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Intensity of Daily Drinking and its Relation to Alcohol Use Disorders

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Abstract

Background: Daily drinking is an important public health concern and informative for evaluating diagnostic classification. In particular, daily binge drinkers might be considered as the prototype of some forms of alcoholism, as this drinking pattern may drive many alcohol use disorder (AUD) symptoms. However, daily drinking potentially captures a wide range of drinkers, including light-moderate daily drinkers who exhibit presumed control over their drinking behavior and might benefit from salutary effects on health. The current study examined the heterogeneity of daily drinkers in detail.

Methods: Data from the two waves of the National Epidemiologic Survey on Alcohol and Related Conditions were used. Participants who reported drinking “every day” during the last 12 months were classified as daily drinkers. A series of regression and logistic regression analyses were conducted to investigate the association between daily drinking and various outcomes.

Results: Daily drinkers were found to vary considerably from each other with respect to diagnostic status, level of consumption, demographic composition, and a range of drinking and health correlates. Further, a substantial number of daily binge drinkers were not diagnosed with AUD under the DSM-IV or DSM-5, although in most groups the DSM-5 criteria diagnosed a larger percentage of participants.

Conclusions: Daily drinkers represents a highly heterogeneous group, and the correlates of daily drinking depend on the usual quantity of daily drinks and the frequency of alcohol-related problems in a given sample. Moreover, AUD, defined both according to DSM-IV and DSM-5, did not capture more than 68% of daily binge drinkers. Given that daily binge drinking is an extremely high threshold for use, this finding may present a challenge for our current classification system.

Keywords

daily drinking; alcohol dependence; alcohol use disorder; DSM-IV; DSM-5

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Introduction

There has been increased debate in recent years over the best definition of risky alcohol use patterns (Dawson, 2011; Dawson et al., 2008; Dawson et al., 2012; Gmel et al., 2011; Ogeil et al., 2015; Rolland and Naassila, 2017). Part of this debate has focused on daily drinking (i.e., alcohol use every day for a specified period of time), which is associated with both positive (Braun et al., 2000; Hajek et al., 2017; Stranges et al., 2006; Turvey et al., 2006; Walsh and Rehm, 1996) and negative health-related outcomes (Askgaard et al., 2015; Braun et al., 2000; Dawson et al., 2008; Marugame et al., 2007; Maurage et al., 2012; Polen et al., 2010). Importantly, a wide range of drinking patterns comprises daily drinkers, which may underlie these mixed findings. For example, moderate daily drinkers (individuals who report a limited quantity of drinks every day) exhibit general control over their drinking and may experience limited effects on health, but daily binge drinkers might have dyscontrolled use that is prototypical of some classical conceptualizations of alcoholism (e.g., Jellinek, 1960) and are at high risk for a multitude of health problems. Despite the theoretical interest of daily drinkers, including the effectiveness of diagnostic classification systems, there is a surprising lack of research on this group and, in particular, heterogeneity regarding their levels of use.

Of the studies conducted on daily drinking, one study has compared daily and near-daily risky drinkers with less frequent risky drinkers (Dawson et al., 2008); another included two categories of daily drinkers (Turvey et al., 2006); and only two studies to our knowledge have examined daily drinking quantities ranging from moderate daily drinkers to daily binge drinkers (Braun et al., 2000; Morois et al., 2017). However, Braun et al. (2000) assessed daily drinking indirectly, by dividing the usual weekly number of drinks by seven and defining daily drinkers as those who drank an *average* of seven drinks a week or more. Thus, presumably the vast majority of drinkers in Braun et al. (2000) did not drink on a daily basis. On the other hand, although Morois et al. (2017) used a more rigorous definition of daily drinking, their study focused specifically on sickness absence, leaving other potential correlates of daily drinking unexamined.

The lack of empirical research on daily drinking and variability in consumption among daily drinkers is surprising, given that daily drinking is central to lay perceptions of alcoholism and Jellinek's characterization of some subtypes of alcoholism by daily (or near-daily) consumption. Perhaps this is because neither modern diagnostic criteria (e.g., DSM-IV, DSM-5) nor drinking guidelines (e.g., National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2010) consider the frequency of drinking as a key construct (though the 2010 recommended drinking guidelines do consider total drinks per week). Although DSM-III required a pattern of pathological use that could be indicated by, among other things, a "need for daily use of alcohol for adequate functioning," (American Psychiatric Association [APA], 1980, p.169) this was not included in later diagnostic revisions. In general, quantity of use such as per-occasion consumption (e.g., binge drinking) has been more emphasized than frequency measures. However, the consequences of drinking frequency have been more recently highlighted (Silins et al., in press). In addition, recent public health concern with daily drinking has led to the recommendation of having alcohol-free days every week (House of Commons Science and Technology Committee, 2012; Saito et al., 2017) due to

the potential of this practice to reduce alcohol-related mortality. Moreover, a non-trivial proportion of the adult general population report drinking every day (Braun et al., 2000; Morois et al., 2017; see also Materials and Methods section), making it a relevant sub-group of alcohol users deserving further study.

