



Published in final edited form as:

Psychol Addict Behav. 2026 May ; 40(3): 343–349. doi:10.1037/adb0001111.

Modeling the Reciprocal Dynamic Between Alcohol and Suicide Urges among College Students: Ecological Momentary Assessment Study

Jeremy L. Grove¹, Elizabeth A. Edershile², Thomas O’Kane^{2,3}, Evan M. Kleiman²

¹Duke University School of Medicine Department of Psychiatry and Behavioral Sciences

²Rutgers, The State University of New Jersey Department of Psychology

³Center for Integrated Care, University Behavioral Healthcare, Rutgers Health

Abstract

Objective: Alcohol use is associated with suicidal thoughts, urges, and behavior. However, prior research has been mostly cross-sectional, limiting understanding of how these variables influence one another across short time periods. The present study used ecological momentary assessment (EMA) methods to establish the temporal ordering of alcohol- and suicide-related phenomena, specifically exploring the momentary dynamic between these variables.

Method: A diverse sample of college students ($N = 527$, 50.5% Asian, 72.0% cisgender female, mean age = 19.4) completed smart phone EMA up to 6 times daily for 6 to 8 weeks (81,299 total observations; $M_{Observations} = 154$ per person), answering questions about current urge to use alcohol and urge to engage in suicidal behavior. Dynamic structural equation modeling was used to investigate within-person autoregressive and cross-lagged effects.

Results: Autoregressive effects were found, such that urge to do a behavior at the previous timepoint ($t-1$) positively predicted urge to do that same behavior at the current time point (t). Cross-lagged analyses revealed that alcohol urges at the previous timepoint positively predicted suicide urges at the current time point, and suicide urges at the previous time point positively predicted alcohol urges at the current time point, demonstrating a reciprocal dynamic (i.e., positive feedback loop).

Conclusions: Results provide initial empirical support for a reciprocal dynamic between drinking urges and urge to engage in suicidal behavior among young people and college students that occurs over a short time period, underscoring the potential importance of in the moment intervention strategies.

Keywords

Suicide; Alcohol; Ecological momentary assessment; Substance use; Suicidal ideation; College student

Address for Correspondence: Jeremy L. Grove, Ph.D., Department of Psychiatry and Behavioral Sciences, Duke University School of Medicine, 2400 Pratt Street, Durham, NC 27705, Jeremy.grove@duke.edu.

Disclosure Statement

None of the authors report a conflict of interest.

Alcohol misuse and dependence, as well as suicidal thoughts and behaviors, are significant public health concerns that are strongly linked (see Isaacs et al., 2022 for a meta-analysis). Whereas most research has established chronic alcohol misuse, including alcohol use disorder (AUD), as a long-term vulnerability factor for suicidal ideation, attempts, and death (Felsborg-Madsen et al., 2009; Rizk et al., 2021), literature also suggests a short-term association between alcohol consumption and suicide-related phenomena. Among persons with a history of suicidal behavior, suicidal thoughts and urges tend to be higher on days when alcohol is consumed (Gilmore et al., 2024). Moreover, suicide attempts commonly occur in the context of alcohol intoxication (Griffin et al., 2018). Importantly, literature on the relation between alcohol consumption and suicide risk has almost exclusively been cross-sectional. Yet, there is considerable intraindividual moment-to-moment variability in urges to drink (Kuerbis et al., 2020) and urges to engage in suicidal behavior (Kivela et al., 2022), suggesting these variables may influence one another at a similarly *momentary* timescale. Indeed, the relation between alcohol- and suicide-related phenomena at this level of granularity is poorly understood.

Although sparse, some research has considered the putative temporal ordering of alcohol-related variables and suicide risk. For example, case-controlled epidemiological studies have shown that people are more likely to make a suicide attempt within 24 hours of drinking alcohol (Borges et al., 2017a), and do so using more lethal means when alcohol is consumed in larger quantities (Borges et al., 2017b). Conversely, another cross-sectional study found that people may use alcohol to cope with distressing suicidal thoughts (Gonzalez et al., 2009), suggesting that suicide-related phenomena may contribute to alcohol urges and lead to consumption. We are only aware of one study that has considered the potential bidirectional association. This qualitative study uncovered a theme across participant responses suggesting that alcohol can both increase vulnerability for suicidal thoughts and urges, as well as be used as a method to cope with troubling suicidal thoughts (Gilmore et al., 2024). Thus, collectively, findings from research suggest the possibility of a reciprocal association between alcohol and suicide variables, such that alcohol-related phenomena (e.g., urges, consumption) predict subsequent increase in suicide risk (e.g., urges, ideation, behaviors), and suicidality predicts subsequent alcohol-related outcomes. The bidirectional association between these variables has long been theorized (e.g., Bagge & Sher, 2008). However, the bulk of empirical studies are cross-sectional or retrospective, precluding any conclusions about the temporal order of momentary phenomena. Indeed, to our knowledge, no prior research has explored this process quantitatively leveraging methods designed to capture this potential dynamic (e.g., ecological momentary assessment [EMA]).

