

# Gender differences in lifetime and current use of online support for recovery from alcohol use disorder

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## Abstract

**Background:** Digital recovery support services (D-RSS) use technology to engage individuals seeking recovery from alcohol use disorder (AUD). Given sparse data on use of these emergent services as well as longstanding and stark gender disparities in use of traditional alcohol treatment services, we sought to quantify lifetime and current D-RSS use and to test associations with several recovery outcomes, with particular attention to gender differences.

**Methods:** We analyzed data obtained in fall 2020 in a national survey of adults with a resolved alcohol problem ( $n = 1487$ ). We estimated lifetime and current D-RSS use, prevalence of various types of D-RSS, and related outcomes (e.g., recovery stability, relapse events, quality of life). Stratified logistic regression models identified correlates of D-RSS use for women and men, controlling for demographic and AUD characteristics.

**Results:** Overall, an estimated 14.9% of the population of adults with a resolved alcohol problem reported lifetime use of D-RSS, with no difference by gender. Current use was lower and was reported by more men than women (9.9% vs. 5.8%, respectively). Men had higher odds of D-RSS use if they had <1 year of recovery (adjusted odds ratio [aOR] 7.84), 1 to 5 years of recovery (aOR 2.17), and if never married (aOR 3.29). Among women, higher odds of D-RSS were associated with AUD symptom count (aOR 1.30), being unemployed (aOR 9.85), and having minor children in the household (aOR 3.58). Among women, there was no association between D-RSS use and recovery stability, relapse events, and quality of life. However, among men D-RSS use was associated with reporting that the COVID-19 pandemic had made it more difficult to resist alcohol or drugs and with lower self-reported quality of life.

**Conclusions:** D-RSS are a promising technological approach to support recovery. There is room to increase their use, and gender-specific approaches may be needed given different correlates of use for women and men. In addition, further research is needed to explore whether D-RSS may confer benefits through similar mechanisms as in-person recovery services.

## KEYWORDS

alcohol use disorder, internet, mutual help groups, recovery, social media

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## INTRODUCTION

Alcohol use disorder (AUD) remains a top public health concern, as more than 15 million American adults met diagnostic criteria for AUD in 2020 (Substance Abuse & Mental Health Services Administration, 2021). Moreover, there are indications of a large gap in services. Data from the National Survey on Drug Use and Health showed that <10% of individuals with any past-year substance use disorder received any form of treatment in 2020 (Substance Abuse & Mental Health Services Administration, 2021).

A further concern is the gender disparity in alcohol treatment and use of other services, which is well recognized (Alvanzo et al., 2014; Gilbert et al., 2019; Ilgen et al., 2011). The disparities between men's and women's recovery experiences begin at treatment entry, with women more likely to present with more severe alcohol use disorders due to comorbidities and the telescoping phenomenon (i.e., faster progression from drinking debut to alcohol dependence), lower education level and income, high unemployment and housing needs, as well as higher parental stress (Holzhauer et al., 2020; Keyes et al., 2010b; National Institute on Drug Abuse, 2020; Zilberman et al., 2003). Women may also be affected by additional gender-specific factors that affect treatment retention, such as psychological functioning and social support, number of children, and availability of childcare (Greenfield et al., 2007; Holzhauer et al., 2020; Mulia & Bensley, 2020).

Digital recovery support services (D-RSS) that use online technology-based modalities (e.g., online video recovery support meetings, discussion boards and chat rooms, social networking sites) may provide a novel means through which to engage individuals with recovery-supportive resources, and thereby address the unmet need for services (Ashford et al., 2020; Bergman et al., 2018, 2021; Bergman & Kelly, 2021). Indeed, mutual-help organizations, such as Alcoholics Anonymous (AA) and SMART Recovery, offer a growing number of online synchronous (i.e., real time) meetings using remote video conferencing services. Additionally, social networking sites, such as Reddit (a discussion-board based site), are being used by individuals in or seeking recovery as a source of asynchronous peer support (D'Agostino et al., 2017; Sowles et al., 2017). Other people have used Twitter to post addiction-related questions and concerns during the COVID-19 pandemic (Glowacki et al., 2021). In addition, a number of smartphone apps have been developed as tools to manage alcohol use or to support individuals seeking recovery (Ford et al., 2015).

