Original article

In-Person Contacts and Their Relationship With Alcohol Consumption Among Young Adults With Hazardous Drinking During a Pandemic

Brian Suffoletto, M.D. [a],[*], Nilam Ram, Ph.D. [b], and Tammy Chung, Ph.D. [c]

[a] Department of Emergency Medicine, Stanford University, Palo Alto, California
[b] Department of Psychology and Department of Communication, Stanford University, Palo Alto, California
[c] Department of Psychiatry, Robert Wood Johnson School of Medicine, Rutgers University, Brunswick, New Jersey

A B S T R A C T

Purpose: Social distancing strategies such as "stay-at-home" (SAH) orders can slow the transmission of contagious viruses like the SARS-CoV-2 virus, but require population adherence to be effective. This study explored adherence to SAH orders by young adults with hazardous drinking, and the role of alcohol consumption with in-person contacts on adherence.
Methods: Analyses included young adults with hazardous drinking (i.e., AUDIT-C score ≥3/4 for women/men; n = 50; ages 18–25) participating in a randomized trial in Pittsburgh, PA. Participants provided experience sampling reports on drinking twice per week from the week before SAH orders started on April 1, 2020 through 6 weeks during the SAH period. We examined how in-person contact with non-household friends changed over time and event-level relationships between alcohol consumption and in-person contacts.
Results: The percentage of participants with any in-person contact in the week before SAH was 44% (95% confidence interval [CI] 30%–59%), which decreased to 29% (95% CI 15%–43%) in the first SAH week and increased to 65% (95% CI 46%–85%) by SAH week 6. Controlling for average levels of alcohol consumption, on days when young adults drank, participants reported more in-person contacts compared to nondrinking days.
Conclusions: Preliminary data indicate that, among young adults with hazardous drinking, adherence to public policies like SAH orders is suboptimal, declines over time, and is associated with drinking events. Interventions aimed at enhancing young adults' adherence to social distancing policies are urgently needed.
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IMPLICATIONS AND CONTRIBUTION

This study shows how alcohol consumption is associated with noncompliance with social distancing during a pandemic among young adults with hazardous drinking.

The SARS-CoV-2 virus, which causes COVID-19 illness, is highly contagious, spreading primarily through respiratory droplets, even among individuals who are presymptomatic or nonsymptomatic [1]. Social distancing strategies that involve reducing the number of between-person contacts such as "stay-at-home" (SAH) orders may help delay the exponential spread of the outbreak until effective vaccines become available or communities develop herd immunity [2].

Compliance is needed for social distancing strategies like SAH orders to be effective [3], which is especially difficult in the U.S.,

which prizes individual freedom. Early evidence from tracking smartphones suggests that compliance with SAH orders across the U.S. is suboptimal, with only 35% of people staying at home [4]. Compliance may be especially difficult for young adults. A recent survey of 7,355 respondents found that the youngest age group (18–31 years) reported the lowest compliance rate (52.4%) compared to the other age groups (all > 60%) [5].

In this study, we investigate in-person contacts with non-household friends by young adults with hazardous drinking (i.e., AUDIT-C score ≥3/4 for women/men), and the role of alcohol consumption on the frequency of these contacts, and number of friends involved in these contacts for time periods before and after mandated SAH. Given that 40% of young adults in the U.S. have a history of hazardous drinking, the actions of this population have important public health implications [6]. We leveraged an on-going trial that collected experience sampling data twice per week from young adults with a history of hazardous drinking. We examined how in-person contact with friends (non-housemates) changed over time and event-level relationships between alcohol consumption and in-person contacts. We hypothesized that young adults with a history of hazardous drinking would initially decrease their in-person contacts, but then tire of social distancing and increase in-person contacts (i.e., quarantine fatigue).

Given the prominent role of alcohol consumption in socialization among young adults, particularly those with a history of hazardous drinking [7], we also hypothesized that most in-person contacts would occur with concurrent alcohol consumption (i.e., drinking) events. The use of experience sampling data allowed us to separate within-person and between-person factors associated with SAH order adherence (i.e., in-person contacts) [8]. Within-person analyses provide insights into how alcohol consumption on a given day, which differs from typical drinking for that individual, is associated with in-person contacts on that day. Given that models of viral infectivity suggest intermittent social distancing measures may be necessary until 2022 [9], it is imperative to identify key drivers and modifiable covariates related to compliance with social distancing policies among young adults.