In addition to their utility for investigating risky patterns of alcohol use, examining daily drinking status can provide valuable information regarding the performance of diagnostic definitions of alcohol use disorders (AUDs). Whereas the DSM-IV (APA, 1994) defined AUDs as a diagnosis with either alcohol dependence (AD; at least 3 of 7 criteria), or alcohol abuse (AA; at least 1 of 4 criteria), the DSM-5 (APA, 2013) combines these into one AUD (defined as 2 out of 11 criteria, 10 of which are retained from DSM-IV, with the exclusion of legal problems, and the addition of craving). Several studies have investigated the impact of these changes (e.g., Agrawal et al., 2011; Bartoli et al., 2017; Chung et al., 2017; Hasin et al., 2013; Martin et al., 2011; Peer et al., 2013; Tuithof et al., 2014), but none have investigated how daily drinkers are classified according to DSM-IV and DSM-5 definitions of AUD. Most moderate daily drinkers (e.g., 1–2 daily drinks) would be unlikely to have disordered drinking, although some of them might be previously affected individuals who still struggle to keep their drinking under control (Sher et al., 2009). Moreover, most or all daily *binge* drinkers would be likely to experience alcohol-related problems sufficient for an AUD diagnosis, as this pattern of use might imply tolerance, inability to abstain, or relief drinking. That is, valid definitions of AUDs should be able to discriminate between controlled daily drinkers and daily binge drinkers.

The current study used the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; Grant et al., 2003b) to achieve two different but related goals. First, we aimed to provide a close examination of heterogeneity in daily drinking by characterizing the cross-sectional and prospective correlates of daily drinking across different levels of daily alcohol quantity. Second, we aimed to examine the relationship between AUD diagnoses and daily drinking patterns by comparing subgroups of daily drinkers based on the heaviness of their consumption with both DSM-IV and DSM-5 AUD definitions.

Materials and Methods

Participants

The 2001–2002 NESARC is a study of a representative sample of the U.S. conducted by the NIAAA. The NESARC target population was non-institutionalized civilians who were at least 18 years old and residing in households or group quarters. Face-to-face structured interviews were conducted with 43,093 respondents (response rate = 81%). Blacks, Hispanics, and young adults (ages 18–24) were oversampled with data adjusted for oversampling as well as household- and person-level non-response. The weighted data were then adjusted based on 2000 census data to represent the U.S. civilian population (Grant et al., 2003b). A follow-up second wave of face-to-face interviews was performed during 2004–2005 and contains 34,653 of the same respondents (Grant and Kaplan, 2005). For the purposes of the current study, data from 26,946 past-year alcohol users at Wave 1 (with 22,245 retained at Wave 2) were analyzed. This study was declared exempt from the

University of Missouri institutional review board because it used an existing public use data file.

Measures

Alcohol Use.—A question regarding frequency of use in the past 12 months was included at Wave 1 in NESARC: “During the last 12 months, about how often did you drink ANY alcoholic beverage?” Participants who reported drinking “every day” during the last 12 months were classified as daily drinkers ($n = 1,865$, 7.03% of current drinkers). Additional measures of consumption including quantity (usual number of standard drinks per drinking occasion), max drinks (most drinks consumed in a 24-hour period), and intoxication frequency, were used to characterize daily drinkers at both waves. Family history of alcoholism and age of first drinking were assessed at Wave 1.

Alcohol Use Disorders.—Past-12-month and lifetime AUDs were assessed by the Alcohol Use Disorders and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV) (Grant et al., 2001). The AUDADIS-IV follows DSM-IV criteria for diagnosis of AUD. In addition, the NESARC included two items measuring craving at Wave 2, allowing for the assessment of DSM-5 AUD. A number of studies have provided evidence of the reliability of the AUD diagnoses as measured by the AUDADIS-IV (Grant et al., 1995).

Other Psychiatric Disorders.—The AUDADIS-IV also included modules for assessment of DSM-IV mood disorders (i.e., major depression, dysthymia, and bipolar disorder) and anxiety disorders (i.e., generalized anxiety disorder, panic disorder, specific phobia, and social phobia) at both waves, which have been shown to have test-retest reliability (Grant et al., 2003a).

Other measures.—Other variables used to characterize daily drinkers included demographics, role functioning (i.e., marriage and employment status), health measures (i.e., percentage of participants reporting fair or poor health), other substance use (tobacco and illicit drugs), and treatment utilization (both lifetime and past-12 month). In addition, life satisfaction and current functioning (over the last 4 weeks) was assessed using the two summary scores and eight individual scales from the Short Form 12 Health Survey, Version 2 (SF-12v2; Ware et al., 2002) at Wave 1. All standardized scale scores range from 0 to 100 with a mean of 50 ($SD = 10$), and higher scores reflect better functioning.

Analytic Approach

A series of OLS regression and logistic regression analyses were conducted to investigate the association between daily drinking and various outcomes. Associations were analyzed across three levels of daily drinking quantity. These levels were created according to drinking guidelines (NIAAA, 2010) for females (light: 1 drink/day; heavy: 2–3 drinks/day; binge: 4+ drinks/day) and males (light: 1–2 drinks/day; heavy: 3–4 drinks/day; binge: 5+ drinks/day). The quantity of alcohol used was determined based on the reported number of drinks of any alcohol usually consumed on days when the participant drank alcohol during the last 12 months. Given that participants were selected based on reporting daily drinking,

these quantities correspond to the typical number of drinks consumed every day. That is, daily binge drinkers were participants who reported binge drinking most days during the last 12 months. In addition, the three quantity groups were divided according to their DSM-IV AD diagnosis, so that six mutually exclusive groups of Wave 1 daily drinkers were created. The group of past-year non-daily drinkers served as a reference group.

