

Brand-Specific Consumption of Alcohol Among Underage Youth in the United States

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Background: Little is known about brand-specific alcohol consumption among underage youth, as existing information is collected at the level of alcoholic beverage type. This study identifies the alcohol brands consumed by a nationally representative sample of underage youth in the United States.

Methods: We obtained a national sample of 1,032 underage youth, aged 13 to 20, using a pre-recruited Internet panel maintained by Knowledge Networks. Youth aged 18 to 20 were recruited directly from the panel via email invitation. Teens aged 13 to 17 were identified by asking adult panelists to identify a member of their household. The survey assessed the past 30-day consumption of 898 brands of alcohol among 16 alcoholic beverage types, including the frequency and amount of each brand consumed in the past 30 days. Market share for a given brand was calculated by dividing the total number of drinks for that brand in the past 30 days across the entire sample by the total number of drinks for all identified brands.

Results: The alcohol brands with highest prevalence of past 30-day consumption were Bud Light (27.9%, 95% confidence interval [CI] 23.3 to 32.4%), Smirnoff malt beverages (17.0%, 95% CI 12.9 to 21.1%), and Budweiser (14.6%, 95% CI 11.0 to 18.3%). Brand market share was concentrated in a relatively small number of brands, with the top 25 brands accounting for nearly half of all market shares.

Conclusions: Underage youth alcohol consumption, although spread out over several alcoholic beverage types, is concentrated among a relatively small number of alcohol brands. This finding has important implications for alcohol research, practice, and policy.

Key Words: Alcohol, Brand, Underage Drinking, Surveillance, Youth.

UNDERAGE DRINKING REMAINS a major public health problem in the United States. More than 70% of high school students have consumed alcohol, and about 22% engage in heavy episodic drinking (Eaton et al., 2012). Adequate surveillance of youth alcohol use is essential for

identifying the causes for youth drinking and planning interventions to prevent its negative consequences. Existing national surveys of alcohol use among underage youth have collected data at the level of the alcoholic beverage type (beer, spirits, wine, etc.), but never at the level of alcohol brand (Bud Light beer, Grey Goose vodka, Bacardi rum, etc.) or even liquor subtype (whiskey, rum, tequila, vodka, etc.). In 2004, in response to the lack of information on brand-specific youth alcohol use, a National Academy of Sciences report on alcohol and youth recommended that the federal government collect alcohol brand preference data from underage drinkers to determine the influence of alcohol marketing on youth (Bonnie and O'Connell, 2004). To date, however, there has been no comprehensive collection or publication of brand-specific alcohol consumption among youth at the national level.

Branding plays an essential role in alcohol marketing and the relationship of youth to individual alcohol products (Casswell, 2004; Gordon et al., 2008; Saffer, 2002). Developing brand capital—that is, the meaning and emotion associated with a brand—is perhaps the most important function of alcohol advertising (Casswell, 2004; Gordon et al., 2008). Many adolescents identify with alcohol brands before they start drinking (Aitken et al., 1988). Even among 10-year-olds, nearly 80% were able to recognize an alcohol brand logo (Alcohol Concern, 2012).

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Alcohol branding affects youth's alcohol-related attitudes (Aitken et al., 1988; Grube and Wallack, 1994), and early recognition of brands is associated with an increased likelihood of using those brands throughout one's life (Ellis et al., 2010). Even so, the scientific literature lacks studies that explore the link between youth exposure to advertising for specific alcohol brands and their consumption of those brands. Such studies are not possible unless we first assess alcohol brand use among underage youth. Being able to investigate the relationship between underage drinkers' preferences for particular brands and their exposure to advertising for those brands would represent a significant advance in alcohol marketing research.

Identifying the brands of alcohol that youth consume would contribute not only to our knowledge about whether alcohol advertising affects youth drinking behavior, but also provide a better understanding of underage drinking behavior itself. First, determining the drinking patterns for specific brands of alcohol would greatly increase our knowledge of the factors that influence the initiation and progression of youth alcohol use.

Second, brand-specific consumption data would allow us to calculate the total monthly alcohol dose for each specific type and brand of alcoholic beverage. In particular, it would allow us to itemize the alcohol brands used by heavy drinkers and to identify the relationship between the consumption of those brands and problem drinking, including early signs of alcohol dependence.

Third, ascertaining youth alcohol use by brand may produce a more accurate description of drinking behavior among youth. Previous research has established that greater specificity in asking about alcoholic beverage types results in higher self-reported consumption (Russell et al., 1991; Serdula et al., 1999). By extension, inquiring about specific alcohol brands could result in an even more accurate assessment of youth alcohol consumption. Casswell and colleagues (2002) found that population-based surveys that asked respondents to report the brands of alcohol they consume was 1 of the key factors in their ability to account for 94% of per capita alcohol consumption (as measured by sales data), compared with <60% in prior surveys (Kerr and Greenfield, 2007; Midanik, 1982). Another reason to ask about specific brands is that youth may misclassify the brands they consume, leading to inaccurate estimates of drinking prevalence for alcoholic beverage types such as beer, wine, spirits, and flavored alcoholic beverages (Giga et al., 2011; Siegel et al., 2011a). In short, having a complete database of brand-specific alcohol consumption prevalence, including the frequency and volume of use, would allow us to provide the most comprehensive description to date of alcohol consumption among youth.

Fourth, identifying the patterns of alcohol brand consumption among youth would help in evaluating the feasibility of including alcohol brand use questions on federal or national surveys. As was found for cigarettes, if alcohol brand consumption is concentrated among a relatively small

number of brands, it may be feasible to assess youth alcohol brand preference in national or federal surveys as only a limited number of brands would need to be included.

Last, monitoring youth alcohol use at the brand level would provide a mechanism for identifying new entries in the market that may be popular among youth.

