Published in final edited form as:

Am J Drug Alcohol Abuse. 2014 November ; 40(6): 447–454. doi:10.3109/00952990.2014.938160.

A comparison between brand-specific and traditional alcohol surveillance methods to assess underage drinkers' reported alcohol use

Sarah P. Roberts, MPH^a, Michael B. Siegel, MD, MPH^a, William DeJong, PhD^a, and David H. Jernigan, PhD^b

^aBoston University School of Public Health, Department of Community Health Sciences, 801 Massachusetts Ave., Boston MA 02118

^bDepartment of Health, Behavior, and Society, Johns Hopkins Bloomberg School of Public Health, 624 West Broadway, Room 292, Baltimore, MD 21205, USA

Abstract

Background—Adolescent alcohol consumption remains common and is associated with many negative health outcomes. Unfortunately, common alcohol surveillance methods often underestimate consumption. Improved alcohol use measures are needed to characterize the landscape of youth drinking.

Objectives—We aimed to compare a standard quantity-frequency measure of youth alcohol consumption to a novel brand-specific measure.

Methods—We recruited a sample of 1,031 respondents across the United States to complete an online survey. Analyses included 833 male and female underage drinkers ages 13–20. Respondents reported on how many of the past 30 days they consumed alcohol, and the number of drinks consumed on an average drinking day. Using our brand-specific measure, respondents identified which brands they consumed, how many days they consumed each brand, and how many drinks per brand they usually had.

Results—Youth reported consuming significantly more alcohol (on average, 11 drinks more per month) when responding to the brand-specific versus the standard measure ($p < .001$). The two major predictors of the difference between the two measures were being a heavy episodic drinker ($p < .001$, 95% CI = 4.1 to 12.0) and the total number of brands consumed ($p < .001$, 95% CI = 2.0 to 2.8).

Corresponding Author: Ms. Sarah Roberts, Research Manager, Department of Community Health Sciences, Boston University School of Public Health, 801 Massachusetts Avenue, 3rd Floor, Boston, MA 02118. Phone: 617-414-1429; Fax: 617-638-4483; sprobert@bu.edu.

Contributors:

Authors Michael Siegel, David Jernigan, and William DeJong designed the study, wrote the protocol, and provided manuscript revisions. Author Sarah Roberts conducted relevant literature searches, statistical analysis and interpretation, and wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Declaration of Interest

The authors report no declarations of interest.

Conclusion—This study contributes to the field of alcohol and adolescent research first by investigating a potentially more accurate alcohol surveillance method, and secondly by promoting the assessment of alcohol use among adolescents vulnerable to risky alcohol use. Finally, our survey addresses the potential impact of alcohol marketing on youth and their subsequent alcohol brand preferences and consumption.

Keywords

Alcohol; Brand; Underage Drinking; Surveillance; Youth

Introduction

Alcohol use among underage drinkers continues to be a significant problem due to the well-documented negative outcomes associated with alcohol misuse (1–10). Therefore, accurately characterizing adolescent alcohol consumption patterns is of critical importance. Standardized assessments are employed to measure the quantity, frequency, and risk profile of adolescents' and young adults' drinking behavior, and through these methods a considerable body of self-reported alcohol consumption data is collected for research and surveillance purposes.

While useful, these methods do have important shortcomings. Studies comparing survey measures of overall alcohol consumption in adults with sales-based data have consistently shown that survey data falls short of accounting for the amount of alcohol that consumers purchase (11–15). Among these studies, only Foster and colleagues (2003) explicitly assessed how consumption by underage drinkers contributes to the discrepancy between alcohol sales and consumption data, making what the authors describe as a “conservative” estimate that 19.7% of alcohol consumed in the U.S. was attributable to underage drinkers (11). In addition, there is also evidence that youth may not accurately report alcohol consumption on survey measures (16–18), further emphasizing the need for testing alternative alcohol surveillance measures for youth. With this evidence base in mind, the purpose of this study is to explore a new brand-specific alcohol use measure that may improve the accuracy of youth alcohol consumption reporting and thereby help decrease the discrepancy between sales data and self-reported alcohol use data.

The most commonly employed survey method used to assess alcohol consumption is a quantity-frequency (QF) measure (15,19,20). The QF method multiplies the number of days respondents report drinking within a given reference period (e.g., past year, past 30 days, past 2 weeks) by their estimate of the average number of standard drinks (of any type) they consumed when they drank (15,19). Although a QF surveillance measure is simple to ask and answer, the broad sweep of the questions compromises its ability to capture a drinker's average alcohol consumption or to account for the context of alcohol use and the occurrence of single-episode risky drinking (15,21,19).

To improve the ability of the QF method to measure alcohol consumption accurately, several researchers have modified the approach by asking respondents additional beverage-specific QF questions regarding their consumption of wine, beer, and spirits. This research has found that, compared to a standard QF measure, respondents typically report higher

volumes of alcohol when asked about consumption of different beverage types (15,19,22–28). Even so, this more refined measure does not produce consumption estimates in line with alcohol sales data. For example, Kerr and Greenfield improved on the aggregate QF measure by using a beverage-specific measure, yet could still only account for 52% of alcohol sales in the United States (12).

In another refinement of beverage-specific alcohol measurement, Casswell and colleagues utilized a computer-assisted survey that measured alcohol consumption through a detailed series of location- and beverage-specific questions. With this resource-intensive procedure they were able to account for 94% of the taxable alcohol available to New Zealanders (22). Unfortunately, the extensive location-specific questions in Casswell's survey are less relevant to underage drinkers in the United States, as the places where underage youth in the U.S. can consume alcohol without fear of legal consequences are highly limited. Specifically, data from the 2007 Youth Risk Behavior Survey indicates that for every major alcoholic beverage type consumed (liquor, beer, malt beverages, and wine coolers) the most commonly reported drinking location was their own home or another person's home (29). Thus, rather than replicate the methods of Casswell and colleagues (22), we instead expanded on the beverage-specific survey strategy to create a brand-specific alcohol consumption measure for underage youth in the U.S.

