Full sample (n = 1492)	Women (n = 463)	Men (n = 1029)	p
There are more important things to me in life than using alcohol	1380 (90.6%)	432 (92.2%)	948 (89.7%)	0.27
In general, I am happy with my life	1247 (81.7%)	375 (80.2%)	872 (82.5%)	0.42
I have enough energy to complete the tasks I set for myself	1126 (75.0%)	321 (69.9%)	805 (77.7%)	< 0.01
I am proud of the community I live in and feel a part of it	882 (58.7%)	280 (62.5%)	602 (56.6%)	0.07
I get lots of support from friends	880 (58.0%)	280 (57.8%)	600 (58.1%)	0.91
I regard my life as challenging and fulfilling without the need for using alcohol	1305 (85.8%)	409 (87.2%)	896 (85.1%)	0.40
My living space has helped to drive my recovery journey (or overcome my alcohol problems)	767 (53.6%)	249 (55.7%)	518 (52.6%)	0.35
I take full responsibility for my actions	1423 (93.9%)	444 (94.3%)	979 (93.6%)	0.71
I am happy dealing with a range of professional people	966 (61.9%)	285 (58.7%)	681 (63.6%)	0.13
I am making or maintaining good progress on my recovery journey (or overcoming my alcohol problems)	1311 (86.5%)	406 (86.5%)	905 (86.6%)	0.95

Note: frequency counts are unweighted; percentages are weighted.

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