Despite the compelling need for brand-specific alcohol consumption data among youth, almost all of the previous surveillance of youth alcohol use has been conducted at the aggregate level or at the level of alcoholic beverage type. Several studies have characterized youth drinking patterns by alcoholic beverage type, including the categories of beer, malt liquor, liquor, wine, wine coolers, fortified wine, and flavored alcoholic beverages (Cremeens et al., 2009; Maldonado-Molina et al., 2010; Moore and Werch, 2007; Roeber et al., 2007; Siegel et al., 2011c; Werch et al., 2006). However, we are only aware of 1 published study that has reported brand-specific consumption or preferences among youth (Tanski et al., 2011). Tanski and colleagues (2011) surveyed a national sample of youth concerning their favorite alcohol brand to drink. Top brand preferences of youth who engaged in heavy episodic drinking were associated with brands with high advertising expenditures. This study is a major research advance, but is limited because it only asked about each respondent's favorite brand, not about the full range of alcohol brands they actually consumed.

One reason why researchers have not collected brand-specific alcohol consumption data is the logistical difficulty of obtaining consumption information on each of the hundreds of alcohol brands currently in the market. To address this problem, we developed, pilot-tested, and validated a novel, Internet-based survey, which measures the consumption prevalence and frequency of hundreds of alcohol brands, employing a small sample from an Internet panel of nationally representative underage youth (Siegel et al., 2011a,b).

In this article, we report the results of the full-scale administration of this survey to a national sample of underage youth. We believe this is the first national survey dedicated to measuring alcohol brand consumption preferences among underage youth. We report the past 30-day prevalence of alcohol consumption by brand and the market share by brand for the overall volume of alcohol consumed in the past 30 days.

MATERIALS AND METHODS

Design Overview

We obtained a sample of 1,032 underage youth, aged 13 to 20, who had consumed at least 1 drink of alcohol in the past 30 days, using a prerecruited Internet panel maintained by Knowledge Networks (Palo Alto, CA; Knowledge Networks, 2012). Using an online, self-administered survey, we ascertained each of the brands of alcohol consumed by the respondents during the past 30 days. For each brand, we inquired about the number of days on which it was consumed and the typical number of drinks of that brand on those days. The primary outcome variables were the prevalence of 30-day consumption of each

brand and the market share of consumption for each brand (i.e., the proportion of all drinks of alcohol consumed during the past 30 days attributable to that brand).

Sample

Knowledge Networks maintains a prerecruited panel of approximately 50,000 adults (including young adults aged 18 to 20) who have agreed to be invited periodically to participate in Internet-based surveys (Knowledge Networks, 2012). The company recruited households to its Knowledge Panel® sample through a combination of random digit dialing (RDD) and address-based sampling (ABS) from a sampling frame that includes 97% of U.S. households (Knowledge Networks, 2012).

To ensure adequate representation of panelists across race/ethnicity, telephone numbers from phone banks with higher concentrations of Blacks and Hispanics are oversampled. To ensure adequate participation across levels of socioeconomic status, subjects agreeing to participate in the panel who do not have Internet access are given WebTV and Internet access and training for free.

Using its established Internet panel, Knowledge Networks recruited youth aged 13 to 17 and young adults aged 18 to 20 via email to participate in our Internet survey. For the 18- to 20-year-olds, panelists were sent an email invitation that did not indicate the survey was related to alcohol consumption. Panelists who agreed to participate in the survey were emailed a link to a secure web site where a screening questionnaire was administered to determine whether the panelist consumed alcohol in the past 30 days and was thus eligible for the survey.

For the 13- to 17-year-olds, respondents were identified by asking adult panelists to indicate whether they had any children in this age group and if so, whether they would grant permission to Knowledge Networks to survey those youth. Only 1 teen was selected—randomly—from each household. If parental consent was given, the youth was emailed an invitation to participate in the survey.

Based on a screening questionnaire that did not reveal the purpose of the survey, respondents who had consumed at least 1 drink of alcohol in the past 30 days were provided with an online consent form. Participants who provided informed consent completed the Internet-based questionnaire. After completion of the survey, a \$25 gift was credited to the panel member's account. The protocol was approved by the Institutional Review Board of the Boston University Medical Center.

Response Rate

As the American Association for Public Opinion Research standards for response rate reporting were not established for Internet panels, we used a modification of these standards that was developed and published by Callegaro and Di Sogra (2008). Because 13- to 17-year-olds (younger youth) and 18- to 20-year-olds (older youth) were recruited differently, we report their response rates separately.

Because the study involved a screening procedure to determine eligibility, the overall response rate for the older youth sample has 2 components: (i) the screening completion rate, which is the number of completed screenings divided by the total number of invitations sent; and (ii) the survey completion rate, which is the number of completed surveys divided by the number of eligible respondents.

For the younger youth sample, because parents were screened first to identify potential teenage respondents, the overall response rate has 3 components: (i) the parent completion rate, which is the number of parents who confirmed having a teen in their household and gave consent divided by the estimated number of eligible households with 1 or more teens; (ii) the screening completion rate; and (3) the survey completion rate.

For the older youth sample, the screening completion rate was 46.2% (2,288 invitations, with 1,058 completed screenings). The survey completion rate was 93.8% (705 eligible respondents, with 661 completed surveys). Thus, the overall response rate for the older youth was 46.2% multiplied by 93.8% or 43.3%.

For the younger youth sample, the parent completion rate was 49.2% (an estimated 4,757 eligible households with 1 or more teens, with 2,341 parents giving consent). The screening completion rate was 94.0% (2,341 invitations, with 2,201 teens screened). The survey completion rate was 95.9% (387 eligible respondents, with 371 completed surveys). Thus, the overall response rate for the younger youth was 49.2% multiplied by 94.0% multiplied by 95.9% or 44.4%.