Clarifying this dynamic may be particularly important in college students. College represents a period of heightened risk for problem drinking, including marked increase in drinking days, consumption amount on drinking days, and binge drinking and related consequences (Merrill & Carey, 2016; White & Hingson, 2014). Moreover, suicide is the second leading cause of death among college students in the U.S. (Center for Disease Control, 2022). Indeed, college increases exposure to certain risk factors for suicide, including elevated stress, loneliness and isolation, and substance experimentation and misuse (Assari, 2018; Wilcox et al., 2010). Thus, college students may be a population

vulnerable to a worrisome reciprocal momentary dynamic between alcohol consumption and suicide risk. Intensive longitudinal approaches, such as EMA, are promising methods to empirically examine this hypothesis.

The Present Study

This is the first known study to use intensive longitudinal methods (i.e., EMA) to establish the temporal ordering of alcohol- and suicide-related phenomena, specifically exploring the reciprocal momentary dynamic between urges to drink alcohol and urges to engage in suicidal behavior in a large sample of college students. Participants completed brief surveys randomly dispersed across the day for 6-8 weeks, answering questions about current (at that moment) intensity of alcohol and suicide urges. To test a reciprocal momentary dynamic, we examined autoregressive and cross-lagged effects of these variables. We hypothesized autoregressive effects for alcohol and suicide urges, such that alcohol urges at the previous time point ($t-1$) would positively relate to alcohol urges at the current time point (t), and that suicide urges at the previous time point ($t-1$) would positively relate to suicide urges at the current time point (t). We further hypothesized cross-lagged associations indicative of a positive feedback loop between urges to drink alcohol and urges to engage in suicidal behavior. That is, we expected alcohol urges at the previous time point ($t-1$) would be positively associated with suicide urges at the current time point (t), and that suicide urges at the previous time point ($t-1$) would be positively associated with alcohol urges at the current time point (t).

Method

Participants

A total of 605 participants were recruited and completed this study across two study waves (Wave 1 was occurred between April 2020 and August 2020; Wave 2 occurred between October 2020 and January 2021). Like prior studies (Kleiman et al., 2020), participants were excluded from analyses if they completed fewer than 15 surveys over the study period ($N = 78$). The total sample size for this study was 527. Demographic information is presented in Table 1.

Procedure

Recruitment and baseline. Participants were recruited remotely from the university's undergraduate subject pool and psychology classes. Participants completed a screener prior to ensure they met inclusion criteria (age 18+, smart phone ownership, ability to complete surveys). Once admitted to the study, they completed a baseline assessment pertaining to demographics as well as other constructs not relevant to the current study. After baseline, they downloaded the EMA data collection app (MetricWire) to their phones and began the protocol.

EMA Protocol. All surveys were completed on the participant's own smart phone via the MetricWire app. Surveys were brief (<5 minutes), time-contingent, and administered 6 times per day randomly within windows of 3-4 hours for 6-8 weeks. Participants were

compensated via Amazon Gift Card for each survey completed (\$0.25 per survey, except for the longer nightly surveys, for which they were compensated \$0.50). If participants completed 4 surveys in a day, they received a \$0.50 bonus. In total, participants had the opportunity to be compensated \$141.

Although research consistently indicates that asking about suicide in EMA studies does not increase risk of suicide (see Nock et al., 2021), suicide risk was still monitored. Any EMA survey response suggestive of imminent risk automatically triggered an immediate alert to the study team for further assessment and, when appropriate, referral for a crisis intervention. Crisis interventions, especially interventions requiring emergency services, were exceedingly rare.

Measures

Suicide urge was measured by the single item “Right now, how strong is the urge to kill yourself?” The urge to drink was measured by the single item “Right now, how strong is your urge to use alcohol.” Participants rated both items at every EMA survey using the rating scale 0 (*Not at all*) to 10 (*Very Strong*).

Data Analytic Plan

Dynamic Structural Equation Modeling (DSEM) combines multilevel, structural equation, time-series, and time-varying effects modeling into a single, integrated framework (e.g., Asparouhov et al., 2017, 2018). DSEM is particularly suited for investigating questions related to autoregression—how well a previous state level predicts the current state level—and cross-lagged effects, where the previous state level of one variable predicts the current state level of another. This framework is therefore ideal for examining our research questions related to temporal dynamics of urges for suicide and alcohol consumption.

Figure 1 illustrates the basic proposed model. Within-person coefficients (i.e., β_{SI-SI} , β_{SI-Alc} , $\beta_{Alc-Alc}$, β_{Alc-SI}) estimate how strongly previous states of suicide urge and alcohol urge ($t-1$) predict current states of suicide urge and alcohol urge (t). Although both variables of interest are continuous in our data, responses to both alcohol urge and suicide urge yield a strong floor effect (with over 80% of responses at 0 for both variables). We adapt the proposed model as described below to account for the negative skew in our data.

Muthén, Asparouhov, and Shiffman (2024) recently proposed adaptations to DSEM that leverage a two-part modeling approach for data with floor effects. Muthén and colleagues (2024) recommend parsing the variable with a strong floor effect into two new variables: 1) one variable that “bins” the original variable into whether ratings are present (greater than 0 on original variable; converted to 1 on bin variable) or absent (response at 0 on original variable; maintained 0 on bin variable) and 2) another variable that quantifies how strong ratings of the original variable are if present (responses at 0 on original variable are recoded to “NA” on “pos” variable; responses at 1-10 on original variable are maintained as 1-10 on “pos” variable).

