Stress and Binge Drinking: A Daily Process Examination of Stressor Pile-up and Socioeconomic Status in Affect Regulation

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Abstract

The goal of this study was to enhance understanding of the interconnections between stress, negative mood, and alcohol use. To achieve this goal, daily diary data collected over eight consecutive nights from a nationally representative adult cohort were used to identify if: 1) both daily stress and stress pile-up were associated with increased risk of binge drinking, 2) negative affect mediated associations between stressor variables and binge drinking, and 3) associations among stress, negative affect and binge drinking were moderated by educational attainment as an indicator of socioeconomic status. Results from hierarchical linear models indicated that the odds of binge drinking was higher on days that individuals experienced more severe stressors in contrast to no stress days. Further, the odds of binge drinking also increased as stressors piled-up over consecutive days. There was no evidence indicating that negative affect mediated the effect of stressor exposure on binge drinking. Associations between stressor exposure (both daily stress and stress pile-up) and binge drinking were moderated by educational attainment. The findings of this study are consistent with previous daily process studies examining the association between stress and alcohol. However, the pattern of results from this study suggest that affect regulation researchers need to handle "stress" in a multidimensional way and better situate stressors and individuals stress responses within their social context.

Negative affect holds a special place in the stress and health literature, particularly when considering the putative effect of stress on alcohol use and problem drinking behavior. At the most basic level, the affect regulation model contends that stress and alcohol use are linked through a transactional process whereby stressors create distress, and individuals self-medicate with alcohol to lessen the unpleasantness of distress. Despite the intuitive appeal of the model, reviews of the literature report inconsistent support for the model's basic propositions (Greeley & Oei, 1999). The inconsistent or otherwise modest results obtained from affect regulation studies have led several scholars to call for methodologies that allow for more rigorous and systematic discernment of the interconnections between stressors, affective responses to stressors, and alcohol use (Frone, 1999; Greeley & Oei, 1999; Ragland & Ames, 1996).

Daily process designs, such as daily diary studies, are beginning to offer some consistent results about the linkages between stress, affect, and alcohol use (Armeli, Tennen, Affleck, & Kranzler, 2000; Tennen, Affleck, Armeli, & Carney, 2000). First, the stressor-alcohol relationship is sensitive to the source of stressors: non-work stressors are associated with increased alcohol consumption whereas work stressors are not (Armeli et al., 2000; Carney,

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Armeli, Tennen, Affleck, & O'Neil, 2000). Second there is little evidence that negative mood explains the stressor-alcohol relationship (Armeli et al., 2000; Carney et al., 2000), although negative affect is typically associated with increased alcohol consumption (Armeli et al., 2000; Swendsen et al., 2000). Finally, daily process studies of the affect regulation model provide strong evidence suggesting that stressors and negative affect contribute to greater alcohol consumption; equally important however is the strong evidence indicating significant and explainable variation in the stress-alcohol and the negative affect-alcohol associations (Armeli et al., 2000; Armeli, Carney, Tennen, Affleck, & O'Neil, 2000; Carney et al., 2000; Swendsen et al., 2000). It is clear, for example, that the associations among stress, negative affect, and alcohol is stronger among men than women and among those with higher positive alcohol expectancies (Cooper, Russell, Skinner, Frone, & Mudar, 1992; Armeli et al., 2000).

Daily process studies offer some consistency to the affect regulation literature; nonetheless, more research is needed to understand the role of stress in alcohol use. First, by focusing on the incidence of stressors, previous daily process studies have not adequately addressed the issue of stress chronicity or "pile up" or the idea that independent stressors (particularly daily hassles) may have marginal impact on behavioral outcomes, such as alcohol use, but their cumulative burden may stimulate "release" behaviors such as heavy drinking (Crawford, 1984; Kanner, Coyne, Schaefer, & Lazarus, 1981; McLean, 1976). Evidence suggests, for example, that a negative daily event has a particularly deleterious effect on mood when it is coupled with other ongoing stressors such as living in a poor neighborhood and socioeconomic disadvantage (Caspi, Bolger, & Eckenrode, 1987; Grzywacz, Almeida, Neupert, & Ettner, 2004). The fact that stressor effects on alcohol consumption are partially or completely attenuated after controlling for day of week (Armeli et al., 2000) also supports the plausibility that the buildup of stressors, presumably greatest on Friday (Zerubaval, 1985), may contribute to increased consumption. Thus, one important step in daily process studies of stress and alcohol requires differentiating between specific incidences of stress and their cumulative burden while remaining sensitive to the entrainment of both stressor exposure and alcohol use within the weekly calendar (Armeli et al., 2000).

A second gap in the daily process literature examining stress and alcohol is the relative inattention to variation in both the appraisal (i.e., stressor-affect) and coping (affect-alcohol) linkages within the affect regulation model. Armeli and colleagues (2000) reported significant explainable variation in the stressor-affect and the affect-alcohol associations, but examined between-person differences in only the affect-alcohol linkage. Likewise, Swendsen and colleagues (2000) examined the affect-alcohol linkage and found that the within-person association between nervous mood and alcohol consumption was stronger for men than women. Other studies find significant variation in the stressor-consumption relationship (Armeli et al., 2000; Carney et al., 2000); however, without disaggregating the two components of the model, it is difficult to determine if the variation is attributable to differences in stressor appraisal (i.e., the extent to which stressors elicit distress) or differences in coping (i.e., the extent to which distress elicits drinking behavior).