D-RSS may confer benefits to participants in a similar manner as in-person services, such as by instilling hope, enhancing self-efficacy and coping skills, and providing social support (Kelly et al., 2009, 2012), while counteracting barriers to treatment, such as transportation, geography, cost, and stigma (Bergman et al., 2018; Bergman & Kelly, 2021; Keyes et al., 2010a). Although data on D-RSS effectiveness are still emerging, there is evidence to suggest that people in or seeking AUD recovery are using social networking sites. For example, Ashford et al. (2018) found that the majority (73.6%) of participants in outpatient addiction treatment programs used social

media on a daily basis and that about half (49.1%) were interested in receiving relapse prevention support via social networking sites. Preliminary research during the COVID-19 pandemic suggested that women were more likely to use D-RSS (Holzhauer et al., 2020; Livingston et al., 2021) but evidence remains sparse. Certainly, lower cost and increased accessibility are encouraging benefits, but D-RSS may not eliminate all barriers to recovery services, including ones underlying gender disparities (Ashford et al., 2020).

Given the potential to support recovery through innovative technological resources but the limited research attention to date, we examined D-RSS use in a national survey of adults with a resolved alcohol problem. As the parent study was already in development when the COVID-19 pandemic occurred, we were able to examine behaviors during a period of heightened stressors and potentially diminished resources. Specifically, we sought to estimate lifetime and current prevalence of D-RSS use, with attention to differences between women and men, and to test whether D-RSS use was associated with better recovery outcomes, operationalized as recovery stability, relapse events, and quality of life. As an exploratory study, there were no *a priori* hypotheses.

## MATERIAL AND METHODS

### Study design and sample

This cross-sectional survey used data obtained from a pre-existing national cohort of adults, KnowledgePanel, which has been described in detail elsewhere (<https://www.ipsos.com/en-us/solutions/public-affairs/knowledgepanel>). Briefly, KnowledgePanel is a probability-based sample of non-institutionalized adults (age 18 and older) 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.

In fall 2020, Ipsos drew a probability sample of KnowledgePanel members for our survey, consisting of a general population sample and an oversample of racial/ethnic minorities. Such dual sampling is a standard technique in survey design as it allows researchers to decrease the standard errors of estimated group differences for underrepresented groups. The survey was available in English or Spanish. To be eligible to participate, panel members had to be age 18 or older and self-identify 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." Abstinence was not required; however, current drinkers were screened for hazardous drinking using the three-item AUDIT-C (Bush et al., 1998; Dawson et al., 2005).

Potential participants with AUDIT-C scores indicative of hazardous drinking ( $\geq 4$  for men;  $\geq 3$  for women) were excluded. In total, 31,386 Knowledge Panel members received an email notification about the survey and were directed to an informed consent letter, which described the study as research to understand how people have overcome an alcohol problem, with or without getting treatment or other forms of help. Subsequently, 17,622 completed an eligibility screening (56% response rate). Of those respondents, 1,637 met eligibility criteria and completed the questionnaire. During data preparation, we discovered erroneous or inconsistent responses from 145 respondents and subsequently excluded them because of low data quality. In addition, five participants who did not answer the question about lifetime D-RSS use and six participants who did not answer the question about current D-RSS use (described below) were excluded from lifetime and current use analyses, respectively. As compensation, participants received 20,000 Knowledge Panel points, worth approximately \$20, which could be redeemed from Ipsos. Study materials and procedures were reviewed and approved by Western IRB and the University of Iowa IRB.

## Measures

### Digital recovery support services

Our main outcome was the use of D-RSS, which we conceived as online technological resources for information or sources of interpersonal support for recovery. First, participants answered a dichotomous question (yes or no) about lifetime use of websites, online discussion boards, or social media for help related to drinking. Those who responded affirmatively then received a checklist of six types of D-RSS (e.g., online meetings or mutual-help groups, such as Alcoholics Anonymous (AA) or LifeRing; social networking sites focused on recovery, such as InTheRooms.com) and were asked to check all that they had ever used. There was also a write-in option for "some other internet resource." Second, participants answered a dichotomous question (yes or no) about specifically using online mutual-help or 12-step group meetings for their recovery since January 2020 (coinciding approximately with the onset of the COVID-19 pandemic). Those who responded affirmatively then received a trichotomous question about the frequency of their use since January 2020 (used D-RSS for the first time; used D-RSS as often as before; used D-RSS more than before).

### Recovery during the COVID-19 pandemic

We also collected information on three additional outcomes potentially related to D-RSS use. First, recovery stability was assessed via a dichotomous question (yes or no) that asked if the COVID-19 outbreak had made it more difficult to resist alcohol or drugs. Second, we captured relapse events during the COVID-19 pandemic in an

item that asked if participants 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. We created a binary indicator where an endorsement of either option was coded as a relapse event. Third, we assessed the quality of life using a single, self-report item that inquired how things had been going in the past 4 weeks. Response options were collapsed for analysis into a three-level variable: pretty good to very well; good and bad about equal; pretty bad to very bad (Wasson, 2019).

