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Epidemiological trends in drinking by age and gender: Providing normative feedback to adults[☆]

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Abstract

Objective: The purpose of this research was to evaluate drinking rates as a function of age and gender and to disseminate current estimates of U.S. population drinking norms based on age and gender.

Methods: Participants included 42,706 men and women 18 years and older who provided information about their drinking from the National Epidemiologic Survey on Alcohol and Related Conditions [National Alcohol Survey on Alcohol and Related Conditions (NESARC, 2001) dataset collected between 2001 and 2002 from a representative, non-institutionalized sample.

Results: Results revealed greater frequency and typical quantity of alcohol consumption among men versus women. Age differences in drinking frequency suggests a sharp increase with legal drinking age followed by a period of reduced frequency, in turn followed by gradual increase up to retirement age. Age differences in typical drinking quantity suggest a sharp increase with legal drinking age followed by a gradual linear decline in number of drinks per occasion. Age differences in typical quantity were more pronounced among men.

Conclusions: Analyses provide epidemiological trends in drinking rates by age and gender, and emphasize the importance of within group differences when examining drinking rates. Discussion focuses on explaining how to incorporate norms information in prevention and treatment.

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1. Introduction

The purpose of this research was to evaluate drinking rates as a function of age and gender and to disseminate current estimates of U.S. population drinking norms based on age and gender. Approximately 63 percent of adults 18 and over are current drinkers and have had at least one drink in the past year, and about half of Americans report drinking in the past month (NIAAA, 2004; SAMHSA, 2004). Despite declines in current, weekly, and heavy drinking in the early 1980s, overall drinking rates have been relatively unchanged since 1990 (Greenfield, Midanik, & Rogers, 2000; NIAAA, 2004; SAMHSA, 2004). With regard to alcohol abuse and dependence diagnoses, research suggests that dependence rates have decreased slightly since 1990, and the rates of alcohol abuse have risen from 7.41% to 8.46% (Grant et al., 2004). Within group differences in drinking rates by age and gender also help understand drinking in adulthood. The prevalence of alcohol abuse and dependence diagnoses, for example, peaks in early adulthood (18–25 y) and decreases with age (Grant et al., 2004; Li, Hewitt, & Grant, 2004). The prevalence of heavy episodic drinking follows a similar pattern increasing in young adulthood, and decreasing with older age (Greenfield & Rogers, 1999; SAMHSA, 2004). While heavy episodic drinking rates are concentrated in early adulthood, 70% of heavy drinking episodes are reported among adults aged 26 years and older (Naimi et al., 2003). Examining drinking rates for different demographic groups and by more specific constructs allows for a more comprehensive understanding of how general drinking rates differ within groups.

1.1. Age and gender differences in drinking rates

Adulthood (18 years and older) may represent the age group with the most dynamic alcohol consumption patterns. Research suggests that 18–29 year olds are more likely to have higher rates of current and weekly drinking than older adults. Even within this early adult age range, frequency rates vary significantly between 15–19, 20–24, and 25–29 year olds, until more homogenous consumption after age 30 (Johnstone, Leino, Ager, Ferrer, & Fillmore, 1996). Drinking quantity also has been shown to steadily decrease with age (York, Welte, & Hirsch, 2003).

Frequency and quantity rates have also been shown to differ significantly by gender. National studies show that the prevalence of drinking in the past month is significantly higher in men than in women (73% vs. 67%). However, this finding is covaried by age such that these differences are more pronounced beginning at age 18 versus at earlier ages (SAMHSA, 2004). Men have higher rates of moderate, binge, and heavy drinking than women, and being male has been shown to be the strongest predictor of current, weekly and heavy drinking (Greenfield et al., 2000; NIAAA, 2004).

1.2. The value of disseminating current and accurate estimates of drinking norms

Dissemination of current estimates for U.S. population drinking norms based on age and gender can provide a potentially valuable tool for clinicians. Most brief alcohol interventions provide feedback on how a participant's frequency (number of drinking days per week) and quantity (number of drinks per occasion) of alcohol consumption compares to others in their demographic cohort (e.g., female college students; Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001; Marlatt et al., 1998). This type of feedback typically ranks an individual's self reported consumption in a percentile (e.g., "Your percentile ranking is 90%, which suggests you drink as much or more than 90% of female college students") and has been

found to significantly reduce drinking among college students when provided as a stand alone intervention (Neighbors, Larimer & Lewis, 2004).