Finally, the samples used in previous daily process studies are limited. All of the previous daily process studies of alcohol have used convenience samples; consequently, the generalizability of the study to the broader population of adults is tenuous. The samples in previous studies were also small and relatively homogeneous with regard to age, education, marital status, and employment. Small and homogeneous samples limit the possible number of between-person characteristics that can be used to explain variation in either the appraisal or coping linkages of the affect regulation model. Socioeconomic status (SES) is a compelling potential source of between-person variation in the affect regulation model because it is inversely associated with elevated rates of heavy drinking (Naimi et al., 2003), it conditions exposure to life stressors (Turner & Lloyd, 1999), it influences the relative availability of resources for coping with

stressors (Turner & Marino, 1994; Turner, Wheaton, & Lloyd, 1995), and evidence indicates that stressors have a greater psychological impact on lower status individuals (Grzywacz et al., 2004). Moreover, compelling ethnographic research suggests that SES is strongly linked to the culture of control and release (Crawford, 1984). This evidence suggests that SES, which is difficult to capture in small samples, may contribute to variation in the average levels of alcohol use as well as variation in the associations of stress and affect with alcohol use.

The goal of this paper was to address the limitations of previous daily process studies examining the affect regulation model of alcohol consumption. In this paper we seek to enhance our understanding of the interconnections between stress, negative mood, and alcohol use by exploiting the first nationally representative daily diary study to accomplish three aims: 1) identify if both daily stress and stress pile-up were associated with increased risk of binge drinking, 2) determine the extent to which negative affect mediates associations between stressor variables and binge drinking, and 3) delineate whether associations among stress, negative affect and binge drinking are moderated by educational attainment as a proxy indicator of socioeconomic status.

METHOD

Sample

Data for the analyses are from the National Study of Daily Experiences (NSDE). NSDE respondents included 1,031 adults (562 women, 469 men) who had previously participated in the National Survey of Midlife Development in the United States (MIDUS), a nationally representative telephone-mail survey of 3032 people, aged 25–74 years, carried out in 1995–1996 under the auspices of the John D. and Catherine T. MacArthur Foundation Network on Successful Midlife. NSDE respondents were randomly selected from the MIDUS sample and received $20 for their participation in the project. Over the course of eight consecutive evenings, respondents completed short telephone interviews about their daily experiences. Data collection spanned an entire year (March 1996 to April 1997) and consisted of 40 separate "flights" of interviews with each flight representing the eight-day sequence of interviews from approximately 38 respondents. The initiation of interview flights was staggered across the day of the week to control for the possible confounding between day of study and day of week. Of the 1,242 MIDUS respondents contacted, 1,031 agreed to participate, yielding a response rate of 83%. Respondents completed an average of 7 of the 8 interviews, resulting in a total of 7221 daily interviews.

The analytic sample used in this study was restricted to NSDE participants who reported not abstaining from drinking alcohol. An estimated 22.2% of NSDE respondents reported abstaining from alcohol, a proportion that is lower than the estimated 35.4% of adults who reported abstaining from alcohol in the 1995 National Alcohol Survey (Greenfield, Midanik, & Rogers, 2000). The final analytic sample included n = 802 individuals. Sampling weights correcting for selection probabilities and non-response to the original sample, and modified for the current analysis allow this sample to match the composition of the U.S. population on age, sex, race and education based upon the October 1995 Current Population Survey.

Study participants were, on average, 44.6 (SD = 13.4) years old, 57% female, and 13% non-white (Table 1). Seventy percent of this population was currently married, the modal level of education (40%) in this sample was a "high school degree or General Equivalence Degree (GED)". Approximately 8% of the population had less than a high school degree, 27% of the population reported having a vocational/technical degree or some college, and approximately 25% reported graduating from college. Approximately 15% of the population reported one or more episodes of binge drinking during the interview period, and the average level of negative affect across interview days and individuals was 1.20. Stressors were reported on about 30%

of the days in the broader sample (Almeida et al., 2002), contributing to a low overall daily stressor level in the sample, and an average stressor pile-up of 1.03 (*SD* = .67).

Measures

Dependent variable—*Binge drinking* was constructed from a single question from the daily interview that asked "Counting a drink as a bottle of beer, a glass of wine, or shot of liquor, how many drinks did you have since we spoke yesterday?". If an individual reported consuming five or more drinks for men and four or more for women (Wechsler, Dowdall, Davenport, & Rimm, 1995) within the previous 24-hour recall period, they were coded one for having binge drank on that day. Preliminary analyses suggest that the binge drinking variable is reliable and valid. The intraclass correlation of respondents' alcohol consumption across the interview period was .85 suggesting considerable stability in individuals' alcohol use patterns. The estimated prevalence of binge drinking among NSDE respondents was 15.3%, a figure comparable to those obtained from the Behavioral Risk Factor Surveillance System from 1995 and 1997 (Naimi et al., 2003). Finally, using prospective data from the MIDUS survey one year earlier in which respondents were asked about alcohol-related experiences, preliminary analyses indicated that the odds of having reported one or more episodes of binge drinking during the interview period were 2.3 (*CI* = 1.60 – 3.40) and 6.9 (*CI* = 4.35 – 11.12) times higher for those who reported one or more symptoms of alcohol dependence and one or more episodes of having drank more than intended in the previous year.