Examination of Response Self-Consistency

In an attempt to identify possible errant or implausible reports of the number of drinks consumed for particular brands, we examined the self-consistency of the survey responses by comparing the overall number of drinks per day that each respondent reported consuming in the past 30 days to the sum of the number of drinks that individual reported consuming of each brand. We identified 1 major inconsistency, in which a respondent reported drinking more than 15 drinks per day of more than 20 alcohol brands. This respondent was deleted from the data set. Thus, our final data set consisted of 1,031 individuals.

Survey Instrument

The Internet-based survey instrument was developed to assess brand-specific alcohol consumption among underage youth. Using several sources, we identified 898 major brands of alcohol within 16 different alcoholic beverage types. The brands included in the data set consisted of (i) all alcohol brands advertised in national issues of magazines or on national television (network or cable) during the years 2006 through 2010, based on data licensed from Nielsen (New York, 2011), the leading company that tracks advertising placements; (ii) the complete list of alcohol brands measured by GfK Mediamark Research and Intelligence in its Survey of the Adult Consumer; (iii) an extensive list of alcoholic energy drinks compiled by the National Association of Attorneys General; and (iv) all alcohol brands reported by participants in 2 pilot studies of youth alcohol brand preference (Siegel et al., 2011a,b).

The final data set consisted of the following numbers of brands in each of these categories, with a total of 898 alcohol brands: 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.

Our survey was conducted after certain alcoholic energy drinks were either removed from the market or reformulated so as not to contain caffeine or other stimulants. Former alcoholic energy drink brands that remained on the market but without caffeine (e.g., Four Loko) were classified in our survey as flavored alcoholic beverages. However, there was a small class of alcoholic energy drinks that were not removed from the market. These are spirits brands, such as vodka or liqueur, which contain either caffeine or other stimulants (e.g., guarana, taurine). Accordingly, we retained them in our survey under the classification of "spirits-based energy drinks."

For each category of alcohol, respondents checked off which specific brands they had consumed during the past 30 days. If a specific brand was not listed, then respondents entered the name, giving as specific a name as possible. After identifying the brands they had consumed in the past 30 days, respondents reported the number of days during the past 30 that they had consumed each brand and how many drinks of each brand they usually had on a day when they drank that brand.

Drinks were defined based on the NIAAA definition of a “standard drink,” which is a drink size that contains 14 grams of pure alcohol (National Institute on Alcoholism and Alcohol Abuse [NIAAA], 2012). Thus, based on the average alcohol content of different alcoholic beverage types, we defined a drink as a 12-ounce can or bottle of beer; a 5-ounce glass of wine or champagne; 4 ounces of low-end fortified wine; an 8.5-ounce flavored alcoholic beverage; an 8-ounce alcohol energy drink; a 12-ounce wine cooler; 8.5 ounces of malt liquor; 1.5 ounces of liquor (spirits or hard alcohol), whether in a mixed drink or as a shot; 2.5 ounces of cordials or liqueurs, whether in a mixed drink, a coffee drink, or consumed on their own; and 1 ounce of grain alcohol, whether in a mixed drink, punch, or as a shot.

Measures

Prevalence of Past 30-Day Consumption. The prevalence of past 30-day consumption of each alcohol brand was defined as the proportion of respondents who reported having consumed that brand in the past 30 days.

Consumption-Based Market Share. The consumption-based market share for each brand (referred to hereafter simply as “market share”) was defined as the proportion of the total drinks consumed during the past 30 days by all of the respondents combined that was attributable to a specific brand. To estimate the number of drinks of each brand consumed in the past 30 days by individual respondents, we multiplied the number of days they reported drinking that brand by the typical number of drinks of that brand they reported consuming on those days. The total number of drinks was then summed across all brands and across all respondents. In calculating market shares, we included drinks for alcoholic beverages reported as “other” (and not included in our list of 898 brands).

We used a common approach for shielding the analyses of drinking frequency from outlying data without dropping observations: “winsorization,” which involves recoding outliers at a specified percentile level of the distribution (Balsa et al., 2011; Dixon, 1960). Winsorization is defined as the replacement of extreme values with a given, less extreme value. For example, the number of drinks per day could be recoded from extreme values to a set upper limit deemed to be reasonable, such as the value at the 99th percentile. In our data, the 99th percentile for maximum number of drinks per brand per day was 20. Thus, for each alcohol brand, we winsorized the reported number of drinks per day at 20. We conducted a sensitivity analysis to examine whether the winsorization procedure changed our estimates of brand market shares. Differences in estimated market shares were similar with and without winsorization and the top 25 brands by market share were the same.

Weighting Procedures

Knowledge Networks applied statistical weighting adjustments to account for selection deviations and to render the sample representative of the underlying population (Di Sogra, 2009). These weights accounted for the different selection probabilities associated with the RDD- and ABS-based samples, the oversampling of minority communities, nonresponse to panel recruitment, and panel attrition. Poststratification adjustments were based on demographic distributions from the Current Population Survey conducted by the U.S. Bureau of the Census. The poststratification weights adjusted for gender, age, race/ethnicity, census region, household income, home ownership status, metropolitan area, and household size.

Validation of Methodology

Validation studies have demonstrated that behavioral data obtained from the Knowledge Networks panel compare closely with

estimates derived from more traditional survey techniques, such as national household, telephone, or in-person surveys (Bethell et al., 2004; Chang and Krosnick, 2009; Heeren et al., 2008; Novak et al., 2007; Smith, 2003; Yeager et al., 2011). We have previously shown that estimates of current drinking obtained through a survey conducted by Knowledge Networks were similar to those from the National Epidemiologic Survey on Alcohol and Related Conditions (Heeren et al., 2008). Thus, the Knowledge Networks panel is a less expensive, viable alternative to telephone and in-person surveys for assessing drinking behavior.