Brief feedback-based interventions have been implemented in a variety of settings such as primary care (Fleming et al., 1997; Fleming, Brown & Brown, 2004), trauma centers (Lincourt, Kuettel, & Bombardier, 2002; Soderstrom, DiClemente, Dischinger, Hebel & McDuff, 2005), Employee Assistance Programs (Chan, Zellmer, & Marlatt, 2005; Schneider, Casey & Kohn, 2000), and worksite settings (Anderson & Larimer, 2002). Cunningham, Wild, Bondy & Lin (2001) found that normative feedback with Canadian adult problem drinkers lowered alcohol use at follow-up. With a larger population sample, normative feedback in combination with self-help materials improved drinking outcomes (Cunningham, Koski-Jannes, Wild, & Cordingley, 2002). The motivational enhancement therapy (MET) condition of Project MATCH (1998) provided gender-specific feedback to adults based on the National Alcohol Survey as part of their therapy (Miller, Zweben, DiClemente & Rychtarik, 1994). Anderson and Larimer (2002) also utilized NAS' gender-specific feedback with adult employees and conducted a MET intervention based on the BASICS curriculum. They found that MET was effective in reducing drinking frequency for men and reducing alcohol-related negative consequences for women when compared to an assessment only group. Since Project MATCH, however, there has been no data published updating these gender norms. In addition to being somewhat out of date, estimates of U.S. drinking norms have not previously been provided which allow for easy construction of feedback regarding how an individual's drinking compares with typical drinking by others of the same gender and age group.

The current study focuses specifically on gender and age-specific drinking frequency and quantity feedback for adults 18 years and older from a nationally representative dataset.

2. Methods

2.1. Participants

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC, 2001) dataset was obtained from the National Institute on Alcohol Abuse and Alcoholism (NIAAA). These data were collected between 2001 and 2002 and consisted of non-institutionalized households living in the United States (N=43,093). The data primarily examined alcohol and drug use, abuse, dependence, and their associated disabilities. To more accurately reflect the drinking norms of current drinkers, participants that were reported as lifetime abstainers and former drinkers were considered non drinkers by recoding values for drinking frequency and quantity to zero. Given the present focus on drinking frequency and quantity, participants with either of those variables missing were excluded from the analyses. The resulting sample of 42,706 participants was comprised of 18,280 men (43%) and 24,426 women (57%) 18 years and older ($M_{age}=41$ years, $SD=9.95$). Race/ethnicity of the sample was 56.9% White, 19.1% Black, 1.6% American Indian/Alaska Native, 3.1% Asian/Native Hawaiian/Pacific Islander, and 19.3% Hispanic or Latino. Individuals aged 18–24 and racial/ethnic minorities were all over-sampled. The data were weighted by region, race, age, and sex to be nationally representative using NESARC's "weight" variable (Grant, Kaplan, Shepard, & Moore, 2003). To account for the influence of the complex sampling design and generate unbiased standard errors, the SUDAAN software package was used (Research Triangle Institute, 2002).

2.2. Procedure

Face-to-face interviews were conducted by approximately 1800 interviewers from the US Census Bureau on a random adult member of each housing unit and the overall survey response rate was 81% (see Grant et al., 2004 for interviewer training, experience, and quality control procedures).

2.3. Measures

Measures used in the present study were drawn from the Alcohol Use Disorder and Associated Disability Interview Schedule—DSM-IV Version (AUDADIS-IV), which has been used extensively in previous research (e.g., Canino et al., 1999; Chatterji et al., 1997; Grant et al., 2004). The reliability and validity of the AUDADIS-IV has been published extensively in numerous articles (e.g., Cottler et al., 1997; Grant et al., 2003; Grant, Harford, Dawson, Chou, & Pickering, 1995). The two dependent variables used in this study were frequency (the number of drinking days/occasions in an average week in the past 12 months) and quantity (the average number of drinks per drinking occasion in the past 12 months).

2.4. Variables

2.4.1. Frequency

Participants were shown flashcards indicating categorical options for frequency (“how often drank any alcohol in last 12 months”; never, less than once/month, 2–3×/month, 1×/week, 2×/week, 3–4×/week, nearly every day, and everyday). Values were recoded to reflect the number of drinking days or fraction thereof per week.

2.4.2. Typical quantity

Participants were asked an open-ended question for typical quantity per occasion, “number of drinks of any alcohol usually consumed on days when drank alcohol in last 12 months”. Preliminary analyses revealed a strong positive skew as a result of extreme values reported by some participants (e.g., 98 drinks per occasion). Values above 25 drinks per occasion (<1% of scores) were recoded as 25 to address this issue.

2.4.3. Drinks per week

The NESARC dataset provides a variable representing the average daily volume of ethanol intake for the past 12 months (NESARC, 2004). This variable was converted from ounces into standard drinks by dividing by 0.6 and was multiplied by 7 to calculate the number of standard drinks per week. The drinks per week variable has been used widely in feedback for various brief interventions (Anderson & Larimer, 2002; Chan et al., 2005) and has been shown to be one of the best measures of outcome in college students (Borsari, Neal, Collins, Carey, 2001).

3. Results

3.1. Frequency as a function of sex and age

Preliminary analyses revealed relatively complex non-linear relationships between age and drinking. Consequently, age was operationalized categorically using standard category ranges from national studies

(SAMHSA, 2004). SUDAAN's PROC REGRESS was used to examine weekly frequency of alcohol consumption as a function of sex and age category. Results revealed a main effect of sex, with men reporting more frequent consumption than women, $F(1, 65) = 744.41, p < .0001$. In addition, there were overall differences in weekly frequency of consumption across age categories, $F(10, 465) = 7.21, p < .0001$. The pattern of means suggested a relatively sharp increase in frequency associated with legal drinking age followed by general decline in frequency through ages 30–34 which was in turn followed by gradual increase in frequency through ages 50–54 and ending with a relatively sharp decline in the 65+ cohort. There were no significant variations in frequency as a function of age and sex, $F(10, 65) = 1.07, p = ns$.

3.2. Typical quantity per drinking occasion as a function of sex and age

Next, SUDAAN's PROC REGRESS was used to examine weekly typical quantity of alcohol consumption per drinking occasion, as a function of sex and age category. Results revealed a main effect of sex, with men consuming more drinks per occasion than women, $F(1, 65) = 614.97, p < .0001$. There were also overall differences in typical quantity per drinking occasion across age categories, $F(10, 65) = 35.27, p < .0001$. The pattern of means suggested that after an increase associated with legal drinking age, there was a gradual, relatively linear, decline in number of drinks per drinking occasion across age categories. The interaction between sex and age category revealed a sharper decline across age categories among men, $F(10, 65) = 10.26, p < .0001$.

3.3. Norm tables

A primary aim of this research was to disseminate current and accurate norms information in a way that will allow construction of population based normative feedback which is gender and age specific. Accordingly, Table 1 provides the percentages of men and women that consume varying number of drinks per week. For example, a man aged 30 who consumes an average of six drinks per week (assessed by the Daily Drinking Questionnaire; Collins, Parks, & Marlatt, 1985) could be given feedback that he drinks more than 73% of men his age in a typical week.

Table 2 provides average drinks per occasion for men and women by age category. Several personalized normative feedback interventions (e.g., Anderson & Larimer, 2002; Baer et al., 2001; Chan et al., 2005; Marlatt et al., 1998) have presented this information in bar graph format graphing three bars: (1) the average number of drinks an average adult *actually* drinks (i.e. obtained from Table 2), (2) the participant's *estimate* of how much the average adult drinks (assessed by the Drinking Norms Rating Form; Baer et al., 1991), and (3) the amount the participant drinks. As an example for the 30 year old man, Table 2 states that men between 30 and 34 years old tend to drink an average of 2.64 drinks per occasion. See Fig. 1 for an example of how this information would be graphed if the man estimated that men his age drink five drinks per occasion and he reported drinking three drinks per occasion.

4. Discussion

The current paper was designed to provide information regarding age- and gender-specific drinking rates of a representative population of US adults from the NESARC (2001) dataset. This information is

Table 1
Cumulative percentile of drinks per week by age and gender

| Men age | 0 | 1 | 2–3 | 4–5 | 6–8 | 9–12 | 13–19 | 20–29 | 30–39 | 40+ |
|-----------|-----|-----|-----|-----|-----|------|-------|-------|-------|------|
| Total | 32% | 65% | 71% | 76% | 80% | 84% | 87% | 90% | 93% | 100% |
| 18–20 | 20% | 49% | 59% | 65% | 73% | 79% | 85% | 90% | 93% | 100% |
| 21–25 | 19% | 53% | 63% | 71% | 78% | 84% | 91% | 94% | 97% | 100% |
| 26–29 | 21% | 57% | 68% | 76% | 82% | 88% | 93% | 96% | 97% | 100% |
| 30–34 | 25% | 57% | 67% | 73% | 80% | 86% | 91% | 95% | 97% | 100% |
| 35–39 | 26% | 60% | 68% | 74% | 80% | 86% | 91% | 94% | 95% | 100% |
| 40–44 | 27% | 59% | 69% | 75% | 81% | 86% | 91% | 94% | 96% | 100% |
| 45–49 | 28% | 61% | 70% | 75% | 81% | 86% | 92% | 95% | 96% | 100% |
| 50–54 | 32% | 65% | 72% | 78% | 84% | 89% | 94% | 97% | 98% | 100% |
| 55–59 | 36% | 68% | 74% | 77% | 83% | 88% | 93% | 96% | 97% | 100% |
| 60–64 | 45% | 73% | 78% | 82% | 87% | 91% | 95% | 98% | 99% | 100% |
| 65+ | 29% | 61% | 69% | 75% | 81% | 86% | 91% | 95% | 96% | 100% |
| Women age | 0 | 1 | 2–3 | 4–5 | 6–8 | 9–12 | 13–19 | 20–29 | 30–39 | 40+ |
| Total | 40% | 81% | 86% | 90% | 92% | 94% | 96% | 97% | 98% | 100% |
| 18–20 | 27% | 72% | 81% | 85% | 90% | 93% | 96% | 98% | 99% | 100% |
| 21–25 | 30% | 80% | 88% | 91% | 94% | 97% | 98% | 99% | 99% | 100% |
| 26–29 | 32% | 80% | 87% | 92% | 94% | 97% | 98% | 99% | 99% | 100% |
| 30–34 | 32% | 78% | 86% | 90% | 93% | 96% | 98% | 99% | 99% | 100% |
| 35–39 | 35% | 80% | 86% | 91% | 94% | 96% | 98% | 99% | 100% | 100% |
| 40–44 | 36% | 79% | 86% | 89% | 93% | 95% | 97% | 99% | 99% | 100% |
| 45–49 | 42% | 82% | 87% | 90% | 94% | 96% | 98% | 99% | 99% | 100% |
| 50–54 | 43% | 82% | 88% | 91% | 93% | 96% | 98% | 99% | 99% | 100% |
| 55–59 | 50% | 85% | 90% | 93% | 95% | 98% | 99% | 100% | 100% | 100% |
| 60–64 | 63% | 89% | 92% | 94% | 96% | 98% | 99% | 100% | 100% | 100% |
| 65+ | 41% | 81% | 87% | 91% | 94% | 96% | 98% | 99% | 99% | 100% |

important for provision of normative feedback as part of feedback-based interventions such as Motivational Enhancement Therapy (MET; Miller et al., 1994). The current paper also provides a snapshot of age- and gender-related differences in drinking frequency and quantity, which may assist with targeting intervention efforts.

Consistent with previous research, results indicate that on average, the US population drinks infrequently, with approximately 32% of men and 40% of women reporting no consumption of alcoholic beverages in the past year. Drinking frequency in adulthood is not uniform across age cohorts. Results show increases at age 21 and 35, and decreases at ages 26 and 65.

Consistent with previous research, the NESARC (2001) data indicate the period of peak consumption per occasion (quantity) occurred in the 18–29 year old age cohorts, with a slight increase coinciding with legal drinking age from ages 21–25, and decreasing linearly with age beginning at 30. This pattern was true for both men and women, though men continue to report more drinks per occasion than women in every age cohort. Again, results suggest the majority of the US population drinks moderately or not at all.

The current paper provides sex- and age-specific quantity and frequency tables which can be used to calculate percentile ranks and provide age- and gender-specific normative feedback, updating information previously in use since the early 1990's (Miller et al., 1994). Given the increase in brief

Table 2
Mean number of drinks per typical occasion by sex and age

| Age | Men | | Women | | Men and Women | |
|----------|------|------|-------|------|---------------|------|
| | Mean | SE | Mean | SE | Mean | SE |
| 18–20 | 3.40 | 0.13 | 1.80 | 0.08 | 2.62 | 0.08 |
| 21–25 | 3.41 | 0.09 | 1.99 | 0.05 | 2.68 | 0.05 |
| 26–29 | 2.91 | 0.09 | 1.53 | 0.04 | 2.21 | 0.05 |
| 30–34 | 2.64 | 0.07 | 1.50 | 0.04 | 2.07 | 0.04 |
| 35–39 | 2.49 | 0.07 | 1.44 | 0.03 | 1.95 | 0.04 |
| 40–44 | 2.28 | 0.06 | 1.29 | 0.03 | 1.78 | 0.04 |
| 45–49 | 2.10 | 0.06 | 1.22 | 0.04 | 1.65 | 0.04 |
| 50–54 | 1.83 | 0.05 | 0.97 | 0.03 | 1.39 | 0.03 |
| 55–59 | 1.60 | 0.06 | 0.92 | 0.03 | 1.25 | 0.03 |
| 60–64 | 1.49 | 0.07 | 0.77 | 0.03 | 1.11 | 0.04 |
| 65+ | 1.02 | 0.03 | 0.49 | 0.01 | 0.71 | 0.01 |
| All ages | 2.23 | 0.02 | 1.20 | 0.01 | 1.69 | 0.01 |

