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Missed and Inconsistent Classification of Current Drinkers: Results from the 2005 US National Alcohol Survey

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Abstract

Aims—This study compares current 12-month drinkers who do not report drinking in the last 30 days with current drinkers who drank in the last 30 days and assesses possible misclassification errors from use of a 30-day consumption measure.

Design—Data are from the 2005 US National Alcohol Survey (N=6919), a national household probability survey.

Setting—Telephone interviews were used to measure alcohol use and alcohol-related problems.

Participants—This study compared 1,300 current drinkers who did not drink in the last 30 days with 2,956 current drinkers who drank in the last 30 days.

Measurements—Volume was measured by Quantity/Frequency Scales (12-month and 30-day) and a Graduated Frequency Scale (12-month). Both groups were compared by demographic, alcohol volume, days of 5 or more drinks, social consequences and dependence measures.

Findings—Results indicate a significantly lower prevalence rate of current drinking for 30-day measures - 47.3% (45.8%, 48.8%) versus 67.3% (66.0%, 68.7%) with 12-month measure. Further, 385 non 30-day drinkers reported 12-month drinking frequencies of once a month or more often, suggesting a possibly inconsistent reporting of their alcohol use. When this group of “inconsistent” respondents is compared with the 915 non 30-day current drinkers who reported less than monthly drinking, they reported significantly higher yearly volume, days of 5 or more drinks, mean social consequences, and proportion reporting alcohol dependence.

Conclusions—In population surveys assessing alcohol use, asking about the previous 12 months rather than the past 30 days provides higher estimates of current use including more days of heavy episodic use.

Keywords

measurement; inconsistent reporting; alcohol consumption; 30-day measures; 12-month measures; current drinkers

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Introduction

The quest to find the best way to ask about alcohol use in the U.S. has been a focus of much research dating back to the 1939 when the Gallup Poll determined that 58 percent of the U.S. population were drinkers by asking the question “Do you have occasion to use alcoholic beverages such as liquor, wine, or beer, or are you a total abstainer?” [1,2] In the 1950s, Strauss & Bacon [3] introduced multidimensional ways to assess alcohol use by including items of duration and intensity. College drinkers were asked how often they drank alcohol (frequency), and on the days that they drank, how much alcohol they typically consumed (quantity). Over time, these Quantity/Frequency (QF) scales were expanded to include episodic higher drinking volumes e.g., the Quantity Frequency Variability or QFV scale [4,5], the proportion of drinking occasions scale -- the Knupper Series [6,7], and more recently the Graduated Frequency Scale [7,8].

Scales with longer timeframes have tended to yield higher reports of alcohol intake, because, it has been argued, they can include more occasional heavy episodic drinking than scales with shorter reference periods [9,10]. Despite these findings, there is still a tendency to use 30-day QF measures in many US surveys (e.g., the Behavioral Risk Factors Surveillance System surveys [11]). It is possible that the researchers who have selected 30-day measures do this because of their brevity and simplicity, the perception that recent periods are more readily recalled, and also because of comparability with other studies particularly in the medical domain that may have employed 30-day measures.

Recent alcohol measurement reviews have raised empirically based and conceptual concerns about short reference period summary measures, particularly prior week measures [10] and even 30-day measures [9,12]. Shorter time frames may not identify accurately the prevalence of alcohol use or the consumption patterns of those who may engage in drinking, and sometimes episodic drinking, that occurs beyond the “window” of the survey. It has become apparent that those drinkers at any time in the past 12 months but not in the last 30 days may not all be light, low volume drinkers who always drink within ‘safe’ guidelines, however defined [13,14]. Particularly important is whether these individuals may sometimes drink 5 or more drinks in any day in the prior 12 months, since this heavy per occasion pattern, even among lower volume drinkers, has been found to increase risks of drunk driving [15], non-fatal injuries [16], alcohol dependence [17], other alcohol problems [18] and even all-cause mortality [19,20] compared to those never drinking 5+ drinks.