## Covariates

Key covariates included lifetime AUD severity, use of treatment services, recovery length, COVID-19 stressors, recovery capital, social support, and several demographic characteristics. Lifetime AUD symptoms were assessed via 11 items drawn from the National Epidemiological Survey on Alcohol and Related Conditions that 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 to 11). In turn, we created a four-level classification of lifetime AUD severity: subclinical (1 symptom); mild (2 to 3 symptoms); moderate (4 to 5 symptoms); and severe (6 or more symptoms). We classified participants into three recovery groups based on self-reported lifetime use of 14 different services: treated recovery (any use of specialty services, such as in-patient or out-patient rehabilitation); assisted recovery (any use of mutual-help groups and no use of specialty services); or independent recovery (no use of specialty services nor mutual-help groups). Although some participants in the independent recovery group reported D-RSS use, online mutual-help groups was not one of the types reported. Length in recovery was reported by participants as a categorical variable: early recovery (<1 year); intermediate recovery (1 to 5 years); or long-term recovery (>5 years). To assess COVID-related stressors, we adapted an item 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>). The item presented 12 possible sources of stress during the pandemic and asked participants to choose all that apply. We derived a count variable of stressors by summing affirmative responses (range 0 to 12). There were two measures of recovery support. 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 5-point Likert-type responses (strongly disagree to strongly agree) with higher scores indicating greater levels of recovery capital and social support, respectively. Finally, we examined six additional sociodemographic variables: age, race/ethnicity, educational

attainment, employment status, household poverty status, the presence of minor children in the household, and relationship status.

## Analysis

We used weighted data to make generalizable inferences about the population of adults with a resolved alcohol problem. To begin, we produced descriptive statistics, calculating frequencies and percentages of categorical variables, and means and standard deviations of continuous or count variables. Then, we estimated the prevalence of lifetime and current D-RSS use, as well as prevalence of various types of D-RSS, and used survey-weighted chi-square tests to detect differences between women and men. Given the low frequency of D-RSS use, we identified in advance a reduced set of variables to examine in survey-weighted logistic regression models that was based on theoretical or empirical associations with recovery outcomes. These variables included lifetime AUD severity, recovery group (i.e., history of treatment services use), recovery length, COVID-related stressors, recovery capital, social support, age, race/ethnicity, educational attainment, employment status, household poverty status, the presence of minor children in the household, and relationship status. Due to small cell counts when stratified by gender, we used a dichotomous age variable (<60 years vs. ≥60 years) instead of the original four-level categorical variable. Finally, to explore the potential health impacts of D-RSS use, we tested associations with indicators of recovery stability, relapse events, and quality of life in chi-square tests stratified by gender, using Fisher's exact test when cell counts were very low. Throughout, we chose to stratify analyses by gender based on the extant literature and prior expertise indicating that the processes of recovery are likely different for women and men. The primary analyses presented do not directly test for gender differences; however, we explored gender differences via interaction effects in supplemental analyses (Supplemental Analyses). Adding pairwise interactions between all covariates and gender did not significantly improve fit and showed some minor indications of instability relative to stratified models. Pursuing a more parsimonious interaction model, we applied backwards selection based on AIC from this full interaction model. The revised model showed less evidence of instability, but those results must be interpreted with extra caution as they arose from model selection, and it is not generally possible for the reader to formally interpret the reported p-values for this type of procedure. As the full interaction model point estimates were extremely close to those obtained in our preplanned stratified model, we report the latter here to maximize interpretation by readers. We used the survey package for R v.4.0.3 for all analyses. The critical alpha for tests was 0.05.

## RESULTS

As shown in [Table 1](#), the majority the sample was male, aged 45 or older, White, had some college education or a college degree, was

currently employed, was married or cohabitating, and had household incomes greater than twice the federal poverty limit. In terms of alcohol problem characteristics, the majority met criteria for severe AUD, and was classified in the independent recovery group (i.e., never used specialty services nor mutual-help groups), and reported being in recovery for more than 5 years. Comparing lifetime D-RSS users to nonusers, we noted several differences. Among users, there were larger proportions of adults aged 44 and younger, with a Bachelor's degree or higher, employed, persons who had never married, and households above 200% of the federal poverty level than among nonusers. Three alcohol problem characteristics also differed between the groups. D-RSS users had a larger proportion of persons with severe lifetime AUD, who had obtained treatment, and who were in recovery less than five years than nonusers. We observed no differences between lifetime users and nonusers in terms of gender, race/ethnicity, and the presence of minor children in the household.