Since beverage-specific QF questions appear more likely to yield accurate estimates of population-level alcohol consumption, we can posit that asking *brand*-specific questions might prompt survey respondents to provide an even more accurate and comprehensive accounting of their recent drinking behavior. Specific brands are highly salient to consumers: alcohol is marketed by brand, and consumers purchase certain brands according to their preference. As a result, alcohol consumers often associate their drinking behavior and even identity with specific brands (30–32). This is particularly relevant for adolescent and young adult alcohol consumption, given the substantial evidence that youth are not only exposed to alcohol brand marketing, but may be responding to such exposure with increased alcohol use (32–35,35–60).

Together, this body of research indicates that alcohol use among underage drinkers remains a significant public health threat, that adolescents are responsive to alcohol brand advertising, and that our current best methods of assessing alcohol use tend to underestimate true levels of youth consumption. To address these points, the primary aim of the present study is to compare underage drinkers' self-reported alcohol consumption via traditional QF measure to their self-reported consumption when provided a detailed list of brand-specific QF questions. We hypothesize that the brand-specific measure will yield greater reported alcohol consumption compared to the traditional measure.

Our secondary aim is to identify respondent characteristics and behavioral factors that are associated with the expected discrepancy between the brand-specific and traditional measures. Specifically, we hypothesize that youth who drink a greater number of alcohol brands will report a larger discrepancy between the two measures, as will those who are classified as heavy episodic drinkers, based on their reporting consumption of 5 or more drinks in one sitting.

Methods

Study Design

Our survey methodology has been published previously (61). The protocol was approved by the Institutional Review Board of the Boston University Medical Center. To summarize, this study surveyed a pre-recruited internet panel managed by the research organization Knowledge Networks (Palo Alto, CA) (62), consisting of 1,031 male and female underage drinkers, ranging in age from 13 to 20. Respondents were included only if they reported consuming at least one drink of alcohol in the past 30 days. Knowledge Networks recruited their adolescent panel members via email to participate in our internet-based survey; younger youth (ages 13–17) were recruited by contacting a parent member of the Knowledge Network panel, while older youth (ages 18–20) were contacted directly with information about the study. All youth completed a screening questionnaire that did not reveal the survey's purpose, and those who were eligible were provided an online consent form to review and sign. Following the consent procedure the youth completed the internet-based questionnaire. After finishing the survey, respondents were paid \$25.

Sample

Knowledge Networks maintains a pre-recruited panel of about 55,000 adults, ages 18 and older, who have agreed to take part in occasional online surveys (62). Panel members from all 50 U.S. states were recruited to join the Knowledge Panel® via probability-based address-based sampling (ABS) and random digit dialing (RDD) methods. These sampling methods ensure that respondents are randomly selected to join the Knowledge Panel® from a sample frame that includes 97% of households in the U.S., thereby avoiding the pitfalls of “opt-in” convenience sampling strategies (62). This sample frame includes households without landline telephones, residents with unlisted phone numbers, and households without Internet access. For the purpose of this study, we sought to achieve appropriate representation of panelists across race, ethnicity, and socioeconomic status by 1) oversampling telephone numbers from phone banks with higher concentrations of black and Hispanic residents and 2) providing no-cost internet access, training, and WebTV to subjects without an internet connection.

Weighting Procedures

As an additional step to render our sample more comparable to the general population, Knowledge Networks applied statistical weights to account for selection deviations (63). These weights adjusted for the different selection probabilities attendant with RDD- and ABS-based samples, and for our oversampling of minority communities. The weights also accounted for non-response to panel recruitment, and panel attrition. Using demographic distributions data from the U.S. Census Bureau's Current Population Survey (CPS), Knowledge Networks applied additional post-stratification weights that adjusted for age, gender, race/ethnicity, home ownership status, metropolitan area, census region, household income, and household size.

Response Rate

As there are no response rate reporting standards promulgated by the American Association for Public Opinion Research (AAPOR) that address internet panels, we used a modified version of these standards created by Callegaro and DiSogra (64). We will report the response rates for the younger youth vs. older youth separately since these samples were recruited differently.

The screening completion rate for 18- to 20-year olds (older youth) was 46.2% (2,288 invitations, 1,058 completed screenings); the survey completion rate was 93.8% (705 eligible respondents, 661 completed surveys). Therefore, the overall response rate for the older youth was 43.4% (46.2% multiplied by 93.8%).

For the 13- to 17-year-olds (younger youth) sample, the parent completion rate was 49.2% (approximately 4,757 eligible households with one or more teens, with 2,341 parents giving consent). The younger youth screening completion rate was 94.0% (2,341 invitations, 2,201 teens screened); the survey completion rate was 95.6% (387 eligible respondents, 370 completed surveys). Therefore, the overall response rate for the younger youth was 44.4% (49.2% multiplied by 94.0% multiplied by 95.6%).

Comparison of Respondents and Non-Respondents

The sample of older youth (18- to 20-year-olds) in our sample were recruited from Knowledge Networks enrolled panelists, allowing us to compare the demographic factors of respondents and non-respondents in order to address potential non-response bias. We used a chi-square test to assess whether there were meaningful differences in characteristics between respondents and non-respondents in the older youth sample and found that the non-respondents were similar in gender ($p=0.41$), but somewhat older ($p<0.05$), more likely to be Black ($p<0.0001$), to come from lower income households ($p<0.01$), and not to have internet access ($p<0.0001$). We found no significant differences by region ($p=0.11$). As the younger youth sample (13- to 17-year olds) was recruited via a parent or guardian belonging to the Knowledge Networks panel, we could not conduct this type of analysis. *Measures*

Using an online, self-administered questionnaire, we first employed the standard QF measure of alcohol consumption by asking the respondents to report on how many of the past 30 days they had at least one drink of alcohol, and the average number of drinks they consumed on a day when they drank.