Values reflect participant self-report and may not reflect standard drinks.

interventions in a variety of applied settings (Anderson & Larimer, 2002; Chan et al., 2005; Fleming et al., 1997; 2004; Schneider et al., 2000), the availability of current normative information is critical for the successful implementation of these programs. In addition, the provision of age- and gender-specific normative information may be useful for accompanying other public health messages regarding alcohol, for use in more universal prevention efforts. This information also can accompany other components of feedback that can be gathered from a client's baseline assessment (e.g., beliefs about alcohol, high-risk drinking situations, negative consequences associated with drinking, and family history of drinking and their risk for alcohol problems; Anderson & Larimer, 2002; Chan et al., 2005; Dimeff, Baer, Kivlahan, & Marlatt, 1999). However, given promising findings with personalized normative feedback alone as an intervention in college populations (Neighbors et al., 2004; Lewis & Neighbors, 2004), research is warranted evaluating the impact of this minimal

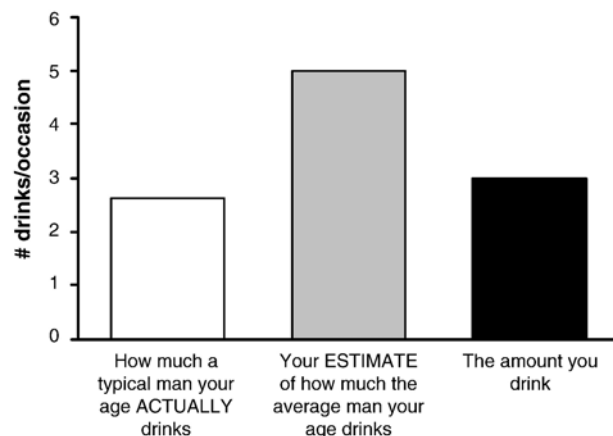


Fig. 1. Example of graphic normative feedback for number of drinks per occasion for a 30 year-old man.

intervention with older adults, and this research is facilitated by the availability of age- and gender-specific norms.

Despite the many strengths and opportunities for providing normative feedback in the context of alcohol prevention and treatment programs, there are several limitations and other important considerations that need to be addressed. Although NESARC (2001) is based on a large dataset that is nationally representative within age and ethnic groups, the current findings are primarily presented in terms of the respondent's age and gender. The primary purpose of this paper was to present information that would be useful to clinicians in helping their clients understand how their drinking compares with other adults of similar age and gender. Drinking rates vary as a function of numerous variables including ethnicity, SES, age, gender, region, presence of a comorbid disorder, etc. (e.g., Grant et al., 2004; Muthén & Muthén, 2000; NIAAA, 2004; O'Malley & Johnston, 2002; SAMHSA, 2004). As a result, future research may also provide explicit norms for various ethnic, education, or geographic subgroups.

Providing norms specific to the reference group (e.g., by demographics and/or setting) may potentially increase the impact of norms based feedback. The same principle could be extended to other population parameters including worksite, neighborhood, and social acquaintances that may impact the feedback given to individual drinkers. Recent research suggests sex-specific norms may be more useful for women than for men (Lewis & Neighbors, 2004) in college populations—research is needed to explore these moderators of efficacy of normative feedback interventions in adult populations.

The first wave of the NESARC survey was a cohort study and this paper does not include any longitudinal data that would provide feedback on changes and developmental trends in drinking rates. Although findings are presented for different age and gender groups, each of these is based on cross-sectional cohort data, so it would be inappropriate to predict future changes for any one age group. The second wave of the NESARC data collection was completed in September 2005, which would allow for longitudinal interpretation and future research could examine the stability of these findings over time. The data in this paper, however, do suggest a pattern or trajectory of drinking across the lifespan, which may be useful in the context of identifying intervention targets, both on the larger scale (i.e., continued efforts to target heavy episodic drinking among young adults, and efforts to reduce drinking frequency among older adults) as well as on the individual level. For example, in the context of brief interventions it may be useful to describe drinking trajectories and compare the individual's trajectory (i.e., increasing quantity of consumption) to the typical trajectory (decreasing quantity of consumption over time).

In closing, it is important to highlight the potential efficacy of providing up-to-date normative feedback about drinking rates and patterns among adult populations in a variety of health-care and worksite environments. Data from NESARC and similar studies are already available to be used in the context of screening and brief intervention programs, and more studies are needed to assess the utility of this inexpensive and practical normative feedback program.

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