Recommendations from Muthén and colleagues (2024) are for DSEM models with one variable with a strong floor effect and another that is normally distributed. However, in the

current study, both alcohol urge and suicide urge have strong floor effects. Thus, rather than estimating the two-part model simultaneously, we estimate the two-part model components in separate models. We used Mplus version 8.10 (Muthén & Muthén, 2023) to estimate: 1) the autoregressive and cross-lagged effects of the presence (binary coded 0 or 1) of suicide urge and alcohol urge, using a probit link that is the default for categorical models in Mplus (for a detailed description of categorical DSEM models in Mplus, see McNeigh et al., 2023), and 2) the autoregressive and cross-lagged effects of the strength (continuous variable between 1 and 10) of alcohol urge and suicide urge if urges are present (where 0s are coded as missing). Mplus uses latent variable decomposition and both models are estimated using the Bayesian estimator function in Mplus. All effects are reported as standardized estimates, allowing for direct comparison between binary and continuous outcome models. We also use Markov chain Monte Carlo with 10,000 iterations per chain. In both models, we controlled for time in the study (in hours) at the within-person level centered on the midpoint of the study, as well as effects for day in the study, time of day (morning as the reference group), and weekend (0 for weekday and 1 for weekend).¹ Data are available upon reasonable request from the corresponding author.

Results

Overview

There were 81,299 observations across 527 total participants ($M_{Observations}=154$ per person; $SD = 105$). Participants answered at least one survey on an average of 37.6 days ($SD = 18.1$). The mean lag between observations in the presence model was 6.95 hours ($SD = 17.5$; median = 3.18). The mean lag between consecutive non-zero observations in the strength model was 29.1 hours ($SD = 68.8$; median = 6.56). 55.3% of participants ($N = 334$) endorsed SI urges at least once during the study period, 66.1% ($N = 399$) endorsed alcohol urges, and 73.2% ($N=442$) endorsed either urge type. Basic descriptives of all main study variables can be found in Table 2.

Autoregressive and Cross-lagged Effects

We use the following ranges to discuss magnitude of the effects: Small < .10; .10 Medium < .30; .30 Large (Funder & Ozer, 2019). Figure 2 presents the within-person autoregressive and cross-lagged effects for the presence of suicide urge and alcohol urge.

Presence Models

All presence models included binary outcomes. Standardized coefficients (β) represent effect sizes for the latent propensity underlying urge occurrence. Thus, results presented below can be interpreted as “a one standard deviation increased in the previous urge state is associated with β standard deviation increase in the *latent propensity for a current urge state*.”

¹Please note, an additional consideration is that observations within days may be more similar than observations across days. Initially, we attempted a three-level model in which observations were nested within days within persons. However, we encountered convergence issues implementing this model with our complex two part zero-inflated DSEM framework. We encourage future research to further investigate a three-level nesting frameworks for data with similar structures.

Within-person autoregressive effects for the presence of urges. Beginning first with the autoregressive paths, the presence of suicide urge at the previous time point was positively associated with presence of suicide urge at the current time point at a large effect. The presence of the urge to drink alcohol at the previous time point was positively associated with the presence of the urge to drink at the current time point at a large effect.

Cross-lagged associations with the presence of suicide and alcohol urges. Turning to the cross-lagged associations, the presence of suicide urge at the previous time point was positively associated with the presence of the urge to drink at the current time point at a medium effect. The presence of the urge to drink alcohol at the previous time point was positively associated with the presence of suicide urge at the current time point at a medium effect.

Strength Models

All strength models included continuous outcomes in instances where urges were greater than zero. Thus, results presented below can be interpreted as “a one standard deviation increase in the previous urge state is associated with β standard deviation urge increase in current urge strength during periods when urges are present.”

Within-person autoregressive effects for strength of urges. Figure 3 presents the within-person autoregressive effects for the strength of suicide urge and alcohol urge. Again, starting with the autoregressive paths, the strength of suicide urge at the previous time point was positively associated with the strength of suicide urge at the current time point at a medium effect. The strength of the urge to drink alcohol at the previous time point was positively associated with the strength of the urge to drink at the current time point at a medium effect.

Cross-lagged associations with strength of suicide and alcohol urges. Finally, with respect to cross-lagged associations, the strength of suicide urge at the previous time point was positively associated with the strength of the urge to drink at the current time point at a medium effect. The strength of the urge to drink alcohol at the previous time point was positively associated with the strength of suicide urge at the current time point at a medium effect.

Discussion

The present study used EMA and DSEM to examine the temporal ordering of urges to drink alcohol and urges to engage in suicidal behavior among college students, specifically exploring the reciprocal momentary dynamic between these variables. All analyses were within-subject. As expected, there were significant autoregressive effects, such that alcohol urges at the previous time point (t-1) positively predicted alcohol urges at the current time point (t), and suicide urges (t-1) positively predicted suicide urges (t). Additionally, consistent with hypotheses, cross-lagged analyses confirmed a reciprocal momentary dynamic, characterized by a positive feedback loop between alcohol and suicide urges. In other words, alcohol urges (t-1) were positively associated with suicide urges (t), and suicide urges (t-1) were positively associated with alcohol urges (t). Associations were

significant in both the categorical model (i.e., presence of an urge) and dimensional model (i.e., strength of the urge). This suggests that the presence of one behavioral urge may predict the subsequent presence of the other behavioral urge. Further, once present (i.e., rated > 0), the strength (or severity) of one urge predicts the severity of the other urge.