We initially pilot-tested the survey instrument and assessed its feasibility and effectiveness among a convenience sample of 241 youth ages 16 to 18 (Siegel et al., 2011b). We then conducted a full pilot test, using the same methods that are reported in this research, but restricting the total sample size to 100 completed surveys among 16- to 20-year-olds (Siegel et al., 2011a). We validated our pilot study results among 18- to 20-year-olds with data on alcohol beverage type preferences among that age group obtained from the 2007 MRI Survey of the Adult Consumer (Siegel et al., 2011a). The concordance of these results demonstrated the validity of our study methodology in ascertaining type-specific patterns of consumption among underage youth, thus supporting the use of these methods for assessing brand-specific alcohol consumption.

Misclassification of Alcohol Brands by Alcoholic Beverage Type

Because we allowed respondents to list “other” brands in each alcoholic beverage type category, we were able to examine the extent to which respondents misclassified brands by alcoholic beverage type. There were a total of 90 misclassifications. Of these, 69 represented misclassifications among categories of beer, spirits, wine, and flavored alcoholic beverages, and the remaining 21 were misclassifications within types of spirits.

The most common misclassifications were listing flavored alcoholic beverages as alcoholic energy drinks (11 cases involving Four Loko and Sparks), listing vodkas as flavored alcoholic beverages (6 cases involving Ciroc, Grey Goose, Skyy, and Smirnoff), listing Canadian or Irish whiskeys as bourbon (6 cases involving Black Velvet, Crown Royal, Jameson, Canadian Mist, and Windsor Canadian), and listing vodkas as beer (4 cases involving Smirnoff, UV, and Three Olives).

RESULTS

Sample Description

The sample, consisting of 1,031 individuals aged 13 to 20, was skewed slightly toward women and heavily toward older adolescents and college-age youth. This was due to the frequency of drinking, and thus survey eligibility, being higher among these panelists (Table 1). Distribution of respondents by race/ethnicity, household income, region, and Internet access was roughly representative of youth nationally. Approximately half of the respondents reported heavy episodic drinking, defined as consuming 5 or more drinks in a row.

Comparison of Respondents and Nonrespondents

Because the sample of 18- to 20-year-olds was drawn from the existing Knowledge Networks panelists, we were able to compare 18- to 20-year-old respondents and nonrespondents

Table 1. Demographic Characteristics of Survey Respondents

	Number of respondents	Percentage (%)
Total	1,031	100.0
Age		
13–15	117	11.4
16–18	461	44.7
19–20	453	43.9
Sex		
Male	428	41.5
Female	603	58.5
Race/ethnicity		
White, non-Hispanic	592	57.4
Hispanic	214	20.8
Black	126	12.2
Other	99	9.6
Annual household income		
Less than \$15,000	235	22.8
\$15,000–\$39,999	270	26.2
\$40,000–\$99,999	365	35.4
\$100,000 or more	161	15.6
Region		
Northeast	177	17.2
Midwest	287	27.8
South	327	31.7
West	240	23.3
Internet access		
Yes	934	90.6
No	97	9.4
Days consumed alcohol in past 30 days		
1	295	28.6
2–3	308	29.9
4–7	207	20.1
8 or more	221	21.4
Heavy episodic drinking in past 30 days		
Yes	512	49.7
No	519	50.3

Internet access refers to access prior to joining the Knowledge Networks panel. Recruited panelists who did not have Internet access were provided with access by Knowledge Networks. Heavy episodic drinking is defined as consuming 5 or more drinks in a row. Proportions in the table are unweighted.

on basic demographic factors to help assess the nature of potential nonresponse bias, using a chi-square test to assess the significance of observed differences (Table 2). The nonrespondents were slightly older ($p < 0.05$), but similar in gender ($p = 0.41$). Nonrespondents were more likely to be Black ($p < 0.0001$), to come from lower-income households ($p < 0.01$), and not to have Internet access ($p < 0.0001$). There were no substantial differences by region ($p = 0.11$). This type of analysis was not possible for the 13- to 17-year-old nonrespondents.

Prevalence of Use and Market Share by Alcoholic Beverage Type

The most prevalent alcoholic beverage types among underage drinkers were beer (68.9%, 95% confidence interval [CI] 64.4 to 73.3%) and spirits (68.7%, 95% CI 64.4 to 73.0%), followed by flavored alcoholic beverages (49.9%, CI 44.9 to 54.9%) and wine (31.6%, 95% CI 26.9 to 36.3%) (Table 3). Within the spirits category, the most popular subtypes were vodka (41.5%, 95% CI 36.5 to 46.6%), rum

Table 2. Comparison of Demographic Characteristics of Older Youth (Ages 18 to 20) Survey Respondents and Nonrespondents

	Respondents (%)	Nonrespondents (%)
Total (N)	661	1,274
Age*		
18	31.5%	31.4%
19	26.2%	31.0%
20	42.4%	37.6%
Sex		
Male	36.2%	38.1%
Female	63.8%	61.9%
Race/ethnicity*		
White, non-Hispanic	54.8%	43.6%
Hispanic	22.5%	23.5%
Black	13.0%	22.2%
Other	9.7%	10.7%
Annual household income*		
Less than \$15,000	29.2%	35.5%
\$15,000–\$39,999	28.6%	30.5%
\$40,000–\$99,999	30.0%	24.7%
\$100,000 or more	12.3%	9.3%
Region		
Northeast	15.3%	15.3%
Midwest	27.7%	23.6%
South	32.5%	37.5%
West	24.5%	23.6%
Internet access*		
Yes	89.4%	81.0%
No	10.6%	19.0%

Internet access refers to access prior to joining the Knowledge Networks panel. Recruited panelists who did not have Internet access were provided with access by Knowledge Networks. Proportions in the table are unweighted.