Although we expected to find very few cases of daily binge drinkers who were not diagnosed with AD, we decided to conduct a specific set of comparisons focusing on this group. Thus, two contrasts were performed comparing (1) the non-dependent (ND) daily binge drinker group with the other ND groups and (2) the ND daily binge drinker group with all dependent groups. A pattern showing significant differences in the former comparison and no differences in the latter comparison would suggest that participants in this group might be misclassified as non-dependent (i.e., false negatives). Given the descriptive nature of these analyses, no other covariates were included in these models, except for the models predicting Wave 2 variables, in which the corresponding Wave 1 variable was entered as a covariate (except for diagnostic variables, drinking quantity and percentage of daily drinking, because these variables are part of or correlate highly with the grouping variable). To adjust for the complex sampling design used in NESARC, analyses were conducted using the SUDAAN statistical package version 11 (Research Triangle Institute [RTI], 2012) that uses Taylor series linearization.

Results

Cross-Sectional Correlates of Daily Drinking

Table 1 shows the characteristics of daily drinkers in NESARC, grouped by typical number of daily drinks and AD diagnosis (15 daily drinkers were not classified due to missing information regarding quantity). Although the light daily drinking group with AD includes only 27 participants and there were large standard errors associated with it, we included this group in further analyses given that it may be theoretically informative. Daily drinkers were, on average, older than non-daily drinkers. They also included a larger percentage of males, and individuals who are married, unemployed, and have not attended college. However, there were important differences within the daily drinking group, with light, ND daily drinkers being older and including a larger percentage of married, retired, and college-educated individuals. In contrast, light dependent daily drinkers were younger and included more individuals from ethnic minorities and who were employed.

With regard to substance outcomes, as expected, daily drinkers showed more substance involvement on average, compared to non-daily drinkers. However, light, ND daily drinkers showed a pattern of substance involvement that was generally less severe than non-daily drinkers. Moreover, heterogeneity within daily drinkers was expressed in significant differences by diagnostic status (e.g., years drinking the same), quantity (e.g., number of drinks without intoxication) or, in most cases, both (e.g., max drinks).

Regarding health outcomes, non-daily drinkers tended to report a better perception of health than daily drinkers, but no differences were found for mood or anxiety disorders. Again, however, differences were found within the daily-drinking group. Perception of health

became worse with increasing quantity of daily drinks, whereas the prevalence of both mood and anxiety disorders was larger in the AD groups.

Notably, the ND daily-binge-drinking group ($n = 225$, 0.89% of the current sample and 0.58% of the total NESARC sample [including abstainers]) was significantly different from both the other ND and AD groups in a number of outcomes, suggesting that this group occupies a middle place between ND and AD in most characteristics (e.g., the ND daily-binge-drinking group had a mean age of 48.86, whereas the other ND groups were significantly older and the AD groups were significantly younger). However, for six variables (including smoking and current fair/poor health) the ND daily-binge-drinking group was significantly different from the other ND groups and not different from the AD groups (e.g., in the ND daily-binge-drinking group 20.64% had current fair/poor health, which is not significantly different to the percentages found in the AD groups, whereas in the other ND groups this percentage was lower than 12%). The opposite pattern (with the ND daily-binge-drinking group significantly different from the AD groups but not from the other ND groups) was found in three variables (including family history and past-year mood disorders).

Current functioning of daily drinkers is shown in Table 2. In most physical health-related scales, non-daily drinkers showed better functioning than daily drinkers. However, daily drinkers exhibited less mental disability, and better social functioning and mental health, an effect driven by the light and heavy ND groups. Also on the physical health-related scales, there was less heterogeneity than in other outcomes, with no significant differences among groups, but in other scales differences emerged in association with both drinking quantity and diagnostic status (e.g., social functioning, role emotional, and mental health scales). Of particular interest, the ND daily-binge-drinking group was significantly different from other ND groups on five scales (mental disability, general health, social functioning, role emotional, and mental health) and from AD groups on three scales (mental disability, vitality, and mental health). Moreover, this group was significantly different from the other ND groups and not different from the AD groups in three scales (general health, social functioning, and role emotional; for instance, in general health the ND daily-binge-drinking group had a mean score of 47.77, which is significantly worse than the other ND groups but not significantly different from the AD groups), whereas the opposite pattern was found only in one scale (vitality).

Prospective Correlates of Daily Drinking

Table 3 shows the association of Wave 1 quantity and dependence groups with several outcomes assessed at Wave 2. As can be seen, heterogeneity within daily drinkers was still evident by the 3-year follow-up. As expected, AD groups were more likely to be diagnosed again at Wave 2. However, the AD diagnosis was only moderately persistent, even in the most severe AD binge-drinking group. More than one-third of individuals in this group also did not meet criteria for DSM-IV and DSM-5 AUD at Wave 2, despite being a group that, overall, shows significant substance involvement and health impairment at follow-up. Additionally, daily drinking was not a persistent behavior for the majority of individuals in all groups, although there is evidence of continued drinking and only a small proportion of

participants, even in the most severe groups, received treatment in the interval between assessments. With regard to health and mental health, no significant differences in perception of health were found at follow-up, whereas mood and anxiety disorders were more prevalent among Wave 1 AD groups.

The ND daily-binge-drinking group differed from other non-dependent groups in all alcohol diagnostic categories, treatment during the interval, max drinks, and drinking quantity. This group also differed from the dependent groups in all alcohol diagnostic categories, intoxication frequency, and mood disorders. Overall, the ND daily-binge-drinking group was significantly different from the other ND groups but not from the AD groups in three variables (treatment during the interval, max drinks, and drinking quantity), whereas the opposite pattern was found in two variables (intoxication frequency and mood disorders).

AUD diagnoses and daily drinking

The extent to which AUD as defined by DSM-IV and DSM-5 captures daily drinkers is presented in Table 4. Neither system diagnosed more than ~2/3 of participants at any of the quantity levels. In other words, even among daily binge drinkers a substantial number of participants were not diagnosed under either DSM-IV or DSM-5. However, in most groups the DSM-5 criteria diagnosed a larger percentage of participants. To determine if these differences are significant, multinomial logistic regression was conducted in Mplus (Muthén and Muthén, 1998), with non-daily drinkers as the reference group. The odds ratios for DSM-IV and DSM-5 were then constrained to be equal (at each quantity level, one at a time) and a chi-square difference test based on loglikelihood values and scaling correction factors (Satorra and Bentler, 2001) was used to determine if model fit was significantly worse when this constraint was applied. The results shown in Table 4 indicate that DSM-5 is more sensitive to daily binge drinking overall, and in particular among older and male participants, with no significant differences found at lower levels of daily drinking.

Discussion

To the best of our knowledge, this is the first study that specifically focuses on different correlates of daily drinkers, a population that has considerable theoretical utility. Although some studies have compared daily drinkers with non-daily drinkers (e.g., Aresi et al., 2018; Askgaard et al., 2015; Dawson et al., 2008; Polen et al., 2010; Stranges et al., 2006; Walsh and Rehm, 1996), closer examination revealed that daily drinkers (a group including 7% of current drinkers in NESARC) are a rather heterogeneous group, with a wide range of drinking patterns (Braun et al., 2000; Turvey et al., 2006). Consequently, daily drinkers should be considered with regard to the mean quantity of daily drinks and the frequency of dependence symptomatology. Though heterogeneity among abstainers and drinkers in general has been largely recognized in the literature (Jackson et al., 2001; Liang and Chikritzhs, 2011; Mun et al., 2008; Shaper, 1993, 1995), no prior studies have examined heterogeneity among daily drinkers.

Arguably the most striking finding was that a large number of daily binge drinkers were not diagnosed with AD (see Table 1). In fact, 56% of daily binge drinkers in NESARC *did not have an AD diagnosis*. Moreover, even the broader category of AUD (defined both according

to DSM-IV and DSM-5) did not capture more than 68% of daily binge drinkers in the overall NESARC sample (see Table 4). This is consistent with a previous study that found little overlap of DSM-IV and DSM-5 AUD with excessive alcohol consumption, defined as >14/21 drinks weekly for women/men and at least three 5+ drinking days per week (Tuithof et al., 2013). However, the DSM-5 produced slightly higher prevalence rates than DSM-IV in diagnosing daily binge drinkers with an AUD, which might represent progress if daily binge drinking is accepted as an external validity criterion for AUD (i.e., most daily binge drinkers are likely to experience problems sufficient for a diagnosis). In any case, this is an entirely unexpected finding that presents a challenge for our current diagnostic system. Although the current findings are in contrast with a recent report from the Swedish REBUS study (Lundin et al., 2015), in which only one daily heavy drinker out of 20 was not diagnosed with alcoholism according to the International Classification of Diseases, version 8 (ICD-8) (World Health Organization [WHO], 1965), the assessment in that study was performed by psychiatrists using a semi-structured interview (in contrast with the structured interview used in NESARC), which might have provided more flexibility to address potential inconsistencies between consumption and symptom information.

To examine the extent to which the ND daily-binge-drinking group resembles the functioning of daily drinkers diagnosed with AD, a series of comparisons were conducted between this group and both the other ND groups and all the AD groups. Although results suggest that the ND daily-binge-drinking group does not have the same level of impairment as the AD groups, there were fewer differences between ND daily-binge drinkers and AD binge drinkers than between ND daily-binge drinkers the other ND groups. In particular, ND daily-binge-drinking participants were more similar to dependent participants than to other non-dependent individuals with regard to smoking status, perception of health, general health, social functioning, role emotional functioning, and treatment during Wave 1 and Wave 2. Although the opposite pattern was also found for some outcomes (i.e., the ND daily-binge-drinking group being different from AD groups and not different from other ND groups), participants in the ND daily-binge-drinking group were as likely as AD participants to ultimately seek treatment, which suggests that ND daily-binge-drinkers do experience alcohol-related consequences and a significant proportion of this group might be misclassified as non-dependent. Moreover, it should be noted that for several other outcomes no significant differences were found between the ND daily-binge-drinking group and both dependent and non-dependent groups. The reason for this might be that the ND daily-heavy-drinking group is also at high risk for some outcomes, including individuals who are also misclassified as non-dependent.

We have previously suggested that the DSM-5 algorithm is too lenient and that it may lead to overestimation of disordered drinking rates (Martin et al., 2011). Results from the current study indicate that concern with DSM-5 should not be limited to false positives, and that daily binge drinkers can be informative with regard to avoiding false negatives. The issue of false negatives in DSM-IV has been discussed for over a decade, focusing on “diagnostic orphans” (Littlefield et al., 2010; Pollock and Martin, 1999). Non-diagnosed daily binge drinkers might offer an additional possibility to detect false negatives and improve diagnostic accuracy. In fact, 55.2% of ND daily-binge-drinkers had one or two AD criteria. However, we do not believe that diagnosis of daily binge drinkers should be pursued by

lowering the diagnostic threshold, but by improving the current criteria set to better reflect modern notions of addiction, based on neurobehavioral research (Koob and Le Moal, 2001; Litten et al., 2015; Robinson and Berridge, 1993). In addition, the current findings suggest the need to move away from screening and policy strategies that focus predominantly on clinically diagnosable AUD.

Contrary to the surprising findings regarding daily binge drinkers, as expected only a minimal number of light daily drinkers diagnosed with AD were identified. Results indicate that this group has elevated rates of prior-to-past-year AD and lifetime treatment, which is consistent with the notion that a number of these participants are previously disordered individuals trying to achieve moderation in their drinking.

A final, somewhat surprising, finding is that, among daily drinkers, mean number of drinks without intoxication is associated with daily drinking quantity but not with AD diagnosis (Table 1). This is unexpected given that number of drinks without intoxication is directly related to an AD symptom, namely, tolerance. However, tolerance has been criticized as a symptom because it does not provide good discrimination in terms of severity (Martin et al., 2008; Martin et al., 2006) and it does not add much to withdrawal in terms of defining physiological dependence (Schuckit et al., 1998). One could speculate that tolerance is an important contributor to the dependence syndrome but, perhaps, should be considered distinct from it. That is, these findings suggest the hypothesis that the development of tolerance is associated with high alcohol exposure which, in turn, is causally and transactionally related to dependence. This intriguing possibility should be further explored as it has important implications for identifying core symptoms of dependence and identifying potential targets for prevention and treatment.

The current study has several strengths, including the use of a large, prospective, nationally-representative sample. However, all assessments are based on self-report and thus subject to reporting biases. This is particularly relevant for the classification of daily drinkers by quantity, so that it is possible that a number of participants were misidentified, for example, as daily binge drinkers when in fact they were either not daily drinkers or not binge drinkers. In particular, as the measure of quantity of alcohol used included in this study refers to the usual number of drinks in the last 12 months, there might be a large variability regarding the exact number of days in the past year in which daily binge drinkers actually had a binge. Future research focusing on daily drinkers and using more intensive longitudinal follow-ups should be able to determine the extent to which these self-report measures are accurate. Another limitation relates to the current definition of binge drinking, which might be considered as a relatively low threshold to define a pathological pattern of alcohol use (Hingson et al., 2017). Future research should examine the correlates of extreme daily drinking, which might differ from the current findings. Finally, as we mentioned before, heterogeneity among abstainers and drinkers in general, is a recognized fact. However, as the current study focused on daily drinkers, we decided to include all non-daily drinkers as one comparison group, to simplify the presentation of results. Future studies might examine heterogeneity along the full spectrum of drinking patterns, which might help clarify potential interactions between frequency and quantity (Rehm & Roerecke, 2015).

In spite of these limitations, the current study highlights that, at least using DSM-IV, one cannot assume that someone who reports bingeing on a daily basis is alcohol dependent. Although we are not implying that daily binge drinking should overlap perfectly with AUD diagnosis, evidently the vast majority of people who report daily binge drinking should be captured by a formal diagnosis. In fact, these daily binge drinkers are clearly not unaffected as evidenced by increased levels of a variety of problems, particularly those associated with poorer mental health and physical health, to the point that non-dependent daily binge drinkers often end up seeking treatment. While one might argue that these types of findings suggest that broader conceptions of AUD such as those defined in the DSM-5 will “identify” more of these individuals with marked levels of alcohol consumption, it is not clear if the broad AUD notion embodied in DSM-5 has a meaningful conceptual core and whether it makes sense to combine those with compulsive drinking patterns (as sampled by multiple dependence criteria) with those without such patterns. Perhaps it speaks to the value of having a harmful use category, as in the ICD, to identify those individuals whose drinking contributes to health-related problems (i.e., causes harm) but has no identifiable dysfunction to base a formal diagnosis on (Wakefield and Schmitz, 2014).

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Characteristics of daily drinkers by number of daily drinks and presence or absence of DSM-IV Alcohol Dependence diagnosis in Wave 1 of NESARC

Variables	Non-daily Drinkers				Daily Drinkers (<i>n</i> = 1,850) ^a				Contrasts			
		Light			Heavy			Binge		Non-daily vs daily Wald <i>F</i> (1, 65 <i>df</i>)	ND Binge vs other ND Wald <i>F</i> (1, 65 <i>df</i>)	ND Binge vs all AD Wald <i>F</i> (1, 65 <i>df</i>)
		ND	AD		ND	AD		ND	AD			
<i>n</i>	25,081	843	27	510	71	225	174					
Demographics												
Mean Age	41.97 (0.16)	57.30 (0.76)a	34.68 (2.39) b	53.66 (0.81)c	40.70 (1.86)b	46.86 (0.89)d	36.12 (1.12)b	26.17 *	72.05 *	39.83 *		
% Male	51.47 (0.45)	70.48 (1.70)a	83.53 (8.82)ab	51.88 (2.52)b	71.08 (6.08)a	76.77 (3.31)a	77.20 (3.72)a	49.84 *	13.30 *	0.03		
% White	74.98 (1.47)	81.44 (2.05)ac	67.89 (11.25)abc	84.37 (1.54)a	70.12 (6.23)ac	72.42 (3.56)b	73.34 (3.94)c	0.04	13.11 *	0.11		
% Married	62.33 (0.56)	71.89 (1.68)a	52.50 (8.93)abc	64.83 (2.06)b	49.02 (7.36)bc	60.25 (3.78)b	36.49 (4.66)c	8.09 *	4.70	6.96		
% Employed	73.34 (0.41)	51.78 (2.31)a	83.38 (7.59)b	63.47 (2.29)b	55.34 (7.43)ab	68.47 (3.70)b	64.66 (4.49)ab	9.60 *	6.68	0.01		
% Retired	11.66 (0.27)	39.66 (2.17)a	6.64 (4.86)bcd	26.55 (2.21)b	9.60 (3.62)c	17.56 (2.67)b	4.28 (1.48)d	1.49	17.79 *	8.68 *		
% Attended College	61.96 (0.63)	64.01 (2.20)a	52.07 (8.96)ab	61.42 (2.49)a	54.18 (7.76)ab	39.65 (3.62)b	41.68 (4.41)b	19.00 *	35.94 *	2.67		
Substance Outcomes												
% Smokers	32.42 (0.59)	26.51 (1.79)a	60.14 (9.88)bcd	42.28 (2.65)b	68.96 (5.72)cd	59.94 (3.60)c	82.31 (3.55)d	113.92 *	45.15 *	4.67		
% Illicit Drug Users	8.26 (0.28)	4.05 (0.95)a	52.53 (9.97)c	8.29 (1.54)ab	40.62 (7.24)c	13.00 (2.87)b	41.56 (5.09)c	72.22 *	8.27 *	28.72 *		
% Treatment Lifetime	4.07 (0.18)	2.88 (0.58)a	29.91 (8.84)cd	5.84 (1.05)b	33.91 (7.82)d	14.11 (2.64)c	43.14 (4.37)d	184.11 *	24.10 *	18.95 *		
% Treatment PY	1.02 (0.08)	0.66 (0.30)a	12.96 (7.59)bc	1.10 (0.41)a	9.16 (4.32)bc	2.53 (0.97)ab	27.42 (4.01)c	54.51 *	7.53 *	15.71 *		
% Family History	22.97 (0.43)	15.68 (1.58)a	47.40 (12.62)bc	22.09 (2.24)ab	51.61 (7.41)c	26.32 (3.21)b	51.28 (4.44)c	23.10 *	5.79	14.07 *		
% Alcohol Dependence PPY	13.91 (0.42)	5.25 (0.84)a	87.73 (7.59)c	13.66 (1.75)b	84.76 (4.60)c	19.44 (2.75)b	89.14 (2.65)c	131.22 *	20.99 *	96.74 *		
M. Max Drinks PY	4.31 (0.05)	3.23 (0.21)a	8.52 (1.73)bcd	5.53 (0.20)b	8.86 (0.86)c	11.75 (0.52)d	19.37 (1.04)e	219.59 *	196.18 *	0.38		
M. Intox. Frequency PY	0.92 (0.02)	0.86 (0.09)a	3.34 (0.76)bc	1.23 (0.10)d	3.68 (0.37)b	2.33 (0.22)c	5.98 (0.28)e	134.43 *	29.43 *	29.02 *		
M. Drinks w/o Intox.	3.67 (0.04)	3.47 (0.16)a	3.99 (0.67)ab	4.65 (0.22)b	5.00 (0.49)b	7.88 (0.47)c	7.86 (0.47)c	107.51 *	63.26 *	16.27 *		
M. Age Started Drinking	19.39 (0.05)	20.68 (0.34)a	15.53 (0.44)b	19.50 (0.29)ac	17.35 (0.69)bc	18.22 (0.53)c	16.04 (0.35)b	62.75 *	10.85 *	9.64 *		
M. Years Drinking the Same	11.14 (0.13)	16.51 (0.55)a	7.67 (1.91)b	16.62 (0.72)a	10.09 (1.33)b	14.74 (0.91)a	9.68 (0.79)b	9.60 *	3.59	20.60 *		

Variables	Non-daily Drinkers				Daily Drinkers (<i>n</i> = 1,850) ^a				Contrasts		
	Light		AD		ND		Heavy		Non-daily vs daily Wald <i>F</i> (1, 65 <i>df</i>)	ND Binge vs other ND Wald <i>F</i> (1, 65 <i>df</i>)	ND Binge vs all AD Wald <i>F</i> (1, 65 <i>df</i>)
	ND	AD	AD	AD	ND	AD	ND	AD			
Health and Mental Health											
% Current Fair/Poor Health	10.19 (0.28)	11.44 (1.22)a	14.87 (7.23)ab	11.62 (1.48)a	11.62 (1.48)a	24.81 (7.00)ab	20.64 (3.29)b	30.88 (4.58)b	29.34 [*]	9.52 [*]	0.16
% Mood Disorders PY	10.06 (0.26)	5.14 (0.86)a	17.38 (7.51)bc	4.13 (0.86)a	4.13 (0.86)a	31.95 (7.51)c	7.37 (1.96)ab	26.40 (3.64)c	2.40	2.38	15.72 [*]
% Anxiety Disorders PY	11.66 (0.34)	6.56 (1.07)a	18.58 (9.75)ab	10.72 (1.66)ab	10.72 (1.66)ab	31.09 (7.41)c	13.38 (2.32)b	28.14 (4.40)c	6.59	5.36	5.6

Note. Standard errors are in parenthesis. Cells sharing the same subscript are not significantly different. ND = No Dependence; AD = Alcohol Dependence; PY = Past Year. PPY = Prior to Past Year; M. = Mean; Intox. = Intoxication;

^{*} = $p < .01$.

^a Due to missing values in the quantity variable, the total number of daily drinkers is lower than reported in text (1,865).

Current functioning of daily drinkers by number of daily drinks and presence or absence of DSM-IV Alcohol Dependence diagnosis in Wave 1 of NESARC

Non-daily drinkers										Daily Drinkers (<i>n</i> = 1,850) ^a					Contrasts		
Variables	Light			Heavy			Binge			Non-daily vs daily Wald <i>F</i> (1, 65 <i>df</i>)	ND Binge vs other ND Wald <i>F</i> (1, 65 <i>df</i>)	ND Binge vs all D Wald <i>F</i> (1, 65 <i>df</i>)					
	ND	D		ND	D		ND	D									
<i>N</i>	25,081	843	27	510	71		225	174									
Physical disability score	52.37 (0.09)	50.77 (0.42)a	50.63 (1.80)a	51.61 (0.51)a	49.68 (1.88)a		49.97 (0.70)a	49.23 (1.02)a	19.86 [*]	2.39	0.01						
Mental disability score	52.52 (0.08)	54.43 (0.33)a	44.16 (2.58)c	53.26 (0.46)ab	45.38 (1.80)c		51.08 (0.83)b	46.19 (1.27)c	34.16 [*]	9.55 [*]	16.57 [*]						
Physical functioning	52.94 (0.08)	51.79 (0.36)a	49.69 (2.42)a	52.11 (0.45)a	51.20 (1.45)a		51.41 (0.63)a	50.35 (0.94)a	13.94 [*]	0.60	0.76						
Role physical	52.57 (0.09)	51.45 (0.40)a	48.56 (2.61)a	52.08 (0.48)a	47.17 (2.32)a		50.36 (0.80)a	49.54 (0.89)a	21.18 [*]	2.76	2.03						
Bodily pain	51.19 (0.10)	50.78 (0.52)a	46.01 (2.72)ab	51.07 (0.54)a	46.78 (2.12)ab		48.87 (1.02)ab	47.05 (1.21)b	22.19 [*]	3.43	2.05						
General health	52.39 (0.12)	51.84 (0.51)a	49.85 (2.78)ab	51.95 (0.60)a	46.02 (2.47)ab		47.77 (0.97)b	44.34 (1.30)b	32.23 [*]	16.38 [*]	0.41						
Vitality	54.40 (0.11)	55.45 (0.49)a	50.71 (3.17)ab	55.41 (0.51)ab	51.55 (1.46)bc		55.79 (0.87)ab	50.69 (1.10)c	4.25	0.14	10.16 [*]						
Social functioning	52.56 (0.08)	53.32 (0.34)a	46.10 (2.37)c	52.69 (0.43)ab	47.41 (2.01)bc		49.73 (0.82)c	46.77 (1.39)c	31.45 [*]	14.30 [*]	4.19						
Role emotional	51.93 (0.09)	52.03 (0.36)a	44.53 (3.17)abc	51.90 (0.48)ab	44.09 (2.69)c		49.47 (0.86)bc	47.04 (1.11)c	27.99 [*]	7.82 [*]	7.05						
Mental health	52.19 (0.10)	54.25 (0.39)a	43.34 (2.56)cd	52.70 (0.50)b	45.54 (1.71)cd		50.49 (0.92)bc	45.52 (1.31)d	33.73 [*]	9.21 [*]	13.93 [*]						

Note. Higher scores reflect better functioning. Standard errors are in parenthesis. Cells sharing the same subscript are not significantly different. ND = No Dependence; D = Dependence.

^{*} = $p < .01$.

^a Due to missing values in the quantity variable, the total number of daily drinkers is lower than reported in text (1,865).

Wave 2 characteristics of Wave 1 daily drinkers by number of daily drinks and presence or absence of DSM-IV Alcohol Dependence diagnosis in Wave 1 of NESARC

	Level of Drinking						Contrasts	
	Light		Heavy		Binge		ND Binge vs other ND Wald <i>F</i> (1, 65 <i>df</i>)	ND Binge vs all AD Wald <i>F</i> (1, 65 <i>df</i>)
	ND	AD	ND	AD	ND	AD		
<i>n</i>	695	18	420	57	179	124		
Substance Outcomes								
% Dependence PY	3.66 (0.92)a	46.98 (10.88)c	8.77 (1.76)ab	61.09 (7.93)c	14.44 (2.88)b	47.50 (5.39)c	12.97*	38.92*
% DSM-IV AUD PY	10.64 (1.53)a	55.90 (10.40)cd	22.00 (2.40)b	67.84 (7.29)d	29.49 (4.06)bc	62.03 (5.36)d	14.59*	23.78*
% DSM-5 AUD PY	11.93 (1.38)a	62.35 (9.81)cd	27.02 (2.43)b	77.57 (5.91)d	33.15 (4.38)bc	63.08 (5.22)d	12.70*	31.89*
% Daily drinking PY	41.00 (2.00)a	24.71 (11.68)a	42.95 (2.95)a	28.88 (7.26)a	45.35 (4.21)a	32.29 (4.85)a	0.57	6.69
% Smokers DI	20.99 (1.86)a	46.38 (10.66)ab	36.17 (2.74)ab	59.36 (8.06)b	50.96 (4.20)b	75.40 (4.89)b	4.07	0.10
% Illicit Drug Users DI	5.38 (0.87)a	40.16 (10.56)abc	12.34 (2.11)b	55.55 (7.99)c	14.62 (3.16)b	36.27 (5.44)b	2.40	4.14
% Alcohol Treatment DI	0.73 (0.28)a	19.30 (11.37)bc	2.85 (0.89)ab	22.21 (8.45)c	6.21 (1.76)bc	20.23 (4.76)c	14.08*	6.64
Mean Max Drinks PY	4.08 (0.25)a	11.64 (2.94)abc	5.75 (0.24)b	9.81 (1.03)c	9.26 (0.49)c	13.83 (0.90)c	15.30*	2.70
Mean Intoxication Frequency PY	0.76 (0.08)a	4.03 (0.94)b	1.15 (0.10)a	3.53 (0.47)b	1.66 (0.22)a	4.25 (0.33)b	3.03	25.54*
Mean Quantity PY	2.12 (0.22)a	4.37 (0.75)bc	2.85 (0.10)b	4.05 (0.31)c	4.54 (0.22)c	6.96 (0.59)d	68.84*	1.96
Health and Mental Health								
% Current Fair/Poor Health	12.48 (1.54)a	9.75 (7.65)a	12.42 (1.72)a	24.09 (8.08)a	24.04 (4.11)a	23.30 (4.82)a	4.59	1.00
% Mood Disorders PY	5.15 (0.94)a	49.19 (16.68)b	7.22 (1.48)ab	27.57 (7.23)b	7.93 (2.29)ab	18.83 (4.23)b	0.45	10.66*
% Anxiety Disorders PY	6.36 (1.01)a	15.98 (10.29)ab	8.91 (1.76)a	33.97 (8.38)b	14.52 (2.97)ab	28.42 (5.51)b	4.38	1.71

Note. Standard errors are in parenthesis. Cells sharing the same subscript are not significantly different. ND = No Dependence; AD = Alcohol Dependence; PY = past year; DI = during interval since Wave 1.

* = $p < .01$.

Table 4

DSM-IV and DSM-5 Alcohol Use Disorder diagnoses in daily drinkers by number of daily drinks in Wave 2 of NESARC

	Non-daily drinkers	Level of Drinking		
		Light	Heavy	Binge
<i>N</i> Overall	20,833	637	425	282
% DSM-IV AUD	13.89 (0.37)	10.48 (1.39)	26.82 (2.51)	58.15 (3.73)
% DSM-5 AUD	15.45 (0.39)	11.14 (1.31)	30.20 (2.52)	67.46 (3.45)
$\chi^2(1)$	Ref	0.33	0.38	12.50 *
Comparisons within age groups				
<i>n</i> 21–37	7,476	55	52	73
% DSM-IV AUD	20.11 (0.65)	36.05 (7.96)	33.10 (7.56)	64.06 (7.36)
% DSM-5 AUD	23.57 (0.69)	36.87 (8.02)	38.02 (8.15)	71.96 (6.43)
$\chi^2(1)$	Ref	0.59	0.04	0.75
<i>n</i> 38+	13,357	582	373	209
% DSM-IV AUD	10.09 (0.36)	8.08 (1.23)	25.94 (2.70)	55.81 (4.33)
% DSM-5 AUD	10.50 (0.34)	8.72 (1.24)	29.10 (2.65)	65.68 (4.19)
$\chi^2(1)$	Ref	0.05	1.12	16.48 *
Comparisons within gender groups				
<i>n</i> Females	11,320	184	203	75
% DSM-IV AUD	8.27 (0.34)	4.15 (1.80)	19.73 (3.05)	54.79 (7.47)
% DSM-5 AUD	10.33 (0.38)	8.75 (2.36)	27.32 (3.47)	63.57 (7.25)
$\chi^2(1)$	Ref	2.99	2.85	1.82
<i>n</i> Males	9,513	453	222	207
% DSM-IV AUD	19.28 (0.56)	12.79 (1.68)	32.67 (3.69)	59.18 (4.40)
% DSM-5 AUD	20.36 (0.55)	12.01 (1.60)	32.58 (3.77)	68.66 (4.04)
$\chi^2(1)$	Ref	1.41	0.17	11.99 *

Note. Standard errors are in parenthesis. The cutoff at age 38 in Wave 2 corresponds to a cutoff at age 35 in Wave 1. χ^2 corresponds to chi-square difference tests based on loglikelihood values and scaling correction factors from multinomial logistic regressions comparing models in which the odds ratios for DSM-IV and DSM-5 were allowed to differ and then constrained to be equal at each quantity level, one at a time.

* = $p < .01$.