Independent variables—*Daily stress* and *stress pile-up* were assessed with the Daily Inventory of Stressful Experiences (DISE, Almeida et al., 2002). The DISE is a semi-structured instrument containing seven "stem" questions for identifying whether stressful events occurred in various life domains such as at work or in your family, as well as a series of questions for probing affirmative responses. For each daily interview, individuals who responded affirmatively to any of the stem questions received a value of one on an indicator variable of "any stress" and were coded zero otherwise. Respondents' narrative responses to investigator probes to affirmative responses to any of the stem questions provided additional information on the content of the stressful experiences as well as the meaning of the stressor for the respondent. Objective severity, similar to Brown and Harris' (1978) ratings of short-term contextual threat, was assigned by trained coders based upon the degree of disruptiveness and unpleasantness associated with the stressor. Coders' scores ranged from a minor or trivial annoyance (1) to a severely disruptive event (4). Inter-rater reliability (Kappa) on the objective severity measure was .75. Any stress was then combined with coders' ratings of how disruptive or unpleasant the stressor to yield an ordered four-category *daily stressor* variable: 0 = no stressor, 1 = stressor/low severity, 2 = stressor/medium severity, and 3 = stressor/high severity.

The "any stress" indicator variable was also used to construct a variable assessing *stressor pile-up*. Stressor pile-up is a lagged variable representing the number of days over the past three days in which a stressor was recorded. The first day in each person's diary was coded as missing because the previous three days were completely unknown. The sum total of "any stress" days for the previous three days were computed for the second thru eighth diary days even if three previous days were not recorded. The three-day period for defining stressor pile-up operationally was based on both conceptual and practical grounds. Conceptually, in the context of diary study, stressor pile-up connotes exposure to stressors across multiple days, thereby requiring a two-day period at a minimum. Practically, our measurement options were constrained by the 8-day duration of the diary study. We selected the three-day period to maximize the number of days a variable could be created and used in the analysis, while remaining attentive to the idea of temporal accumulation over several days.

Daily negative affect was operationalized using an inventory of ten emotions expanded from the psychological distress scale designed for the MIDUS survey (Mroczek & Kolarz, 1998) and queried during each telephone interviews. This scale was developed from the following well-known and valid instruments: The Affect Balance Scale (Bradburn, 1969), the University of Michigan's Composite International Diagnostic Interview (Kessler et al., 1994), the Manifest Anxiety Scale (Taylor, 1953), and the Center for Epidemiological Studies Depression Scale (Radloff, 1977). Respondents were asked how much of the time today did they feel: worthless; hopeless; nervous; restless or fidgety; that everything was an effort; and so sad that nothing could cheer you up. Response categories for the index items were 1=none of the time, 2=a little of the time, 3=some of the time, 4=most of the time, and 5=all of the time. Scores across the ten items were summed ($\alpha = .89$).

Socioeconomic status was operationalized as a series of dichotomous indicators of educational attainment representing less than high school education; high school or General Equivalency Degree (GED), a technical degree or some college education, and college graduate (reference category). This strategy was chosen because education captures the well-established health gradient (Adler et al., 1994; Marmot, Ryff, Bumpass, Shipley, & Marks, 1997; Marmot et al., 1998; Marmot et al., 1997; Marmot et al., 1998) and it is less prone than household income to exhibit missing data values. Additionally, education is relatively stable across the life course after early adulthood, it is more comparable across men and women than occupation, and it is more comparable across single and married persons than income. Most importantly, education is less prone to endogeneity bias from reverse causality (e.g., binge drinking affecting the socioeconomic status measure) than measures such as income and occupation.

ANALYSES

The method used to examine the associations posited by the affect regulation model and sources of variation in affect regulation linkages by SES was based on a multilevel model, also commonly referred to as a hierarchical linear model with a logit-link function for dichotomous oucomes (HLM, (Bryk & Raudenbush, 1992). The simple form of an HLM can be conceived of as two separate models, one a within-person model (Level 1) and the other a between-person model (Level 2). A distinctive feature of HLM is that the intercepts and slopes are allowed to vary across persons (Lee & Bryk, 1989), allowing estimates of between-person models of within-person variability. Using a simple example in which binge drinking depends on a single explanatory variable – stressors - the model can be expressed as:

$$\text{Level 1: } BINGE_{it} = a_{0i} + a_{1i}STRESS + e_{it,} \tag{1}$$

where $BINGE_{it}$ is an indicator representing whether or not Person i binge drank on Day t, STRESS, represents whether Person i experienced a stressor and its objective severity on Day t, a_{01} is the intercept indicating Person i's average level of binge drinking when no stressor was reported, a_{1i} is the slope indicating the association between daily stress and binge drinking for Person i, and e_{it} is the random component or error associated with binge drinking of Person i on Day t. To estimate average effects for the entire sample, the intercepts and slopes of the Level 1 within-person model become the outcomes for the Level 2 between-person equations as follows.

$$\text{Level 2: } a_{0i} = B_0 + d_{i,} \tag{2}$$

$$a_{1i} = B_1 + g_i \tag{3}$$

Equation 2 shows that Person i's average logit for binge drinking across the diary days (a_{0i}) is a function of the intercept for the entire sample (B_0)--the grand mean of the sample--and a random component or error (d_i). Likewise, equation 3 shows that Person i's slope between daily stress and binge drinking (a_{1i}) is a function of the grand mean of the entire sample (B_1), and a random component or error (g_i).

