Is Posting about Alcohol on Social Networking Sites Associated with Self-reported Alcohol-Induced Blackouts in a Diverse Sample of Non-College-Attending Young Adults?

Jennifer E. Merrill
Brown University
jennifer_merrill@brown.edu

Lily Davidson
University of Queensland
lily.davidson@uq.net.au

Benjamin C. Riordan
La Trobe University
B.Riordan@latrobe.edu.au

Zoey Logan
Brown University
Zoey_logan@brown.edu

Rose Marie Ward
University of Cincinnati
wardrm@ucmail.uc.edu

Abstract

Research among young adults (YA), in samples of majority White college students, indicates links between posting about alcohol on social media and self-reported drinking behavior. We sought to extend this work by examining unique associations between public versus private posting about alcohol and the high-risk outcome of alcohol-related blackouts, among a sample of racially/ethnically diverse, non-college YA. A sample of 610 participants (74% non-White) completed an online survey about social media use and drinking behavior. Across three platforms (Twitter, Instagram, TikTok), public posting on Instagram was most common. A higher frequency of private posting about alcohol was associated with a higher frequency of past-month blackouts. Private posting on Instagram and TikTok (though not Twitter) were uniquely related to blackouts, as was public posting on TikTok. Results have implications for eventual online interventions, which can identify individuals potentially at risk for hazardous drinking, based on their social media posting behavior.

Keywords: alcohol, blackouts, social media, non-college young adults, racial/ethnic identity

1. Introduction

Alcohol misuse is a major public health concern, particularly for young adults (YA, age 18-29). YA have high rates of heavy episodic drinking (HED), alcohol use disorders (AUD), and related mortality (Grant et al., 2017). However, YA rarely seek alcohol treatment (Buscemi et al., 2010; Mulia et al., 2014). It is critical to continue to develop efficient methods for identifying young adult problematic drinkers, in order to ultimately disseminate effective interventions for this high-risk group.

One particularly concerning consequence of alcohol use among YA is alcohol-induced memory loss, or blackouts, reported by one third to one half of YA who drink (Hingson et al., 2016; Wetherill & Fromme, 2016; White & Ray, 2013). Blackouts confer risk for other negative outcomes both concurrently (e.g., hangover) (Merrill et al., 2019) and longitudinally (e.g., subsequent injury, alcohol use disorder) (Mundt et al., 2012; Studer et al., 2019). Blackouts may be a good marker of a need to change drinking behavior, and for some, they may even motivate change (Marino & Fromme, 2018). As such, blackouts have been recommended as a potential screening criterion for alcohol-related problems (Merrill et al., 2016; Miller et al., 2019).

The majority of research on blackouts, and etiology and treatment of alcohol misuse among YA more broadly, focuses on students in 4-year colleges. Yet, 70% of YA in the US are *not* in 4-year college (National Center for Educational Statistics, 2019), and only 60% who seek a Bachelor's degree complete it (*College Graduation Statistics*, 2021). An additional 10% of YA attend 2- rather than 4-year college. Non-college YA (defined here as not graduated from and not currently attending 4-year college) differ in several ways from college YA and report experiencing different negative alcohol-related consequences (Patrick et al., 2020). Even one year post high school, they are more likely to report offenses for driving while under the influence (DWI) than their college attending peers (Simons-Morton et al., 2017). Whereas community college students engage in heavy drinking and experience negative consequences at rates similar to 4-year students (Cremeens-Matthews & Chaney, 2016; Wall et al., 2012), they are at higher risk for more *serious* consequences like DWI and attempting suicide (Cremeens-Matthews & Chaney, 2016). Yet, opportunities to identify hazardous drinking among non-college YA are scant. Since non-college YA are not located in one single place, they are often not targeted in mass approaches to alcohol screening and are subject

HĬCSS

to fewer opportunities for intervention, such as those available on 4-year college campuses.

Moreover, there are racial/ethnic disparities in college attendance (National Center for Educational Statistics, 2019; Provasnik & Planty, 2008), alcohol misuse (Grant et al., 2015; NIAAA, 2021), and alcohol treatment (Cummings et al., 2011; Mulia et al., 2014). Non-college YA are more likely to be Black, Hispanic, or Native American (National Center for Educational Statistics, 2019), and non-White individuals are particularly unlikely to receive treatment (Manuel, 2017; Mulia et al., 2014). Given a lack of representation in both research and receipt of intervention, research on alcohol misuse among YA from diverse racial/ethnic groups and who are not enrolled in 4-year college is crucial.

Social networking sites (SNS) may be a simple, cheap, and scalable way to screen for alcohol risk. SNS are online platforms where users create public profiles and interact with others. SNS use is especially common among YA; 88% use at least one (Smith & Anderson, 2018) and many SNS are used at similar rates across racial/ethnic groups (Perrin & Anderson, 2019). In research, SNS recruitment can increase heterogeneity of samples, reach, and access to underrepresented groups (Wasilewski et al., 2018). For similar reasons, SNS may serve as a valuable platform for *screening* for hazardous drinking, using publicly posted content. Ultimately, such an approach could be used to disseminate interventions and document rates of high-risk drinking in populations that include individuals otherwise underrepresented in research or outreach efforts. A first step involves determining the extent to which SNS posting about alcohol is in fact a marker of alcohol risk.