*Differences are significant at $p < 0.05$ by a chi-square test.

(26.3%, 95% CI 21.9 to 30.7%), tequila (21.4%, 95% CI 17.2 to 25.6%), and bourbon (18.4%, 95% CI 14.2 to 22.6%).

The consumption-based market share in the past 30 days was highest for beer (42.5%), followed by spirits (35.8%), flavored alcoholic beverages (16.1%), and wine (5.7%) (Table 3). Among spirits, the top 4 categories by market share were vodka (11.1%), rum (5.2%), bourbon (4.5%), and tequila (3.6%). Alcohol brand market shares were concentrated by alcoholic beverage type. The 3 leading types/subtypes by market share—beer (42.5%), flavored alcoholic beverages (16.1%), and vodka (11.1%)—accounted for 69.7% of all alcohol drinks consumed. No other alcoholic beverage type had a market share greater than 5.2%.

Prevalence of Use and Market Share by Brand

Examining prevalence of any use in the past 30 days, the most commonly consumed alcohol brands were Bud Light (27.9%, 95% CI 23.3 to 32.4%), Smirnoff malt beverages (17.0%, 95% CI 12.9 to 21.1%), and Budweiser (14.6%, 95% CI 11.0 to 18.3%) (Table 4). Of the top 25 brands, 12 were spirits brands (including 4 vodkas, 3 rums, 2 tequilas, and 1 each of bourbon, cognac, and cordial/liqueur), 9 were beers, and 4 were flavored alcoholic beverages.

Table 3. Prevalence of Alcohol Use and Market Share by Total Number of Drinks Consumed in the Past 30 Days by Alcoholic Beverage Type

Alcoholic beverage type	Prevalence of (95% CI) alcohol use in past 30 days	Market share by volume consumed in past 30 days
All types	100.0%	100.0%
Beer	68.9% (64.4–73.3%)	42.5%
Flavored alcoholic beverages	49.9% (44.9–54.9%)	16.1%
Spirits	68.7% (64.4–73.0%)	35.8%
Spirits-based energy drinks	10.5% (7.2–13.9%)	3.3%
Bourbon	18.4% (14.2–22.6%)	4.5%
Brandy	7.2% (4.6–9.8%)	1.1%
Cognac	7.4% (4.4–10.3%)	0.8%
Cordials/Liqueurs	12.2% (8.9–15.5%)	2.4%
Gin	9.6% (6.8–12.4%)	1.0%
Rum	26.3% (21.9–30.7%)	5.2%
Scotch	4.0% (2.0–6.1%)	0.7%
Tequila	21.4% (17.2–25.6%)	3.6%
Vodka	41.5% (36.5–46.6%)	11.1%
Whiskey	9.0% (5.9–12.2%)	1.4%
Grain alcohol	5.8% (3.3–8.2%)	0.7%
Wines	31.6% (26.9–36.3%)	5.7%
Table wine	29.6% (25.0–34.3%)	5.2%
Low-end fortified wine	5.9% (3.9–8.0%)	0.5%

CI, confidence interval. Proportions in the table are weighted. Market shares represent the total number of drinks in the past 30 days for a given alcoholic beverage type across the entire sample divided by the total number of drinks for all alcoholic beverage types consumed in the past 30 days. Market share estimates are weighted.

By market share, consumption was concentrated in a relatively small number of brands, with the top 25 brands accounting for nearly half of all market share (Table 5). No other alcohol brands had a market share of 1% or greater. The leading brands by market share were dominated by beer brands (14), followed by spirits (7: including 3 vodkas, 2 rums, a spirits-based energy drink, and a bourbon), flavored alcoholic beverage brands (3), and wine (1).

Market Share by Brand within Alcoholic Beverage Types

Within alcoholic beverage types and subtypes, market share was concentrated among a small number of brands (Table 6). For all spirits, the top 18 brands accounted for half of market share, and the top 34 brands accounted for two-thirds of market share. Within the rum category, the top 4 brands (Captain Morgan, Bacardi, Malibu, and Admiral Nelson) accounted for 76.4% of all rum consumption by volume. For tequila, the top 4 brands (Jose Cuervo, Fat Ass, Patron, and 1800) accounted for 68.0% of market share. For vodka, the top 4 brands (Grey Goose, Smirnoff, Absolut, and UV) accounted for 46.8% of market share. For flavored alcoholic beverages, the top 4 brands (Smirnoff malt beverages, Mike's, Jack Daniel's cocktails, and Four Loko) accounted for 41.7% of market share. Even in a large, diverse category such as beer, just the top 7 brands (Bud Light, Budweiser, Coors, Miller Lite, Corona Extra Light,