Although research on the alcohol-suicide risk dynamic at the momentary level is still in its infancy, prior research provides some clues regarding the current study's findings of a positive feedback loop between urges to drink and engage in suicidal behavior. For instance, although literature is somewhat mixed with respect to alcohol, there is evidence that alcohol misuse and suicidal behavior overlap in behavioral functions, including affect regulation (Law et al., 2015; Tovmasyan et al., 2022), suggesting the possibility that both urges can occur and interact in response to the same stimulus in real time. Directionally, alcohol intoxication may lead to subsequent increase in suicide urges due to its effects on behavioral inhibition, decision-making, cognitive flexibility, and negative affect and regulation (Conner & Bagge, 2019). At the same time, people may drink as a coping strategy after experiencing distressing suicidal urges or thoughts (Gonzalez et al., 2009) or use alcohol to facilitate a suicide attempt (Bagge et al., 2015). Additional longitudinal research is necessary to further clarify these mechanisms. However, at a minimum, the current research suggests a worrisome dynamic between alcohol and suicide urges that potentially increases risk for engagement in both behaviors over a short time period.

The current research had limitations. The sample was derived from an unselected population of college students not recruited based on alcohol use or suicide risk. As such, results may not generalize to clinical populations (e.g., persons with AUD or a history of suicide attempts) or persons in different developmental life stages. Indeed, effect sizes demonstrated were driven by a smaller subset of the sample and should be interpreted with caution. Low endorsement of alcohol use and suicide attempts precluded our ability to examine these behaviors in the model, and there was a strong floor effect for both alcohol and suicide urges in our sample. Although urges typically precede behaviors, without examining the actual behaviors in real time, it is unclear if the reciprocal urge patterns observed lead to behavioral expression, or that there is a reciprocal pattern between expressed behaviors. This study was conducted during the COVID-19 pandemic, and thus findings may not translate to post-pandemic times. Finally, this study's statistical model was quite limited, and not fully reflective of the complexity of the momentary dynamic between alcohol and suicide urges, a dynamic that is almost certainly influenced by a multitude of internal and contextual variables. Additional longitudinal work with more complex models should continue to probe the reciprocal nature of alcohol- and suicide-related urges to elucidate for whom, when, why, and under which contexts this dynamic unfolds, and explore if and how this leads to behavioral outcomes (e.g., suicide attempts, drinking).

Limitations notwithstanding, this study is the first to leverage cutting edge longitudinal methodology and analyses to model associations between alcohol- and suicide-related phenomena, demonstrating reciprocal momentary relations between alcohol and suicide urges in a large, racially and ethnically diverse sample of college students. There are important clinical implications from this line of research. For instance, a positive feedback loop between alcohol and suicide urges that occurs over short time periods suggests a

relatively brief window of time for intervention, especially among persons who may already be engaging in problem drinking and/or in an acute state of suicide risk. The development of timely “in the moment” intervention strategies (e.g., Coppersmith et al., 2022), particularly those that target both urges simultaneously may be crucial (e.g., Goldston et al., 2021). Such strategies could be impactful for the prevention and treatment of acute and chronic vulnerability for alcohol and suicide-related outcomes, especially among young people and college students who are well-suited for, and may be receptive to, these kinds of interventions (Oliveira et al., 2021).

Funding

Dr. Grove was funded by NIH NIAAA Career Development Award (K23AA031035).

Data Availability Statement

Data are available upon reasonable request from the corresponding author.