Three especially popular SNS include Twitter (now known as X), Instagram, and TikTok. Twitter is a free platform where users can post public micro-blogs (i.e., Tweets) for other users to interact with by "liking," replying, or re-tweeting. Twitter is used by 25% Hispanic, 24% Black, 21% White individuals, and by 44% of 18-24 year-olds (Perrin & Anderson, 2019). Instagram is a free online photo sharing platform, where users post images with a caption for others to engage by liking, commenting, or re-posting. Instagram is used by 51% of Hispanic, 40% Black, 33% White individuals, and by 75% of 18-24 year-olds (Perrin & Anderson, 2019). TikTok is a free online video sharing platform, where users post videos with a caption for others to engage with by liking or commenting. TikTok is used by 31% of Hispanic, 30% Black, 18% White individuals (Pew Research Center, 2021), and by 52% of U.S YA (Vaterlaus & Winter, 2021). All three platforms can involve either public posts (e.g., users make posts that can be viewed by the public) or private posts (to just a select group).

SNS are a common outlet for YA to discuss substance use (Boyle et al., 2016; Egan & Moreno, 2011; Erevik et al., 2017), and non-college YA post about substance use publicly (George et al., 2019). Notably, people (1) use SNS to publicly discuss a desire to engage in blackout drinking (Riordan et al., 2019), and (2) often describe blackouts in a positive light on SNS (Merrill et al., 2020).

Posts about alcohol may represent an opportunity to identify someone drinking hazardously. Indeed, alcohol-related content in SNS posts has been linked to actual drinking behavior. For example, college students' alcohol-related Facebook postings positively predicted number of drinks per week, alcohol-related problems, risk of AUD, and alcohol cravings (Westgate et al., 2014); and number of alcohol-related Tweets was associated with self-reported number of drinks (Moreno et al., 2016). In a sample of 186 college and non-college YA (Litt et al., 2018), researchers found a link between alcohol-related Tweets and higher willingness to drink, drinks per week, number of consequences experienced, and higher Alcohol Use Disorder Identification Test (AUDIT) scores. In another study (Moreno et al., 2012), college students with Facebook profiles including posts about intoxication/problem drinking had increased likelihood of hazardous drinking (positive AUDIT scores) and alcohol-related injury in the past year.

While valuable, this prior work is marked by several gaps. First, this work has been conducted primarily with college students. Understanding whether similar associations between SNS posting behavior and personal drinking behavior are observed among non-college attending YA is an essential prerequisite for using SNS to screen for risky drinking on a broader scale. Second, no prior study has examined the link between SNS posting about alcohol and alcohol-related blackouts in particular, despite how common and serious alcohol-induced blackouts are.

Third, samples in prior work were largely White, and the extent to which SNS posting is related to hazardous drinking in more racially/ethnically diverse samples has not been examined. Likewise, whether racial/ethnic identification *moderates* links between SNS posting and drinking behavior is understudied. A single study showed that posting and high-risk drinking was moderated by race/ethnicity (Bergman et al., 2020). Specifically, at-risk drinking was associated with a higher number of Instagram posts among White, Asian, and Black participants, whereas drinking and posting were unlinked for Hispanic individuals. However, this study focused only on Instagram posts, and on posts of any type, rather than alcohol-specific posts.

Moreover, others acknowledge that work in this area must continue to expand beyond Facebook (Boyle et al., 2017), where participants' profiles and posts are now typically private. Twitter, Instagram, and TikTok are

more often used publicly, which can allow for more convenient and unbiased screening for hazardous drinking. The extent to which public posting on SNS relates to actual behavior may differ from posts made privately (LaBrie et al., 2019), such as those accessed only with permission in prior work. Research underscores that some people share more risky depictions on their private social media posts because public displays of the same content could damage their image if viewed by parents or employers (Vanherle et al., 2023). Recent research also suggests that male students who had Finstas (fake/private Instagram accounts) had higher alcohol use than those who only had public Instagram accounts (LaBrie et al., 2023). Little is known about use of private social media accounts among non-college-attending YA.

1.1. Current Study

The goal of the present study was to test the hypothesis that posting on SNS about alcohol at higher frequencies would be positively associated with past-month alcohol-induced blackout frequency. We explored whether associations between SNS posting and blackout frequency differed by racial/ethnic identification. Additionally, we explored whether frequency of posting on three separate SNS (Twitter, Instagram, TikTok), both publicly and privately, was associated with past 30-day blackouts.

2. Methods

2.1. Participants and Procedures

Participants included 610 YA. To be eligible, participants were required to report age 18-29 years, not currently enrolled in 4-year college, not having completed a 4-year college degree, living in the United States (U.S.), a public account on Twitter or Instagram, past-month posting of alcohol-related content on either Twitter or Instagram, and willingness to allow researchers to archive past 30-day public SNS posts. Although we were interested in studying self-reported TikTok usage, participants were not required to have a public TikTok account.

Participants were recruited via Qualtrics Panels. Potentially eligible respondents within a panel were sent an email invitation informing them of an available survey. To avoid self-selection bias, the email invitation did not include specific details about the content of the survey. Those who opened the link were directed to complete an online consent form and screening questionnaire. Those who were eligible, based on their responses to an initial set of items, could continue through the remainder of the survey. Participants in the Qualtrics panels were recruited from various sources

including website intercept recruitment, member referrals, target email lists, gaming sites, and other sources such as social media. Rather than being paid by the research team, they were compensated by the panel provider in a variety of ways (e.g., airline points, cash, gift cards). To ensure a diverse and representative participant pool, the Qualtrics panel was programmed to meet target quotas for the race/ethnicity with which each participant most strongly identified. Quotas were set as follows: 25% Black or African-American, 25% White, 25% Latinx or Hispanic, 10% Asian, 5% Native American, and 10% other. For participants who provided a verified SNS account, we supplemented this with a $5 payment to Amazon.com.

Data quality was managed by both a Qualtrics survey specialists as well as research staff. Cleaning of the Qualtrics panel data included removal of duplicate responses, partial or incomplete data, and fraudulent responses. To avoid scam responses within the survey data, we included security checks such as asking participants to answer simple questions in full sentences or affirm their age. Further, use of IP address monitoring and other Qualtrics bot-detections were used to ensure a participant pool from within the U.S.