An estimated 14.9% of this population reported ever using D-RSS, with no difference in lifetime use by gender (women:  $n = 61$ , 12.7% vs. men:  $n = 138$ , 16.0%;  $F_{1,1485} = 1.82$ ,  $p = 0.18$ ). However, a greater proportion of men than women reported using D-RSS during the COVID-19 pandemic since January 2020 (men:  $n = 93$ , 9.9% vs. women:  $n = 29$ , 5.8%;  $F_{1,1485} = 5.51$ ,  $p = 0.02$ ). Of the current users, nearly half (48.2%) of men and approximately one-third (35.3%) of women reported using D-RSS as often as before. Among women users, approximately one-third (36.1%) reported using D-RSS for the first time during the COVID-19 pandemic, while among men approximately one-quarter (28.7%) reported using D-RSS for the first time during the COVID-19 pandemic. However, neither of these differences in use reached statistical significance.

Among lifetime users, we observed varying levels of use for different types of D-RSS ([Table 2](#)). The most frequently used type was social networking sites that were not focused on recovery (e.g., Facebook), reported by more women than men; however, the difference failed to reach statistical significance (44.4% vs. 34.2%,  $F_{1,197} = 1.24$ ,  $p = 0.27$ ). There were two significant differences by gender for other types of D-RSS. Larger proportions of men than women reported use of online mutual-help group meetings (41.5% vs. 17.7%,  $F_{1,197} = 9$ ,  $p < 0.01$ ). Similarly, more men than women reported using informational websites about treatment (39.5% vs. 21.9%,  $F_{1,197} = 4.63$ ,  $p = 0.03$ ). Less than one-quarter of the sample reported ever using the remaining types of D-RSS (e.g., podcast, informational website about alcohol use, recovery-focused social networking site), with no differences between women and men.

Seeking to identify correlates of current D-RSS use among women and men separately, we used gender-stratified, survey-weighted multivariable logistic regression ([Table 3](#)). Conditional on the other variables presented, men had higher odds of D-RSS use if they were in early recovery (<1 year, adjusted odds ratio [aOR] 7.84,  $p < 0.01$ ; 1 to 5 years, aOR 2.17,  $p < 0.001$ ) and if never married (aOR 3.29,  $p < 0.01$ ). Among women, higher odds of R-DSS were associated with AUD symptom count (aOR 1.20,  $p = 0.01$ ), being unemployed (aOR 9.85,  $p < 0.01$ ), and having minor children in the household (aOR 3.58,  $p = 0.03$ ).

**TABLE 1** Demographic characteristics by lifetime digital recovery support services use in a national sample of adults with a resolved alcohol problem, *n* (%)