To measure brand-specific alcohol consumption, we first ascertained each of the alcohol brands respondents consumed during the past 30 days. Using several sources, we generated a final list of 898 total brands in each of these beverage categories: 306 table wines, 132 beers, 86 vodkas, 77 cordials/liqueurs, 62 flavored alcoholic beverages, 54 rums, 33 tequilas, 29 whiskeys, 27 gins, 25 scotches, 23 bourbons, 15 brandies, 10 spirits-based energy drinks, 9 cognacs, 5 low-end fortified wines, and 5 grain alcohols.

For each alcohol category, the respondents indicated which specific brands they had consumed during the past 30 days. If a particular brand was not listed, then respondents entered as specific a name as possible. After identifying the universe of brands they had

consumed in the past 30 days, the respondents reported on how many of the past 30 days they consumed each brand and the average number of drinks of each brand they usually had on a day when they drank that brand.

We defined “drink” in accordance with the NIAAA definition of a “standard drink,” which is a beverage size containing 14 grams of pure alcohol (65). Thus, based on the average alcohol content of different alcoholic drinks, we defined a drink as a 12-ounce can or bottle of beer; 8.5 ounces of malt liquor; an 8.5-ounce flavored alcoholic beverage; an 8-ounce alcohol energy drink; a 12-ounce wine cooler; a 5-ounce glass of wine or champagne; 4 ounces of low-end fortified wine; 2.5 ounces of cordials or liqueurs (in a mixed drink, shot, or consumed alone); 1.5 ounces of liquor (spirits or hard alcohol, in a mixed drink, shot, or consumed alone); and 1 ounce of grain alcohol (in a mixed drink, shot, or consumed alone). In order to help respondents more accurately estimate their alcohol consumption, we provided a written definition and image of standard drink sizes at the beginning of the survey. Additionally, each survey item inquiring about alcohol consumption included the text “View the definition of a standard drink.” If the respondent moved their cursor over this text, the visual representation of standard drink sizes would re-appear.

Validation of Methodology

Based on the outcome of validation studies, behavioral data collected from the Knowledge Networks panel align closely with the estimates obtained from more commonly employed survey methods, such as national household, telephone, or in-person surveys (66–71). In fact, self-reports of alcohol use behavior obtained through a Knowledge Networks survey were found to be similar to data reported on the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) (68). This indicates that the Knowledge Networks panel is a viable—and less expensive—alternative to telephone and in-person survey techniques used to estimate alcohol consumption. In further support for the validation of our methodology, we conducted a full pilot test of the study using the same survey methods employed in the present study, but with a sample size of 100 completed surveys among 16- to 20-year-olds (72). We compared the results of the 18- to 20-year old respondents in our pilot study to findings from the 2007 MRI Survey of the Adult Consumer, which provides data on type-specific alcohol beverage preferences (72). We found a strong correlation ($r = .86$, $p = .0006$) between our beverage category preference estimates and those identified in the MRI survey (72). The concordance of the results from these two surveys demonstrated the validity of our methodology for determining type-specific patterns of alcohol consumption among underage drinkers, thus supporting the application of these methods for evaluating brand-specific alcohol consumption.

Statistical Analysis

The analyses include respondents who reported consuming one or more drinks in the past month on both the brand-specific QF measure and the traditional QF measure ($N=899$). To prevent the possibility of finding a difference between the two measures based on a small number of outliers, we deleted respondents ($N=66$) who reported consuming more than 200 drinks per month. All analyses included this final sample of 833 subjects.

The cutoff for maximum reported drinks per month was set at 200 based on the distribution of the brand-specific and traditional measurement data, which illustrated an asymptote at 200 units of alcohol per month. Because 200 drinks per month constitutes a substantial amount of alcohol to consume daily (nearly 7 drinks), we repeated the analyses using smaller maximum monthly consumption cutoffs to ensure that any difference between the mean number of drinks reported by the two measures was not a result of extreme values.

For both methods, the reported number of drinks consumed per month was positively skewed and not normally distributed. Accordingly, we ran a single-variable Wilcoxon signed-ranks test to compare the mean number of drinks per month calculated by the traditional method to the brand-specific method.

In line with our secondary aim, we also explored individual-level predictors of the difference between the traditional and brand-specific alcohol consumption measures using a multiple regression analysis controlling for respondent sex, age, race, and income. We computed the difference between the brand-specific and traditional QF measures by subtracting the estimated monthly alcohol consumption using the traditional measure from the estimated monthly consumption using the brand-specific measure. Therefore, a positive value for this difference indicates a respondent reported drinking more alcohol on the brand-specific measure, while a negative value indicates that a respondent reported drinking less alcohol on the brand-specific measure.

Results

Respondent characteristics

Sample demographics have been reported more extensively elsewhere (61). In short, the sample included 603 female respondents (58.5%) and 428 males (41.5%). Most respondents (88.6%) were between the ages of 16 and 20, while youth ages 13–15 accounted for the remaining 11.4% of the sample (N=117). The majority of respondents (57.4%, N=592) were non-Hispanic White; Hispanic youth (N=214) accounted for 20.8% of the sample, and 12.2% of respondents (N=126) identified as Black. Respondents who identified as mixed-race or “other” race were combined into the category “Other” (9.6%, N=99). Over two-thirds of the sample (71.4%, N=736) reported consuming alcohol on two or more days in the past month, and just under half of all respondents (49.7%, N=512) reported heavy episodic drinking in the past 30 days.

Comparison of number of drinks as measured by traditional vs. brand-specific method

The average number of drinks consumed during the past 30 days was significantly greater when measured by the brand-specific QF method instead of the traditional QF method (27.8 vs. 17.2, respectively, $p<.001$) Table 1. This difference remained significant when the cutoff for maximum number of drinks reported per month was reduced to 150 and then 100, suggesting the difference is unrelated to extreme values in reported recent alcohol use Table 2.

Over half of respondents reported more alcohol consumption when asked brand-specific questions about their recent drinking behavior, whereas only 16.6% of respondents reported

more drinks when responding to the traditional QF measure Table 3. For about one-quarter of respondents, the brand-specific measure produced an estimate of monthly alcohol consumption more than 11 drinks higher than the traditional QF measure.

Factors contributing to discrepancy between traditional and brand-specific alcohol measures

We next explored potential explanations for the observed difference between the brand-specific and traditional QF measures. First, the more brands of alcohol respondents indicated consuming, the greater the discrepancy between their traditional and brand-specific reports Table 4 Specifically, for every additional brand consumed, respondents reported an extra 2.4 drinks using the brand-specific method ($p < .001$, 95% CI = 2.0 to 2.8) compared to the traditional QF method. Second, respondents who engaged in heavy episodic drinking in the past reported 8.1 additional drinks when responding to the brand-specific questions ($p < .001$, 95% CI = 4.1 to 12.0). Third, the regression coefficient for respondent age indicated that compared to the oldest respondents (ages 19–20), the youngest respondents (ages 13–15) reported 3.7 more drinks when responding to the brand-specific measure ($p < .05$, 95% CI = 0.8 to 6.5). No additional demographic variables significantly predicted the difference between the traditional and brand-specific measures. The overall R^2 -value for the model was 0.27.

Discussion

To the best of our knowledge, this is the first study to compare a brand-specific QF measure and a standard QF measure to assess underage alcohol consumption. We found that youth reported consuming significantly more alcohol in the past 30 days when responding to brand-specific questions compared to traditional questions about overall alcohol use. Specifically, our survey respondents reported an average of 11 drinks more per month when completing the brand-specific surveillance measure compared to the traditional QF measure.

We found two major factors that predicted an increased discrepancy between the brand-specific and traditional QF measures. First, youth who reported drinking more brands of alcohol reported greater alcohol consumption when assessed by the brand-specific measure. Second, youth identified as recent heavy episodic drinkers were more likely to report greater alcohol consumption when assessed by the brand-specific measure.

What might account for these findings? First, the highly detailed, brand-specific measure may improve the ability of respondents who drink a wide range of brands and/or engage in heavy episodic drinking to recall the full scope of their drinking experiences. In contrast, the standard QF measure asks respondents to average out their recent consumption levels without any direct prompts that could improve their recall of specific drinking episodes. It is also possible that providing an up-front QF estimation might be more likely to trigger social desirability bias among these drinkers (73) and thereby cause them to under-report.

Another potential explanation for the relationship between heavy episodic drinker identity and greater reported alcohol use on the brand-specific measure is that youth who drink heavily may be more likely to engage in opportunistic drinking behavior. Thus, rather than

consuming a few select and preferred brands, it is possible that youth who drink heavily engage in a pattern of diverse and indiscriminate alcohol brand use better captured by a brand-level measure.

We also found that the youngest respondents (13–15 years old) were more likely to have a brand-specific consumption measure that exceeded the traditional QF measure. Any explanation would be entirely speculative, but it is possible that younger drinkers may experiment with more brands of alcohol as they develop drinking preferences. Conversely, it could be possible that younger drinkers are less familiar with alcohol brand distinctions and are therefore more likely to misremember or even over-report brand-specific consumption. Future research with this measure would benefit from repeating this survey among a larger sample of young underage drinkers (ages 13–15) and among a sample of adults ages 21 and over. Such research could yield important findings regarding the development of alcohol brand preferences and consumption patterns, and would provide important insight into the relationship between age, brand-consciousness, and reported brand preference. Other potential predictors of the discrepancy between the brand-specific and traditional measures, such as respondents' usual source of alcohol or their reported exposure to alcohol marketing, also warrant investigation.

Another valuable study would be to compare this brand-level measure to a context-specific survey such as the one utilized by Casswell and colleagues (22). While promoting alcohol use recall via drinking location prompts may be less effective among youth who are limited in where they can legally consume alcohol, such a comparison of methods would nevertheless provide important data regarding the predictors of measurement response difference as well as another opportunity to compare overall alcohol consumption trends between the two surveys.

Finally, additional research is needed to assess the predictive validity of the brand-specific measure compared to the traditional survey items. Specifically, it would be important to analyze the relationship between reported alcohol consumption on each measure and respondents' reported alcohol-related outcomes such as fights, injuries, and other health and social consequences of drinking.

Limitations

The major limitation of our study is the lack of a “gold standard” by which to determine actual alcohol consumption, and therefore we cannot be absolutely certain whether youth are under-reporting alcohol consumption when using the traditional QF measure or if they are over-reporting consumption when using the brand-specific measure. It is possible that utilization of a brand-specific measure that includes nearly 900 brands of alcohol could prompt over-estimation of one's alcohol consumption, rather than promoting better recall. That said, in light of previous research suggesting that more specific alcohol consumption measures appear to match up more closely with sales-based data (12,22), we think that under-reporting on the traditional measure is the more likely explanation. Notably, the average proportion of alcohol sales accounted for by traditional alcohol consumption surveys is only about 40–60% (12,15). We found that our brand-specific measure accounted for approximately 60% more alcohol consumption than the traditional QF survey items (27.8

drinks on average vs. 17.2 drinks, respectively). If this observed difference held true for the entire U.S. population, then the brand-specific measure could substantially close the gap between the consumption survey data and sales data.

An additional limitation of this paper is that the response rates of 43% among 18- to 20-year-olds and 44% among 13- to 17-year-olds create the potential for non-response bias, a type of selection bias. In light of our comparison of respondents and non-respondents, the primary concern is that both Black and lower-income youth were less likely to have completed the survey. In order to diminish the potential for non-response bias, we adjusted our estimates via post-stratification by weighting survey responses from Black and lower-income youth more heavily. While non-response bias could potentially limit our ability to generalize these findings to some population subgroups, we do not believe it has affected our overall findings or threatened the study's internal validity as we did not find any relationship between respondents' income or race and the primary outcome measures. Moreover, because the analysis compared different alcohol measures within and not between individuals, the response rate does not threaten the internal validity of the study.

Conclusions

Despite the limitations described here, our study successfully implemented a survey of underage drinkers' recent alcohol consumption using a unique brand-specific QF measure. Our findings are relevant to the field of alcohol and adolescent health research for a number of reasons. First, this paper takes an important step towards improving the specificity of alcohol surveillance methods, as our research suggests a brand-specific measure may more accurately capture the full scope of underage drinkers' alcohol consumption. While any comparison of brand-specific consumption to U.S. sales data would pertain specifically to drinkers aged 21 and over, this study demonstrates the utility of a novel alcohol measurement approach that can be employed in future studies of youth and adult drinkers. Secondly, this study has important implications for promoting the assessment of alcohol use among adolescents, a population at risk for harmful short and long-term consequences related to alcohol use. Finally, the brand-specific nature of our survey sheds light on important information regarding the potential impact of alcohol marketing on youth, particularly as it pertains to the intersection of alcohol brand preferences and risky drinking behavior.

Our findings highlight the need for further research comparing measures of brand-specific consumption to other surveillance methods and alcohol sales data. As it stands, this study suggests that modifying alcohol surveillance measures to include brand-specific questions has valuable potential for improving reporting accuracy. While this brand-specific measure is extensive in its scope, our pilot data suggests that the survey can be completed reasonably quickly (median time of completion: 16 minutes; 68.5% of pilot respondents completed the survey in less than 20 minutes [72]). Future iterations of the measure can be tailored to better target alcohol brand use by region, population, or other characteristics.

Acknowledgments

Grant Support: This research was supported by grant R01 AA020309-01 from the National Institute on Alcohol Abuse and Alcoholism (NIAAA). NIAAA had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

Grant Support: This research was supported by a grant from the National Institute on Alcohol Abuse and Alcoholism (R01 AA020309-01).

References

1. Bye EK, Rossow I. The impact of drinking pattern on alcohol-related violence among adolescents: An international comparative analysis: Drinking patterns and violence in adolescence. *Drug Alcohol Rev.* Oct 5; 2009 29(2):131–137. [PubMed: 20447219]
2. Committee on Substance Abuse. Alcohol Use by Youth and Adolescents: A Pediatric Concern. *Pediatrics.* Apr 12; 2010 125(5):1078–1087. [PubMed: 20385640]
3. Currie, C. Social determinants of health and well-being among young people: health behaviour in school-aged children (HBSC) study: international report from the 2009/2010 survey. Copenhagen: WHO Regional Office for Europe; 2012. World Health Organization, Regional Office for Europe, Health Behaviour in School-aged Children (survey).
4. Mason WA, Toumbourou JW, Herrenkohl TI, Hemphill SA, Catalano RF, Patton GC. Early age alcohol use and later alcohol problems in adolescents: Individual and peer mediators in a bi-national study. *Psychol Addict Behav.* 2011; 25(4):625–633. [PubMed: 21553944]
5. Rehm J, Gmel G, Sempos CT, Trevisan M. Alcohol-related morbidity and mortality. *Alcohol Res Health J Natl Inst Alcohol Abuse Alcohol.* 2003; 27(1):39–51.
6. Rehm J, Taylor B, Room R. Global burden of disease from alcohol, illicit drugs and tobacco. *Drug Alcohol Rev.* Nov 1; 2006 25(6):503–513. [PubMed: 17132570]
7. Stueve A, O'Donnell LN. Early alcohol initiation and subsequent sexual and alcohol risk behaviors among urban youths. *Am J Public Health.* 2005; 95(5):887–893. [PubMed: 15855470]
8. Toumbourou JW, Hemphill SA, McMorris BJ, Catalano RF, Patton GC. Alcohol use and related harms in school students in the USA and Australia. *Health Promot Int.* Nov 2; 2009 24(4):373–382. [PubMed: 19884245]
9. Verdurmen J, Monshouwer K, van Dorsselaer S, ter Bogt T, Vollebergh W. Alcohol use and mental health in adolescents: interactions with age and gender-findings from the Dutch 2001 Health Behaviour in School-Aged Children survey. *J Stud Alcohol.* Sep; 2005 66(5):605–609. [PubMed: 16329458]
10. World Health Organization. Global status report on alcohol and health. Geneva, Switzerland: World Health Organization; 2011. p. 286
11. Foster SE, Vaughan RD, Foster WH, Califano JA Jr. Alcohol consumption and expenditures for underage drinking and adult excessive drinking. *JAMA J Am Med Assoc.* Feb 26; 2003 289(8): 989–995.
12. Kerr WC, Greenfield TK. Distribution of Alcohol Consumption and Expenditures and the Impact of Improved Measurement on Coverage of Alcohol Sales in the 2000 National Alcohol Survey. *Alcohol Clin Exp Res.* Oct; 2007 31(10):1714–1722. [PubMed: 17651465]
13. Lemmens P, Tan ES, Knibbe RA. Measuring quantity and frequency of drinking in a general population survey: a comparison of five indices. *J Stud Alcohol.* Sep; 1992 53(5):476–486. [PubMed: 1405641]
14. Midanik L. The Validity of Self-Reported Alcohol Consumption and Alcohol Problems: A Literature Review. *Addiction.* Dec; 1982 77(4):357–382.
15. Rehm J. Measuring quantity, frequency, and volume of drinking. *Alcohol Clin Exp Res.* 1998; 22(S2):4s–14s. [PubMed: 9603301]
16. Gfroerer J, Wright D, Kopstein A. Prevalence of youth substance use: the impact of methodological differences between two national surveys. *Drug Alcohol Depend.* Jul 25; 1997 47(1):19–30. [PubMed: 9279494]

17. White AM, Kraus CL, Flom JD, Kestenbaum LA, Mitchell JR, Shah K, et al. College students lack knowledge of standard drink volumes: implications for definitions of risky drinking based on survey data. *Alcohol Clin Exp Res.* Apr; 2005 29(4):631–638. [PubMed: 15834229]
18. Harris KM, Griffin BA, McCaffrey DF, Morral AR. Inconsistencies in self-reported drug use by adolescents in substance abuse treatment: Implications for outcome and performance measurements. *J Subst Abuse Treat.* Apr; 2008 34(3):347–355. [PubMed: 17614240]
19. Bloomfield K, Hope A, Kraus L. Alcohol survey measures for Europe: A literature review. *Drugs Educ Prev Policy.* Jan 9.2012 :1–13.
20. Centers for Disease Control and Prevention (CDC). 2013 Behavioral Risk Factor Surveillance System Questionnaire [Internet]. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2013. Available from: http://www.cdc.gov/brfss/questionnaires/pdf-ques/2013%20BRFSS_English.pdf [cited 2013 Oct 17]
21. Dawson DA. Methodological issues in measuring alcohol use. *Alcohol Res Health J Natl Inst Alcohol Abuse Alcohol.* 2003; 27(1):18–29.
22. Casswell S, Huckle T, Pledger M. Survey data need not underestimate alcohol consumption. *Alcohol Clin Exp Res.* 2002; 26(10):1561–1567. [PubMed: 12394290]
23. Ekholm O, Strandberg-Larsen K, Grønbaek M. Influence of the recall period on a beverage-specific weekly drinking measure for alcohol intake. *Eur J Clin Nutr.* 2011; 65(4):520–525. [PubMed: 21326272]
24. Feunekes GI, van't Veer P, van Staveren WA, Kok FJ. Alcohol intake assessment: the sober facts. *Am J Epidemiol.* 1999; 150(1):105–112. [PubMed: 10400547]
25. Gmel G, Graham K, Kuendig H, Kuntsche S. Measuring alcohol consumption-should the “graduated frequency” approach become the norm in survey research? *Addiction.* Jan; 2006 101(1):16–30. [PubMed: 16393189]
26. Russell M, Welte JW, Barnes GM. Quantity-frequency measures of alcohol consumption: beverage-specific vs global questions. *Br J Addict.* 1991; 86(4):409–417. [PubMed: 2054535]
27. Serdula MK, Mokdad AH, Byers T, Siegel PZ. Assessing alcohol consumption: beverage-specific versus grouped-beverage questions. *J Stud Alcohol.* Jan; 1999 60(1):99–102. [PubMed: 10096314]
28. Williams GD, Proudfit AH, Quinn EA, Campbell KE. Variations in quantity-frequency measures of alcohol consumption from a general population survey. *Addiction.* 1994; 89(4):413–420. [PubMed: 8025494]
29. Siegel MB, Naimi TS, Cromeens JL, Nelson DE. Alcoholic Beverage Preferences and Associated Drinking Patterns and Risk Behaviors Among High School Youth. *Am J Prev Med.* Apr; 2011 40(4):419–426. [PubMed: 21406275]
30. Tanski SE, McClure AC, Jernigan DH, Sargent JD. Alcohol brand preference and binge drinking among adolescents. *Arch Pediatr Adolesc Med.* 2011; 165(7):675. [PubMed: 21727284]
31. Mosher JF. Joe Camel in a bottle: Diageo, the Smirnoff brand, and the transformation of the youth alcohol market. *J Inf [Internet].* 2012; 102(1) Available from: <http://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.2011.300387>.
32. Henriksen L, Feighery EC, Schleicher NC, Fortmann SP. Receptivity to Alcohol Marketing Predicts Initiation of Alcohol Use. *J Adolesc Health.* Jan; 2008 42(1):28–35. [PubMed: 18155027]
33. Jackson MC, Hastings G, Wheeler C, Eadie D, MacKintosh AM. Marketing alcohol to young people: implications for industry regulation and research policy. *Addiction.* Dec 10; 2000 95(12):597–608.
34. Casswell S. Alcohol brands in young people's everyday lives: New developments in marketing. *Alcohol Alcohol.* Oct 5; 2004 39(6):471–6. [PubMed: 15456692]
35. Jernigan DH, Ostroff J, Ross C, O'Hara JA III. Sex differences in adolescent exposure to alcohol advertising in magazines. *Arch Pediatr Adolesc Med.* 2004; 158(7):629. [PubMed: 15237061]
36. Chen M-J, Grube JW, Bersamin M, Waiters E, Keefe DB. Alcohol Advertising: What Makes It Attractive to Youth? *J Health Commun.* Sep; 2005 10(6):553–65. [PubMed: 16203633]
37. Collins RL, Ellickson PL, McCaffrey DF, Hambarsoomians K. Saturated in beer: Awareness of beer advertising in late childhood and adolescence. *J Adolesc Health.* Jul; 2005 37(1):29–36. [PubMed: 15963904]

38. Gordon R, Hastings G, Moodie C. Alcohol marketing and young people's drinking: what the evidence base suggests for policy. *J Public Aff.* Sep 30; 2009 10(1–2):88–101.
39. Nelson MR, McLeod LE. Adolescent brand consciousness and product placements: awareness, liking and perceived effects on self and others. *Int J Consum Stud.* 2005; 29(6):515–28.
40. Dal Cin S, Worth KA, Dalton MA, Sargent JD. Youth exposure to alcohol use and brand appearances in popular contemporary movies. *Addiction.* Dec; 2008 103(12):1925–32. [PubMed: 18705684]
41. King C, Siegel M, Jernigan DH, Wulach L, Ross C, Dixon K, et al. Adolescent Exposure to Alcohol Advertising in Magazines: An Evaluation of Advertising Placement in Relation to Underage Youth Readership. *J Adolesc Health.* Dec; 2009 45(6):626–33. [PubMed: 19931836]
42. Chung PJ, Garfield CF, Elliott MN, Ostroff J, Ross C, Jernigan DH, et al. Association between adolescent viewership and alcohol advertising on cable television. *Am J Public Health.* 2010; 100(3):555–62. [PubMed: 19696391]
43. Grier SA, Kumanyika S. Targeted Marketing and Public Health. *Annu Rev Public Health.* Mar; 2010 31(1):349–69. [PubMed: 20070196]
44. Gordon R. An audit of alcohol brand websites. *Drug Alcohol Rev.* 2011; 30(6):638–44. [PubMed: 21355900]
45. Primack BA, Nuzzo E, Rice KR, Sargent JD. Alcohol brand appearances in US popular music: Alcohol brand appearances. *Addiction.* Mar; 2012 107(3):557–66. [PubMed: 22011113]
46. Ross CS, Ostroff J, Jernigan DH. Evidence of underage targeting of alcohol advertising on television in the United States: Lessons from the Lockyer v Reynolds decisions. *J Public Health Policy.* Feb; 2014 35(1):105–18. [PubMed: 24424494]
47. Anderson P, de Bruijn A, Angus K, Gordon R, Hastings G. Impact of Alcohol Advertising and Media Exposure on Adolescent Alcohol Use: A Systematic Review of Longitudinal Studies. *Alcohol Alcohol.* Feb 23; 2009 44(3):229–43. [PubMed: 19144976]
48. Collins RL, Ellickson PL, McCaffrey D, Hambarsoomians K. Early Adolescent Exposure to Alcohol Advertising and Its Relationship to Underage Drinking. *J Adolesc Health.* Jun; 2007 40(6):527–34. [PubMed: 17531759]
49. Ellickson PL, Collins RL, Hambarsoomians K, McCaffrey DF. Does alcohol advertising promote adolescent drinking? Results from a longitudinal assessment. *Addiction.* Feb; 2005 100(2):235–46. [PubMed: 15679753]
50. Engels RCME, Hermans R, van Baaren RB, Hollenstein T, Bot SM. Alcohol Portrayal on Television Affects Actual Drinking Behaviour. *Alcohol Alcohol.* Feb 23; 2009 44(3):244–9. [PubMed: 19237443]
51. Gordon R, MacKintosh AM, Moodie C. The Impact of Alcohol Marketing on Youth Drinking Behaviour: A Two-stage Cohort Study. *Alcohol Alcohol.* Aug 25; 2010 45(5):470–80. [PubMed: 20739441]
52. Grube JW, Wallack L. Television beer advertising and drinking knowledge, beliefs, and intentions among schoolchildren. *Am J Public Health.* 1994; 84(2):254–9. [PubMed: 8296950]
53. Hanewinkel R, Sargent JD. Longitudinal Study of Exposure to Entertainment Media and Alcohol Use Among German Adolescents. *PEDIATRICS.* Mar 2; 2009 123(3):989–95. [PubMed: 19255030]
54. Hanewinkel R, Tanski SE, Sargent JD. Exposure to alcohol use in motion pictures and teen drinking in Germany. *Int J Epidemiol.* Jun 22; 2007 36(5):1068–77. [PubMed: 17586537]
55. McClure AC, Dal Cin S, Gibson J, Sargent JD. Ownership of Alcohol-Branded Merchandise and Initiation of Teen Drinking. *Am J Prev Med.* Apr; 2006 30(4):277–83. [PubMed: 16530613]
56. Morgenstern M, Isensee B, Sargent JD, Hanewinkel R. Exposure to alcohol advertising and teen drinking. *Prev Med.* Feb; 2011 52(2):146–51. [PubMed: 21130108]
57. Primack BA, Kraemer KL, Fine MJ, Dalton MA. Media Exposure and Marijuana and Alcohol Use Among Adolescents. *Subst Use Misuse.* Jan; 2009 44(5):722–39. [PubMed: 19306219]
58. Sargent JD, Wills TA, Stoolmiller M, Gibson J, Gibbons FX. Alcohol use in motion pictures and its relation with early-onset teen drinking. *J Stud Alcohol Drugs.* 2006; 67(1):54.

59. Smith LA, Foxcroft DR. The effect of alcohol advertising, marketing and portrayal on drinking behaviour in young people: systematic review of prospective cohort studies. *BMC Public Health*. 2009; 9(1):51. [PubMed: 19200352]
60. Snyder LB, Milici FF, Slater M, Sun H, Strizhakova Y. Effects of alcohol advertising exposure on drinking among youth. *Arch Pediatr Adolesc Med*. 2006; 160(1):18. [PubMed: 16389206]
61. Siegel M, DeJong W, Naimi TS, Fortunato EK, Albers AB, Heeren T, et al. Brand-Specific Consumption of Alcohol Among Underage Youth in the United States. *Alcohol Clin Exp Res*. Jul; 2013 37(7):1195–203. [PubMed: 23398328]
62. Knowledge Networks. KnowledgePanel(R) Design Summary [Internet]. Menlo Park, CA: Knowledge Networks; 2013. Available from: <http://www.knowledgenetworks.com/knpanel/docs/KnowledgePanel%28R%29-Design-Summary-Description.pdf> [cited 2013 Oct 17]
63. DiSogra, C. Overview of KnowledgePanel(R) Weighting Protocol [Internet]. Menlo Park, CA: Knowledge Networks; 2009. Available from: <http://www.knowledgenetworks.com/ganp/docs/kn-weighting-synopsis.pdf>
64. Callegaro M, DiSogra C. Computing Response Metrics for Online Panels. *Public Opin Q*. Jan 29; 2009 72(5):1008–32.
65. National Institute on Alcohol Abuse and Alcoholism (NIAAA). What is a standard drink?. Rockville, MD [Internet]: National Institute on Alcohol Abuse and Alcoholism; 2014. Available from: http://pubs.niaaa.nih.gov/publications/Practitioner/pocketguide/pocket_guide2.htm [cited 2014 Jan 23]
66. Bethell C, Fiorillo J, Lansky D, Hendryx M, Knickman J. Online consumer surveys as a methodology for assessing the quality of the United States health care system. *J Med Internet Res*. Jan 20.2004 6(1):e2. [PubMed: 15111268]
67. Chang L, Krosnick JA. National Surveys Via Rdd Telephone Interviewing Versus the Internet: Comparing Sample Representativeness and Response Quality. *Public Opin Q*. Dec 1; 2009 73(4): 641–78.
68. Heeren T, Edwards EM, Dennis JM, Rodkin S, Hingson RW, Rosenbloom DL. A comparison of results from an alcohol survey of a prerecruited Internet panel and the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Clin Exp Res*. Feb; 2008 32(2):222–9. [PubMed: 18162076]
69. Novak SP, Kroutil LA, Williams RL, Van Brunt DL. The nonmedical use of prescription ADHD medications: results from a national Internet panel. *Subst Abuse Treat Prev Policy*. 2007; 2:32. [PubMed: 17974020]
70. Smith TW. An Experimental Comparison of Knowledge Networks and the GSS. *Int J Public Opin Res*. Jun 1; 2003 15(2):167–79.
71. Yeager DS, Krosnick JA, Chang L, Javitz HS, Levendusky MS, Simpser A, et al. Comparing the Accuracy of RDD Telephone Surveys and Internet Surveys Conducted with Probability and Non-Probability Samples. *Public Opin Q*. Oct 5; 2011 75(4):709–47.
72. Siegel M, DeJong W, Naimi TS, Heeren T, Rosenbloom DL, Ross C, et al. Alcohol brand preferences of underage youth: results from a pilot survey among a national sample. *Subst Abuse Off Publ Assoc Med Educ Res Subst Abuse*. Oct; 2011 32(4):191–201.
73. Davis CG, Thake J, Vilhena N. Social desirability biases in self-reported alcohol consumption and harms. *Addict Behav*. Apr; 2010 35(4):302–11. [PubMed: 19932936]

Table 1

Self-reported total number of alcoholic drinks consumed during the past 30 days by type of survey method

<i>Survey Method</i>	Weighted		Unweighted	
	<i>Mean^a (SD)</i>	<i>N</i>	<i>Mean^a (SD)</i>	<i>N</i>
Traditional QF	17.2 (38.4)	833	16.1 (39.0)	833
Brand-Specific QF	27.8 ^{***b} (24.3)	833	26.0 ^{***} (25.9)	833

^aFor both survey methods, the maximum number of self-reported drinks was capped at 200. We conducted a single-variable Wilcoxon signed-ranks test to assess the difference between the two methods.

^b
 $p < 0.05$

*
 $p < 0.05$

**
 $p < 0.01$

 $p < 0.001$

Table 2

Mean differences in self-reported total number of drinks between the traditional and brand-specific QF methods by total consumption cap

Maximum number of drinks reported ^a	Mean difference: ^b Weighted ^c	Mean difference: ^b Unweighted ^d	N
None	41.1 *** ^e	44.3 ***	899
200	10.6 ***	9.9 ***	833
150	8.4 ***	7.4 ***	806
100	6.3 ***	5.6 ***	772

^aFor both survey methods, the maximum number of self-reported drinks was capped at 200, 150, or 100.

^bThe mean difference is determined by subtracting the total number of drinks in the past 30 days reported via the traditional QF survey method from the total number of drinks in the past 30 days reported via the brand-specific QF survey method.

^cFor weighted values, we conducted a student's t-test to assess the difference between the two methods.

^dFor unweighted values, we conducted a single-variable Wilcoxon signed-ranks test to assess the difference between the two methods.

^e $p < 0.05$,

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$

Table 3

Number and percentage of respondents by the size of the difference between brand-specific QF and traditional QF measures of total alcohol consumption in the past 30 days

Difference in self-reported total number of drinks: (Brand-specific QF—Traditional QF) ^a	Percentage of respondents	Number of respondents
<-50	0.8	8
-11 to -50	4.0	38
-1 to -10	14.4	137
0	24.2	229
1 to 10	27.2	257
11 to 50	15.6	148
>50	13.8	128

^aThe difference is determined by subtracting the total number of drinks in the past 30 days reported via the traditional QF survey method from the total number of drinks in the past 30 days reported via the brand-specific QF survey method. For both survey methods, the maximum number of self-reported drinks was capped at 200, 150, or 100.

Table 4

Linear regression analysis: Predictors of difference between monthly alcohol consumption measurement methods

Variables	Weighted		Unweighted	
	Regression Coefficient ^a	95% CI	Regression Coefficient	95% CI
Intercept	-9.6	-15.5,-3.8	-5.9	-11.9,0.2
Number of brands consumed	2.4 *** ^b	2.0,2.8	1.9 ***	1.6,2.3
Heavy episodic drinker (N=369)	8.1 ***	4.1,12.0	9.7 ***	5.5,13.8
Cigarette smoker (N=211)	2.4	-1.6,6.5	0.8	-3.5,5.1
Sex: Female (N=494)	3.0	-0.4,6.3	2.2	-1.6,6.0
Age: 16-18 (N=383)	3.2	-0.4,6.8	-0.9	-5.0,3.2
Age: 13-15 (N=88)	3.7 *	0.8,6.5	2.7	-0.5,5.9
Income: \$15K-\$39.9K (N=218)	-2.9	-8.9,3.1	-3.6	-9.1,1.8
Income: \$40K-\$99.9K (N=303)	-0.9	-6.2,4.4	0.2	-5.2,5.5
Income: \$100K+ (N=140)	1.2	-4.6,7.0	1.6	-4.8,8.0
Race: Black (N=99)	3.8	-2.4,9.9	5.6	-0.5,11.7
Race: Hispanic (N=161)	-0.1	-4.2,4.1	0.5	-4.3,5.3
Race: Other (N=75)	3.1	-3.4,9.5	5.6	-1.0,12.2

^aOutcome variable is the difference between alcohol consumption surveillance methods, determined by subtracting the total number of drinks in the past 30 days reported via the traditional QF survey method from the total number of drinks in the past 30 days reported via the brand-specific QF survey method.

^b $P < 0.05$,

* $P < 0.05$,

** $P < 0.01$,

*** $P < 0.001$.