2.2. Measures

2.2.1. Demographics. Demographics assessed included age, sex assigned at birth (male, female, intersex), transgender (yes, no), gender identity (man, woman, non-binary, prefer not to answer), highest level of school completed, sexual orientation, and employment pattern for the majority of the past year. The survey also assessed ethnicity (Hispanic or Latino/a/x; yes/no) and race (White, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, Other). Participants who checked more than a single race/ethnicity were asked, "With which racial/ethnic group do you most strongly identify?"

2.2.2. Alcohol Use. Past 30-day alcohol use was assessed via a grid modeled after the daily drinking questionnaire (Collins et al., 1985). Number of standard drinks and hours over which they were consumed were assessed for each day of a typical week. For the present study, these data were summed across days to indicate drinks consumed per typical week.

2.2.3. Blackouts. Past 30-day blackouts were assessed with the 8-item Alcohol-induced Blackout Measure-2 (ABOM) (Boness et al., 2022). The questionnaire assesses past 30-day experiences of various types of memory loss ranging in severity (e.g., unable to remember a few minutes of what happened, wake up with no idea where you had been or what you had done

after a certain point). Responses were scored on a scale including 0 (never), 1 (1 time), 2 (2 times), 3 (3 times) or 4 (4 or more times). Items were summed to create a total scale (Cronbach's alpha = .94).

2.2.4. SNS use. Participants reported the approximate number of posts they make per week on SNS. Participants were instructed that examples of alcohol-related content might include "a posted statement about your own or someone else's drinking, a meme related to alcohol, or a photo or video where you or someone else is drinking alcohol." For each of six possible account types endorsed at screening (public Twitter, private Twitter, public Instagram, private Instagram, public TikTok, private TikTok), they were asked about frequency of alcohol-related posting in the past three months. Response options were: never (0), less than once a month (1), monthly (2), weekly (3), and daily (4). We created sums of (a) private posting frequency, and (b) public posting frequency, across the three platforms.

Participants were asked to indicate on which of the following platforms they had posted alcohol-related content (a) publicly and (b) privately in the prior 30 days: Facebook, Instagram, Snapchat, Twitter, TikTok, Finsta (fake Instagram), another fake SNS account, or "other." We calculated the total number of platforms (out of these 8) on which the participant posted (a) publicly and (b) privately, about alcohol in the past month. Participants were also asked how often they *view* alcohol-related content on SNS (never, less than once a month, monthly, weekly, and daily).

2.3. Analysis Plan

Following descriptive and correlational analysis, ANOVAs were used to test differences by racial/ethnic identification in blackout frequency, public and private posting about alcohol. Next, three multiple linear regression models were used to examine associations between alcohol-related posting on public and private SNS (two primary independent variables) and blackouts (dependent variable). Model 1 included only public and private posting, to examine unique contributions of each type of posting when controlling for the other. In Model 2, we add all covariates of interest. The categorical racial/ethnic identity variable was recoded into three dummy codes: contrasts between White race and (1) Black, (2) Hispanic, and (3) Other (collapsed due to small subgroup sizes). We controlled several potential confounding variables, given the possibility each may relate to both our primary predictor (alcohol-related SNS posting) and outcome (blackouts), and to isolate unique effects of posting. These included typical weekly drinking, general posting on SNS (i.e., posts per week), number of different platforms across which participants

post alcohol content, and viewing of alcohol-related content on SNS. In Model 3, we added a set of 2-way interactions to examine whether either public or private posting about alcohol was moderated by racial/ethnic identity. Finally, to examine for which specific account types the frequency of posting about alcohol was related to blackout frequency, we used an additional multiple regression model with six predictors (public posting about alcohol on each of three platforms, private posting about alcohol on each of three platforms). Covariates and interaction terms were not included in this model.

3. Results

3.1. Sample Descriptives

Participant demographics are shown in Table 1 (next page). Participants reported an average of 11.25 (SD = 12.27) drinks per typical week. They had an average ABOM score (blackout frequency) of 8.81 (SD = 8.39) out of maximum possible score of 32, and 76.5% of the sample reported at least one instance of alcohol-induced memory loss in the past month. ANOVAs did not reveal significant differences by strongest racial/ethnic identification in frequency of blackouts, public posting about alcohol, or private posting about alcohol ($ps>.05$).

3.2 SNS Use and Alcohol-related Posting

Figure 1 shows past three-month frequency of posting about alcohol privately on private accounts and publicly on public accounts. Across platforms, public posting about alcohol was more frequent than private posting, and Instagram had the highest rates of past three-month public posting about alcohol. Table 2 (next page) shows descriptives on general SNS use.
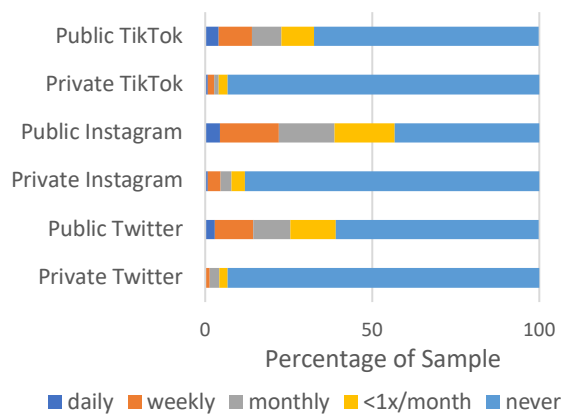
Figure 1. Frequency of posting about alcohol in past 3 months on public vs private TikTok, Instagram, and Twitter accounts