The purpose of this study is to assess what types of drinkers are missed, and possibly misclassified, with 30-day measures in terms of demographic characteristics and drinking patterns. Specifically, this paper will address the following three research questions: 1) How much do prevalence rates of drinking differ based on a 30 day versus a 12-month alcohol use measure? 2) Based on the 30-day measures, do 12-month drinkers who did *not* report drinking in the last month differ from those who did drink in the last month on demographic, alcohol consumption and alcohol-related problem measures? 3) What proportion of non 30-day drinkers may inconsistently report monthly drinking during the last 12 months?

Methods

Data

This study utilizes data from the 2005 National Alcohol Survey (NAS) funded in the Alcohol Research Group’s National Alcohol Research Center by the US National Institute on Alcohol Abuse and Alcoholism (NIAAA). The 2005 National Alcohol Survey (NAS) is part of a 5-yearly national alcohol survey series dating back to the mid 1960s but including standard measures allowing trend studies since 1979 [5,6,21–27]. The 2005 NAS provides a

unique opportunity to compare current drinkers who did or did not report alcohol use in the last 30 days and to determine who may be missed when a shorter timeframe is used.

For the 2005 NAS, telephone interviews were administered to a nationally representative sample of U.S. adults aged 18 years and older residing in households with telephones within all 50 states and the District of Columbia. A nationwide oversample of Black and Hispanic households was included. Data were collected using list-assisted random digit dial (RDD) methods. Households not reached by any kind of telephone have been for many years and remain under 2 percent and thus, traditionally, about 98 percent of adults have been covered by RDD telephone surveys. During the period from November 2004 through June 2006, interviews were conducted by trained survey interviewers used Computer Assisted Telephone Interview (CATI) methods and were conducted in either English or Spanish based upon respondent preference. All respondents who agreed to participate provided verbal informed consent. The study protocol was approved by the Institutional Review Board of the Public Health Institute.

The study response rate was 56 percent, comparable to current telephone survey response rates [28]. Although such rates may raise questions about potential non-response bias, recent methodological studies have found that increased non-response in telephone surveys does not necessarily result in biased estimates [29,30]. The final sample size was 6,919 adults; in this study, we focused primarily on current 12-month drinkers who reported drinking alcohol in the last 12 months (n=4,256).

Measures

Current Drinkers and 30-day drinkers—Using an overall frequency measure, we categorized Current (last 12 months) drinkers as respondents who reported having at least 1 drink in the last 12 months. All current drinkers were also asked: “During the past 30 days, how often have you had at least one drink of any alcoholic beverage?” (number of days). Current drinkers who reported no drinking days in the last 30 days were categorized as *non 30-day drinkers*, and those reporting drinking on at least 1 day in the last 30 days and were categorized as *30-day drinkers*.

Alcohol Consumption Measures

Volume: Graduated Frequency (last 12 months): Current (12-month) drinkers were asked a series of graduated frequency (GF) questions to estimate frequency of drinking all alcohol beverages during the past 12 months combined in successively lower amount-per-day intervals. First, a categorical maximum amount in any one day during the last 12 months question **was** asked: “Think of all kinds of alcoholic beverages combined, that is any combination of bottles or cans of beer, glasses of wine, drinks containing liquor of any kind, or coolers, flavored malt beverages or p-made cocktails. In this question, one drink is equal to a 12 ounce bottle of beer or cooler, a four to five ounce glass of wine, or one shot of liquor (1.5 ounces). During the last 12 months, what is the largest number of drinks you had on any single day? Was it...” Categories began with 24 or more drinks, then 12–23, 8–11, 5–7, 3–4 drinks and finally 1–2 drinks [31]. Depending on the response to this item, frequencies of drinking at a series of levels *at or below* the reported maximum were asked. For example, if the maximum was either 24+ or 12–23 drinks, these began with 12 or more drinks, followed by 8–11, 5–7, 3–4, and 1–2 drinks per day, in that descending order. (Reporting a lower maximum led to entry in the question series at an appropriately lower quantity.) Seven discrete choices for frequency ranged from “every day or nearly every day” “3–4 times a week” to “less than once a month”, “once in the last year” and “never in the last year.” The GF approach is used in this study to measure the volume of consumption and frequency of heavy drinking (5+, described below) in the last 12 months. The GF approach