Table 4. Prevalence of Use in the Past 30 days for the Top 25 Alcohol Brands

Rank/Brand	Use in past 30 days (95% CI)	Type	ABV range (%)
1. Bud Light	27.9% (23.3–32.4%)	Beer	4.2
2. Smirnoff Malt Beverages	17.0% (12.9–21.1%)	FAB	5.5–15.0
3. Budweiser	14.6% (11.0–18.3%)	Beer	5.0
4. Smirnoff Vodkas	12.7% (9.2–16.3%)	Vodka	35.0–50.0
5. Coors Light	12.7% (9.2–16.3%)	Beer	4.2
6. Jack Daniel's Bourbons	11.4% (7.9–15.0%)	Bourbon	40.0–43.0
7. Corona Extra	11.3% (8.2–14.3%)	Beer	4.2–4.6
8. Mike's	10.8% (7.9–13.6%)	FAB	5.0–10.0
9. Captain Morgan Rums	10.4% (7.3–13.5%)	Rum	35.0–50.0
10. Absolut Vodkas	10.1% (6.7–13.5%)	Vodka	40.0–50.0
11. Heineken	9.7% (6.7–12.7%)	Beer	5.0–5.1
12. Bacardi Rums	9.3% (6.4–12.2%)	Rum	40.0–75.5
13. Blue Moon	8.2% (5.3–11.1%)	Beer	5.2–5.6
14. Bacardi Malt Beverages	8.0% (5.1–11.0%)	FAB	10.0–15.0
15. Jose Cuervo Tequilas	8.0% (5.2–10.8%)	Tequila	40.0
16. Miller Lite	7.4% (4.8–10.1%)	Beer	4.2
17. Grey Goose Vodkas	6.7% (4.0–9.5%)	Vodka	40.0
18. Malibu Rums	6.3% (3.7–8.8%)	Rum	21.0–35.0
19. Four Loko	6.1% (4.1–8.1%)	FAB	6.0–12.0
20. Keystone Light	6.0% (3.5–8.5%)	Beer	4.2
21. Hennessy Cognac	5.6% (2.8–8.5%)	Cognac	40.0
22. Patron Tequilas	5.5% (3.2–7.9%)	Tequila	40.0
23. Bailey's Irish Cream	5.2% (2.7–7.6%)	Cordials /Liqueurs	17.0
24. Corona Extra Light	5.2% (3.3–7.2%)	Beer	3.7–4.6
25. UV Vodkas	5.1% (3.1–7.2%)	Vodka	25.0–40.0

CI, confidence interval; ABV, alcohol by volume; FAB, flavored alcoholic beverage. ABV data are taken from the work of DiLoreto and colleagues (2012). Proportions in the table are weighted.

Natural Light, and Coors Light) accounted for nearly half (48.2%) of market share.

DISCUSSION

To the best of our knowledge, this is the first comprehensive report of brand-specific alcohol consumption among underage youth in the United States. Our major finding is that although alcohol consumption is spread out over a considerable number of alcoholic beverage types, it is concentrated among a relatively small number of alcohol brands. The top 25 brands account for about half of all alcohol consumption by volume. Within alcoholic beverage types and subtypes, a small number of brands account for an even larger proportion of the alcohol consumed.

The most important limitation of this study is that the response rates of 43% among 18- to 20-year-olds and 44% among 13- to 17-year-olds create the possibility of nonresponse bias, a form of selection bias. Based on a comparison of respondents and nonrespondents, the primary concern is

Table 5. Consumption-Based Market Shares in the Past 30 Days for the Top 25 Alcohol Brands

Rank/Brand	Type	Market share (%)	Cumulative market share (%)
1. Bud Light	Beer	6.4	6.4
2. Budweiser	Beer	3.0	9.3
3. Smirnoff Malt Beverages	FAB	2.9	12.2
4. Coors	Beer	2.6	14.9
5. Miller Lite	Beer	2.3	17.1
6. Corona Extra Light	Beer	2.2	19.4
7. Natural Light	Beer	2.1	21.4
8. Coors Light	Beer	2.0	23.4
9. Corona Extra	Beer	2.0	25.4
10. Keystone Light	Beer	2.0	27.3
11. Mike's	FAB	1.9	29.3
12. Grey Goose Vodkas	Vodka	1.8	31.0
13. Heineken	Beer	1.8	32.8
14. Natural Ice	Beer	1.6	34.4
15. Jack Daniel's Bourbon	Bourbon	1.6	36.0
16. Guinness	Beers	1.5	37.5
17. Captain Morgan Rums	Rum	1.4	38.9
18. Agwa de Bolivia	SED	1.4	40.4
19. Smirnoff Vodkas	Vodka	1.4	41.7
20. Barefoot Wines	Wine	1.3	43.1
21. Czechvar	Beer	1.3	44.4
22. Absolut Vodkas	Vodka	1.3	45.6
23. Bacardi Rums	Rum	1.3	46.9
24. Blue Moon	Beer	1.0	47.9
25. Jack Daniel's Cocktails	FAB	1.0	48.9

SED, spirits-based energy drink; FAB, flavored alcoholic beverage. Market share represents the total number of drinks in the past 30 days for a given brand across the entire sample divided by the total number of drinks in the past 30 days for all brands. All market share estimates in the table are weighted.

that both Black and lower-income youth were less likely to have responded. To reduce the potential for nonresponse bias, we adjusted our estimates, via poststratification, by weighting the survey responses from Black and lower-income respondents more heavily. Note that, as our aim was to assess differences in alcohol brand use rather than absolute rates of alcohol use in the population, bias would be introduced only if nonrespondents had differential brand preferences. Even with this weighting procedure, differential response bias remains a possibility, and these results should therefore be interpreted with caution.

In particular, a potential concern is that nonresponse bias led to an underrepresentation of Black and lower-income respondents in the survey, meaning that our estimates of brand consumption prevalence and market shares may be biased toward White, middle- and upper-income youth. Although beyond the scope of this article, we plan to examine and report demographic differences in alcohol brand preference in a subsequent article. This will help public health practitioners understand brand-specific drinking patterns that are relevant to the particular communities in which they work.