References

- Asparouhov T, Hamaker EL, & Muthén B (2017). Dynamic latent class analysis. *Structural Equation Modeling*, 24, 257–269. 10.1080/10705511.2016.1253479
- Asparouhov T, Hamaker EL, & Muthén B (2018). Dynamic structural equation models. *Structural Equation Modeling*, 25, 359–388. 10.1080/10705511.2017.1406803
- Assari S (2018). Multiplicative effects of social and psychological risk factors on college students' suicidal behaviors. *Brain Sciences*, 8, 91–98. 10.3390/brainsci8050091 [PubMed: 29772772]
- Bagge CL, Conner KR, Reed L, Dawkins M, & Murray K (2015). Alcohol use to facilitate a suicide attempt: an event-based examination. *Journal of Studies on Alcohol and Drugs*, 76, 474–481. 10.15288/jsad.2015.76.474 [PubMed: 25978835]
- Bagge CL, & Sher KJ (2008). Adolescent alcohol involvement and suicide attempts: Toward the development of a conceptual framework. *Clinical Psychology Review*, 28, 1283–1296. 10.1016/j.cpr.2008.06.002 [PubMed: 18676078]
- Borges G, Bagge CL, Cherpitel CJ, Conner KR, Orozco R, & Rossow I (2017). A meta-analysis of acute use of alcohol and the risk of suicide attempt. *Psychological Medicine*, 47, 949–957. 10.1017/S0033291716002841 [PubMed: 27928972]
- Borges G, Cherpitel CJ, Orozco R, Ye Y, Monteiro M, Hao W, & Benegal V (2017). A dose–response estimate for acute alcohol use and risk of suicide attempt. *Addiction Biology*, 22, 1554–1561. 10.1111/adb.12439 [PubMed: 27507572]
- Centers for Disease Control and Prevention. (2021). Provisional Numbers and Rates of Suicide by Month and Demographic Characteristics: United States, 2021. U.S. Department of Health and Human Services <https://www.cdc.gov/nchs/data/vsrr/vsrr024.pdf>
- Conner KR, & Bagge CL (2019). Suicidal behavior: Links between alcohol use disorder and acute use of alcohol. *Alcohol Research: Current Reviews*, 40, 1–15. 10.35946/arcr.v40.1.02
- Coppersmith DD, Dempsey W, Kleiman EM, Bentley KH, Murphy SA, & Nock MK (2022). Just-in-time adaptive interventions for suicide prevention: Promise, challenges, and future directions. *Psychiatry*, 85, 317–333. 10.1080/00332747.2022.2092828 [PubMed: 35848800]
- Flensburg-Madsen T, Knop J, Mortensen EL, Becker U, Sher L, & Grønbaek M (2009). Alcohol use disorders increase the risk of completed suicide—irrespective of other psychiatric disorders. A longitudinal cohort study. *Psychiatry Research*, 167, 123–130. 10.1016/j.psychres.2008.01.008 [PubMed: 19359047]
- Funder DC, & Ozer DJ (2019). Evaluating effect size in psychological research: Sense and nonsense. *Advances in Methods and Practices in Psychological Science*, 2, 156–168. 10.1177/2515245919847202

- Gilmore AK, Moore CJ, Nielsen KE, Prince JR, Fortson K, Mullican KN, ... & Ward-Ciesielski E. (2024). Mixed method examination of alcohol and suicidality among actively suicidal adults who engage in heavy episodic drinking. *Addictive Behaviors*, 151. 10.1016/j.addbeh.2023.107938
- Goldston DB, Curry JF, Wells KC, Kaminer Y, Daniel SS, Esposito-Smythers C, ... & Roley-Roberts M. (2021). Feasibility of an integrated treatment approach for youth with depression, suicide attempts, and substance use problems. *Evidence-Based Practice in Child and Adolescent Mental Health*, 6, 155–172. 10.1080/23794925.2021.1888664 [PubMed: 35692895]
- Gonzalez VM, Bradizza CM, & Collins RL (2009). Drinking to cope as a statistical mediator in the relationship between suicidal ideation and alcohol outcomes among underage college drinkers. *Psychology of Addictive Behaviors*, 23, 443–451. 10.1037/a0015543 [PubMed: 19769428]
- Griffin E, Arensman E, Perry IJ, Bonner B, O'Hagan D, Daly C, & Corcoran P (2018). The involvement of alcohol in hospital-treated self-harm and associated factors: findings from two national registries. *Journal of Public Health*, 40, e157–e163. 10.1093/pubmed/fox049 [PubMed: 28498968]
- Kivelä L, van der Does WA, Riese H, & Antypa N (2022). Don't miss the moment: A systematic review of ecological momentary assessment in suicide research. *Frontiers in Digital Health*, 4, 1–22. 10.3389/fgth.2022.876595
- Kleiman EM, Yeager AL, Grove JL, Kellerman JK, & Kim JS (2020). Real-time mental health impact of the COVID-19 pandemic on college students: Ecological momentary assessment study. *JMIR Mental Health*, 7, 1–8. 10.2196/24815
- Kuerbis AN, Shao S, Treloar Padovano H, Jadanova A, Selva Kumar D, Vitale R, ... & Morgenstern J. (2020). Context and craving among individuals with alcohol use disorder attempting to moderate their drinking. *Experimental and Clinical Psychopharmacology*, 28, 677–690. 10.1037/pha0000349 [PubMed: 31971419]
- Law KC, Khazem LR, & Anestis MD (2015). The role of emotion dysregulation in suicide as considered through the ideation to action framework. *Current Opinion in Psychology*, 3, 30–35. 10.1016/j.copsyc.2015.01.014
- Merrill JE, & Carey KB (2016). Drinking over the lifespan: Focus on college ages. *Alcohol Research: Current Reviews*, 38, 103–114. 10.1037/a0034743
- McNeigh D, Somers JA, & Savord A (2023). Dynamic structural equation models with binary and ordinal outcomes in Mplus. *Behavior Research Methods*, 56; 1506–1532. 10.3758/s13428-023-02107-3 [PubMed: 37118647]
- Muthén B, Asparouhov T & Shiffman S (2024). Dynamic Structural Equation Modeling with Floor Effects. Version 2. Forthcoming in *Psychological Methods*. 10.1037/met0000720
- Nock MK, Kleiman EM, Abraham M, Bentley KH, Brent DA, Buonopane RJ, ... & Pearson JL. (2021). Consensus statement on ethical & safety practices for conducting digital monitoring studies with people at risk of suicide and related behaviors. *Psychiatric Research and Clinical Practice*, 3, 57–66. 10.1176/appi.prcp.202000 [PubMed: 34414359]
- Oliveira C, Pereira A, Vagos P, Nóbrega C, Gonçalves J, & Afonso B (2021). Effectiveness of mobile app-based psychological interventions for college students: A systematic review of the literature. *Frontiers in Psychology*, 12, 1–15. 10.3389/fpsyg.2021.647606
- Rizk MM, Herzog S, Dugad S, & Stanley B (2021). Suicide risk and addiction: The impact of alcohol and opioid use disorders. *Current Addiction Reports*, 8, 194–207. 10.1007/s40429-021-00361-z [PubMed: 33747710]
- Tovmasyan A, Monk RL, & Heim D (2022). Towards an affect intensity regulation hypothesis: Systematic review and meta-analyses of the relationship between affective states and alcohol consumption. *PloS one*, 17, 1–8. 10.1371/journal.pone.0262670
- White A, & Hingson R (2014). The burden of alcohol use: Excessive alcohol consumption and related consequences among college students. *Alcohol Research: Current Reviews*, 35, 201–210.
- Wilcox HC, Arria AM, Caldeira KM, Vincent KB, Pinchevsky GM, & O'Grady KE (2010). Prevalence and predictors of persistent suicide ideation, plans, and attempts during college. *Journal of Affective Disorders*, 127, 287–294. 10.1016/j.jad.2010.04.017 [PubMed: 20471691]