Table 1. Demographic Characteristics of Participants (*N* = 610)	
Variable	**% or Mean (*SD*)**
Age	24.51 (3.12)
Strongest racial/ethnic identity	
Black/African American	39.7%
White	25.7%
Hispanic/Latino	25.2%
Asian	4.9%
American Indian/Alaska Native	2.9%
Hawaiian/Pacific Islander	0.5%
Other	1.1%
Female sex at birth	50.5%
Transgender	1.6%
Gender Identity	
Woman	49.5%
Man	49.8%
Non-Binary	0.7%
Sexual Orientation	
Heterosexual	76.1%
Gay/Lesbian	4.2%
Bisexual	15.6%
Other	3.3%
Prefer not to say	0.8%
Highest Education	
Less than High School	3.3%
High School Diploma	52.6%
GED	4.9%
Some College	24.3%
Associates Degree	14.4%
Other	0.5%

Note. SD = standard deviation, GED = general educational development test

Table 2. Social Networking Site (SNS) Account Use (*N* = 610)	
Variable	**% or *Mean* (*SD*)**
Public Account Ownership	
Twitter	70.7%
Instagram	84.1%
TikTok	70.2%
Private Account Ownership	
Twitter	16.6%
Instagram	23.1%
TikTok	16.7%
Posts per week (range 0-99)	7.53 (13.53)
Frequency of viewing alcohol content on SNS	
Never	8.0%
<1x/month	15.6%
Monthly	20.2%
Weekly	37.4%
Daily	18.9%
# accounts where alcohol is posted	
Publicly (observed range 1-7)	2.40 (1.33)
Privately (observed range 0-6)	1.92 (1.21)

Note. Account Ownership = percentage of sample that owns this account type; SD = standard deviation, SNS = Social Networking Site; # = number.

3.3 Associations between alcohol-related posting and blackouts

Frequency of posting about alcohol privately and publicly significantly correlated with blackout frequency (r = .13 and .14, respectively, ps<.05). Regression results are shown in Table 3. In Model 1, both public and private posting about alcohol were related to blackout frequency. In Model 2 (adjusting for covariates), only private posting was significant. Across models, there were no main effects of racial/ethnic identification on blackout frequency. In Model 3, we observed no main effects or interactions with

racial/ethnic identification for the frequency of private alcohol posting. However, significant interactions suggested racial/ethnic differences in associations between public posting and blackout frequency (Table 3, Model 3). As White identity served as the referent group, the significant main effect of public alcohol posting frequency is specific to this group. To probe the significant interaction between public alcohol posting for each additional group, we ran follow-up models in which we changed the referent group. The effect of effect of public posting about alcohol and blackout frequency was non-significant for participants identifying as Hispanic (beta = -.05, B = -0.16, 95% CI

	Model 1			Model 2			Model 3		
	Beta	B	95%CI of B	*Beta*	B	95%CI of B	*Beta*	B	95%CI of
Public alcohol posting freq	.11	.32	.06, .58	.07	.20	-.07, .48	**.25**	**.76**	**.24, 1.28**
Private alcohol posting freq	.14	.84	.32, 1.36	.12	.68	.19, 1.17	.14	.80	-.08, 1.69
Covariates									
# platforms public alcohol				.08	.51	-.19, 1.21	.08	.53	-.17, 1.23
# platforms private alcohol				.06	.43	-.35, 1.21	.06	.44	-.35, 1.22
# SNS posts per week				**-.16**	**-.11**	**-.16, -.05**	**-.17**	**-.11**	**-.17, -.06**
Freq viewing alcohol on SNS				**.10**	**.50**	**.07, .94**	**.10**	**.52**	**.08, .96**
Drinks per typical week				**.36**	**.26**	**.20, .32**	**.34**	**.25**	**.19, .31**
Black (vs White)				-.04	-.72	-2.45, 1.02	-.05	-.92	-2.66, .83
Hispanic (vs White)				.02	.31	-1.58, 2.20	.00	.05	-1.85, 1.94
Other race/ethnicity (vs White)				-.02	-.54	-3.09, 2.02	-.03	-.74	-3.31, 1.83
Interactions between public posting and racial/ethnic identity									
Black x public alcohol posting							-.13	-.58	-1.22, .05
Hispanic x public posting							**-.14**	**-.92**	**-1.66, -.17**
Other race x public posting							**-.13**	**-1.24**	**-2.25, -.23**
Interactions between private posting and racial/ethnic identity									
Black x private posting							.00	-.00	-1.16, 1.15
Hispanic x private posting							-.06	-.83	-2.27, .60
Other race x private posting							.01	.15	-1.57, 1.87

Note. Overall F tests of all three models were significant (ps<.001). CI = confidence interval; *Beta* is standardized, B is unstandardized; Effects adjusted for all other variables in the model; bolded effects are significant at p<.05

Table 4. Predicting blackouts from social networking site posting specifically about alcohol

	Beta	B	95%CI of B
Public posting: Twitter	-.08	-.52	-1.30, .26
Public posting: Instagram	.08	.48	-.28, 1.24
Public posting: TikTok	**.16**	**1.05**	**.26, 1.84**
Private posting: Twitter	.06	.78	-.68, 2.20
Private posting: Instagram	**.12**	**1.08**	**.08, 2.08**
Private posting: TikTok	**.11**	**1.25**	**.03, 2.48**

Note. All predictors entered into a single model; CI= confidence interval, *Beta* is standardized, B is unstandardized.

= -0.72 - 0.40, *p* = .584), Black (beta = .06, B = 0.18, 95% CI = -0.22 - 0.57, *p*=.375), and "other" race (beta = -.16, B = -0.48, 95% CI = -1.34 – 0.39, *p*=.279).

Regression results examining posting on specific platforms (Table 4) also indicated that, collapsing across racial/ethnic groups, more frequent posting about alcohol specifically on TikTok publicly, and Instagram or TikTok privately, was associated with increased blackout frequency. Posting on Twitter, publicly or privately, was not associated with blackout frequency.