Methods

Participant screening and recruitment

This study includes a sub-sample of non-treatment seeking young adults (ages 18–25) who screened positive for hazardous alcohol consumption in an emergency department and enrolled in a randomized trial testing different text message interventions. Briefly, during the period of enrollment for this study, 128 young adults who presented to an urban emergency department and were not seeking help for drinking were screened for hazardous alcohol use. A total of 54 young adults reported a score of ≥3 for women or ≥4 for men on the Alcohol Use Disorder Identification Test for Consumption (AUDIT-C) [10] and reported at least one binge drinking episode (4+ drinks per day for women; 5+ drinks per day for men [11]) in the prior month. Four young adults were excluded for reporting past treatment for drug or alcohol use or current medical treatment for psychiatric disorders, resulting in a final sample of 50 participants. The study protocol was approved by the Institutional Review Board at the University of Pittsburgh. The trial was preregistered (NCT02918565). Full details of the screening, enrollment, and intervention features are described in prior papers [12,13].

Procedures

Two days per week participants were prompted to report the number of alcoholic drinks consumed the prior day (i.e., drinking quantity [DQ]). The day(s) of the week that a participant received assessments were based on an individual's baseline drinking patterns as reported in the 30-day Time Line Follow-Back calendar at baseline. This design feature was intended to capture days with a higher probability of alcohol consumption and minimize assessment burden on nondrinking days. We made an institutional review board–approved modification to the text message protocol on March 23, 2020 to also assess the number of friends (not including housemates) the participants were with and the number of those friends who were drinking alcohol. Prompts and responses were provided and obtained via text messaging (i.e., SMS) and stored in a Microsoft Access database.

Measures

Day-level measures

Alcohol consumption. At 12 P.M. on 2 days per week an individual told us they typically drink, we asked: "How many drinks did you have yesterday?" The definition for standard drinks was provided in enrollment procedures. We examined DQ as a continuous (count) variable. We coded each day when a woman reported at least 1 day of consuming >4 or more standard drinks or a man reported >5 or more standard drinks as having a binge drinking day (BDD). We have successfully used this single-item measure in prior studies, where responses were correlated with Time Line Follow-Back measures [14].

In-person contacts. If a participant reported not drinking the prior day, we asked: "How many friends were you with yesterday? (not including people you live with)". If a participant reported drinking the prior day, they received the following question: "How many friends were you with while drinking? (not including people you live with)". At the day level, the in-person contacts variable was coded as a count variable representing the number of nonhousehold friends with whom the participant spent time.

Weekend. We coded assessments that occurred on a Friday or Saturday as weekend and Sunday through Thursday as non-weekend.

Week-level measures

In-person contacts. To understand how in-person contacts changed from the week before SAH orders through the SAH period, we created week-level variables related to in-person contacts. By summing the in-person contacts over days sampled, we created variables for any in-person contact in a given week (none = 0; any = 1) and maximum number of in-person contacts in a given week.

Person-level measures. At baseline, participants reported age, sex (male = 1; female = 0), race (Black = 0, white = 1, other = 2), current college enrollment (yes = 1; no = 0), and living situation (by self = 0; with other(s), same sex = 1; with other(s), other sex = 2; with family = 3). We measured alcohol use severity using the AUDIT-C [10].

Table 1
Baseline characteristics

Characteristics	Analyzed (n = 50)
Age, mean (SD)	22.2 (2.1)
Female	32 (64%)
Race	
White	38 (76%)
Black	11 (22%)
Asian	1 (2%)
Hispanic ethnicity	4 (8%)
Current college enrolment	24 (48%)
Living situation	
Alone	11 (22%)
Friends, same sex	10 (20%)
Friends, other sex	8 (16%)
Family	21 (42%)
Employment	
None	11 (22%)
Part-time	16 (32%)
Full-time	23 (46%)
Alcohol use	
AUDIT-C score, median (IQR)	6 (5.7)
BDD	2.0 (2.6)

Results are presented as mean (SD) unless specified otherwise.
AUDIT-C = alcohol use disorders identification test for consumption; BDD = binge drinking days; IQR = interquartile range; SD = standard deviation.