Public Health Significance:

The current study is the first to use intensive longitudinal methods to demonstrate that, among college students, there is a reciprocal association between alcohol and suicide urges such that increased urges to do one behavior leads to stronger urges to do the other, and that this troubling dynamic occurs over short time periods. This is important because college students are at elevated risk of problem drinking and suicidality. This research adds to our understanding of alcohol and suicide risk by demonstrating that urges to drink alcohol and urges to engage in suicidal behavior are temporally linked at the momentary level. Future studies from this line of work may inform “just-in-time” efforts to prevent the behavioral expression of this potentially risky combination of urges, particularly among college students and other vulnerable populations.

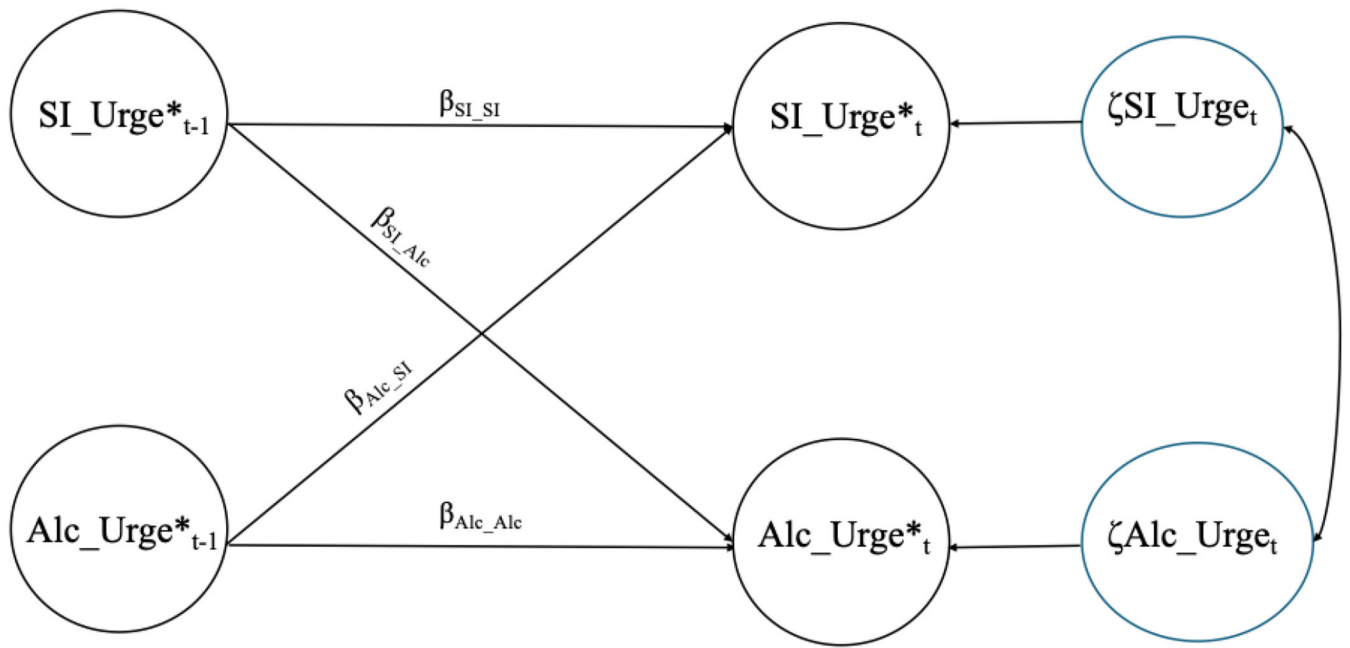


Figure 1. Proposed DSEM model of within-person autoregressive and cross-lagged effects of SI urge and Alcohol urge.