has been validated against drinking diary data [32,33] and has been recommended for use in the international monitoring of consumption survey [34]. It should be noted that interviewers need to be trained well in its use to avoid data problems [35]. In about one tenth of cases where the reported frequency category midpoints when summed exceed 365 days, a downward capping algorithm is used, which was shown to be somewhat more concordant with diary data as compared to simple prorating of frequencies [32], though with a non-significant difference.

Volume: Quantity/Frequency (last 30 days, last 12 months): Volume measured by a QF scale in the last 30 days was determined by the number of days drank any alcohol in the last 30 days multiplied by the average number of drinks consumed in the last 30 days (“On the days that you drank, how many drinks did you drink on average”). Volume measured by a QF scale in the last 12 months was based on two items: 1) Overall Frequency: “Now, thinking of your overall drinking, how often do you usually have any kind of beverage containing alcohol – whether it is wine, beer, whiskey, coolers, or any other drink?” Answer categories ranged from three or more times a day to less than once a year. Overall frequency is also used to define at least monthly drinking or not among the non 30 day drinkers. 2) Quantity: “On those days when you (drink/drank) wine, beer, or hard liquor, how many drinks (did/do) you usually have per day?” The respondent provided the number of drinks.

5 or more drinks (5+): A measure of number of 5+ drinking days was derived from the GF series created from 5–7, 8–11 and 12+ GF quantity levels. The midpoints of respective frequency categories (converted to days in a year) for the up to three levels (less than three when the maximum was lower than 12+ drinks) indicative of 5 or more drinks in a day (i.e., 5–7, 8–11, 12+ drinks) were summed up for a quasi-continuous measure of 5+ frequency [9]. If no daily quantity was drunk at the 5 or more levels, the 5+ level was zero (never).

Alcohol-Related Problems—Two 12-month variables were used for analyses as follows:

1) *Social and Health Consequences* were assessed using 15 standard items in five problem areas: The item content covers five important domains: work problems (3 items), fights/arguments and family reactions (4 items), accidents (2 items) trouble with the law (3 items), and health problems (3 items). With the exception of the health subscale, the internal consistencies of constituent subscales in 1984 and 1995 were good to acceptable for research purposes with alphas ranging from .74 to .87 (health subscale alphas have ranged from .58 to .67) [24,25]. To assess Consequences, for increased sensitivity, rather than employing a dichotomy based on a cut point, we used the quasi-continuous count of problem items (of 15) affirmed as occurring during the prior 12 months; 2) *Alcohol Dependence* was assessed using a set of 17 items [36] covering seven domains defining DSM-IV alcohol dependence in the Fourth Edition of the Diagnostic and Statistical Manual (DSM-IV) [37]. The diagnostic areas and number of survey items in each available include: (1) Drinking larger amounts or over a longer period than intended (the NAS scale contains 2 items), (2) An unsuccessful or persistent desire to cut down or control drinking (2 items), (3) A great deal of time spent in activities necessary to obtain alcohol, to drink, or to recover from its effects (1 item), (4) Important social, occupational, or recreational activities given up or reduced because of drinking (2 items), (5) Continued drinking despite knowledge of persistent or recurrent physical or psychological problems (2 items), (6) Tolerance—need for markedly increased amounts of alcohol to achieve intoxication or desired effect; markedly diminished effect with continued use of the same amount of alcohol; or has functioned adequately at doses or blood levels of alcohol that would produce significant impairment in a casual user (2 items), and (7) Withdrawal [38] — the characteristic withdrawal syndrome, with alcohol often taken to relieve or avoid withdrawal symptoms (6 items). Respondents who affirmed,

during the past 12 months, experiencing at least one symptom in each of the seven were considered positive for that domain. For a similar reason to that described for Consequences (increased sensitivity compared to a dichotomous criterion) our DSM-IV symptom measure instead used a count of positive domains (i.e., 1+ items affirmed in a given domain), yielding a variable with a range of from 0 to 7. Note that this is a positive domain count not an item count.