HLM provides the flexibility to allow the intercepts and slopes to vary across persons by stable individual characteristics (e.g., SES). For example, to examine SES differences in the daily covariation of binge drinking and daily stress, one can formulate the following model:

$$\text{Level 1: BINGE}_{it} = a_{0i} + a_{1i}\text{STRESS} + e_{it} \tag{4}$$

$$\text{Level 2: } a_{0i} = B_0 + B_1(\text{SES}) + d_i \tag{5}$$

$$a_{1i} = B_2 + B_3(\text{SES}) + g_i \tag{6}$$

Equation 5 and Equation 6 model SES differences in Level 1 intercepts and slopes. Of particular note is equation 6 because it tests whether the stressor-binge drinking slopes (a_{1i}) vary according to socioeconomic status.

In these analyses, as in previous daily process studies (e.g., Armeli et al., 2000), day of week differences in drinking were controlled using six orthogonal dummy variables, with "Monday" serving as the omitted reference variable. Age, gender, race and ethnicity, and marital status are also controlled by including these between-person predictors in the level 2 intercepts model (i.e., equation 5).

RESULTS

Table 2 reports the results of the level 1 within-person associations posited by the affect regulation model. The first column provides weighted unstandardized logistic regression coefficients estimating the association of daily stressors and stressor pile-up with binge drinking. This model provides a basic test of whether variation in stressor exposure is associated with binge drinking. These estimates indicate that as the severity of experienced stressors increases, the odds of reporting binge drinking also increases.[1] Independent of the effect of daily stressors, however, results reported in the first column also indicate that a greater accumulation of stressors across the past three days is also associated with increased odds of binge drinking. The odds of binge drinking are 16% greater (i.e., EXP(0.15)) on days when an individual's stressor pile-up is one unit greater than her/his average.

The remaining columns of Table 2 reflect tests of the specific linkages in the affect regulation model. Results reported in the second column of Table 2 speak to the association between stressor exposure and negative affect, or the appraisal linkage of the affect regulation model. Results from the "appraisal" model (column 2) indicate that negative affect is greater on days when individuals confront more severe stressors, suggesting that negative affect is a viable mediator of the association between stressor exposure and binge drinking. However, stressor

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[1]Additional analyses using dummy indicators of low, medium, and high stressor severity in contrast to no stressors were also undertaken. The results indicated that medium and high severity stressors differed from no stressor, but there was no difference between low severity stressors and no stressor.

pile-up is not associated with greater daily negative affect. The last column of Table 2 simultaneously addresses two elements of the affect regulation model. First, it considers the "coping linkage" of the affect regulation model, or the extent to which negative affect is associated with binge drinking. Second, it informs the extent to which associations between stress exposure and binge drinking are attenuated after modeling the effects of negative affect, suggesting mediation. Results reported in the last column of Table 2 indicate that daily stressors, stressor pile-up, and negative affect are each associated with binge drinking in the expected direction. Although there is some apparent attenuation of the daily stressor parameter estimate in the last column compared to the first column, the attenuated estimate lies within the 95% confidence interval of the first estimate suggesting no change. Further, the p-value from a simple Sobel test did not reach traditional significance levels (p = 0.075). Thus, there is no evidence indicating that negative affect mediates the association of the daily stress-binge drinking association.

Table 3 reports the results of the cross-level associations where the intercepts and slopes of the level 1 models, reported in Table 2, were regressed on gender and educational attainment as an indicator of socioeconomic status. Column 1 indicates that average levels of binge drinking are lower among women than men, and higher among those with a high school or GED, and among those with Technical Degree or some college in contrast to those with a college degree. Column 1 also indicates that daily stress and stress pile-up slopes are modified by level of educational attainment. The daily stress-binge drinking slope is weaker for individuals with less than a high school degree than for those who graduated from college. However, the association between stress pile-up and binge drinking is stronger for those with less than a high school degree in contrast to those with a college degree. Results reported in the second column indicate that average levels of negative affect are higher for individuals with less than a high school degree in contrast to those who graduated from college. The effect of daily stress on negative affect is stronger for individuals with a high school degree or GED or less in contrast to those with a college education suggesting that lower status individuals are more psychologically vulnerable to daily stress.

Results reported in the third column of Table 3 mirror those reported for the first column. Interestingly, the parameter estimate indicating a difference in the effect of daily stress on binge drinking among those with less than a high school degree relative to those with a college degree dropped from −0.63 to −0.42 after controlling for negative affect. As before, average levels of binge drinking were lower for women than men, and higher among lower socioeconomic groups. The effect of daily stress on binge drinking continued to be lower for those with less than a high degree than those with the college degree; however, the effect of stress pile-up on binge drinking was greater for those with a high school degree or GED or less in contrast to those with a college degree.

DISCUSSION

The goal of this paper was to extend the affect regulation literature by addressing conceptual and methodological limitations of previous daily process studies of stress and alcohol using data from the first nationally representative daily diary study. The results of this study corroborate several findings from previous studies that used less generalizable samples. First, like previous studies that found greater alcohol consumption on days when stressful events occurred (Armeli et al., 2000; Carney et al., 2000), we found that the odds of binge drinking was greater on days when stressors – particularly severe stressors – were confronted. Second, we found that binge drinking is also more likely to occur on days of elevated negative affect (Swendsen et al., 2000) suggesting that binge drinking may be used to cope with elevated distress. However, in contrast to the central tenant of the affect regulation model, we found little evidence suggesting that negative affect mediates the relationship between stressful events

and alcohol use. These results parallel other daily process studies of alcohol use as well as reviews of the literature (Armeli et al., 2000; Carney et al., 2000; Greeley & Oei, 1999).

The results of this study also make new contributions to the affect regulation literature. First, our results indicating that both daily stressors and the accumulation of stressors over time are associated with greater odds of binge drinking among adults is a new and important contribution to the literature. These results are consistent with arguments that stressors take a variety of forms (Pearlin, 1989; Wheaton, 1994), and that exposure to different forms of stressors can have independent and incremental health effects (Burks & Martin, 1985; Caspi et al., 1987; Lepore, Evans, & Palsane, 1991; Wheaton, 1994). We acknowledge that it is difficult to interpret the meaning of the *stress pile-up* variable because it could be reflective of a single underlying chronic stressor such chronic underemployment or mismatch between work and family which have been linked to problem drinking (Frone, Russell, & Cooper, 1997; Grzywacz & Dooley, 2003; Grzywacz & Marks, 2000), but it could also reflect the accumulation of a series of unrelated events. Nonetheless, our results clearly suggest that future daily process studies of stress and alcohol need to be attentive to the broader stress universe (Wheaton, 1994) because acute events, chronic stressors, and daily hassles are distinct yet inter-related experiences. Perhaps a broader conceptualization of "stress" that includes a relative mix of stressors will yield a better and more consistent understanding of the linkages between stress and alcohol use.

Our evidence indicating that stress-binge drinking association is conditioned by level of educational attainment, as a proxy of socioeconomic status, is also an important contribution to the affect regulation literature. Apart from gender (e.g., Cooper et al., 1992), the affect regulation literature has given little attention to how macro-level forces such as social structure and culture influence stressor exposure and shape individual responses to stressors. Our results suggest that the stress-binge drinking association differs by SES such that binge drinking in response to daily stress is less common among those with little formal education relative to college graduates, but that binge drinking in response to stress accumulation is more common among those with little formal education relative to college graduates.

Theory and previous research suggest two possible explanations for differences in the stress-alcohol association by SES. The first possibility is that lower status individuals have less access to social resources for coping with stressors (Pearlin, 1989; Turner and Marino, 1994; Turner and Lloyd, 1999) and consequently turn to less adaptive forms of coping, such as heavy drinking, to handle the accumulation of daily stress. Although this explanation is theoretically plausible and consistent with previous research and results of this study indicating that lower status individuals are more psychologically vulnerable to the stressors of daily life (Aneshensel, 1992; Grzywacz et al., 2004), it cannot explain our results suggesting that lower status individuals are *less likely* than high status individuals to binge drink on days where a single more severe stressor was confronted. We believe that the culture of "control and release" (Crawford, 1984) provides a more convincing explanation for the current findings. We interpret the weaker daily stressor-binge drinking slope for individuals with low education in contrast to college graduates to reflect adherence to idea of personal control: in the face of difficulty lower status individuals believe it is important to demonstrate high levels of personal control. By contrast, we interpret the stressor pileup – binge drinking association, which is stronger for individuals with low educational attainment than for college graduates, to reflect the culture of release: sometimes it is in the best interest of personal health to just "let it go" and not worry (Crawford, 1984). Unfortunately, whether the different association of binge drinking with stressors and negative affect by SES are due to differences in socially structured resources for coping (Pearlin, 1989; Turner & Marino, 1994; Turner & Lloyd, 1999; Wheaton, 1983) or cultural differences in appropriate responses to stressors cannot be discerned in our data. Future research should examine these alternative explanations.

The contributions of this study must be considered within the context of its limitations. The diary period only spanned an eight-day period, raising question as to whether individuals' typical drinking patterns were captured, particularly when diary studies are known to promote behavioral self-monitoring and possibly less alcohol use. However, even though *individuals*' typical drinking patterns may not have been captured, the overall design and execution of the NSDE should have effectively captured the experiences of different socioeconomic *groups* in terms of their stressors, negative affect, and alcohol use. A second limitation is the relative rarity of binge drinking in the data (i.e., 4% of interview days), and the possibility that estimated associations between stressors, negative affect, and binge drinking may be unreliable (King & Zeng, 2000). Several of the estimated standard errors were greater than 30% of their respective parameter estimates, suggesting that some observed associations should be viewed as preliminary and interpreted with caution. Next, although previous research suggests that the association between stress exposure and alcohol use may depend on the source of stress (Armeli et al., 2000; Carney et al., 2000), we were not able to consider this issue because of insufficient power due to the relative infrequency of work- and family-specific stressors (7% and 5% of study days for work and family stressors respectively). The relative absence of minorities in the analysis sample limits the ability to generalize study results to racial and ethnic minority groups. Our operational definition of stressor pile-up, while conceptually driven, was constrained by the number of total days of observation. Future research should empirically evaluate alternative operational definitions of this concept. A final limitation is our reliance on educational attainment as an indicator of SES. Although education is a commonly used, it does not adequately capture the complexities shaping an individual's location in the social hierarchy (Magnuson & Duncan, 2002). Limitations notwithstanding, the results of this study make important contributions to the affect regulation literature.

The results of this study suggest two distinct expansions of the affect regulation model. First, the results of our study suggest that the affect regulation needs to be refined to incorporate an expanded conceptualization of stress. Whereas affect regulation researchers have examined a variety of individual characteristics that moderate the linkage between stress and alcohol use such as dominant coping style or beliefs about alcohol (Armeli et al., 2000; Cooper et al., 1992), stressors have been handled monolithically. More attention needs to be given to the complexities of the "stress universe" (Wheaton, 1994) in terms of the temporal nature of stressors (e.g., acute versus chronic), stressor origins (e.g., work versus family; Armeli et al., 2000), and the inherent threats embodied in stressors (Almeida et al., 2002). Second, affect regulation researchers need to give greater attention to individuals' social contexts. Variables such as socioeconomic status, location in the life span, race and ethnicity, as well as marital status, parental status, and employment arrangement have been largely overlooked in the affect regulation literature despite evidence indicating that they each condition exposure to different types of stressors, they shape individuals responses to stressors and overall levels of affect, and they shape individuals' alcohol use patterns (e.g., Finch, Catalano, Novaco, & Vega, 2003; Grzywacz et al., 2004; House et al., 1994; Turner et al., 1995; Lachman & Weaver, 1998; Naimi et al., 2003). We argue that a better understanding of the affect regulation model requires placing individuals and their responses to stressors within their broader social context.

In conclusion, this study complements and extends the affect regulation literature in several important ways. Using data from the first nationally representative daily diary study, we found that the odds of binge drinking were greater on days in which more severe stressors were experienced and on days when stressors accumulated. Like previous studies using less generalizable samples we also found no evidence suggesting that negative affect mediated the stressor-drinking association. Newer to the literature is our evidence indicating that several of the pathways in the stressor-drinking association were stronger for lower status individuals, as indicated by educational attainment, in contrast to those in a higher status location. Collectively, the results of our study and those of others suggest that "stress" plays an important role in

understanding individuals' use of alcohol; however, our results highlighted the complexities of the "stress" concept and the importance of individuals' social contexts in shaping the stress-alcohol association. These results suggest that future attempts to refine the affect regulation model require more sophisticated and multifaceted handling of the "stress" concept, as well as the theoretical and methodological ability to situate individuals' experience and responses to stressors within a broader social context.

Acknowledgments

References

Adler NE, Boyce T, Chesney MA, Cohen S, Folkman S, Kahn RL, Syme SL. Socioeconomic status and health: The Challenge of the gradient. American Psychologist 1994;49:15–24. [PubMed: 8122813]

Almeida DM, Wethington E, Kessler RC. The Daily Inventory of Stressful Events: An interview-based approach for measuring daily stressors. Assessment 2002;9:41–55. [PubMed: 11911234]

Aneshensel CS. Social stress: Theory and research. Annual Review of Sociology 1992;18:15–38.

Armeli S, Carney MA, Tennen H, Affleck G, O'Neil T. Stress and alcohol use: A daily process examination of the stressor-vulnerability model. Journal of Personality and Social Psychology 2000;78:979–994. [PubMed: 10821203]

Armeli S, Tennen H, Affleck G, Kranzler HR. Does affect mediate the association between daily events and alcohol use? Journal of Studies on Alcohol 2000;61:862–871. [PubMed: 11188492]

Bradburn, N. The structure of psychological well-being. Chicago: Aldine; 1969.

Brown, GW.; Harris, TO. Social origins of depression: A study of depressive disorder in women. New York: Free Press; 1978.

Bryk, AS.; Raudenbush, SW. Hierarchical linear models: Applications and data analysis. Newbury Park, CA: Sage; 1992.

Burks N, Martin B. Everyday problems and life change events: Ongoing versus acute sources of stress. Journal of Human Stress 1985;11:27–35. [PubMed: 3843104]

Carney MA, Armeli S, Tennen H, Affleck G, O'Neil TP. Positive and negative daily events, perceived stress, and alcohol use: A diary study. Journal of Consulting & Clinical Psychology 2000;68:788–798. [PubMed: 11068965]

Caspi A, Bolger N, Eckenrode J. Linking person and context in the daily stress process. Journal of Personality and Social Psychology 1987;52:184–195. [PubMed: 3820071]

Cooper ML, Russell M, Skinner JB, Frone MR, Mudar P. Stress and alcohol use: Moderating effects of gender, coping and alcohol expectancies. Journal of Abnormal Psychology 1992;101:139–152. [PubMed: 1537960]

Crawford, R. A cultural account of "health": Control, release, and the social body. In: McKinlay, JB., editor. Issues in the political economy of health care. New York: Tavistock Publications; 1984. p. 60-103.

Finch BK, Catalano RC, Novaco RW, Vega WA. Employment frustration and alcohol abuse/dependence among labor migrants in California. Journal of Immigrant Health 2003;5:181–186. [PubMed: 14574069]

Frone MR. Work stress and alcohol use. Alcohol Research and Health 1999;23:284–291. [PubMed: 10890825]

Frone MR, Russell M, Cooper ML. Relation of work-family conflict to health outcomes: A four-year longitudinal study of employed parents. Journal of Occupational and Organizational Psychology 1997;70:325–335.

Greeley, J.; Oei, T. Alcohol and tension reduction. In: Leonard, KEBHT., editor. Psychological theories of drinking and alcoholism. Vol. 2nd ed. New York: Guilford Press; 1999. p. 14-53.

Greenfield TK, Midanik LT, Rogers JD. A 10-year national trend study of alcohol consumption, 1984–1995: Is the period of declining drinking over? American Journal of Public Health 2000;90:47–52. [PubMed: 10630136]

Grzywacz JG, Almeida DM, Neupert SD, Ettner SL. Stress and socioeconomic differentials in physical and mental health: A daily diary approach. Journal of Health and Social Behavior 2004;45:1–16. [PubMed: 15179904]

Grzywacz JG, Dooley CD. "Good Jobs" to "Bad Jobs": Replicated Evidence of an Employment Continuum from Two Large Surveys. Social Science and Medicine 2003;56:1749–1760. [PubMed: 12639591]

Grzywacz JG, Marks NF. Family, work, work-family spillover and problem drinking during midlife. Journal of Marriage and the Family 2000;62:336–348.

House JS, Lepkowski JM, Kinney AM, Mero RP, Kessler RC, Herzog AR. The social stratification of aging and health. Journal of Health and Social Behavior 1994;35:213–234. [PubMed: 7983335]

Kanner AD, Coyne JC, Schaefer C, Lazarus RS. Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. Journal of Behavioral Medicine 1981;4:1–39. [PubMed: 7288876]

Kessler RC, McGonagle KA, Zhao S, Nelson CB, Hughes M, Eshleman S, Wittchen HU, Kendler KS. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Survey. Archives of General Psychiatry 1994;51:8–19. [PubMed: 8279933]

King G, Zeng L. Logistic regression in rare events data. Political Analysis 2000;9:1–27.

Koslowsky M, Sagie A, Krausz M, Singer AD. Correlates of employee lateness: Some theoretical considerations. Journal of Applied Psychology 1997;82:79–88.

Lachman ME, Weaver SL. The sense of control as a moderator of social class differences in health and well-being. Journal of Personality and Social Psychology 1998;74:763–773. [PubMed: 9523418]

Lee VE, Bryk AS. A multilevel model of the social distribution of high school achievement. Sociology of Education 1989;62:172–192.

Lepore SJ, Evans GW, Palsane MN. Social hassles and psychological health in the context of chronic crowding. Journal of Health and Social Behavior 1991;32:357–367. [PubMed: 1765626]

Magnuson, K.; Duncan, GJ. Off With Hollingshead. In: Bornstein, MH.; Bradley, RH., editors. Socioeconomic Status, Parenting, and Child Development. Mahwah, NJ: Lawrence Erlbaum; 2002. p. 83-106.

Marmot M, Ryff CD, Bumpass LL, Shipley M, Marks NF. Social inequalities in health: Next questions and converging evidence. Social Science and Medicine 1997;44:901–910. [PubMed: 9080570]

Marmot MG, Fuhrer R, Ettner SL, Marks NF, Bumpass LL, Ryff CD. Contribution of psychosocial factors to socioeconomic differences in health. The Milbank Quarterly 1998;76:403–440. [PubMed: 9738169]

McLean, PD. Depression as a specific response to stress. In: Sarason, IG.; Spielberger, CD., editors. Stress and anxiety. Vol. Vol. 3. Washington, DC: Hemisphere; 1976. p. 297-323.

Mroczek DK, Kolarz CM. The effect of age on positive and negative affect: A developmental perspective on happiness. Journal of Personality and Social Psychology 1998;75:1333–1349. [PubMed: 9866191]

Naimi TS, Brewer RD, Mokdad A, Denny C, Serdula MK, Marks JS. Binge drinking among US adults. JAMA 2003;289:70–75. [PubMed: 12503979]

Pearlin LI. The sociological study of stress. Journal of Health & Social Behavior 1989;30:241–256. [PubMed: 2674272]

Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement 1977;1:385–401.

Ragland DR, Ames GM. Current developments in the study of stress and alcohol consumption. Alcoholism: Clinical and Experimental Research 1996;20(8 Suppl):51A–53A.

Swendsen JD, Tennen H, Carney MA, Affleck G, Willard A, Hromi A. Mood and alcohol consumption: An experience sampling test of the self- medication hypothesis. Journal of Abnormal Psychology 2000;109:198–204. [PubMed: 10895557]

Taylor JA. A personality scale of manifest anxiety. Journal of Abnormal and Social Psychology 1953;48:285–290.

Tennen H, Affleck G, Armeli S, Carney MA. A daily process approach to coping: Linking theory, research, and practice. American Psychologist 2000;55:626–636. [PubMed: 10892205]

Turner RJ, Lloyd DA. The stress process and the social distribution of depression. Journal of Health and Social Behavior 1999;40:374–404. [PubMed: 10643162]

Turner RJ, Marino F. Social support and social structure: A descriptive epidemiology. Journal of Health and Social Behavior 1994;35:193–212. [PubMed: 7983334]

Turner RJ, Wheaton B, Lloyd DA. The epidemiology of social stress. American Sociological Review 1995;60:104–125.

Wechsler H, Dowdall GW, Davenport A, Rimm EB. A gender-specific measure of binge drinking among college students. American Journal of Public Health 1995;85:982–985. [PubMed: 7604925]

Wheaton B. Stress, personal coping resources, and psychiatric symptoms: An investigation of interactive models. Journal of Health and Social Behavior 1983;24:208–229. [PubMed: 6630976]

Wheaton, B. Sampling the stress universe. In: Avison, WR.; Gotlib, IH., editors. Stress and mental health: Contemporary issues and prospects for the future. New York: Plenum Press; 1994. p. 77-114.

Zerubaval, E. The seven day circle: The history and meaning of the week. New York: Free Press; 1985.

Table 1

Descriptive statistics for all analytic variables

	M or %	SD
Age	44.61	13.42
Gender (female = 1)	56.9%	
Race/Ethnicity (nonwhite = 1)	12.6%	
Marital Status (married = 1)	69.9%	
Education		
Less than high school	7.3%	
High School or GED	40.2%	
Voc./Tech Deg or Some Col	27.2%	
College Graduate	25.4%	
Binge Drinking	15.3%	
Negative Affect	1.20	0.28
Daily Stress	0.69	0.56
Stressor Pile-up	1.03	0.67

Note: Weighted estimates from the National Study of Daily Experiences (NSDE)

Table 2

Pooled within-person associations of daily stress and stress pile-up with binge drinking and negative affect.

Outcome	Binge Drinking[†] b (SE)	Negative Affect[‡] b (SE)	Binge Drinking[†] b (SE)
Intercept	−2.32 (0.09) ***	1.11 (0.02) ***	−2.10 (0.08) ***
Daily Stressor	0.16 (0.04) ***	.03 (0.01) ***	0.11 (0.03) **
Stress Pile-up	0.15 (0.06) **	−.01 (0.01)	0.21 (0.05) ***
Negative Affect			0.51 (0.23) *

Notes: Weighted estimates from the National Study of Daily Experiences (NSDE). b = unstandardized regression coefficients for Level 1: SE = standard error. Models adjust for day-of-week.

[†]Estimates obtained from a multilevel logistic regression model.

[‡]Estimates obtained from a multilevel linear regression model.

*
p < .05

**
p < .01

***
p < .001 (two-tailed)

Table 3

Cross-level interactions predicting binge drinking and negative affect: Intercepts and slopes of discrete outcomes in the affect regulation model as a function of gender and socioeconomic status.

	Binge Drinking[†] b (SE)	Negative Affect[‡] b (SE)	Binge Drinking[†] b (SE)
Intercept			
Gender (Female = 1)	−0.54 (0.07) ***	−0.01 (0.01)	−0.44 (0.06) ***
< H.S.	−0.19 (0.12)	0.08 (0.03) *	−0.06 (0.10)
H.S. or GED	0.21 (0.09) *	0.03 (0.02)	0.19 (0.07) **
Voc. Deg/Some Col.	0.21 (0.08) **	0.03 (0.02)	0.17 (0.07) **
Daily Stressor			
Gender (Female = 1)	−0.05 (0.05)	0.02 (0.01)	−0.05 (0.04)
< H.S.	−0.63 (0.09) ***	0.15 (0.07) *	−0.42 (0.05) ***
H.S. or GED	−.05 (0.06)	0.03 (0.01) *	−0.07 (0.05)
Voc. Deg/Some Col.	−.06 (0.05)	−0.01 (0.01)	−0.03 (0.04)
Stress Pile-up			
Gender (Female = 1)	0.15 (0.08) *	0.01 (0.02)	0.20 (0.07) **
< H.S.	0.67 (0.19) ***	−0.11 (0.09)	0.43 (0.11) ***
H.S. or GED	−0.14 (0.10)	−0.02 (0.02)	−0.11 (0.08)
Voc. Deg/Some Col.	0.06 (0.07)	−0.04 (0.02)	0.02 (0.06)
Negative Affect			
Gender (Female = 1)			0.34 (0.20)
< H.S.			0.01 (0.24)
H.S. or GED			−0.08 (0.25)
Voc. Deg/Some Col.			−0.42 (0.27)

Notes: Weighted estimates from the National Study of Daily Experiences (NSDE). B = unstandardized regression coefficients for Level 2: SE = standard error. Intercept model adjusts for age, marital status (married = 1), and race and ethnicity (nonwhite=1). College graduates are the omitted reference category for educational attainment.

[†]Estimates obtained from a multilevel logistic regression model.

[‡]Estimates obtained from a multilevel linear regression model.

*
p < .05

**
p < .01

***
p < .001 (two-tailed)