Analyses

We first examined patterns of missingness for the DQ and in-person contact assessments and assessed person-level (i.e., sex, race, college education, AUDIT-C score, living situation) and day-level covariates (i.e., weekend) for associations with missingness. To test our hypothesis that young adults would initially decrease their in-person contacts, but then tire of social distancing and increase them, we used general estimating equations models with exchangeable correlation [15]. Independent variable was week (1 [pre-SAH week one] to 7 [SAH week 6]). Covariates at the person-level (i.e., sex, race, college education, living situation) were tested in univariate models and only retained in the final model if they had significant univariate association.

To test our hypothesis that in-person contacts would primarily occur with concurrent alcohol consumption (i.e., drinking) events, 412 days nested within 47 persons were analyzed using multilevel models. Outcomes of interest were any in-person contact and number of in-person contacts that day. The time-invariant person-level variable for usual alcohol consumption was calculated as the arithmetic mean across each individual's repeated measures. Time-varying, day-level variables were calculated as deviations from those person-level means. Again, covariates at the person-level (i.e., sex, race, college education, living situation) and the day-level (i.e., weekend) were tested in univariate models and only retained in the final model if they had significant univariate association. Full information maximum likelihood estimation was used to handle missing data [16]. Finally, to ensure models were not influenced by non-random missingness, we engaged multiple imputation procedures using sex and AUDIT-C score as predictors of missing values, Poisson distribution for DQ and friend counts, re-ran models and examined estimates from 10 imputations. Analyses were conducted using Stata 15.0 (StataCorp LLC, College Station, TX).

Results

Participant characteristics

Sample (N = 50) mean age was 22.2 (standard deviation [SD] = 2.1), 64% were female, 22% self-identified as Black race, 48% were in college, and 36% were living with friends (see Table 1 for baseline descriptive statistics). At enrollment (baseline), the mean AUDIT-C score was 5.9 (SD 1.7; range 3–10) and in the past month participants reported a mean of two BDD (see Table 1).

Assessment characteristics

In this study, 76.3% of assessments were sent on the weekend and 23.7% on non-weekend days; 22.4% of DQ assessments were missing, and 32.4% of in-person contact assessments were missing. Male sex was associated with missingness for DQ (odds
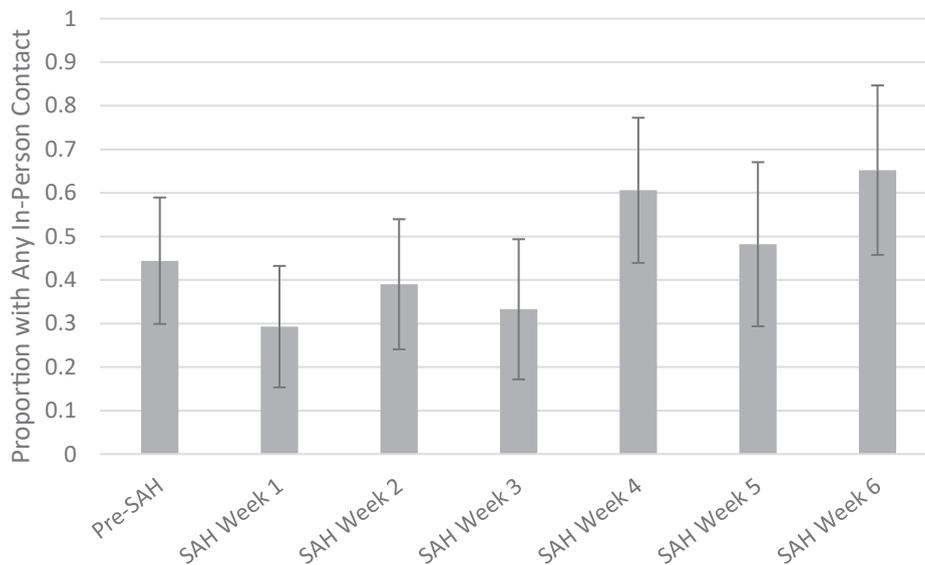

Figure 1. Proportion of participants with any in-person contact by week. SAH = "stay-at-home" orders.

Table 2
Predictors of in-person contact

a. Any in-person contact

	Beta	SE	p-value
Week			
Pre-SAH	REF		
SAH week 1	−.15	.08	.07
SAH week 2	−.03	.09	.7
SAH week 3	−.11	.1	.27
SAH week 4	.16	.08	.05
SAH week 5	.01	.1	.96
SAH week 6	.2	.08	.01
College enrollment			
Yes	REF		
No	.17	.1	.07

b. Max number of in-person contacts

	Beta	SE	p-value
Week			
Pre-SAH	REF		
SAH week 1	−.64	.18	<.0001
SAH week 2	−.28	−.19	.15
SAH week 3	−.29	.2	.15
SAH week 4	.56	.25	.03
SAH week 5	.67	.28	.02
SAH week 6	1.03	.31	.001
College enrollment			
Yes	REF		
No	.95	.2	<.0001

REF = reference; SAH = "stay-at-home" orders; SE = standard error.

ratio [OR] = 2.86; 95% confidence interval [CI] 1.93, 4.22) and missingness for in-person contacts (OR = 1.18; 95% CI 1.26, 2.57).

Drinking and in-person contact characteristics

On drinking days (42.2% of all days assessed, with 83% of participants having at least one drinking day), participants drank an average of 3.1 drinks (SD = 2.8; range = 1–20). When drinking, there was in-person contact on 48.0% of days. 40.0% of the times when in-person contact occurred, it was with one person (range 1–20). When not drinking, there was in-person contact on 20.9% of days. 65.3% of the times when in-person contact occurred when not drinking, it was with one person (range 1–6). There were BDD on 9.9% of all days assessed, with 48.9% of participants having at least one BDD.

Table 3
Association of any drinking with in-person contacts

Any in-person contact	Odds ratio	SE	p-value
Intercept	.17	.07	<.0001
Any drinking (between-person)	7.92	6.88	.02
Any drinking (within-person)	6.58	2.33	<.0001
Weekend	2.18	.89	.06
Level 1 residual variance	2.23	.84	

# In-person contacts	Beta	SE	p-value
Intercept	−1.09	.25	<.0001
Any drinking (between-person)	2.34	.6	<.0001
Any drinking (within-person)	1.32	.15	<.0001
Weekend	.18	.18	.32
Level 1 residual variance	1.44	.46	

SE = standard error.

Table 4
Association of binge drinking with in-person contacts

Any in-person contact	Odds ratio	SE	p-value
Intercept	.17	.07	<.0001
Binge drinking (between-person)	22.6	42.9	.1
Binge drinking (within-person)	8.56	3.79	<.0001
Weekend	2.06	.83	.07
Level 1 residual variance	2.02	.76	

# In-person contacts	Beta	SE	p-value
Intercept	−1.12	.24	<.0001
Binge drinking (between-person)	4.15	1.34	.002
Binge drinking (within-person)	1.64	.13	<.0001
Weekend	.33	.17	.06
Level 1 residual variance	1.44	.46	

SE = standard error.

In-person contact over time

Over the entire sampling period, of the 412 days assessed, any in-person contact occurred on 134 days (32.5%). The percentage of participants with any in-person contact in the week before SAH orders was 44% (95% CI 30%–59%), which decreased to 29% (95% CI 15%–43%) in the first week of the SAH period and increased to 65% (95% CI 46%–85%) by week six of the SAH period (see Figure 1). The general estimating equations models examining the effect of time (week) on any in-person contact and maximum number of in-person contacts are shown in Table 2. Compared to the pre-SAH week, there were significant increases in the probability of any in-person contact by SAH week 6 (beta = .20; standard error [SE] = .08; Table 2, panel a).

Over the entire assessment period, on days with any in-person contact, the mean number of max in-person contacts was 3.8 (SD 2.8). Compared to the pre-SAH week, there were significant reductions in the number of max in-person contacts in SAH week 1 (beta = −.64; SE = .18) and significant increases in the number of max in-person contacts in week 4 (beta = −.56; SE = .25) through 6 (beta = 1.03; SE = .31) (Table 2, panel b). Controlling for weeks, not being enrolled in college was associated with greater max in-person contacts (beta = .95; SE = .20). Model estimates for any and max number of in-person contact were similar when using multiple imputation data sets.

In-person contact and drinking

Mixed-effect model results for the within- and between-person effect of any drinking and binge drinking on in-person contacts are shown in Tables 3 and 4. Within-person (adjusting for an individual's typical drinking) there were greater odds of any in-person contact when participants reported any drinking (OR = 6.6; Table 3) or binge drinking (OR = 8.6; Table 4) on a given day. There were also within-person associations between number of in-person contacts and any drinking (beta = 1.32; Table 3) and binge drinking (beta = 1.6; Table 4). Similar associations also existed between-person. In these multilevel models, no level 2 (between-person) covariates (e.g., sex or college enrollment) nor within-person covariate (i.e., weekend) were associated with in-person contact. Model estimates were similar when using multiple imputation data sets.