Demographic Variables—The following seven demographic variables were used in the analysis: 1) gender; 2) age (18–29, 30–49, 50 or older); 3) ethnicity (Black, White, Hispanic, Other); 4) relationship status (married or living together vs. not, i.e., partnered or not partnered); 5) educational level (high school or less, greater than high school); 6) income (\$40,000 or less, more than \$40,000); and, 7) employment (unemployed vs. employed full or part time).

Analysis Strategy

Sample weights were applied in all analyses to adjust for sample stratification and uneven probabilities of selection due to survey design and non-response. Chi-square analyses and tests of difference in means were conducted in Stata Release 11 [39] using the Survey commands to account for survey design in statistical testing. Pearson Chi-square statistics are corrected for survey design and have been converted into F statistics in Stata. Because of multiple tests involved, a conservative alpha value of $p < .01$ was chosen to indicate significant differences.

Results

1) Prevalence of Drinking

Similar to findings from previous research, using a 30-day measure of alcohol substantially lowers the prevalence rates of alcohol use in the US population when compared to a 12-month measure. The weighted prevalence rate of any alcohol use in the last 12 months is 67.3 percent (66.0%, 68.7%) but decreases to 47.3 percent (45.8%, 48.8%) when the 30-day measure is used (McNemar test statistics=1384, $p < .001$). Thus, of the 4256 respondents who reported that they drank alcohol at least monthly, 1300 or 29.7% (28.0%, 31.4%) 12-month drinkers reported no alcohol use in the last 30 days.

Because it is argued that one advantage of a shorter time frame is recency and potentially better or at best, higher recall of alcohol use, we compared annual volume derived from the 30-day Quantity/Frequency measure (30-day measure multiplied by 12 months) with the 12-month Quantity/Frequency measure for the 30-day drinkers only ($N=2873$). We found that the 30-day measure yielded a slightly lower but not significant average number of drinks per year when compared to the 12-month measure (258.3 versus 268.5, $p < 0.449$).

2) Comparison of non 30 day and 30 day drinkers

Table 1 presents the demographic characteristics, alcohol volume, 5+ drinking and reports of alcohol-related problems for non 30 day drinkers ($n=1,300$), 30 day drinkers ($n=2,956$) drinkers, ex-drinkers ($n=1,447$) and lifetime abstainers ($n=1,216$). For most of the demographic comparisons, Non 30-day drinkers were significantly different from 30-Day drinkers as well as non-drinkers (ex-drinkers and lifetime abstainers) in different directions. For example, Non 30-day drinkers reported a lower education level, lower income and less employment than 30-Day drinkers but had a higher educational level, higher income, and higher employment than both ex-drinkers and lifetime abstainers. Non 30-Day Drinkers were also more likely to consume less alcohol, have fewer days of 5 or more drinks, and

report fewer social/health consequences of alcohol use and fewer alcohol dependence domains when compared to 30 day drinkers.

Looking more closely at what information is potentially missed by using 30 day measures, we compared non 30 days drinkers who did (n=237) and did not (n=1063) report heavy episodic drinking in the last 12 months. Heavy episodic drinking is defined as having 5 (4) or more drinks a day for men (women) at least once during the last 12 months, using question of the categorical maximum before GF series. We found that among respondents who did not report alcohol use in the last 30 days, those who reported heavy episodic drinking in the last 12-months also had significantly higher mean 12-month volume levels (285.6 versus 20.3 drinks per year, $p<0.001$), mean 12-month social consequences (0.33 versus 0.03, $p<0.001$), and mean 12-month alcohol dependence domains (0.56 versus 0.06, $p<0.001$).