Discussion

The present study was the first to examine how self-reported posting on SNS about alcohol, across a range of platforms, and both publicly and privately, may relate to alcohol-induced blackout frequency. Primary findings revealed that public alcohol posting is associated with blackout frequency among White non-college-attending YA, though not for those who most strongly identify as Hispanic, Black, or with other non-

White racial/ethnic groups. This finding has implications regarding the specific groups that may be able to be identified as risky drinkers, based solely on what they post online.

Descriptively, we found public (vs private) posting about alcohol was more frequent, and Instagram had the highest rates of past three-month public posting about alcohol. These findings were promising with regards to the potential use of SNS for screening for problem-drinking among YA, because public alcohol posts are accessible to interventionists (unlike private posts). Also, that Instagram was the more common platform for public alcohol posts suggests this may be one ideal platform for reaching large numbers of YA for eventual alcohol interventions via SNS. Such potential is bolstered by the fact that Instagram is currently the more widely used SNS by YA, of whom large proportions are from racially diverse groups (Perrin & Anderson, 2019). The next most common SNS for posting alcohol-related content (in the past 3-months) were Twitter, followed by TikTok. This order roughly aligns with the general popularity of these SNS among YA, in the current study and previous research (Perrin & Anderson, 2019). This indicates that interventionists who aim to maximize reach to YA posting alcohol-related content, it is valid to prioritize the current popularity of the SNS among YA as a selection criterion (above other features/characteristics of the SNS).

Our primary goal was to examine associations between both public and private SNS posting about alcohol, and recent blackouts, and whether racial/ethnic identity may moderate such associations. While there was no main effect of racial/ethnic identity on recent blackouts, there were interactions between identity and public posting on recent blackouts. We found that for those identifying most strongly as White, more frequent *public* posting about alcohol was a significant, positive correlate of past 30-day blackouts. This association between SNS posting and blackouts was not observed among other racial/ethnic subgroups. Findings were largely consistent with prior work (Bergman et al., 2020), and extended beyond prior research by examining (1) multiple platforms and (2) distinguishing public from private posting. Research on marginalized groups in the U.S supports that YA who identify with a minority racial or ethnic group (e.g., Hispanic and 'other' non-White race) are less likely than White YA to drink hazardously (Wechsler & Kuo, 2003), perhaps to avoid stigma. This would also explain why public posting on SNS about alcohol did not relate to blackouts among some racial/ethnic minority groups in this study. If this interpretation is accurate, these findings also raise a challenge for using public SNS posts about alcohol to screen for problem drinking among racially diverse YA, because it appears that among YA from some racially diverse groups, public posting about alcohol may not represent a good screener for whether they also report high-risk drinking outcomes (e.g., blackouts). However, results indicate that screening for problem drinking among White YA via public SNS posts about alcohol may be effective. Though reaching racially diverse groups is the eventual goal of this research (rather than White YA), any advancement in potential intervention approaches for high-risk drinking among YA in the U.S. is important, particularly for non-college YA who generally have lesser access to alcohol interventions.

Of note, when collapsing across racial/ethnic groups (and accounting for other covariates), frequency of *private* (not public) posting about alcohol was significantly associated with past 30-day blackout frequency. Therefore, it may be that, generally, what YA post *privately* about drinking indicates risk. Once again, this indicates a potential problem with utilizing a social media approach to screening/intervention of problematic alcohol use among YA generally, because private posts cannot be readily accessed and analyzed. In contrast to these findings, when no covariates were accounted for in the model, and only frequency of alcohol posting (private and public) was used to predict blackout frequency, posting both public and private alcohol content was significantly related to more frequent blackouts. However, the models that included covariates likely provided a more realistic estimate of real-world relationships, than the models that did not account for any covariates.

The above results were supplemented by exploration of how public and private posting on the individual SNS explored in this study (Instagram, Twitter, TikTok) related to past-30-day blackout experiences. For Instagram and TikTok, more frequent *private* posting of alcohol-related content related significantly to self-reported blackouts. Contrarily, for Twitter, *public* posting of alcohol-content (not private posting) was related to blackouts. However, this finding may only reflect a difference in the nature of these platforms, since a person's Twitter account typically is publicly viewable to any person (regardless of whether that person is approved as a 'follower'), which is not the case for Instagram and TikTok. Further research is needed to test these effects, which suggest that both the specific platform and the nature of posting (private vs public) are important to consider.

In addition to primary findings, some of our covariate effects were of interest. One significant correlate of past-30-day blackouts in this study was frequency of *viewing* alcohol-related content online. The correlation between viewing alcohol-related content and experiencing blackouts could indicate potential consequences of viewing alcohol-related content on SNS for personal drinking outcomes, or indicate that heavy-drinking YA engage more with alcohol-related content online. Past research favors the

latter explanation, since posting alcohol-related content is a stronger predictor of personal drinking problems than viewing alcohol content on SNS (Westgate et al., 2014), although further research is needed on this relationship. The high rates of viewing alcohol content reported by participants in this study (see Table 2) support that YA are likely to notice alcohol-related content on SNS. The implications of this are both negative (e.g. potentially increasing drinking and blackouts) and positive (e.g. for potential bystander interventions, or for recruiting for alcohol interventions via SNS). We also found a negative relationship between greater *total* posting on SNS and blackouts. A possible explanation for this finding is that YA who spend more time on social media spend less time participating in ´real world´ social communities (Kuss & Griffiths, 2011), which may relate to fewer blackouts due to a lack of social drinking opportunities. Finally, this study suggests that the number of SNS on which the YA posted alcohol-related content (publicly or privately) was *not* related to experiencing alcohol-related blackouts, so screening across multiple sites does not necessarily increase likelihood of identifying a young adult's problem drinking behavior (i.e., screening across the few most popular SNS is a valid approach to SNS screening interventions).