	Full sample ( <i>n</i> = 1,487)	No D-RSS use ( <i>n</i> = 1,288)	Any D-RSS use ( <i>n</i> = 199)	Test statistic <sup>a</sup> <i>F</i> <sub>NumDF,DenDF</sub>	<i>p</i>
<b>Age</b>					
18 to 29 years	89 (12.9%)	62 (11.08%)	27 (23.56%)	19.18 <sub>(2.55,3795.59)</sub>	<0.001
30 to 44 years	293 (24.6%)	218 (21.73%)	75 (40.76%)		
45 to 59 years	437 (27.9%)	372 (28.54%)	65 (24.14%)		
≥60 years	668 (34.6%)	636 (38.65%)	32 (11.54%)		
<b>Gender</b>					
Men	1026 (65.3%)	888 (64.47%)	138 (70.37%)	1.82 <sub>(1,1486)</sub>	0.18
Women	461 (34.7%)	400 (35.53%)	61 (29.63%)		
<b>Race/ethnicity</b>					
White, non-Hispanic	966 (64.2%)	837 (64.14%)	129 (64.22%)	0.08 <sub>(2.96,4405.33)</sub>	0.97
Black, non-Hispanic	165 (11.9%)	144 (11.71%)	21 (12.81%)		
Hispanic, any race	245 (15.3%)	215 (15.52%)	30 (14.05%)		
Multiple or other races	111 (8.7%)	92 (8.63%)	19 (8.92%)		
<b>Educational attainment</b>					
Less than high school	108 (13.9%)	100 (14.61%)	8 (9.85%)	6.02 <sub>(2.68,3976.83)</sub>	<0.001
High school	371 (29.6%)	344 (31.75%)	27 (17.42%)		
Some college	559 (32.3%)	490 (31.85%)	69 (34.67%)		
Bachelor's degree or higher	449 (24.2%)	354 (21.79%)	95 (38.06%)		
<b>Employment status</b>					
Employed	803 (58.2%)	663 (55.57%)	140 (73.2%)	12.08 <sub>(1.74,2584.72)</sub>	<0.001
Unemployed	66 (6.2%)	51 (5.46%)	15 (10.37%)		
Out of the labor force <sup>b</sup>	618 (35.6%)	574 (38.97%)	44 (16.43%)		
<b>Relationship status</b>					
Married or cohabitating	888 (59.9%)	777 (60.88%)	111 (54.29%)	4.25 <sub>(1.89,2803.23)</sub>	0.02
Formerly married <sup>c</sup>	344 (19.8%)	305 (20.43%)	39 (16.16%)		
Never married	255 (20.3%)	206 (18.69%)	49 (29.55%)		
<b>Household poverty status</b>					
<100% FPL	260 (16.8%)	231 (17.34%)	29 (13.97%)	3.29 <sub>(2,2971.2)</sub>	0.04
100%–200% FPL	290 (18.7%)	264 (19.89%)	26 (12.19%)		
>200% FPL	937 (64.4%)	793 (62.77%)	144 (73.84%)		
<b>Minor children in household</b>					
No	1160 (75.1%)	1024 (76.0%)	136 (69.55%)	2.86 <sub>(1,1486)</sub>	0.09
Yes	327 (24.9%)	264 (23.98%)	63 (30.45%)		
<b>Lifetime AUD severity</b>					
Subclinical (1 symptom)	52 (4.3%)	52 (5.07%)	0 (0%)	6.8 <sub>(2.99,4435.94)</sub>	<0.001
Mild (2 to 3 symptoms)	145 (11%)	139 (12.33%)	6 (3.29%)		
Moderate (4 to 5 symptoms)	204 (13.5%)	188 (14.33%)	16 (9.01%)		
Severe (6 or more symptoms)	1086 (71.2%)	909 (68.27%)	177 (87.7%)		
<b>Recovery group</b>					
Independent <sup>d</sup>	888 (61.5%)	807 (64.98%)	81 (41.73%)	16.45 <sub>(1.94,2885.48)</sub>	<0.001
Assisted <sup>e</sup>	225 (13.8%)	183 (13.23%)	42 (16.8%)		
Treated <sup>f</sup>	374 (24.7%)	298 (21.79%)	76 (41.47%)		
<b>Recovery length</b>					

(Continues)

TABLE 1 (Continued)

	Full sample (n = 1,487)	No D-RSS use (n = 1,288)	Any D-RSS use (n = 199)	Test statistic <sup>a</sup> $F_{NumDF,DenDF}$	p
<1 year	65 (6.2%)	45 (4.78%)	20 (13.99%)	20.9 <sub>(1,94,2867.61)</sub>	<0.001
1 to 5 years	286 (22.5%)	210 (19.6%)	76 (39.23%)		
>5 years	1126 (71.3%)	1026 (75.6%)	100 (46.78%)		

Note: Frequencies are unweighted; percentages are weighted.

Abbreviations: AUD, alcohol use disorder; FPL, federal poverty level; D-RSS, digital recovery support services.

<sup>a</sup>The surveychisq procedure applies a second-order Rao-Scott correction to the chi-squared test, which is implemented using an *F* statistic.

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

<sup>c</sup>Formerly married = widowed, divorced, and separated.

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

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

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

TABLE 2 Reported use of digital recovery support services (D-RSS) by gender among lifetime users, n (%)

	All lifetime users (n = 199)	Women (n = 61)	Men (n = 138)	Test statistic <sup>a</sup> $F_{NumDF,DenDF}$	p
Social networking sites not focused on recovery, such as Facebook, to get help for your drinking, or to strengthen or maintain your recovery from an alcohol problem					
No	131 (62.8%)	35 (55.6%)	96 (65.9%)	1.24 <sub>(1,197)</sub>	0.27
Yes	67 (37.2%)	26 (44.4%)	41 (34.2%)		
Online meetings or mutual-help groups, such as Alcoholics Anonymous (AA) or LifeRing					
No	127 (65.6%)	48 (82.3%)	79 (58.5%)	9.00 <sub>(1,197)</sub>	<0.01
Yes	71 (34.4%)	13 (17.7%)	58 (41.5%)		
A website that offers information about alcohol treatment programs to find treatment for yourself					
No	131 (65.8%)	46 (78.2%)	85 (60.5%)	4.63 <sub>(1,197)</sub>	0.03
Yes	67 (34.2%)	15 (21.9%)	52 (39.5%)		
A podcast or online radio show					
No	162 (76.9%)	51 (79.5%)	111 (75.7%)	0.19 <sub>(1,197)</sub>	0.67
Yes	36 (23.1%)	10 (20.5%)	26 (24.3%)		
A website that offers information about alcohol use, such as Drinker's Check-Up, to assess or monitor your drinking					
No	158 (79.1%)	55 (82.8%)	103 (77.5%)	0.33 <sub>(1,197)</sub>	0.57
Yes	40 (20.9%)	6 (17.2%)	34 (22.5%)		
Some other internet resource					
No	165 (83.2%)	49 (80.3%)	116 (84.4%)	0.35 <sub>(1,197)</sub>	0.55
Yes	33 (16.8%)	12 (19.7%)	21 (15.6%)		
Social networking sites focused on recovery, such as InTheRooms.com					
No	172 (86.4%)	55 (90.3%)	117 (84.7%)	0.94 <sub>(1,197)</sub>	0.33
Yes	26 (13.6%)	6 (9.7%)	20 (15.3%)		