3) Misclassification of non 30 day drinkers

To determine if there are misclassification errors among the non 30-day drinkers, we divided this group by those who reported less than monthly drinking on the 12 month overall frequency question (n=915), who can be considered the “true” non-30-day drinkers, and those who reported at least monthly drinking on the same item (n=385), potentially “misclassified” 30 day drinkers. Using the 12-month alcohol consumption and problem measures, Table 2 compares these two groups on volume, mean 5+ days, mean social consequences, and mean alcohol dependence symptoms. On all four measures, those who drank at least monthly drinking in the past 12 months reported significantly higher use of alcohol and higher reports of problems associated with alcohol as compared to those who reported drinking less than monthly.

When we compared the demographic characteristics of the “true” non 30-day drinkers with the misclassified drinkers (Table 3), we found that those who were misclassified (at least monthly drinkers on 12-month measure, but reported no drinking in last 30 days) were significantly more likely to be male, younger, with a higher income level.

Discussion

Using 30-day measures reduces the prevalence rate of alcohol use in the US by almost 20 percentage points. There are several implications of this lowered rate. First, one cannot presume that someone who has not consumed alcohol in the last 30 days is exempt from experiencing heavy episodic drinking and/or alcohol-related problems in the past 12 months. Infrequent drinkers can and do report having alcohol-related problems and a low prevalence rate, based on a 30-day measure, may minimize those who are at-risk for problems such as drunk driving as well as those who may need health or substance abuse services [40,41]. Finally, 30 day QF measures may mask drinking patterns which contribute to alcohol-related problems in that they typically do not capture heavy drinking episodes that may be infrequent. Further, average quantity/frequency measures are more likely to reflect the modal number of drinks consumed on drinking days by respondents as opposed to the mean number of drinks because infrequent heavy drinking days are not included [7].

Perhaps the most interesting finding of this research is that when we examined the non 30-day drinkers more closely, we found that 30 percent were inconsistent with what they reported on an overall frequency measure. This has serious implications for alcohol surveys that use 30-day measures which may, inadvertently, screen out respondents who should be asked about alcohol-related problems and services. If only the 30-day measure had been used in the NAS, as it is in some surveys, the 385 respondents who reported not drinking in the last 30 days but had already reported drinking monthly or more often on the overall

frequency measure would have been eliminated from the group that was asked in more detail about social and health consequences of alcohol use, 5+ measures, and alcohol dependence.

There are several reasons for these inconsistencies. First, respondents may have mistakenly reported non-drinking during the last 30 days (measurement error). Ideally in alcohol surveys, this inconsistency would be found before the interview ends so that the respondents have an opportunity to adjust their responses to reflect their actual drinking patterns. Second, respondents may have stopped drinking alcohol during the last 30-day period. Thus, they may have an average frequency of once a month, but have not consumed any alcohol in the last 30 days. Further, this inconsistency between the 30-day measure and overall frequency may indicate a larger degree of drinking variation across the 12-month period. For example, respondents may “on average” drink monthly but may have had long periods of time throughout the last year when they did not consume alcohol. Despite the cause of these inconsistencies, our analysis indicates that these 385 “inconsistent reporters” in our survey are different from the remaining non-30-day drinkers with respect to both drinking and alcohol-related problems and thus, the non 30-day drinker group should not be treated as homogenous.

It would be useful in alcohol surveys to include questions about periods of alcohol abstinence throughout the last year in order to adjust volume measures. One strategy may be to include items that determine if respondents had periods of time in the last year during which they did not consume any alcohol for one month or more. Respondents who report these periods of abstinence can then be asked how many times this happened and for how long. Further, it would be useful to determine why these periods of abstinence occurred (illness, recovery, pregnancy, etc.). Finding ways to quantify level of variability in drinking may be difficult to construct [42] but would strengthen our ability to provide better estimates of alcohol consumption and patterns over longer time periods.