Further research is needed to support the idea that public posting about alcohol may indicate risk for subsets of non-college-attending YA. If such research supports this idea, eventual interventions could be effective in reaching high-risk young adult drinkers, by screening public alcohol-related posts on popular SNS, and inviting participants to engage with further screening and/or intervention. Additionally, the significant relationship between *private* alcohol-related posting (e.g. on Instagram and TikTok) and recent blackout drinking suggests that a SNS-informed 'bystander' intervention approach (wherein witnesses to dangerous behavior step in to protect others) may hold potential. Such intervention might involve a public health campaign wherein YA are educated to recognize frequent SNS posting about alcohol as a marker of potential problem drinking, to support their peer.

3.2. Limitations

First, data were collected at a single time point, preventing any conclusions regarding directionality of associations between SNS posting and blackouts. Future studies could examine how these online and offline behaviors track together over time. Second, participants were recruited based on endorsement of public posting on three particular platforms, preventing a generalizable assessment of SNS posting about alcohol for those who only post privately or use other platforms. Third, measures of SNS posting were designed by the research team, and the extent to which they correspond to objective measures of posting behavior is unknown. Therefore, future research testing these results with data collected directly from SNS (not self-report SNS-usage data) is necessary. Actual post frequency and content should be compared both to self-reported posting behavior and drinking behavior. Fourth, our dependent variable (blackouts) was assessed with a past month time frame, while our predictors (alcohol-related posting) were assessed with a three-month time frame. Finally, the model examining platform-specific alcohol-related posting did not include confounding variables, and should therefore be interpreted with caution.

3.3. Conclusions

This study found that public posting about alcohol is more common than private posting about alcohol, and popular SNS for posting alcohol-related content among YA in the U.S include Instagram, Twitter and TikTok (in that order). Because of the commonness of alcohol-related posting on SNS by YA from diverse groups in the U.S, there is potential for using SNS to reach at-risk YA for alcohol interventions, via SNS. It appears that the frequency of public posting about alcohol on popular SNS is the behavior that best relates to heavy drinking (resulting in blackout), however only among White YA. Nonetheless, it may be worth investigating SNS as a way to reach YA from a wide variety of backgrounds in the U.S, who would benefit from support, education and/or intervention for alcohol-use. We suggest more research is needed to support the findings of this study, and to increase understanding of the potential SNS-based interventions for various health behaviors and a range of groups.

There is a need for improvements in outreach and treatment engagement of heavy drinking non-college YA from diverse backgrounds. Racial/ethnic minorities in particular are underrepresented in research and underserved with respect to alcohol intervention. Prior work highlights alcohol-related content posted on SNS as indicative of real-life hazardous drinking in largely White samples. Unfortunately, online posts about alcohol are often positive in nature (Beullens & Schepers, 2013; Cavazos-Rehg et al., 2015; Hendriks et al., 2018), with great potential to normalize and even glorify alcohol misuse. To combat this, SNS ultimately may be useful platforms for identifying individuals in need of intervention. Eventually, this work could inform automated methods to screen social media posts for high-risk drinkers, particularly those from traditionally underrepresented segments of the population, and in turn send further screening and online brief interventions, which are particularly efficacious among young adult drinkers (Tait & Christensen, 2010).

5. References

Bergman, B. G., Wu, W., Marsch, L. A., Crosier, B. S., DeLise, T. C., & Hassanpour, S. (2020). Associations Between Substance Use and Instagram Participation to Inform Social Network–Based Screening Models: Multimodal Cross-Sectional Study. *J Med Internet Res*, *22*(9), e21916. https://doi.org/10.2196/21916

Beullens, K., & Schepers, A. (2013). Display of alcohol use on Facebook: a content analysis. *Cyberpsychol Behav Soc Netw*, *16*(7), 497-503. https://doi.org/10.1089/cyber.2013.0044

Boness, C. L., Gatten, N., Treece, M. K., & Miller, M. B. (2022). A mixed-methods approach to improve the measurement of alcohol-induced blackouts: ABOM-2. *Alcohol Clin Exp Res*, *46*(8), 1497-1514. https://doi.org/10.1111/acer.14882

Boyle, S. C., Earle, A. M., LaBrie, J. W., & Ballou, K. (2017). Facebook dethroned: Revealing the more likely social media destinations for college students' depictions of underage drinking. *Addictive Behaviors*, *65*, 63-67. https://doi.org/10.1016/j.addbeh.2016.10.004

Boyle, S. C., LaBrie, J. W., Froidevaux, N. M., & Witkovic, Y. D. (2016). Different digital paths to the keg? How exposure to peers' alcohol-related social media content influences drinking among male and female first-year college students. *Addictive behaviors*, *57*, 21-29.

Buscemi, J., Murphy, J. G., Martens, M. P., McDevitt-Murphy, M. E., Dennhardt, A. A., & Skidmore, J. R. (2010). Help-seeking for alcohol-related problems in college students: Correlates and preferred resources. *Psychology of Addictive Behaviors*, *24*(4), 571.

Cavazos-Rehg, P. A., Krauss, M. J., Sowles, S. J., & Bierut, L. J. (2015). "Hey everyone, I'm drunk." An evaluation of drinking-related Twitter chatter. *Journal of studies on alcohol and drugs*, *76*(4), 635-643.

College Graduation Statistics. (2021). Retrieved October 18, 2021 from https://educationdata.org/number-of-college-graduates

Collins, R. L., Parks, G. A., & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *J Consult Clin Psychol*, *53*(2), 189-200. https://doi.org/10.1037/0022-006x.53.2.189

Cremeens-Matthews, J., & Chaney, B. (2016). Patterns of alcohol use: a two-year college and four-year university comparison case study. *Community College Journal of Research and Practice*, *40*(1), 23-33. https://doi.org/10.1080/10668926.2014.952049

Cummings, J. R., Wen, H., & Druss, B. G. (2011). Racial/ethnic differences in treatment for substance use disorders among U.S. adolescents. *J Am Acad Child Adolesc Psychiatry*, *50*(12), 1265-1274. https://doi.org/10.1016/j.jaac.2011.09.006

Egan, K. G., & Moreno, M. A. (2011). Alcohol references on undergraduate males' Facebook profiles. *American journal of men's health*, *5*(5), 413-420.

Erevik, E. K., Torsheim, T., Vedaa, Ø., Andreassen, C. S., & pallesen, S. (2017). Sharing of alcohol-related content on social networking sites: Frequency, content, and correlates. *Journal of studies on alcohol and drugs*, *78*(4), 608-616.

George, M. J., Ehrenreich, S. E., Burnell, K., Kurup, A., Vollet, J. W., & Underwood, M. K. (2019). Emerging Adults' Public and Private Discussions of Substance Use on Social Media. *Emerging Adulthood*, 2167696819867533. https://doi.org/10.1177/2167696819867533

Grant, B. F., Chou, S. P., Saha, T. D., Pickering, R. P., Kerridge, B. T., Ruan, W. J., Huang, B., Jung, J., Zhang, H., & Fan, A. (2017). Prevalence of 12-month alcohol use, high-risk drinking, and DSM-IV alcohol use disorder in the United States, 2001-2002 to 2012-2013: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *JAMA psychiatry*, *74*(9), 911-923.

Grant, B. F., Goldstein, R. B., Saha, T. D., Chou, S. P., Jung, J., Zhang, H., Pickering, R. P., Ruan, W. J., Smith, S. M., Huang, B., & Hasin, D. S. (2015). Epidemiology of DSM-5 Alcohol Use Disorder: Results From the National Epidemiologic Survey on Alcohol and Related Conditions III. *JAMA Psychiatry*, *72*(8), 757-766. https://doi.org/10.1001/jamapsychiatry.2015.0584

Hendriks, H., Van den Putte, B., Gebhardt, W. A., & Moreno, M. A. (2018). Social drinking on social media: Content analysis of the social aspects of alcohol-related posts on Facebook and Instagram. *J Med Internet Res*, *20*(6).

Hingson, R., Zha, W., Simons-Morton, B., & White, A. (2016). Alcohol-Induced Blackouts as Predictors of Other Drinking Related Harms Among Emerging Young Adults. *Alcoholism: Clinical and Experimental Research*, *40*(4), 776-784. https://doi.org/10.1111/acer.13010

Kuss, D. J., & Griffiths, M. D. (2011). Online social networking and addiction--a review of the psychological literature. *Int J Environ Res Public Health*, *8*(9), 3528-3552. https://doi.org/10.3390/ijerph8093528

LaBrie, J. W., Boyle, S. C., Baez, S., Trager, B. M., de Rutte, J. L., Tan, C. N., & Earle, A. M. (2023). "Follow my Finsta": Drinking trajectories in relation to auxiliary Instagram accounts. *J Am Coll Health*, *71*(3), 749-757. https://doi.org/10.1080/07448481.2021.1906683

LaBrie, J. W., de Rutte, J. L., Boyle, S. C., Tan, C. N., & Kettering, V. L. (2019). First-year "Finsta" phenomenon: Drinking trajectories in relation to auxiliary instagram accounts. Research Society on Alcoholism, Virtual.

Litt, D. M., Lewis, M. A., Spiro, E. S., Aulck, L., Waldron, K. A., Head-Corliss, M. K., & Swanson, A. (2018). #drunktwitter: Examining the relations between alcohol-related Twitter content and alcohol willingness and use among underage young adults. *Drug and alcohol dependence*, *193*, 75-82.

Manuel, J. I. (2017). The Grand Challenge of Reducing Gender and Racial/Ethnic Disparities in Service Access and Needs Among Adults with Alcohol Misuse. *Journal of social work practice in the addictions*, *17*(1-2), 10-35. https://doi.org/10.1080/1533256X.2017.1302887

Marino, E. N., & Fromme, K. (2018). Alcohol-induced blackouts, subjective intoxication, and motivation to decrease drinking: Prospective examination of the transition out of college. *Addict Behav*, *80*, 89-94. https://doi.org/10.1016/j.addbeh.2018.01.013

Merrill, J. E., Boyle, H. K., Jackson, K. M., & Carey, K. B. (2019). Event-Level Correlates of Drinking Events Characterized by Alcohol-Induced Blackouts. *Alcohol*

Clin Exp Res, *43*(12), 2599-2606. https://doi.org/10.1111/acer.14204

Merrill, J. E., Treloar, H., Fernandez, A. C., Monnig, M. A., Jackson, K. M., & Barnett, N. P. (2016). Latent growth classes of alcohol-related blackouts over the first 2 years of college. *Psychol Addict Behav*, *30*(8), 827-837. https://doi.org/10.1037/adb0000214

Merrill, J. E., Ward, R. M., & Riordan, B. C. (2020). Posting Post-Blackout: A Qualitative Examination of the Positive and Negative Valence of Tweets Posted after "Blackout" Drinking. *J Health Commun*, *25*(2), 150-158. https://doi.org/10.1080/10810730.2020.1719242

Miller, M. B., DiBello, A. M., Merrill, J. E., & Carey, K. B. (2019). Development and initial validation of the alcohol-induced blackout measure. *Addict Behav*, *99*, 106079. https://doi.org/10.1016/j.addbeh.2019.106079

Moreno, M. A., Arseniev-Koehler, A., Litt, D., & Christakis, D. (2016). Evaluating College Students' Displayed Alcohol References on Facebook and Twitter. *J Adolesc Health*, *58*(5), 527-532. https://doi.org/10.1016/j.jadohealth.2016.01.005

Moreno, M. A., Christakis, D. A., Egan, K. G., Brockman, L. N., & Becker, T. (2012). Associations between displayed alcohol references on Facebook and problem drinking among college students. *Arch Pediatr Adolesc Med*, *166*(2), 157-163. https://doi.org/10.1001/archpediatrics.2011.180

Mulia, N., Tam, T. W., & Schmidt, L. A. (2014). Disparities in the use and quality of alcohol treatment services and some proposed solutions to narrow the gap. *Psychiatric services (Washington, D.C.)*, *65*(5), 626-633. https://doi.org/10.1176/appi.ps.201300188

Mundt, M. P., Zakletskaia, L. I., Brown, D. D., & Fleming, M. F. (2012). Alcohol-induced memory blackouts as an indicator of injury risk among college drinkers. *Injury Prevention*, *18*(1), 44-49. https://doi.org/10.1136/ip.2011.031724

National Center for Educational Statistics. (2019). Retrieved January 28, 2021 from https://nces.ed.gov/programs/raceindicators/indicator_RFA.asp

NIAAA. (2021). Alcohol and the Hispanic Community. *National Institute on Alcohol Abuse and Alcoholism*. https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/alcohol-and-hispanic-community

Patrick, M. E., Terry-McElrath, Y. M., Evans-Polce, R. J., & Schulenberg, J. E. (2020). Negative alcohol-related consequences experienced by young adults in the past 12 months: Differences by college attendance, living situation, binge drinking, and sex. *Addict Behav*, *105*, 106320. https://doi.org/10.1016/j.addbeh.2020.106320

Perrin, A., & Anderson, M. (2019). *Share of US adults using social media, including Facebook, is mostly unchanged since 2018*. https://www.pewresearch.org/fact-tank/2019/04/10/share-of-u-s-adults-using-social-media-including-facebook-is-mostly-unchanged-since-2018/

Pew Research Center. (2021). Retrieved 6/9/2023 from https://www.pewresearch.org/internet/chart/who-uses-tiktok-nextdoor/

Provasnik, S., & Planty, M. (2008). *Community Colleges: Special Supplement to The Condition of Education 2008 (NCES 2008-033)*. U.S. Department of Education. .

Riordan, B., Merrill, J., & Ward, R. (2019). " Can't Wait to Blackout Tonight": An Analysis of the Motives to Drink to Blackout Expressed on Twitter. *Alcoholism, clinical and experimental research*, *43*(8), 1769-1776.

Simons-Morton, B., Haynie, D., O'Brien, F., Lipsky, L., Bible, J., & Liu, D. (2017). Variability in measures of health and health behavior among emerging adults 1 year after high school according to college status. *Journal of American College Health*, *65*(1), 58-66. https://doi.org/10.1080/07448481.2016.1238384

Smith, A., & Anderson, M. (2018). Social Media Use in 2018. *Pew Research Center*. https://www.pewinternet.org/2018/03/01/social-media-use-in-2018/

Studer, J., Gmel, G., Bertholet, N., Marmet, S., & Daeppen, J. B. (2019). Alcohol-induced blackouts at age 20 predict the incidence, maintenance and severity of alcohol dependence at age 25: a prospective study in a sample of young Swiss men. *Addiction*, *114*(9), 1556-1566. https://doi.org/10.1111/add.14647

Tait, R. J., & Christensen, H. (2010). Internet-based interventions for young people with problematic substance use: a systematic review. *Med J Aust*, *192*(11 Suppl), S15-21.

Vanherle, R., Hendriks, H., & Beullens, K. (2023). Only for Friends, Definitely Not for Parents: Adolescents' Sharing of Alcohol References on Social Media Features. *Mass Communication and Society*, *26*(1), 47-73. https://doi.org/10.1080/15205436.2022.2035767

Vaterlaus, J. M., & Winter, M. (2021). TikTok: an exploratory study of young adults' uses and gratifications. *The Social Science Journal*, 1-20. https://doi.org/10.1080/03623319.2021.1969882

Wall, A. F., BaileyShea, C., & McIntosh, S. (2012). Community College Student Alcohol Use: Developing Context-Specific Evidence and Prevention Approaches. *Community College Review*, *40*(1), 25-45. https://doi.org/10.1177/0091552112437757

Wasilewski, M. B., Stinson, J. N., Webster, F., & Cameron, J. I. (2018). Using Twitter to recruit participants for health research: An example from a caregiving study. *Health informatics journal*, 1460458218775158.

Wechsler, H., & Kuo, M. (2003). Watering down the drinks: The moderating effect of college demographics on alcohol use of high-risk groups. *Am J Public Health*, *93*(11), 1929-1933. https://doi.org/10.2105/ajph.93.11.1929

Westgate, E. C., Neighbors, C., Heppner, H., Jahn, S., & Lindgren, K. P. (2014). "I will take a shot for every 'like' I get on this status": posting alcohol-related Facebook content is linked to drinking outcomes. *J Stud Alcohol Drugs*, *75*(3), 390-398. https://doi.org/10.15288/jsad.2014.75.390

Wetherill, R. R., & Fromme, K. (2016). Alcohol-Induced Blackouts: A Review of Recent Clinical Research with Practical Implications and Recommendations for Future Studies. *Alcohol Clin Exp Res*, *40*(5), 922-935. https://doi.org/10.1111/acer.13051

White, H. R., & Ray, A. E. (2013). Differential evaluations of alcohol-related consequences among emerging adults. *Prevention Science*. https://doi.org/10.1007/s11121-012-0360-8