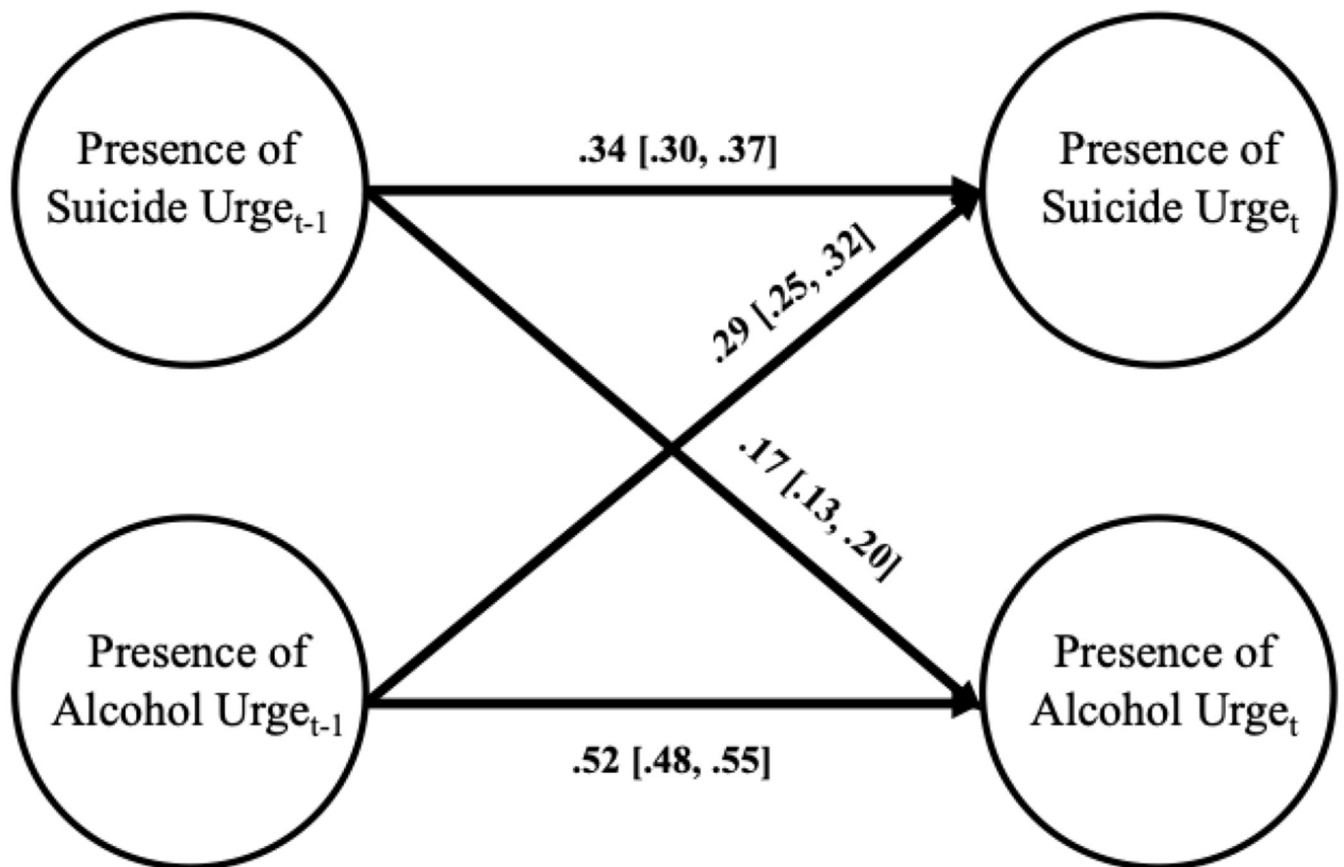


Figure 2.

Within-person results of autoregressive and cross-lagged effects for the presence of SI urge and alcohol urge. $N = 527$ ($N_{\text{Observations}} = 81,299$). Bolded values are those for which the credibility interval does not contain zero. Solid black lines reflect positive paths, and dashed lines reflect negative paths. Effects presented above are adjusted for within-person covariates of centered time in study (in hours), weekend, time of day (with morning as the reference group), and person-specific day in study. The results of these covariates on the outcomes are presented in Table 3.