We recognize that 30 day measures can be useful to describe heavier, frequent drinkers, particularly in younger drinking cohorts. However, based on the results of this study, we concur with the 12-month timeframe recommendations of the NIAAA Task Force on Recommended Alcohol Consumption Questions for alcohol surveys [43] and conclude that use of 30-day drinking measures seriously abbreviates drinking patterns of respondents that may misrepresent national drinking patterns.

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Table 1

Demographic characteristics, Alcohol volume, 5+ Heavy drinking and Alcohol-related problem measures of Non 30-day and 30-day 12-month drinkers (Weighted Percentages)

	Non 30-Day Drinker N=1,300	30-Day Drinker N=2,956	Ex-drinkers N=1,447	Lifetime abstainers N=1,216
DEMOGRAPHIC CHARACTERISTICS				
% Women	59.7	44.6 **	52.0 *	63.8
Age:				
18–29	21.0	20.8	14.9 **	25.9 **
30–49	45.0	41.7	37.2	32.7
50+	34.1	37.4	47.9	41.4
Ethnicity:				
White	70.2	77.9 **	65.0 *	52.7 **
Black	10.4	7.6	16.4	16.8
Hispanic	11.8	9.6	13.1	22.0
Other	7.7	4.9	5.5	8.5
% < HS graduate	9.6	5.8 **	16.3 **	21.2 **
% Income < median	45.5	33.4 **	57.7 **	64.1 **
% not partnered	41.5	39.7	40.6	43.3
% not employed	36.3	26.5 **	45.5 **	49.3 **
ALCOHOL VARIABLES				
Mean 12-mth Vol (Drinks/year-GF)	71.9	388.5 **	--	--
Mean 5+ Days (5+ days/year-GF)	4.4	20.7 **	--	--
Mean 12-month Social and Health Consequences	0.08	0.23 **	--	--
Mean 12-month Alcohol Dependence Domains	0.16	0.39 **	--	--

* p<0.01,

** p<0.001, Chi-square or t-test with Non 30-day Drinkers

Table 2

Misclassification of Non 30-Day Drinkers: Alcohol Consumption and Alcohol-Related Problem Measures of Non 30-day Drinkers (N=1,300) Who Reported having at least One Drink During the Prior 12 Months.

	Less than monthly drinking reported on 12- month Freq N=915	At least monthly drinking reported on 12-month Freq measure "Misclassified" N=385	t-statistics (df=1)
Mean 12-month Volume (drinks per year-GF)	25.9	177.8	t=5.87**
Mean 5+ Heavy Drinking Days (5+ days per year-GF)	1.3	11.5	t=3.96**
Mean Number of 12-month Social and Health Consequences	0.03	0.21	t=3.50**
Mean Number of 12-month Alcohol Dependence Domains	0.08	0.33	t=4.26**

*
p<0.01,

**
p<0.001

Table 3

Demographic Characteristics of consistent and inconsistent non-30-day drinkers

	Less than monthly drinking reported on 12-month Freq N=915	At least monthly drinking reported on 12- month Freq "Inconsistent" N=385	Pearson Chi-square test [†]
% Women	63.2	51.5	F(1, 1299)=9.63, p=0.002
Age:			
18–29	18.2	27.4	F(1.96, 2486)=5.02, p=0.007
30–49	45.1	44.6	
50+	36.7	28.0	
Ethnicity:			
White	71.3	67.6	F(2.45, 3186)=0.38, p=0.724
Black	10.0	11.2	
Hispanic	11.2	13.1	
Other	7.5	8.1	
% < HS graduate	9.8	9.0	F(1, 1293)=0.17, p=0.666
% Income <median	48.2	39.0	F(1, 1113)=4.96, p=0.026
% not partnered	43.6	36.5	F(1, 1295)=3.49, p=0.062
% not employed	36.3	36.3	F(1, 1299)=0.003, p=0.987

[†] Pearson Chi-square statistics are corrected for survey design and are converted into F statistics