Table 6. Consumption-Based Market Shares within Category in the Past 30 Days for the Top 5 Brands in Each of the 6 Most Popular Alcoholic Beverage Categories

Type (absolute market share) Rank Brand (absolute market share)	Market share with in category (%)	Cumulative market share within category (%)
Beer (42.5%)		
1. Bud Light (6.4%)	15.0	15.0
2. Budweiser (3.0%)	7.0	22.0
3. Coors (2.6%)	6.2	28.2
4. Miller Lite (2.3%)	5.4	33.6
5. Corona Light (2.2%)	5.2	38.8
Flavored alcoholic beverages (16.1%)		
1. Smirnoff Malt Beverages (2.9%)	18.0	18.0
2. Mike's (1.9%)	11.9	29.9
3. Jack Daniel's Cocktails (1.0%)	6.2	36.1
4. Four Loko (0.9%)	5.6	41.7
5. Bacardi Malt Beverages (0.9%)	5.3	47.0
Vodka (11.1%)		
1. Grey Goose (1.8%)	15.9	15.9
2. Smirnoff (1.4%)	12.2	28.1
3. Absolut (1.3%)	11.5	39.6
4. UV (0.8%)	7.2	46.8
5. Pinnacle (0.6%)	5.5	52.3
Wine (5.7%)		
1. Barefoot (1.3%)	25.7	25.7
2. Arbor Mist (0.4%)	6.8	32.5
3. Wild Vines (0.3%)	5.5	38.0
4. Franzia (0.2%)	4.7	42.7
5. Sutter Home (0.2%)	4.7	47.4
Rum (5.2%)		
1. Captain Morgan (1.4%)	27.9	27.9
2. Bacardi (1.3%)	24.2	52.1
3. Malibu (0.7%)	13.2	65.3
4. Admiral Nelson's (0.6%)	11.1	76.4
5. Coconut Jack (0.2%)	3.7	80.1
Bourbon (4.5%)		
1. Jack Daniel's (1.6%)	35.0	35.0
2. Wild Turkey (0.9%)	19.0	54.0
3. Jim Beam (0.7%)	14.8	68.8
4. Jeremiah Weed (0.3%)	7.3	76.1
5. Firefly (0.3%)	6.8	82.9
Tequila (3.6%)		
1. Jose Cuervo (0.9%)	24.4	24.4
2. Fat Ass (0.7%)	18.2	42.6
3. Patron (0.6%)	16.4	59.0
4. 1800 (0.3%)	9.0	68.0
5. El Jimador (0.3%)	8.6	76.6

Market share represents the total number of drinks in the past 30 days for a given brand across the entire sample divided by the total number of drinks in the past 30 days for all brands in that alcoholic beverage category. All market share estimates in the table are weighted.

While nonresponse bias could potentially limit the generalizability of these findings to some population subgroups, it does not threaten the validity of our basic finding that underage alcohol use is concentrated among a relatively small number of brands. This finding is important for 3 reasons. First, it suggests that research examining the relationship between brand-specific advertising exposure among youth, and their alcohol brand preferences could provide important insights into the influence of advertising on youth drinking behavior. Now that we have identified underage youth

consumption levels for a wide range of alcohol brands, the logical next step is to examine the relationship between underage drinkers' exposure to brand-specific alcohol advertising and their brand-specific consumption patterns. The clear demarcation between a small number of brands that are popular among youth and a much larger number of brands that are not consumed by youth makes it possible to examine whether the brands with the highest youth advertising exposure are also the ones preferred and consumed by youth drinkers. Similar research that studied the relationship between brand-specific cigarette advertising and cigarette brand market shares among youth played a central role in elucidating the influence of cigarette advertising on youth smoking behavior (King and Siegel, 1999; King et al., 1998; Pollay et al., 1996).

Second, the finding that alcohol use is concentrated among a relatively small number of brands has implications for public health practice. Alcohol prevention programs and policies can now target specific brands, and advocacy efforts can focus on specific companies that manufacture the products most involved in problem drinking behavior among youth.

Third, these results suggest that it may be feasible for federal agencies or public health organizations to establish a surveillance system to monitor alcohol brand use among underage drinkers. Although there are hundreds of alcohol brands, monitoring just the top 100 brands would capture nearly 80% of all underage youth alcohol consumption, and just the top 25 brands would capture nearly 50% of underage consumption. Note that the Monitoring the Future survey includes 23 cigarette brands.

Our finding that youth liquor preferences are highly concentrated among a small number of brands contrasts with adult brand consumption. While half of all spirits market share among underage drinkers is accounted for by 18 brands, 50% of the overall spirits market share in the United States in 2010 was accounted for by 33 brands (Impact Databank, 2011). While two-thirds of the spirits market share among underage youth is accounted for by 34 brands, the same proportion of overall spirits market share in 2010 was accounted for by 65 brands (Impact Databank, 2011).

Another important finding of this study is that underage youth widely misclassify brands by alcoholic beverage type. Among 198 youth who reported an "other" brand that was not included in a list of brands for a given type in the survey, there were 90 misclassifications. This finding suggests that previous studies that asked youth to report their consumption of alcoholic beverage categories (beer, spirits, flavored alcoholic beverages, etc.) may be inaccurate.

Despite potential limitations, these survey data are valuable, as they are the first available national estimates of youth alcohol brand preference that describe brand-specific alcohol use among underage drinkers. Our hope is that this work, by elucidating the nature and extent of alcohol consumption among underage drinkers and by providing a feasible and affordable methodology for its measurement,

will inspire other attempts to measure youth alcohol brand preferences and further research on underage alcohol consumption.