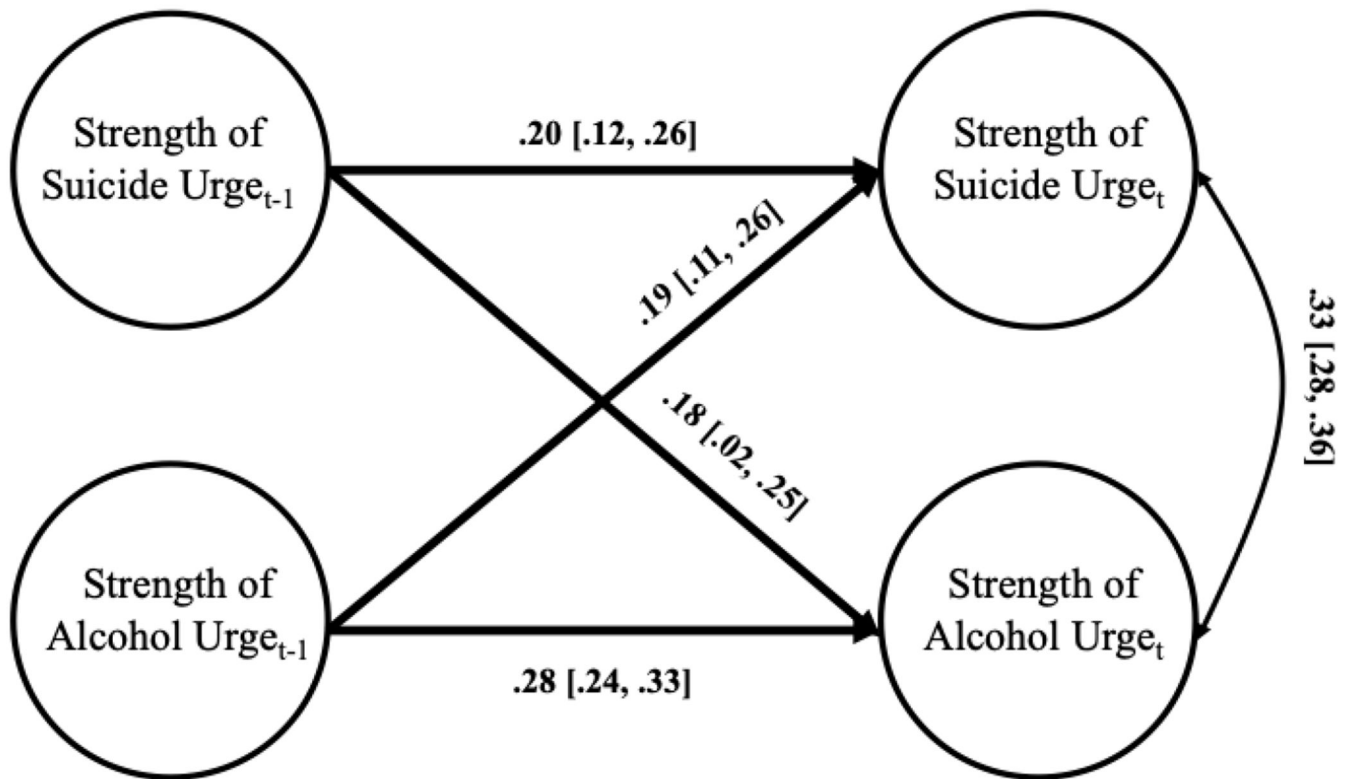


Figure 3.

Within-person results of autoregressive and cross-lagged effects for the presence of SI urge and alcohol urge. $N = 399$ ($N_{Observations} = 44,904$). Bolded values are those for which the credibility interval does not contain zero. Solid black lines reflect positive paths, and dashed lines reflect negative paths. Effects presented above are adjusted for within-person covariates of centered time in study (in hours), weekend, time of day (with morning as the reference group), and person-specific day in study. The results of these covariates on the outcomes are presented in Table 3.

Table 1

Demographics of the study sample

Variable	M (SD) or %
Age	19.4 (2.00)
Race	%
Asian	50.5
White	39.4
Black	7.6
American Indian/Alaskan Native	1.2
Native Hawaiian/Pacific Islander	1
Other	4.7
Ethnicity	%
Hispanic/Latino	12.1
Gender	%
Cisgender male	24.9
Cisgender female	72.0
Non-binary/Gender Non-Conforming	1.6
Transgender man	.7
A gender not listed	.8

Note. $N = 527$. SD = Standard Deviation

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2

Descriptives of Main Study Variables

Variable	Mean (SD)	ICC
Suicidal Urge	.18 (.58)	.44
Alcohol Urge	.43 (.97)	.45
Presence of Suicidal Urge	.07 (.16)	-
Presence of Alcohol Urge	.13 (.22)	-
Severity of Suicidal Urge	1.86 (1.40)	-
Severity of Alcohol Urge	2.64 (1.92)	-

Note. $N = 527$. SD = Standard Deviation; ICC = intraclass correlation. Please note, means of severity ratings are based on only those observations that are higher than 0. Range of responses for severity for both alcohol and suicide urge was 1-10.

Table 3

Day and Time covariate results from models presented in Figures 1 and 2

Variable	Presence of SI Urge	Presence of Alcohol Urge	Strength of SI Urge	Strength of Alcohol Urge
Time in Study	.12 [-.20, .51]	.30 [.09, .46]	.07 [-.31, .63]	.08 [-.68, .60]
Day in Study	-.08 [-.46, .24]	-.34 [-.49, -.13]	-.02 [-.56, .35]	-.08 [-.58, .66]
Weekend	-.07 [-.08, -.05]	-.02 [-.03, -.01]	.06 [.03, .08]	.04 [.02, .06]
Afternoon	-.02 [-.04, .01]	.07 [.04, .09]	.09 [.05, .14]	.07 [.04, .11]
Evening	.10 [.07, .12]	.15 [.13, .18]	.07 [.03, .12]	.11 [.07, .14]
Night	.11 [.09, .14]	.11 [.09, .14]	.00 [-.03, .04]	.03 [-.00, .06]

Note. Models for presence of urges N = 527 (Observations = 81,299); Models for Strength of urges N = 399 (Observations = 44,904). SI = Suicidal Ideation.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript