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The New Normal: Changes in Drinking Norms from College to Post-College Life

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Abstract

Despite the wealth of research on the effects of drinking norms on college students' alcohol consumption, researchers have not yet examined changes in drinking norms and their association with drinking level after students leave the college environment. The current study filled this gap by following students into post-college life, measuring drinking norms and daily drinking behavior. College students (N=1848) were recruited to take part in a daily diary study measuring social and solitary alcohol consumption, and 1142 moderate to heavy drinkers from the college cohort were invited to complete a second wave of daily diaries five years later, with 906 providing at least 15 days of diary data in each wave. Results of multilevel modeling analyses suggest that family injunctive drinking norms become more strongly related to alcohol consumption after individuals leave college. In contrast, institutional injunctive norms may have a greater limiting effect among college students (i.e., the association was greater among college students) and the relations between friend injunctive and descriptive norms to drinking behavior did not change between waves in the current study. This suggests that friend drinking continues to be related to own drinking behavior among adults after leaving the college environment, and highlights the changing importance of institutional norms and family approval. These results may have implications for intervening in young adults' heavy drinking.

Keywords

descriptive drinking norms; injunctive drinking norms; social drinking; solitary drinking; college students; young adults

Previous research suggests that the prevalence of heavy drinking increases from ages 18 to 22 and then decreases (Schulenberg et al., 2018). During college, drinking alcohol helps students connect with their peers (Wolburg, 2001) and drinking with others seems to be a

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The preregistration for this study can be viewed at https://osf.io/qw76v/?view_only=67f0d63dc6cc486b94a09307a5c952f7.

There has been no prior dissemination of the results of the analyses presented in the current manuscript in any presentation or written format.

way of enhancing social experiences (Cooper, Kuntsche, Levitt, Barber, & Wolf, 2015; Mohr et al., 2005). Research has also suggested that perceived drinking norms, i.e., beliefs about how much others drink and how much consumption is viewed as appropriate, are an important factor in college student drinking (Borsari & Carey, 2001). However, research has not examined whether drinking norms and their effects on drinking behavior are different for individuals during versus after college. This has important implications given the prominence of norms-based interventions for young adults (Pedersen, Parast, Marshall, Schell, & Neighbors, 2017). The current study examines whether the associations between drinking norms (injunctive and descriptive) and alcohol consumption change after students leave college. Furthermore, it explores whether the associations between drinking norms and alcohol consumption are similar for social (i.e., drinking with others) versus non-social (i.e., drinking alone or not interacting with others) alcohol consumption.

College Drinking and Maturing Out

College is often portrayed as a time when risk taking and alcohol consumption are prevalent, which may explain why college students often have positive attitudes towards drinking (Wasylkiw & Currie, 2012) and are willing to take their chances with the potential negative consequences (Wolburg, 2001). As emerging adults, college students are also in a developmental period in which substance abuse peaks (Arnett, 2000). In part, this may be because emerging adults, particularly those who leave home to attend college, are less likely to be monitored by parents but have not yet taken on adult roles such as marriage. As individuals progress through this developmental stage, there may therefore be fluctuations in the relative influence of peers, family, and authority figures. In addition, students tend to overestimate drinking norms (Borsari & Carey, 2003) and may view drinking as a key part of the college experience (Crawford & Novak, 2006; Wrye & Pruitt, 2017). However, many of these pressures to drink should be removed after graduation, as students expect to reduce their alcohol consumption after leaving college and transition into adult life (Colby, Colby, & Raymond, 2009). Indeed, students view alcohol consumption as more normative for college students than for adults (Colby, Swanton, & Colby, 2012) and, starting at age 29, individuals report feeling less mature if they have an alcohol use disorder (Winograd, Littlefield, & Sher, 2012). Research has also found that individuals who attend college show a greater increase in alcohol consumption upon leaving home than their non-college peers, and that this increase is followed by a decrease in consumption during the last years of college or after graduation (Carter, Brandon, & Goldman, 2010).

However, graduation does not mark an end to alcohol consumption, and research suggests that young adults still experience pressure to drink (Bartram, Eliott, & Crabb, 2017; Emslie, Hunt, & Lyons, 2012). Although previous research suggests that some students do mature out of risky drinking following graduation (Schulenberg et al., 2001; White, Labouvie, & Papadaratsakis, 2005), those who engage in greater alcohol consumption during college are less likely to do so (Beseler, Taylor, Kraemer, & Leeman, 2012; Campbell & Demb, 2008). Furthermore, research suggests that reductions in alcohol consumption following graduation are a result of reduced quantities being consumed rather than a reduction in the frequency of drinking (Arria et al., 2016). Although risky drinking may be reduced, alcohol consumption continues, i.e., rates of abstinence do not increase (Jackson, Sher, Gotham, & Wood, 2001).

The current study examined whether this reduction in risky drinking after students leave the college environment are due in part to changes in perceived drinking norms and their influence on drinking behavior.

Perceived Norms

Research suggests that college student drinking is influenced by both perceptions of how much others approve of drinking (i.e., injunctive drinking norms) and perceptions of how much others drink (i.e., descriptive drinking norms; Borsari & Carey, 2003). Indeed, perceptions of descriptive norms may be a stronger predictor of students' alcohol consumption than the actual drinking behavior of their peers (Perkins, Haines, & Rice, 2005). Further, students may view adherence to injunctive norms as one means of regaining the approval of their peers (Hamilton & DeHart, 2019).

Although little research has examined drinking norms outside of college students, the available evidence indicates that drinking norms may have a stronger effect on behavior among students than among their non-college attending peers (Quinn & Fromme, 2011). This suggests that the college environment may play a role in the association between drinking norms and alcohol consumption. It is not yet clear, however, whether the effects of norms on drinking behavior change over time. Adults continue to feel pressure to drink when around others who are drinking (Bartram et al., 2017), and view at least moderate alcohol consumption as a part of social life (Emslie et al., 2012), suggesting that there is still some pressure to act in accordance with normative drinking behavior. Indeed, drinking norms continue to be a powerful predictor of drinking behavior among adults (Herd, 1994).

However, the reference groups of influential drinking norms may change from friends to others. For example, research on a sample of newlywed couples suggested that husbands' premarital drinking (but not peer drinking) predicted drinking behavior of both the husbands and wives (Leonard & Mudar, 2003). This suggests that spousal norms (or the husband's norms) may become more important than peer norms. Furthermore, by early midlife, individuals have become more cognizant of their responsibilities and are careful to control their drinking (Emslie et al., 2012), suggesting the potential for increased importance of institutional norms (i.e., norms of religious, health, and government authorities). Because no research has examined whether the associations between injunctive and descriptive drinking norms and drinking behavior change as individuals shift from college to post-college life, the current study seeks to fill this gap by testing the effects of drinking norms on social and solitary drinking among the same individuals during college and after they have left the college environment.

Social Versus Solitary Alcohol Consumption

It is important to understand how drinking norms may differentially influence social and solitary alcohol consumption given their differential influence on alcohol-related consequences. Solitary drinking more strongly predicts hazardous drinking and related consequences than social drinking (Keough, O'Connor, & Stewart, 2018). Further, solitary drinking explains the pathway between negative affect and harmful drinking (Bilevicius,

Single, Rapinda, Bristow, & Keough, 2018) and between depressive symptoms and alcohol-related problems (Keough, O'Connor, Sherry, & Stewart, 2015). Thus, solitary drinking seems to be particularly harmful.

Different drinking motives may lead individuals to engage in alcohol consumption in social versus solitary contexts (Mohr et al., 2001; Mohr et al., 2005). Among college students, drinking to cope with negative moods or negative interpersonal interactions seems to be related to greater alcohol consumption at home without friends (Mohr et al., 2005). On the other hand, positive moods and interactions seem to be related to drinking with friends or drinking away from home, due to social and enhancement motives. Among adults, a similar pattern of positive experiences leading to social drinking emerges, whereas negative experiences predict solitary drinking instead (Mohr et al., 2001). This suggests that social and solitary drinking are distinct behaviors; they should therefore be measured separately in order to fully understand how social pressures such as drinking norms influence alcohol consumption. In the current study, we examined the separate effects of drinking norms (injunctive and descriptive) on both social and solitary drinking.

Effects of Measurement

The current study also adds to the literature on changes in drinking after college by assessing social and solitary alcohol consumption using daily diary reporting. Most of the earlier studies on changes in drinking following college graduation used retrospective reports of alcohol consumption over the previous 30 days (Gotham, Sher, & Wood, 1997; Jackson et al., 2001) or even the previous year (Arria et al., 2016). In the current study, we measured alcohol consumption in two waves using daily diary methodology. In each wave, participants completed an online survey each day for 30 days in which they reported their alcohol consumption. This methodology allowed us to examine alcohol consumption in its natural context, and reduced retrospection error and bias because the time between alcohol consumption and its reporting was minimized (Bolger, Davis, & Rafaeli, 2003; cf. Tennen, Affleck, Coyne, Larsen, & DeLongis, 2006).

Current Research

In the current study, we tested whether the associations between perceived norms and alcohol use changed from college to post-college life. To do this, we followed a large cohort of college students during their college years and then five years later during post-college life, measuring perceived norms and alcohol use at both time points. We tested for effects of injunctive and descriptive norms on social and solitary alcohol consumption, as well as on the frequency of heavy drinking during college versus five years later.

Previous evidence suggests that drinking norms have a stronger effect on college students than on their non-college peers (Quinn & Fromme, 2011), that the reference groups for drinking norms may shift away from friends after college (see Emslie et al., 2012; Leonard & Mudar, 2003), and that emerging adults are in a period of transition into more committed and intimate romantic relationships as well as stable and meaningful careers (Arnett, 2000). Wave 2 occurred after college as participants were leaving emerging adulthood and

beginning to assume their adult roles. We therefore predicted that the effects of friend injunctive and descriptive norms as well as typical peer descriptive norms would be stronger among college students, as these influences may indicate a desire to fit in with peers and a willingness to engage in risky health behavior that is seen as a normal part of college. In contrast, we predicted that the effects of family and institutional injunctive norms (i.e., norms of religious, health, and government authorities) would be stronger after participants had left the college environment, as these influences may indicate a desire to act in accordance with societal pressures rather than focusing on social interactions with peers.[1]

Method

Participants

The participants were undergraduate students at the University of Connecticut above the age of 18 who had used alcohol at least twice in the previous 30 days and had never been treated for alcohol problems. These students were recruited during nine semesters (Spring 2008 – Spring 2012) for a 30-day daily diary study examining alcohol use (Wave 1). To increase the diversity of the sample, recruitment flyers were posted on bulletin boards in cultural centers across campus (e.g., the African American Cultural Center) and care was taken to ensure roughly equal recruitment of men and women.

Of the Wave 1 students, those who were moderate to heavy drinkers were recruited for Wave 2. These were participants who at Wave 1 reported more than one drinking day and at least one heavy drinking day in the initial and daily surveys, and whose weekly drinking levels surpassed guidelines for safe drinking (i.e., consumption a mean of at least 4 drinks for men or 3 drinks for women per week over the 3 months prior to the initial assessment). Participants in Wave 2 were no longer in college and were invited to participate in another 30-day diary study beginning (on average) 5 years after their initial participation. These individuals were chosen because of their increased potential for risky alcohol use following graduation (Beseler et al., 2012; Campbell & Demb, 2008). We anticipated that these persons would be most influenced by drinking norms.

Of the 1848 students who completed the initial survey at Wave 1, 1641 (89%) completed at least fifteen days of the initial diary study. Of these, 1142 were identified as moderate to heavy drinkers and were invited to take part in Wave 2 and 906 (80%) completed at least fifteen days of recording in Wave 2.[2] Individuals who participated in both waves of the study had an average age of 19.18 years (SD = 1.26) at the time of the initial wave and 24.56 years (SD = 1.33) at Wave 2. About half were women (54%). They completed an average of 26.33 (SD = 3.68) diary surveys in the initial wave and an average of 27.92 (SD = 3.33) diary

[1]All hypotheses were registered prior to analysis and can be viewed at https://osf.io/qw76v/?view_only=3e6a6ef4669f40858a570af3b5e60483

[2]Power analyses were calculated prior to the collection of Wave 1 and the sample size was selected to ensure high power to detect effects on drinking of measured norms. The sample size for Wave 2 was determined by the number of eligible participants who agreed to participate (i.e., all eligible participants were contacted and invited to participate in Wave 2). Power analyses conducted prior to Wave 2 suggested that linear models with interaction effects would have high power to detect effects on drinking of measured norms and we believe the current study is sufficiently powered. The primary predictor variables were measured at Level 2 (drinking norms) or were cross-level interactions (drinking norms by Wave). Thus, the minimal sample size at the level of the effect was 552 participants or 736 cases. We have also provided estimates of the effect size of all effects.

surveys in the second wave.[3] Table 1 includes information about drinks per drinking day and percentage of days drinking.

Procedure

The institutional review board at the University of Connecticut and at UConn Health approved all study procedures. Students were recruited via the undergraduate psychology participant pool and campus-wide emails and agreed to be contacted for subsequent studies. For the first wave of the study students provided informed consent, completed an initial online survey assessing demographic information and drinking norms, and then completed an online daily diary survey each day for 30 days. Daily surveys were available from a secure website between 2:30 pm and 7:00 pm, a time window selected to coincide with most undergraduate students' naturally occurring end of school day before typical evening activities begin. To maximize daily survey adherence, the system sent a reminder email at 6 pm; if the survey was not completed by the end of the reporting window, another email was sent reminding the participant to complete the next day's survey. For the second wave of the study, participants provided informed consent, completed an initial online survey assessing drinking norms, and then completed the same online daily diary survey each day for 30 days. Daily surveys were available from a secure website between 4:00 pm and 8:30 pm.

Measures[4]

Descriptive and injunctive drinking norms.—Injunctive drinking norms were measured with 10 items in the initial survey of each wave asking participants to indicate how much specific people or institutions (i.e., religious, health, and government authorities) would consider an appropriate amount of alcohol for them to consume (1 = *none*, 2 = *1 – 3 drinks per month*, 3 = *1 – 3 drinks per week*, 4 = *1 drink per day*, 5 = *more than 1 drink per day*; adapted from Nagoshi, Wood, Cote, & Abbit, 1994). This measure also included a 'not applicable' option. We calculated a friend injunctive norm score by averaging norms for close friends, roommates, social group, and work acquaintances (α = .90). We calculated a family injunctive norm score by averaging norms for parents, siblings, and significant other (α = .80). Finally, we calculated an institution injunctive norm score by averaging norms for religious authorities, health authorities, and government officials (α = .89). Thus, injunctive norms measures were calculated based only on reference groups that were reported as relevant to a participant during that Wave.

Descriptive norms were measured using 3 items in the initial survey of each wave asking participants to indicate how much alcohol they think is consumed by typical same gender peers, their close friends, and members of their social group (1 = *none*, 2 = *1 – 3 drinks per*

[3]Participants who were not included in analyses (i.e., those who did not complete at least 15 days of each wave) did not differ from those who were included in age, $t(1139) = 0.69$, $p = .49$, 95% CI [−0.12, 0.25], However, those included in analyses were more likely to be women, $\chi^2(1, N = 1142) = 17.43$, $p < .001$ and less likely to be White, $\chi^2(1, N = 1142) = 9.73$, $p = .002$. Those included in analyses also reported fewer social drinks per drinking day, fewer solitary drinks per drinking day, and fewer heavy drinking days, all $ts > 2.49$, all $ps < .02$, but greater percent social drinking days, $t(1140) = -5.67$, $p < .001$, 95% CI [−8.07, −3.92], and no difference in percent solitary drinking days, $t(301) = 0.64$, $p = .37$, 95% CI [−1.19, 1.93]. Degrees of freedom for solitary drinking days were adjusted in analysis because Levene's test indicated unequal variances. Finally, participants included in analyses reported lower friend injunctive and descriptive norms and lower typical peer norms, all $ts > 3.89$, all $ps < .001$, but no difference in family or institution injunctive norms, both $ts < 0.93$, both $ps > .36$.

[4]Materials used for this study can be viewed at https://osf.io/pe2s4/?view_only=740ba3a54eef47c38587c21b0e90235a

month, 3 = *1 – 3 drinks per week*, 4 = *1 drink per day*, 5 = *more than 1 drink per day*; adapted from Baer, Stacy, & Larimer, 1991). We calculated a friend descriptive norm score by averaging the norms scores for close friends and social group ($r = .87$, $p < .001$).

Daily alcohol consumption.—In each daily survey, participants indicated how many alcoholic beverages they had consumed alone and with others the previous evening (after completing the previous day's survey) and that day. Participants were reminded each day that a standard drink is defined as one 12-oz beer or wine cooler, one 5-oz glass of wine, or a 1-oz measure of liquor straight or in a mixed drink. Evening and daytime amounts were summed together to create a total number of drinks consumed for each day.

Drinks per drinking day.: For each wave, a participant's average alcohol consumption on drinking days was calculated by taking the average of all their non-zero alcohol consumption amounts across the 30 diary days. Separate scores were calculated for social drinks per drinking day (i.e., number of social drinks in 30 days / number of days in which social drinking was reported) and solitary drinks per drinking day (i.e., number of solitary drinks in 30 days / number of days in which solitary drinking was reported).

Percent days drinking.: In order to measure frequency of alcohol consumption across the 30 diary days in each wave, the percentage of diary surveys containing any amount of alcohol consumption was calculated. Separate scores were calculated for percent social drinking days (i.e., number of days in which social drinking was reported / number of diary surveys completed) and percent solitary drinking days (i.e., number of days in which solitary drinking was reported / number of diary surveys completed).

Percent heavy drinking days.: Finally, we calculated the percentage of daily surveys in which participants reported consuming enough alcohol to meet the heavy drinking threshold (5 or more drinks for men, 4 or more drinks for women; Wechsler & Nelson, 2001). This was calculated as: number of heavy drinking days / number of diary surveys completed.

Analyses

Paired samples t-tests were conducted comparing drinking norms between Wave 1 and Wave 2. Multilevel regression analysis was conducted to test whether the effects of perceived drinking norms on alcohol consumption were different at Wave 1 versus Wave 2. Separate analyses were conducted to test effects on social and solitary consumption quantity and frequency as well as frequency of heavy drinking. Because our design contains two levels of data in which waves of data collection (Level 1) are nested within participants (Level 2), we conducted multilevel regression analyses using SPSS, which uses listwise deletion at the wave-level (i.e., an individual's data for a given wave was not included in analyses if it included missing variables). We modeled a random intercept and used effect coding for Wave (−1 = *Wave 1*, 1 = Wave 2). We controlled for gender (1=*woman*, −1=*man*), age, race (1=*White*, −1=*non-White*), and number of diary surveys completed.

Results[5]

Descriptive Statistics

Table 1 presents the means, standard deviations, and correlations of alcohol consumption and drinking norms variables separately for Waves 1 and 2. In both waves, participants who reported more social drinks per drinking day also reported more solitary drinks per drinking day, greater percent social and solitary drinking days, greater percent heavy drinking days, and more positive drinking norms for all but institution injunctive norms. In Wave 1, participants who reported more solitary drinks per drinking day also reported more frequent heavy drinking. In Wave 2, more solitary drinks per drinking day was related to more frequent solitary drinking and more frequent heavy drinking. However, participants reporting more solitary drinks per drinking day in Wave 2 reported less frequent social drinking and lower institution injunctive norms, i.e., those who drank more alcohol alone believed that institutional authorities perceived lower levels of alcohol consumption as acceptable. In both waves, higher percent social drinking days was related to higher percent solitary and heavy drinking days and to higher drinking norms, i.e., those who drank with others more often viewed others as drinking more alcohol and perceived greater levels of alcohol consumption as more acceptable. Percentage of solitary drinking days was positively related to percentage of heavy drinking days and more positive norms in both waves, except that there was no relation between frequency of drinking alone and typical peer descriptive norms in Wave 2. Finally, percentage of heavy drinking days and all drinking norms variables were positively related to one another in both waves.

Changes in Drinking Norms

Means and standard deviations of drinking norms in each wave are included in Table 1. Analyses indicated increases in family injunctive drinking norms, $t(899) = -18.79$, $p < .001$, 95% CI [−0.66, −0.53], friend injunctive drinking norms, $t(902) = -6.97$, $p < .001$, 95% CI [−0.29, −0.16], institution injunctive drinking norms, $t(722) = -24.90$, $p < .001$, 95% CI [−1.01, −0.87], and friend descriptive drinking norms, $t(905) = -2.11$, $p = .04$, 95% CI [−0.13, −0.01]. However, typical peer descriptive drinking norms decreased from college to post-college life, $t(905) = 2.57$, $p = .01$, 95% CI [0.02, 0.15]. This suggests that people feel that drinking is more approved of after leaving college, and participants believed that their friends drank more post-college than during college. However, estimates of typical peer drinking were higher during college (Wave 1) than after college (Wave 2).

Drinking Norms Predicting Alcohol Consumption

Drinks per drinking day.—Analyses examining social drinks per drinking day (1567 valid level l cases nested within 873 participants) revealed significant effects of gender, age, race, and wave (see Table 2). Men, White participants, and current students consumed more alcohol when they drank with others than did women, minority participants, and those who had left the college environment. Amount consumed also decreased with age. Analyses also revealed a marginally significant effect of institution injunctive norms, a significant effect of friend descriptive norms, and a marginally significant effect of typical peer descriptive

[5]The SPSS code for this study can be viewed at https://osf.io/pe2s4/?view_only=740ba3a54eef47c38587c21b0e90235a

norms. Participants who believed that institutions were less approving of alcohol consumption, that their typical peer consumed less alcohol, and that their friends consumed more alcohol all reported greater consumption when drinking with others. There were no significant effects of family or friend injunctive norms and, contrary to hypotheses, none of the effects of drinking norms were moderated by wave.

Analyses examining solitary drinking (736 valid level l cases nested within 552 participants) once again indicated that men consumed more drinks when alone than women and that alcohol consumption decreased with age (see Table 2). There was also a marginally significant decrease in alcohol consumption from wave 1 to wave 2 suggesting that solitary alcohol consumption may decrease after students leave college, or as they get older. None of the drinking norms had a significant effect on alcohol consumption while alone, however, the effect of institutional injunctive norms was qualified by a significant interaction with wave. That is, the effect of institutional drinking norms depended upon whether individuals were still in college or had already left. We probed this significant Institution Injunctive Norms × Wave interaction using the procedures outlined by Aiken and West (1991). These analyses revealed a significant positive effect of institution injunctive norms on average alcohol consumption when alone during Wave 1, $b = 0.48$, $SE = 0.19$, $t(714) = 2.49$, $p = .01$, $d = .19$ (see Figure 1). In contrast, this effect of institution injunctive norms on average alcohol consumption when alone was not significant during Wave 2, $b = -0.19$, $SE = 0.19$, $t(717) = -1.01$, $p = .32$, $d = .08$. Contrary to our predictions, the effect of institutional norms on alcohol consumption was stronger among college students, although this interaction effect was only significant when predicting solitary alcohol consumption.

Percentage of drinking days.—Analyses examining social drinking (1600 valid level l cases nested within 878 participants) revealed significant effects of age, race, and wave (see Table 2). Specifically, frequency of drinking with others increased with age and was greater among White participants and those who had left college. Descriptive norms of typical peers were negatively related to drinking frequency, whereas friend descriptive norms showed a positive effect on the percentage of days participants reported drinking with friends. There was also a significant positive effect of family injunctive norms that was qualified by a significant interaction with wave. Finally, there was a marginally significant institution injunctive norm by wave interaction. Further analysis of the significant Family Injunctive Norms × Wave interaction revealed a marginally significant positive effect of family injunctive norms on percentage of social drinking days during Wave 1, $b = 1.52$, $SE = 0.80$, $t(1529) = 1.89$, $p = .06$, $d = .10$ (see Figure 2). However, this effect of family injunctive norms on frequency of social drinking was much stronger during Wave 2, $b = 8.49$, $SE = 1.15$, $t(1528) = 7.39$, $p < .001$, $d = .38$. In line with our hypotheses, the effect of family injunctive norms was stronger among individuals who had left the college environment. Further analysis of the marginally significant Institution Injunctive Norms × Wave interaction revealed a significant positive effect of institution injunctive norms on percentage of social drinking days during Wave 1, $b = 1.88$, $SE = 0.83$, $t(1490) = 2.27$, $p = .02$, $d = .12$, but not during Wave 2, $b = -0.11$, $SE = 0.78$, $t(1512) = -0.14$, $p = .89$, $d = .01$ (see Figure 3). Contrary to our hypotheses, the effect of institution injunctive norms was stronger among college students.

Analyses examining percentage of solitary drinking days (1600 valid level l cases nested within 878 participants) suggested that men and minority participants reported more frequent solitary alcohol consumption, and that the frequency increased with age (see Table 2). Participants who believed their families and institutions approved of alcohol consumption also reported more frequent solitary alcohol consumption. Finally, participants with lower perceived drinking of typical peers and higher perceived friend drinking reported more frequent solitary consumption, although this effect of typical peer drinking was qualified by a significant interaction with wave. Further analysis of this significant Typical Peer Descriptive Norms × Wave interaction revealed no effect of typical peer descriptive norms on percentage of solitary drinking days during Wave 1, $b = -0.24$, $SE = 0.54$, $t(1539) = -0.45$, $p = .65$, $d = .02$ (see Figure 4). In contrast, typical peer descriptive norms negatively predicted frequency of solitary drinking during Wave 2, $b = -2.37$, $SE = 0.61$, $t(1532) = -3.88$, $p < .001$, $d = .20$. That is, that the effect of typical peer descriptive norms was stronger among individuals who had left the college environment although higher norms were related to less frequent consumption.

Percentage of heavy drinking days.—Analyses examining the frequency of heavy drinking (1600 valid level 1 cases nested within 878 participants) revealed that men, White participants, and those still in college reported more heavy drinking days (see Table 2). Age was also marginally positively related to heavy drinking. Participants who perceived greater approval of drinking by their family, less typical peer drinking, and greater friend drinking also reported heavy drinking more frequently. However, there was a significant interaction between family injunctive norms and wave and a marginally significant interaction between wave and institutional injunctive norms. Further analysis of this significant Family Injunctive Norms × Wave interaction revealed no effect of family injunctive norms on percentage of heavy drinking days during Wave 1, $b = 0.70$, $SE = 0.52$, $t(1517) = 1.35$, $p = .18$, $d = .07$ (see Figure 5). In contrast, family injunctive norms positively predicted frequency of heavy drinking during Wave 2, $b = 2.40$, $SE = 0.74$, $t(1515) = 3.24$, $p = .001$, $d = .17$. In line with hypotheses, this indicates that the effect of family injunctive norms was stronger among those who had left the college environment. Further analysis of the marginally significant Institution Injunctive Norms × Wave interaction revealed no effect of institution injunctive norms on percentage of heavy drinking days during Wave 1, $b = 0.56$, $SE = 0.53$, $t(1474) = 1.05$, $p = .29$, $d = .05$, or during Wave 2, $b = -0.75$, $SE = 0.50$, $t(1496) = -1.50$, $p = .14$, $d = .08$. Perceived institutional approval of alcohol use does not predict heavy drinking frequency among college students or those who have left college.

Discussion

The current study supports previous research suggesting that college is a time of increased alcohol consumption compared to pre- or post-college life (Schulenberg et al., 2018). However, contrary to expectations, whereas the amount consumed decreased after college, the number of instances of drinking (particularly social drinking) increased. This may be a reflection of the changing drinking patterns seen in the social networks of emerging adults post-college (c.f. Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 1997).

More interestingly, the current study examined the influence of drinking norms on social and solitary alcohol consumption both during and after college. Contrary to hypotheses, the influence of friend injunctive and descriptive norms on alcohol consumption were the same for participants during college and after leaving college. Specifically, we found that greater perceived friend drinking predicted greater average social consumption, more frequent alcohol consumption alone and with others, and greater frequency of heavy drinking. This suggests that perceptions of how much friends drink are related to drinking behavior even after college students leave the college environment. This fits with research suggesting that adults still experience pressure to drink (Bartram, Eliott, & Crabb, 2017; Emslie, Hunt, & Lyons, 2012), although friend drinking norms were lower among participants after college than during college.

Also contrary to hypotheses, we found that the effect of institutional injunctive drinking norms on average solitary alcohol consumption and on the percentage of social drinking days was stronger during college than during post-college life. Specifically, college students drank more alcohol when they were drinking alone, and consumed alcohol with others more frequently if they perceived greater institutional approval of alcohol consumption. This effect was not found after college. Across both waves, higher institution injunctive norms were also related to lower average alcohol consumption with others and greater frequency of drinking alone. Although research has shown the importance of drinking responsibly in early midlife (Emslie et al., 2012), the disapproval of religious, health, and government authorities for alcohol consumption did not generally predict lower alcohol consumption among our sample of participants as they moved from college to post-college life. Instead, disapproval by institutional authorities may have had a limiting effect only on college students' average solitary consumption and their frequency of social drinking. Future research should follow participants further into their twenties and thirties to see how the effects of institutional authorities may change as individuals fully enter early midlife.

However, in line with predictions, the effect of family injunctive drinking norms on percentage of social drinking days and percentage of heavy drinking days was stronger among individuals who had left the college environment. Specifically, among study participants who had left college, those who reported greater perceived family approval of alcohol consumption also reported more frequent social drinking days and more frequent heavy drinking days. This effect on social drinking days was only marginally significant among college students, and there was no effect of family approval of drinking on heavy drinking frequency for participants who were currently in college. Family injunctive drinking norms also positively predicted frequency of drinking alone across both waves. This suggests that the effect of family approval on social and heavy drinking is greater after students have left the college environment. One explanation for this finding may be that participants were more likely to live with their parents after leaving college, thus increasing family influences on drinking behavior (although research suggests that emerging adults living at home tend to be less close with their parents, Arnett, 2000). However, we suggest that the influence of romantic partners on consumption may continue to increase in an older sample than was currently studied as individuals marry and have children. Further research is needed to tease apart the effects of parental versus spousal or significant other norms.

Analyses also revealed that, although participants showed no effect of typical peer perceived drinking on how often they drank alone while in college, after leaving college they reported more frequent solitary alcohol consumption if they perceived that their typical peers consumed less alcohol. This is particularly interesting given results suggesting that typical peer drinking norms were the only norms to decrease from college to post-college life. Typical peer consumption also negatively predicted average alcohol consumption with others, frequency of drinking with others, and frequency of heavy drinking. This contradicts previous research indicating that typical peer drinking norms positively predict alcohol consumption (Lewis & Neighbors, 2004; Perkins et al., 2005). Instead, the current results suggest that participants did not match their drinking behavior to how they perceived was typical of their peers. Perhaps instead these participants, as emerging adults in the process of identity exploration (see Arnett, 2000), sought to distinguish themselves from typical peers in contrast to their desire to fit in with their close friends.

More generally, we should acknowledge that our observed effects – i.e., the differential effects of norms over time – are quite small, attesting to the high power of the study. One possibility is that our effects are somewhat attenuated by the truncated time span for assessment (i.e., Wave 2 being not sufficiently long after leaving college for many participants). Additional assessments further along in the emerging adulthood trajectory might show stronger changes in the effects of norms. In addition, information about contextual factors regarding key norm targets (e.g., parents, spousal/significant other) such as living arrangements and other relationship factors could also help to reduce error variance in predictive models including norms.

A primary strength of the current study is the methodology and measurement used. By following the same participants from college to post-college life, we were able to detect changes in the influence of drinking norms among the same individuals. We also measured alcohol consumption using daily diary methodology, which reduces retrospection error and bias (Bolger, Davis, & Rafaeli, 2003) and may increase accuracy in reporting of alcohol use (Fishburne & Brown, 2006; Hoeppner et al., 2010; Townshend & Duka, 2002). In addition, the current study differentiated between social and solitary alcohol consumption and between average drinking quantity and drinking frequency. In view of research suggesting that social and solitary consumption leads to different outcomes (Bilevicius et al., 2018; Keough et al., 2015; Keough et al., 2018), making this distinction between social and solitary consumption is important. The current study suggests that drinking norms differentially influence these different forms of alcohol consumption, adding to our understanding of the nuances of normative effects on alcohol consumption. Finally, the current study included both descriptive and injunctive norms within the same analyses. This means that all results reported in the current study are unique effects controlling for the influence of other drinking norms.

However, this study also had some noteworthy weaknesses. First, each wave of the current research is cross-sectional and this study therefore cannot support any causal conclusions. For one thing, we cannot determine whether post-college changes in drinking, or in the effects of norms on drinking, were a function of changing reference groups or a maturation process (e.g., “aging out”).

It is also possible that the drinking norms measured here are a retrospective justification of drinking behavior, rather than a determinant. However, because drinking norms were measured in the initial survey of this study, the drinking behavior reported in the daily diaries did not influence reported drinking norms (although these drinking norms themselves may be in part dependent on participants' estimates of their own drinking habits). We should also note that family descriptive drinking norms were not measured. It would be interesting to include both injunctive and descriptive family drinking norms in future research on this topic. The measure of injunctive norms used in the current study also included a 'not applicable' option. Because composite scores were calculated from valid responses only, a participant's score at Wave 2 may be based on different reference groups than at Wave 1, although it could be argued that this is a function of natural changes in injunctive norms. For example, spousal/significant other norms may be more likely to be included in family injunctive norms scores at Wave 2, whereas roommate norms may be more likely to be included in friend injunctive norms at Wave 1.[6] Future researchers may want to consider assessing friend or family norms as a whole in addition to distinct norms for each reference group within each category.

In addition, only moderate to heavy drinkers were invited to participate in the second wave of this study. We chose to focus on this sample due to their greater alcohol use during college and their greater potential for continued risky alcohol use following graduation (Beseler et al., 2012; Campbell & Demb, 2008). However, future research examining changes in drinking norms should test whether the current results hold among light college drinkers. Finally, some of the changes reported here may be due to participants reaching the legal drinking age between Waves. This could lead to an increase in some drinking norms or behaviors even as participants mature out of heavy college drinking. Because most of our participants were below the legal drinking age when they participated in Wave 1, we are unable to fully separate any effect of reaching the legal age from maturing out effects.

Results of the current study support our prediction that family injunctive drinking norms would have a stronger influence on alcohol consumption after individuals leave the college environment. Future work should follow students further into adulthood and examine whether marriage further increases the influence of family norms. It is also interesting that the current study did not find any differences in the influence of friend drinking norms from college to post-college life. This suggests that, even though drinking is often perceived as an element of social life within college, it maintains this role even after individuals leave the college environment, at least among these moderately heavy drinkers. Although drinking norms have been extensively studied among college students, their effects among adult populations is not yet fully understood.

The results of this study have implications for interventions for young adults with alcohol use problems. Whereas typical interventions for alcohol use problems in young adults are usually focused on individual motivation for change (e.g., Mitchell, Gryczynski, O'Grady, & Schwartz, 2013), the results here highlight the influence of various group norms, especially

[6]Of the 906 participants, 342 (38%) included different reference groups for family norms between the two waves, 223 (25%) included different reference groups for friend norms, and 429 (47%) included different reference groups for institutional norms.

peer-group norms, in determining college-age drinking as well as drinking after college. For interventions to be effective in these persons it may be necessary to correct young people's perceptions of what constitutes "normal" or acceptable drinking. Carey, Henson, Carey, and Maisto (2010), among others, have suggested that addressing such norms, particularly descriptive norms, may be more important than addressing other factors in such interventions. The fact that friend descriptive norms were associated with drinking both during and after college may even suggest that if these normative beliefs are addressed in college then it is possible that problem drinking after college might be moderated. Such a consideration should spur additional research into efforts to modify norms in young adults.

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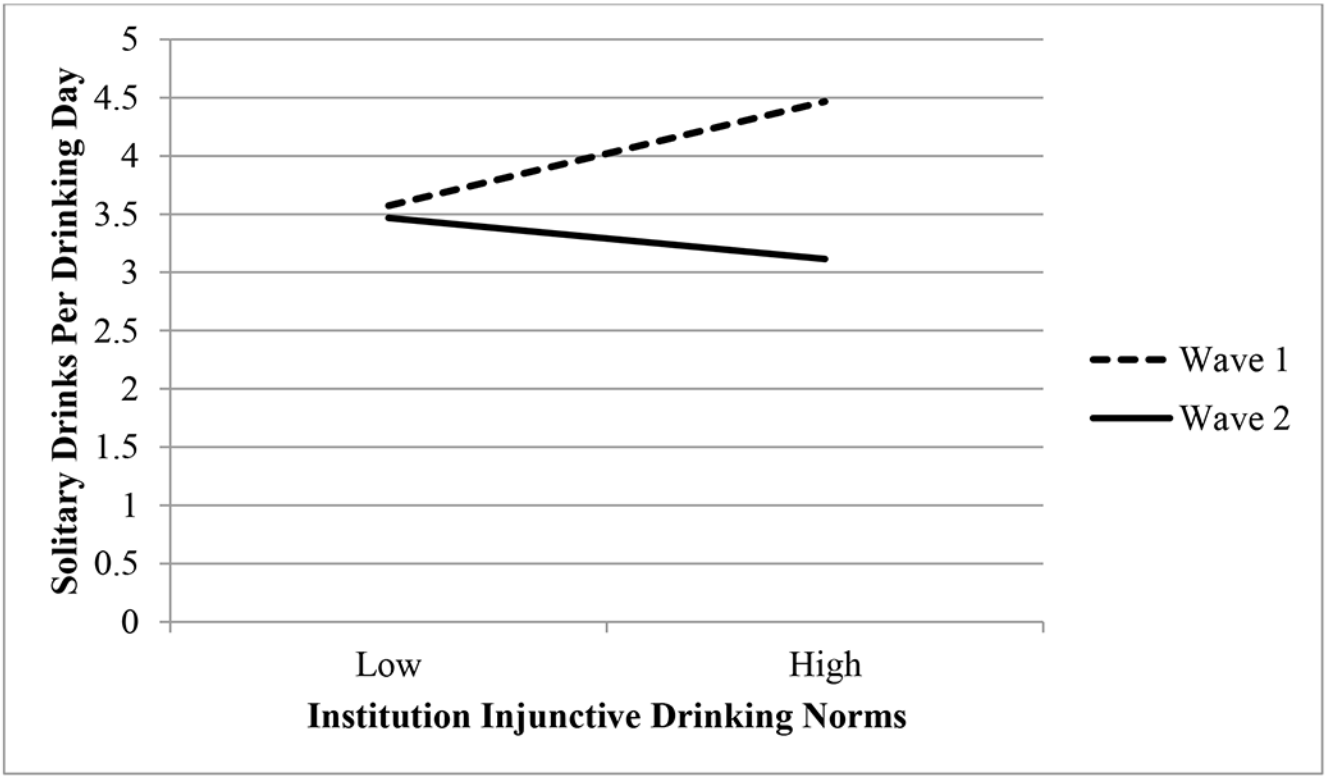

Figure 1.
Solitary drinks per drinking day as a function of Wave and institution injunctive norms.

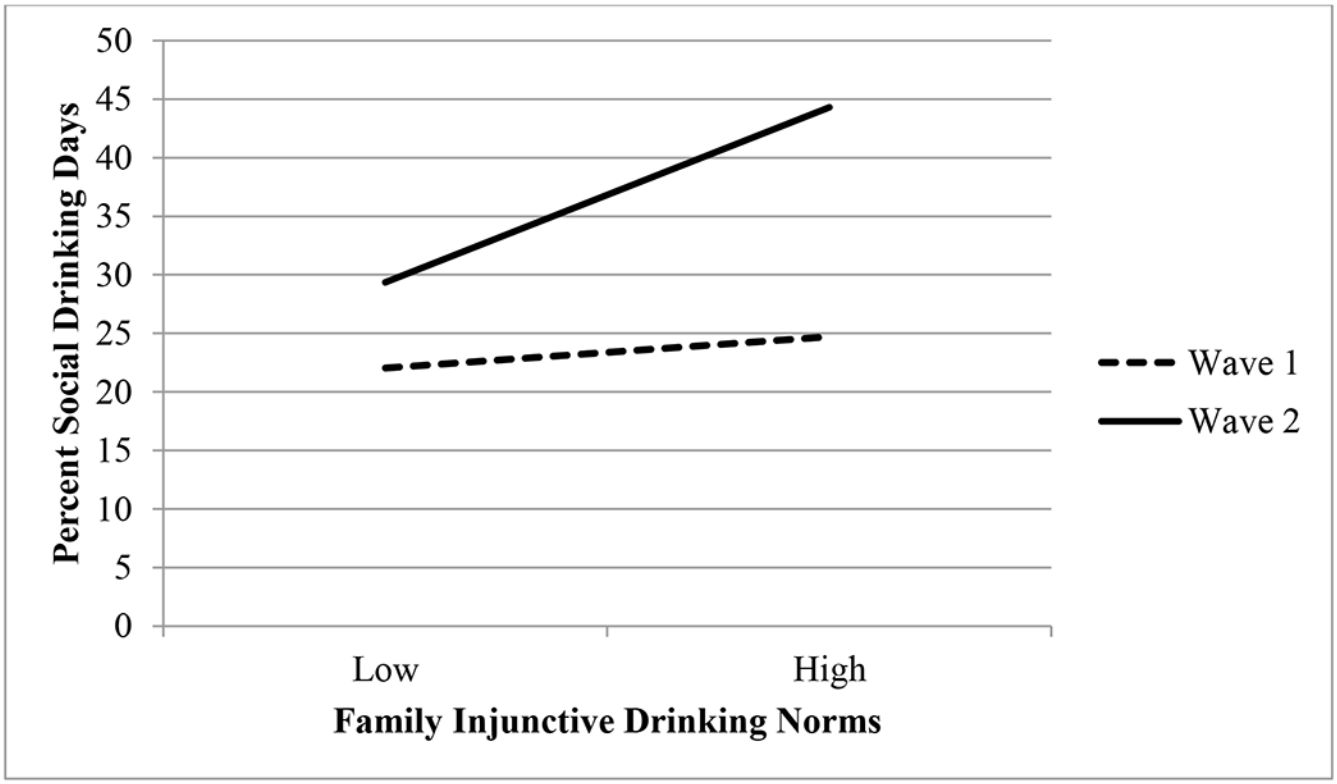

Figure 2.
Percent social drinking days as a function of Wave and family injunctive norms.

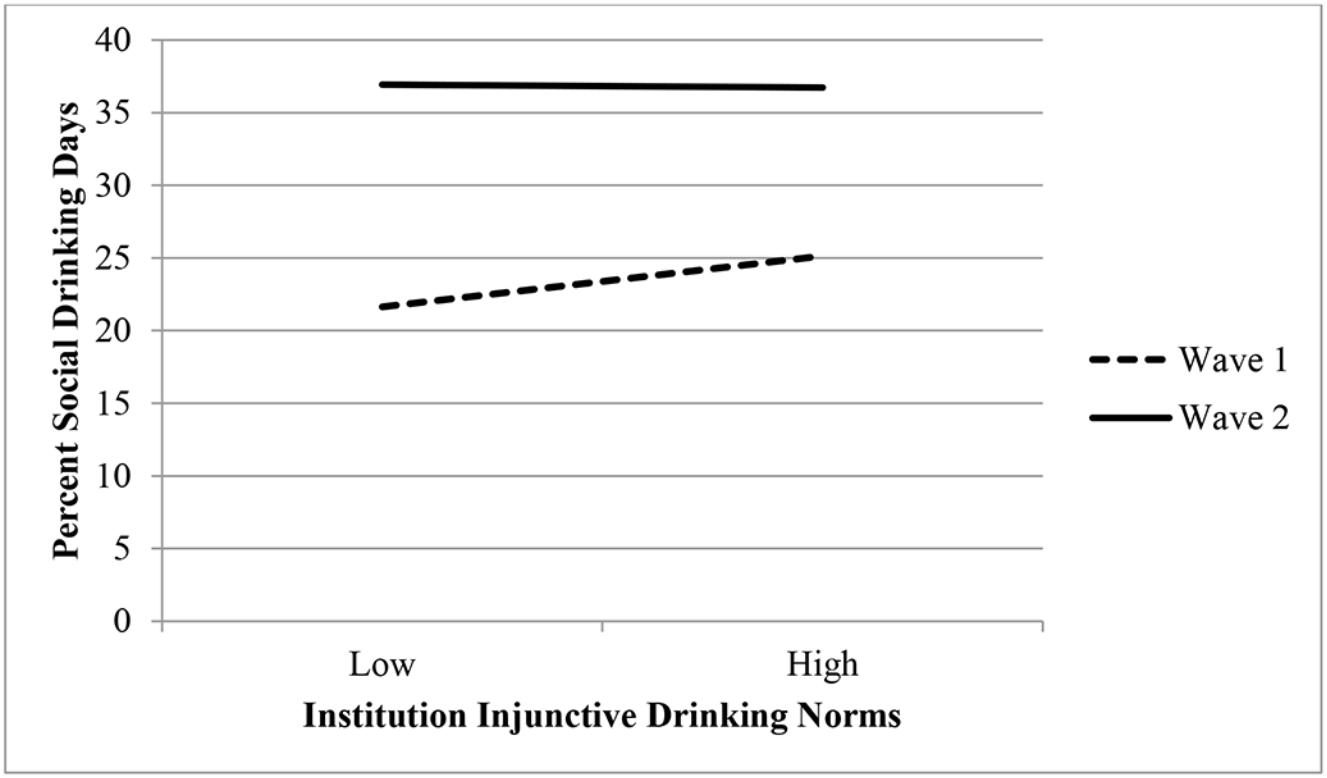

Figure 3.
Percent social drinking days as a function of Wave and institution injunctive norms.

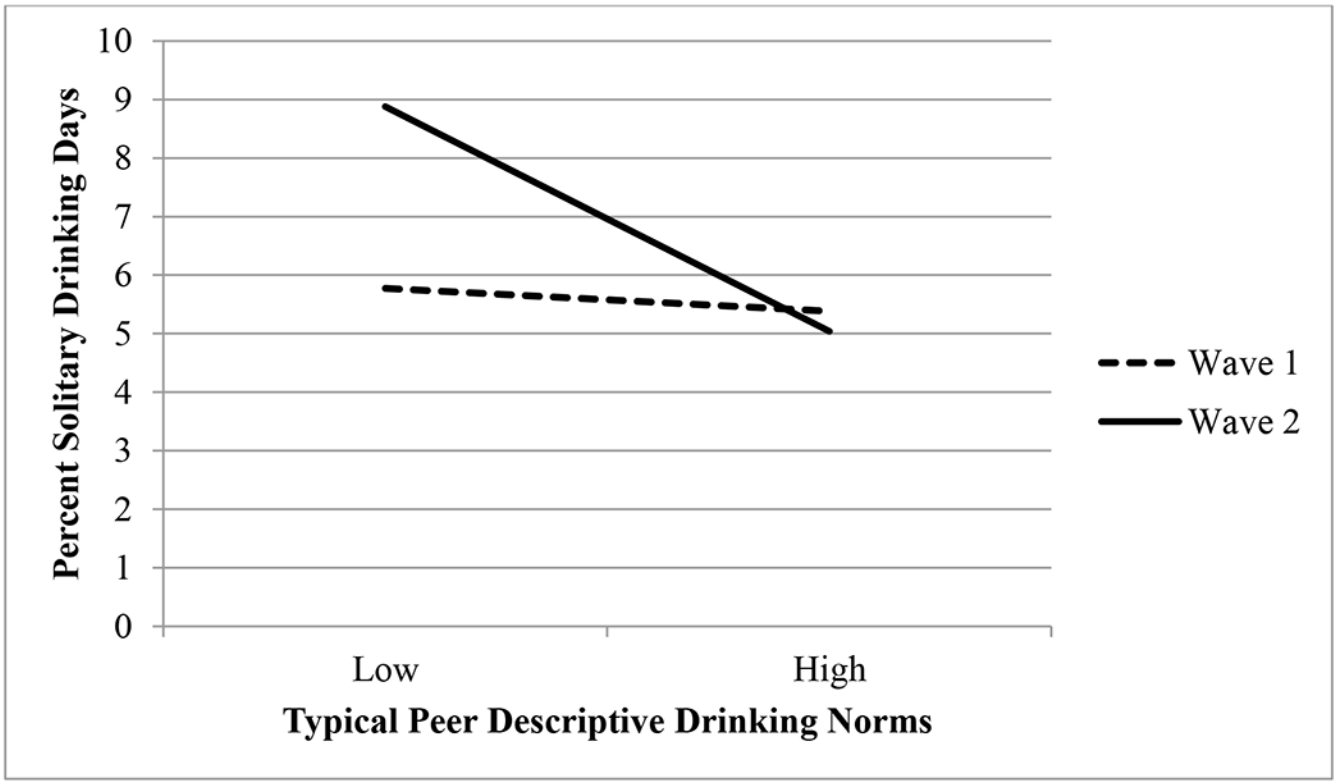

Figure 4.
Percent solitary drinking days as a function of Wave and typical peer descriptive norms.

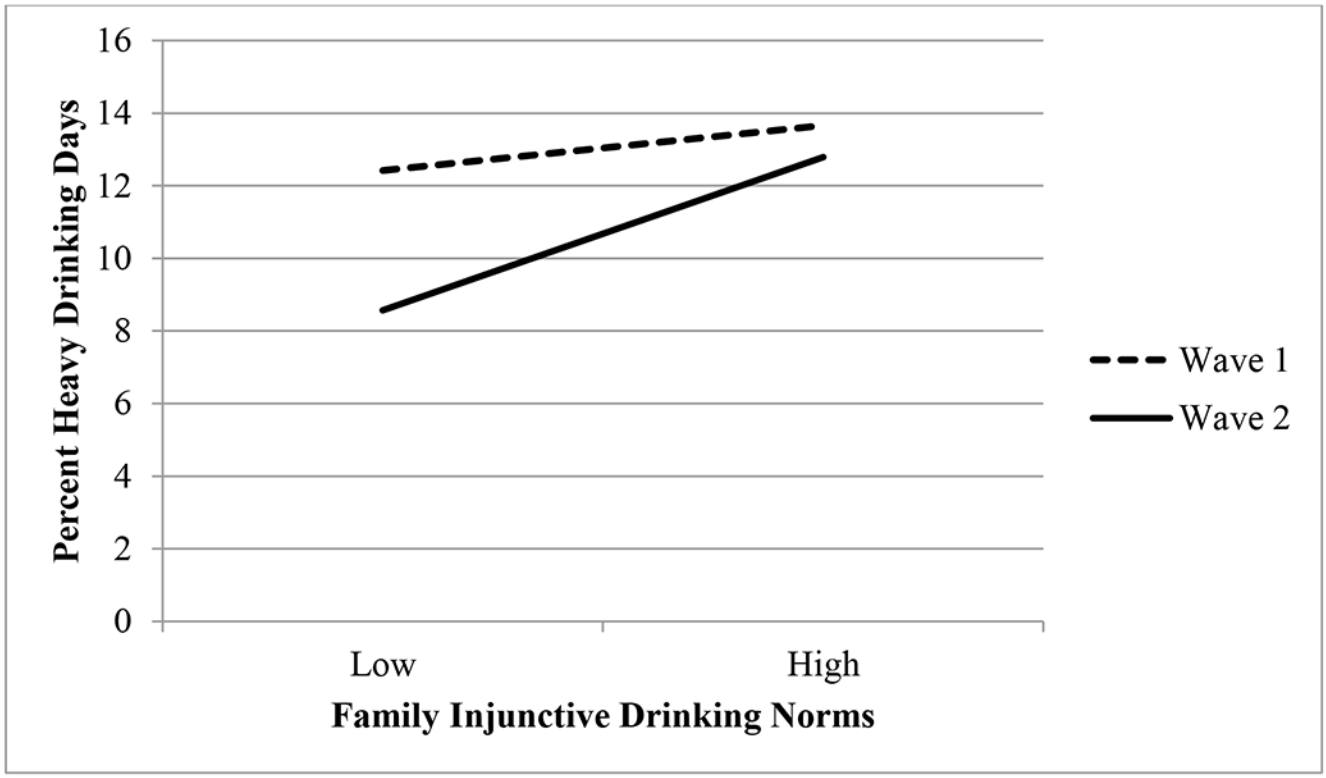

Figure 5.
Percent heavy drinking days as a function of Wave and family injunctive norms.

Table 1

Means, standard deviations, and correlations for alcohol consumption and drinking norm variables in Wave 1 and Wave 2.

Measure	*M* Wave 1 (Wave 2)	*SD* Wave 1 (Wave 2)	*N* Wave 1 (Wave 2)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Social drinks per drinking day	5.72 (3.72)	2.61 (1.86)	895 (880)	–	.39**	.14**	.14**	.68**	.16**	.23**	.05	.13**	.26**
2. Solitary drinks per drinking day	3.76 (2.11)	3.65 (1.64)	388 (460)	.44**	–	−.15**	.11*	.23**	−.06	−.02	−.13**	−.06	−.05
3. Percent social drinking days	23.13 (35.60)	14.24 (20.80)	906 (906)	.21**	−.02	–	.29**	.59**	.39**	.33**	.22**	.17**	.31**
4. Percent solitary drinking days	4.21 (6.53)	8.25 (11.61)	906 (906)	.09**	.001	.44**	–	.36**	.18**	.17**	.15**	.02	.14**
5. Percent heavy drinking days	13.57 (10.36)	11.71 (10.74)	906 (906)	.62**	.18**	.76**	.34**	–	.30**	.30**	.11**	.16**	.32**
6. Family injunctive norms	2.58 (3.18)	0.85 (0.81)	902 (904)	.14**	−.01	.30**	.16**	.25**	–	.74**	.58**	.38**	.54**
7. Friend injunctive norms	3.31 (3.55)	0.83 (0.83)	905 (904)	.25**	.03	.32**	.17**	.31**	.53**	–	.46**	.50**	.71**
8. Institution injunctive norms	1.54 (2.46)	0.75 (0.87)	819 (782)	.06	.08	.31**	.25**	.19**	.42**	.32**	–	.29**	.33**
9. Typical peer descriptive norms	3.49 (3.31)	0.85 (0.76)	906 (906)	.14**	.01	.19**	.09**	.19**	.35**	.56**	.22**	–	.66**
10. Friend descriptive norms	3.33 (3.39)	0.79 (0.79)	906 (906)	.25**	.01	.32**	.15**	.33**	.45**	.75**	.29**	.69**	–

Note. Correlations below the diagonal are Wave 1; above the diagonal are Wave 2.

* $p < .05$;

** $p < .01$

Table 2

Alcohol consumption as a function of Wave, drinking norms, and their interactions.

Variable	*b*	*SE*	*t*	*df*	*p*	CI	*d*
Social drinks per drinking day							
Gender	**−0.73**	**0.06**	**−12.25**	**866**	**<.001**	**−0.85, −0.61**	**.83**
Age	**−0.18**	**0.05**	**−3.97**	**1042**	**<.001**	**−0.27, −0.09**	**.25**
Race	**0.23**	**0.09**	**2.59**	**877**	**.01**	**0.06, 0.40**	**.17**
Wave	**−0.82**	**0.11**	**−7.65**	**1513**	**<.001**	**−1.03, −0.61**	**.39**
Family injunctive norms	0.08	0.10	0.84	1547	.40	−0.11, 0.27	.04
Friend injunctive norms	0.10	0.11	0.97	1496	.33	−0.11, 0.32	.05
Institution injunctive norms	−0.12	0.08	−1.64	1527	.10	−0.28, 0.02	.08
Typical peer descriptive norms	−0.15	0.09	−1.67	1536	.10	−0.32, 0.03	.09
Friend descriptive norms	**0.47**	**0.11**	**4.33**	**1494**	**<.001**	**0.26, 0.69**	**.22**
Family injunctive norms × Wave	0.03	0.09	0.37	1309	.71	−0.14, 0.21	.02
Friend injunctive norms × Wave	−0.14	0.10	−1.32	1394	.19	−0.34, 0.07	.07
Institution injunctive norms × Wave	−0.001	0.07	−0.02	1292	.99	−0.14, 0.14	.001
Typical peer descriptive norms × Wave	0.02	0.08	0.21	1304	.83	−0.15, 0.18	.01
Friend descriptive norms × Wave	−0.08	0.11	−0.74	1376	.46	−0.29, 0.13	.04
Solitary drinks per drinking day							
Gender	**−0.30**	**0.11**	**−2.74**	**569**	**.01**	**−0.51, −0.08**	**.23**
Age	**−0.19**	**0.08**	**−2.30**	**598**	**.02**	**−0.34, −0.03**	**.19**
Race	−0.11	0.15	−0.71	586	.48	−0.41, 0.19	.06
Wave	**−0.37**	**0.21**	**−1.71**	**720**	**.09**	**−0.11, 1.57**	**.13**
Family injunctive norms	−0.20	0.18	−1.13	720	.26	−0.72, 0.41	.08
Friend injunctive norms	0.21	0.21	1.00	720	.32	−0.45, 0.78	.07
Institution injunctive norms	0.14	0.14	1.03	720	.30	−0.57, 0.18	.08
Typical peer descriptive norms	0.01	0.16	0.05	720	.96	−0.46, 0.47	.004
Friend descriptive norms	−0.13	0.21	−0.60	720	.55	−0.62, 0.54	.04
Family injunctive norms × Wave	0.05	0.18	0.27	704	.79	−0.79, 0.60	.02
Friend injunctive norms × Wave	−0.05	0.21	−0.23	699	.82	−0.71, 0.90	.02
Institution injunctive norms × Wave	**−0.34**	**0.13**	**−2.51**	**698**	**.01**	**0.15, 1.20**	**.19**

Variable	*b*	*SE*	*t*	*df*	*p*	CI	*d*
Typical peer descriptive norms × Wave	−0.002	0.16	−0.02	699	.99	−0.63, 0.64	.002
Friend descriptive norms × Wave	0.08	0.21	0.40	707	.69	−1.00, 0.66	.03
Percent social drinking days							
Gender	−0.34	0.45	−0.76	895	.45	−1.23, 0.54	.05
Age	**2.41**	**0.34**	**7.00**	**1077**	**<.001**	**1.73, 3.09**	**.43**
Race	**1.93**	**0.66**	**2.92**	**905**	**.004**	**0.63, 3.23**	**.19**
Wave	**6.72**	**0.83**	**8.14**	**1558**	**<.001**	**5.10, 8.34**	**.41**
Family injunctive norms	**5.00**	**0.72**	**6.95**	**1584**	**<.001**	**3.59, 6.42**	**.35**
Friend injunctive norms	0.66	0.82	0.80	1552	.42	−0.94, 2.25	.04
Institution injunctive norms	0.89	0.58	1.53	1571	.13	−0.25, 2.03	.08
Typical peer descriptive norms	**−1.66**	**0.66**	**−2.50**	**1573**	**.01**	**−2.96, −0.36**	**.13**
Friend descriptive norms	**3.50**	**0.84**	**4.20**	**1546**	**<.001**	**1.87, 5.14**	**.21**
Family injunctive norms × Wave	**3.49**	**0.68**	**5.13**	**1367**	**<.001**	**2.15, 4.82**	**.28**
Friend injunctive norms × Wave	−0.94	0.79	−1.19	1451	.24	−2.49, 0.61	.06
Institution injunctive norms × Wave	**−0.99**	**0.56**	**−1.79**	**1371**	**.07**	**−2.09, 0.10**	**.10**
Typical peer descriptive norms × Wave	−0.05	0.64	−0.08	1387	.94	−1.31, 1.21	.004
Friend descriptive norms × Wave	0.25	0.82	0.31	1443	.76	−1.35, 1.86	.02
Percent solitary drinking days							
Gender	**−1.60**	**0.27**	**−5.81**	**901**	**<.001**	**−2.14, −1.06**	**.39**
Age	**0.99**	**0.21**	**4.69**	**1073**	**<.001**	**0.57, 1.40**	**.29**
Race	**−0.79**	**0.40**	**−1.97**	**912**	**.05**	**−1.58, −0.002**	**.13**
Wave	0.69	0.51	1.34	1568	.18	−0.32, 1.70	.07
Family injunctive norms	**1.03**	**0.45**	**2.32**	**1583**	**.02**	**0.16, 1.91**	**.12**
Friend injunctive norms	0.25	0.51	0.49	1569	.62	−0.75, 1.24	.02
Institution injunctive norms	**1.01**	**0.36**	**2.79**	**1581**	**.01**	**0.30, 1.72**	**.14**
Typical peer descriptive norms	**−1.31**	**0.41**	**−3.17**	**1582**	**.002**	**−2.12, −0.50**	**.16**
Friend descriptive norms	**1.24**	**0.52**	**2.39**	**1567**	**.02**	**0.22, 2.26**	**.12**
Family injunctive norms × Wave	0.47	0.43	1.11	1405	.27	−0.36, 1.31	.06
Friend injunctive norms × Wave	0.24	0.49	0.49	1487	.62	−0.73, 1.21	.03
Institution injunctive norms × Wave	−0.13	0.35	−0.37	1411	.71	−0.81, 0.56	.02
Typical peer descriptive norms × Wave	**−1.07**	**0.40**	**−2.65**	**1430**	**.01**	**−1.85, −0.28**	**.14**

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Variable	*b*	*SE*	*t*	*df*	*p*	CI	*d*
Friend descriptive norms × Wave	0.54	0.51	1.05	1481	.29	−0.47, 1.54	.05
Percent heavy drinking days							
Gender	**−1.46**	**0.29**	**−4.94**	**883**	**<.001**	**−2.03, −0.88**	**.33**
Age	**0.40**	**0.22**	**1.79**	**1071**	**.07**	**−0.04, 0.84**	**.11**
Race	**1.36**	**0.43cc**	**3.15**	**893**	**.002**	**0.51, 2.20**	**.21**
Wave	**−1.18**	**0.53**	**−2.22**	**1551**	**.03**	**−2.22, −0.14**	**.11**
Family injunctive norms	**1.55**	**0.47**	**3.33**	**1583**	**.001**	**0.63, 2.46**	**.17**
Friend injunctive norms	0.62	0.53	1.19	1541	.24	−0.41, 1.66	.06
Institution injunctive norms	−0.09	0.38	−0.25	1564	.80	−0.83, 0.64	.01
Typical peer descriptive norms	**−1.22**	**0.43**	**−2.84**	**1566**	**.01**	**−2.06, −0.38**	**.14**
Friend descriptive norms	**3.17**	**0.54**	**5.89**	**1534**	**<.001**	**2.11, 4.23**	**.30**
Family injunctive norms × Wave	**0.85**	**0.44**	**1.94**	**1344**	**.05**	**−0.01, 1.71**	**.11**
Friend injunctive norms × Wave	−0.53	0.51	−1.04	1430	.30	−1.53, 0.47	.06
Institution injunctive norms × Wave	**−0.66**	**0.36**	**−1.84**	**1347**	**.07**	**−1.36, 0.05**	**.10**
Typical peer descriptive norms × Wave	−0.07	0.41	−0.16	1362	.87	−0.88, 0.74	.01
Friend descriptive norms × Wave	−0.31	0.53	−0.59	1421	.55	−1.35, 0.72	.03