Discussion

In this exploratory study, we found that many young adults with past hazardous drinking do not strictly adhere to SAH orders. Overall, in the first 6 weeks of SAH orders, 44% of young adults reported in-person contacts with nonhousemate friends, and there were an average number of 3.8 in-person contacts per social event, nearly identical to the week before SAH orders. When viewed at this level, it appears that SAH orders did not influence in-person social interactions with non-housemate friends among study participants. However, when viewed by week, we found an initial dip in the prevalence and number of in-person contacts, which rebounded and increased above the pre-SAH week by week four of SAH orders. These findings are consistent with prior studies demonstrating the lower prevalence of social distancing among young adults [5], and concern in the lay press regarding quarantine fatigue. Study results also suggest that, among young adult hazardous drinkers, public policies need to consider the potential for rebound effects of social distancing for certain at-risk subgroups.

We found that there is a strong association between drinking events and in-person contacts. Overall, in the SAH order period, 63% of days with in-person contact occurred during drinking events. Individuals with greater overall probability of drinking, and binge drinking, had higher odds of any in-person contact and reported higher in-person contact with non-housemate friends. On any given day, controlling for their typical drinking, individuals who drank at all or who had a binge drinking episode had both greater odds of any in-person contact and reported a greater number of in-person social contacts.

Social-ecological models suggest that interpersonal processes, social networks, social context, and social infrastructures all play a role in individuals' behavior and how it changes over time—sometimes in conflicting ways. The findings of this study fit with potential social network-level effects as described in social-ecological models of alcohol use in young adults [17], prior research showing the influence of peers on alcohol consumption [7], and that the number of friends present at a social occasion is directly associated with drinking quantity [18]. Our findings extend prior work by showing that these interpersonal-level factors continue to play a role in young adult drinking behavior despite environmental restrictions such as SAH orders and related fears around person-to-person viral transmission. Drinking excessively could put individuals at additional viral transmission risk due to loss of inhibition and increased interpersonal contacts [19]. In addition, depressed immune function related to binge drinking could compound risk of infection [20].

We did not find that sex, race, employment, or living situation were associated with in-person contacts (and thus were not included in final model outputs). We did find, however, that not being enrolled in college was associated with higher probability of social contacts over time (i.e., during the SAH order period). This result suggests that there may be educational barriers to compliance with public policies and young adults not in college may lack health education available to those in college. It is somewhat surprising that drinking-related social events were as common as they were in young adults. Given statewide closures of college campuses, bars, and restaurants, certain opportunities for socialization are curtailed. With many college students (48% of our sample) presumably moving home with parents, we expected increases in parental oversight of young adult behaviors to potentially result in curtailed drinking [21] and support of SAH orders.

Findings highlight challenges with social distancing among young adults. There are numerous factors that can affect compliance with social distancing policies. On one level, compliance requires awareness or understanding of the rules and trust toward the authorities that enact them. On another level, compliance requires a belief that one could put oneself and/or others at risk by not following social or physical distancing guidelines. Young adults may have difficulty with compliance with SAH orders due to a combination of lack of concern for getting themselves (due to perceived lack of vulnerability) or others sick (due to lack of awareness of asymptomatic transmission). Early reports of norms-based interventions were not effective at increasing social distancing during the COVID-19 pandemic but illustrate that fear of missing out on social events was a key target [22]. This suggests that platforms that provide a way for young adults to meaningfully socialize remotely could help reduce in-person contacts.

There are several limitations that should be considered. First, we were only able to study a relatively small sample of young adults with hazardous drinking histories and results may not be representative of other populations of young adults. All measures were self-report and subject to reporting biases. We were not able to assess more detailed event-level factors such as drinking context and perceived peer norms. Finally, we have limited data on alcohol availability. Strengths of this study include the following. We recruited a sociodemographically diverse cohort of young adults not seeking treatment for alcohol use. We used experience sampling methods to understand this event-level relationship, which reduces recall biases and allows us to make inferences about temporality [23]. Finally, we used models accounting for clustering of data within individuals and included relevant covariates, which reduces the possibility of confounding.

Conclusions

We found preliminary evidence that young adults' adherence to public policies like SAH orders is suboptimal, declines over time, and is associated with drinking events. Interventions that address the role of alcohol with in-person contacts among young adults are needed.

Funding Sources

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