Note: Frequencies are unweighted; percentages are weighted.

<sup>a</sup>The surveychisq procedure applies a second-order Rao-Scott correction to the chi-squared test, which is implemented using an *F* statistic.

Finally, we examined three recovery outcomes that might be associated with D-RSS use (Table 4). Among women, there were no differences between users and nonusers in terms of recovery stability, relapse events, and quality of life; however, two significant differences emerged among men. Specifically, a larger proportion of men who used D-RSS than non-users reported that the COVID-19 pandemic had made it more difficult to resist alcohol or drugs (21.5% vs. 5.6%,  $p < 0.001$ ). There was also a difference in the distribution of responses to the quality-of-life measure, with a lower proportion

of D-RSS users than nonusers endorsing the pretty good or very well option (70.5% vs. 77.3%,  $p = 0.02$ ).

## DISCUSSION

Technology-based services are a recent and growing development that hold much promise for recovery support. Taking advantage of a national survey that was already in development when the COVID-19

**TABLE 3** Gender stratified logistic regression models of current digital recovery support services (D-RSS) use in a national sample of adults with a resolved alcohol problem ( $n = 1486$ )

	Women ( $n = 461$ )			Men ( $n = 1025$ )		
	aOR	95% CI	<i>p</i>	aOR	95% CI	<i>p</i>
Lifetime AUD symptom count	1.30	1.06, 1.59	0.01	1.05	0.94, 1.18	0.38
<b>Recovery group</b>						
Treated <sup>a</sup>	ref.	-	-	ref.	-	-
Assisted <sup>b</sup>	1.52	0.49, 4.69	0.47	0.39	0.19, 0.79	<0.01
Independent <sup>c</sup>	0.07	0.02, 0.23	<0.001	0.07	0.03, 0.19	<0.001
<b>Recovery length</b>						
<1 year	3.03	0.76, 12.01	0.12	7.92	2.84, 22.11	<0.001
1 to 5 years	0.34	0.09, 1.32	0.12	2.16	1.07, 4.38	0.03
More than 5 years	ref.	-	-	ref.	-	-
COVID-related stressors	1.03	0.85, 1.23	0.79	1.07	0.94, 1.21	0.31
Recovery capital	1.07	0.97, 1.18	0.17	1.01	0.95, 1.08	0.68
Social support	1.01	0.95, 1.07	0.77	1.03	0.97, 1.09	0.33
<b>Age</b>						
<60 years	ref.	-	-	ref.	-	-
≥60 years	1.50	0.46, 4.91	0.50	0.69	0.33, 1.41	0.31
<b>Race/ethnicity</b>						
White, non-Hispanic	ref.	-	-	ref.	-	-
Black, non-Hispanic	0.93	0.24, 3.63	0.92	1.29	0.49, 3.39	0.61
Hispanic, any race	2.48	0.50, 12.21	0.27	0.75	0.29, 1.96	0.56
Other and multiple races	0.12	0.01, 1.45	0.10	1.95	0.75, 5.08	0.17
<b>Educational attainment</b>						
Less than high school diploma	0.57	0.12, 2.78	0.49	0.26	0.06, 1.10	0.07
High school diploma	0.79	0.21, 2.99	0.73	0.35	0.13, 0.95	0.04
Some college	1.41	0.46, 4.35	0.55	0.60	0.30, 1.19	0.15
Bachelor's degree or higher	ref.	-	-	ref.	-	-
<b>Employment status</b>						
Employed	ref.	-	-	ref.	-	-
Unemployed	9.85	1.87, 51.96	<0.01	0.6	0.15, 2.35	0.47
Out of the labor force <sup>d</sup>	1.81	0.45, 7.18	0.40	1.24	0.59, 2.61	0.57
<b>Relationship status</b>						
Married	ref.	-	-	ref.	-	-
Formerly married <sup>e</sup>	0.69	0.22, 2.18	0.52	0.89	0.39, 2.03	0.78
Never married	2.16	0.45, 10.38	0.34	3.29	1.66, 6.52	<0.01
<b>Household poverty status</b>						
<100% federal poverty level	1.30	0.31, 5.50	0.72	0.47	0.18, 1.27	0.14
100%-200% federal poverty level	0.13	0.02, 0.87	0.04	0.70	0.34, 1.47	0.35
>200% federal poverty level	ref.	-	-	ref.	-	-
<b>Minor children in household</b>						
Yes	3.58	1.11, 11.57	0.03	0.98	0.48, 1.99	0.95
No	ref.	-	-	ref.	-	-

Note: aOR = adjusted odds ratio from a multivariable logistic regression.

Abbreviations: aOR, adjusted odds ratio; AUD, alcohol use disorder.

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

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

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

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

**TABLE 4** Gender stratified chi-square tests of recovery outcomes with current digital recovery support services (D-RSS) use in a national sample of adults with a resolved alcohol problem ( $n = 1486$ )

	Did not use D-RSS		Used D-RSS		<i>p</i>
	<i>n</i>	%	<i>n</i>	%	
<b>Women (<math>n = 461</math>)</b>					
Has the coronavirus/COVID-19 outbreak made it more difficult for you to resist alcohol or drugs?					
No	398	93.8%	29	100%	0.25 <sup>a</sup>
Yes	32	6.3%	0	0%	
Relapse event <sup>b</sup>					
No	414	95.6%	26	86.6%	0.14 <sup>a</sup>
Yes	18	4.4%	3	13.4%	
How have things been going for you in the past four weeks?					
Pretty good or very well	295	69.3%	23	85.8%	0.16 <sup>a</sup>
Good and bad about equal	112	25.5%	3	7.8%	
Pretty bad or very bad	24	5.2%	2	6.5%	
<b>Men (<math>n = 1025</math>)</b>					
Has the coronavirus/COVID-19 outbreak made it more difficult for you to resist alcohol or drugs?					
No	881	94.4%	76	78.5%	<0.001
Yes	48	5.6%	16	21.5%	
Relapse event <sup>b</sup>					
No	880	93.8%	86	92.3%	0.63
Yes	52	6.2%	7	7.7%	
How have things been going for you in the past four weeks?					
Pretty good or very well	737	77.3%	66	70.5%	0.02 <sup>a</sup>
Good and bad about equal	160	18.2%	18	21.5%	
Pretty bad or very bad	33	4.5%	9	8.1%	

Note: Frequencies are unweighted; percentages are weighted.

<sup>a</sup>Used Fisher's exact test.

<sup>b</sup>Relapse events were defined as having been abstinent but drank alcohol again (slip, relapse) or had controlled drinking but started drinking more than usual.

pandemic occurred, we were able to assess the prevalence of lifetime and current D-RSS use among adults with a resolved alcohol problem, identify gender-specific correlates of D-RSS use, and test whether D-RSS use was associated with select recovery outcomes. Although this study was exploratory, it has the potential to contribute to the emergent knowledge base about D-RSS use and to inform future efforts to expand recovery support services.

An initial finding was the low overall use of D-RSS. Approximately 15% of this population was estimated to have any lifetime use, with no detected difference by gender. Our findings are comparable to the level of use found in the National Recovery Study (Bergman et al., 2018). The low use of D-RSS may be the result of limited knowledge, lack of perceived need, or little perceived benefits of such services, as well as personal characteristics and preferences. For example, participant demographics may have influenced our study's findings. Nearly three-quarters of our sample was middle-aged or older, and there were significantly more young and early middle-aged adults among current D-RSS users than nonusers. Age may be a factor, such that online recovery support may be more

appealing to younger adults and older adults may be more inclined to seek out traditional interpersonal recovery supports. In addition, there were more participants with severe lifetime AUD among D-RSS users than nonusers. More severe alcohol problems may prompt individuals to use a wider range of supportive services, including D-RSS, to enhance recovery. Our finding that AUD symptom count was associated with D-RSS among women is consistent with this mechanism, while the lack of an association among men suggests that it may not be a universal factor. Furthermore, we found lower use of D-RSS among the independent recovery group compared to the treated recovery group. Although we did not hypothesize any differences by treatment exposure, this is an intriguing finding. As D-RSS are publicly available, lay resources, we might expect that people who are unable or unwilling to seek treatment services would be more likely to seek out such alternatives. However, there may be an unanticipated link between treatment and lay services. If D-RSS are included as adjuncts to treatment or as part of after-care services, then individuals who obtained treatment may be more likely to use D-RSS than peers who did not obtain treatment. This may indicate a



need to increase awareness of D-RSS among those seeking recovery outside of treatment services.

A second finding was the low use of D-RSS since January 2020, with a significantly lower level among women compared to men. This is notable because the recall period for current use overlapped with the onset of the COVID-19 pandemic, a period of increased stressors and decreased availability of many traditional services. Other studies have noted similar findings, such as lower levels of engagement with a popular online mutual-help group (Reddit "StopDrinking" forum) during the COVID-19 pandemic, which were likely due to broader population trends of increased problematic alcohol use and recovery disengagement associated with social distancing restrictions (Colditz et al., 2020). Additionally, this may indicate unidentified barriers to D-RSS use beyond awareness. For example, the stigma of AUD may decrease the likelihood of participating in public forums, individuals may be reluctant to use D-RSS due to concerns about privacy and information sharing in online formats, and D-RSS may not correspond to individuals' specific needs (i.e., more intensive support in early recovery vs. established recovery). As these are suppositions, further research is needed to understand the barriers to D-RSS use. Furthermore, there appears to be a gender disparity for current D-RSS use. This may be explained by the differential impacts of the COVID-19 pandemic. Women may have had increased caregiving responsibilities and, therefore, had little time for D-RSS, despite its high accessibility. Further research on competing demands among those seeking recovery services, including differences by gender, would advance our ability to promote D-RSS use.

In terms of other gender differences, our modeling showed that women and men have several distinct correlates of current D-RSS use. Among women, the strongest effects were for unemployment and the presence of minor children in the household. These may act as gender-specific contextual stressors that prompt women to seek out additional recovery supports; however, we urge caution in interpreting these results given the wide confidence intervals, which are likely due to the small number of women participants. In contrast, among men, personal characteristics, such as recovery length and marital status, had the strongest associations with current D-RSS use. In terms of outcomes, we found no association between D-RSS use and recovery stability, relapse events, and quality of life for women. However, there was an association between current D-RSS use and recovery stability and quality of life among men. This is consistent with Livingston et al.' (2021) finding that men were more likely to see benefits of online services. In response, tailored efforts that address gender-specific factors may be necessary to increase D-RSS use by women and men.

While the COVID-19 pandemic presented an opportunity to leverage technology in support of recovery, it also underscores the need for research on alternative service formats. Among key questions, it is unclear if online services are as efficacious as traditional in-person services, and whether some types of recovery services would be better delivered in one format versus another. The protocol for a trial of an online mental health treatment program has

recently been published (Alavi et al., 2020), and it may serve as a model for a future study of online AUD treatment. Similarly, there is a need for research to explore whether D-RSS may confer benefits to participants through similar mechanisms as in-person services, such as enhancing self-efficacy, providing social support, and so on (Bergman & Kelly, 2021; Kelly et al., 2018, 2020). In addition, we caution against presuming that the digital divide has been resolved. Without ensuring equitable access to technology resources, a shift to online treatment may inadvertently exacerbate racial/ethnic, gender, or rural disparities in services utilization (i.e., facilitating access by groups already utilizing services while impeding use by groups already showing low uptake). We encourage careful consideration of inequities as the emphasis on online technologies continues to grow.

Despite its strengths, this study's findings should be considered in light of several potential limitations. First, we may have omitted potentially important types of D-RSS, such as wearable health trackers or smartphone apps to monitor alcohol consumption, which may have limited our conclusions. Given how rapidly technology evolves, we look forward to future research studies that investigate a wider range of digital supports for recovery. Second, the cross-sectional design may have constrained insights. Pandemic conditions have varied over time, and in turn current D-RSS use could have varied as well, but we were unable to detect trends over time. In addition, the cross-sectional design prevented any causal inferences, and we were only able to identify associations. Future longitudinal studies could help by identifying patterns of D-RSS use over time and by testing causal relationships. In particular, longitudinal data would permit researchers to confirm whether D-RSS use is helpful for recovery in the long run. Third, our modeling of correlates of D-RSS use and related outcomes may have suffered from limited statistical power. The low frequency of D-RSS use, particularly among women, could have prevented us from detecting some associations. Finally, to better evaluate the preliminary findings of benefits of D-RSS use, more rigorous investigations that include clinical outcomes in addition to self-reported variables are needed.

## CONCLUSIONS

In summary, this study leveraged several strengths, such as a large sample, timely data collection, and salient measures, to advance our understanding of a promising technological approach to support recovery from AUD. We conclude that there is potential to increase use of D-RSS, that there is a gender disparity that warrants attention, and that tailored interventions for women and men may be needed.

## CONFLICT OF INTEREST

None of the authors has any conflict of interest to declare.

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#### SUPPORTING INFORMATION

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