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REFERENCES

- Aitken PP, Leathar DS, Scott AC (1988) Ten-to sixteen-year-olds' perceptions of advertisements for alcoholic drinks. *Alcohol Alcohol* 23:491–500.
- Alcohol Concern (2012) Recognition of alcohol brands by primary school children. Alcohol Concern, Cardiff, UK. Available at: <http://alcoholireland.ie/wp-content/uploads/2012/04/marketing.pdf>. Accessed October 11, 2012.
- Balsa AI, Giuliano LM, French MT (2011) The effects of alcohol use on academic achievement in high school. *Econ Educ Rev* 30:1–15.
- Bethell C, Fiorillo J, Lansky D, Hendryx M, Knickman J (2004) Online consumer surveys as a methodology for assessing the quality of the United States health care system. *J Med Internet Res* 6:e2. doi:10.2196/jmir.6.1.e2.
- Bonnie RJ, O'Connell ME (2004) Reducing Underage Drinking: A Collective Responsibility. National Academy Press, Committee on Developing a Strategy to Reduce and Prevent Underage Drinking, National Research Council and Institute of Medicine, Washington, DC.
- Callegaro M, DiSogra C (2008) Computing response metrics for online panels. *Public Opin Q* 72:1008–1031.
- Casswell S (2004) Alcohol brands in young peoples' everyday lives: new developments in marketing. *Alcohol Alcohol* 39:471–476.
- Casswell S, Huckle T, Pledger M (2002) Survey data need not underestimate alcohol consumption. *Alcohol Clin Exp Res* 26:1561–1567.
- Chang LC, Krosnick JA (2009) National surveys via RDD telephone interviewing vs. the internet: comparing sample representativeness and response quality. *Public Opin Q* 73:641–678.
- Cremins JL, Miller JW, Nelson DE, Brewer RD (2009) Assessment of source and type of alcohol consumed by high school students: analyses from four states. *J Addict Med* 3:204–210.
- DiLoreto JT, Siegel M, Hinchey D, Valerio H, Kinzel K, Lee S, Chen K, Shoaff JR, Kenney J, Jernigan DH, DeJong W (2012) Assessment of the average price and ethanol content of alcoholic beverages by brand—United States, 2011. *Alcohol Clin Exp Res* 36:1288–1297.
- DiSogra C (2009) Overview of KnowledgePanel[®] Statistical Weighting Protocol. Knowledge Networks, Menlo Park, CA. Available at: <http://www.knowledgenetworks.com/ganp/docs/KN-Weighting-Synopsis.pdf>. Accessed October 11, 2012.
- Dixon WJ (1960) Simplified estimation from censored normal samples. *Ann Math Stat* 31:385–391.
- Eaton DK, Kann L, Kinchen S, Shanklin S, Flint KH, Hawkins J, Harris WA, Lowry R, McManus T, Chyen D, Whittle L, Lim C, Wechsler H (2012) Youth risk behavior surveillance—United States, 2011. *MMWR Surveill Summ* 61:1–162.
- Ellis AW, Holmes SJ, Wright RL (2010) Age of acquisition and the recognition of brand names: on the importance of being early. *J Consum Psychol* 20:43–52.
- Giga NM, Binakosky J, Ross C, Siegel M (2011) The nature and extent of flavored alcoholic beverage consumption among underage youth: results of a national brand-specific survey. *Am J Drug Alcohol Abuse* 37:229–234.
- Gordon R, Hastings G, McDermott L, Evans WD (2008) Building brands with competitive analysis, in *Public Health Branding: Applying Marketing for Social Change* (Evans WD, Hastings G, eds), pp 73–90. Oxford University Press, Oxford, UK.

- Grube JW, Wallack L (1994) Television beer advertising and drinking knowledge, beliefs, and intentions among schoolchildren. *Am J Public Health* 84:254–259.
- Heeren T, Edwards EM, Dennis JM, Rodkin S, Hingson RW, Rosenbloom DL (2008) 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* 32:222–229.
- Impact Databank (2011) The U.S. Distilled Spirits Market. M. Shanken Communications, New York.
- Kerr WC, Greenfield TK (2007) 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* 31:1714–1722.
- King C, Siegel M (1999) Brand-specific cigarette advertising in magazines in relation to youth and young adult readership, 1986–1994. *Nicotine Tob Res* 1:331–340.
- King C, Siegel M, Celebucki C, Connolly GN (1998) Adolescent exposure to cigarette advertising in magazines: an evaluation of brand-specific advertising in relation to youth readership. *JAMA* 279:516–520.
- Knowledge Networks (2012) KnowledgePanel® Design Summary. Knowledge Networks, Menlo Park, CA. Available at: <http://www.knowledgenetworks.com/knpanel/docs/KnowledgePanel%28R%29-Design-Summary-Description.pdf>. Accessed October 11, 2012.
- Maldonado-Molina MM, Reingle JM, Tobler AL, Komro KA (2010) Effects of beverage-specific alcohol consumption on drinking behaviors among urban youth. *J Drug Educ* 40:265–280.
- Midanik L (1982) The validity of self-reported alcohol consumption and alcohol problems: a literature review. *Br J Addict* 77:357–382.
- Moore MJ, Werch C (2007) Results of a two-year longitudinal study of beverage-specific alcohol use among adolescents. *J Drug Educ* 37:107–122.
- National Institute on Alcoholism and Alcohol Abuse (NIAAA) (2012) What is a Standard Drink? National Institute on Alcoholism and Alcohol Abuse, Rockville, MD. Available at: http://pubs.niaaa.nih.gov/publications/Practitioner/pocketguide/pocket_guide2.htm. Accessed November 5, 2012.
- Novak SP, Kroutil LA, Williams RL, Van Brunt DL (2007) The nonmedical use of prescription ADHD medications: results from a national internet panel. *Subst Abuse Treat Prev Policy* 2:32.
- Pollay RW, Siddarth S, Siegel M, Haddix A, Merritt RK, Giovino GA, Eriksen MP (1996) The last straw? Cigarette advertising and realized market shares among youths and adults, 1979–1993. *J Mark* 60:1–16.
- Roeber J, Green DL, Meurer KM, Armitage JJ, Maas GM, McClinton RC, Courtney K, Cremeens JL, Brewer RD, Miller JW, Eaton D (2007) Types of alcoholic beverages usually consumed by students in 9th–12th grades—four states, 2005. *MMWR Morb Mortal Wkly Rep* 56:737–740.
- Russell M, Welte JW, Barnes GM (1991) Quantity-frequency measures of alcohol consumption: beverage-specific vs global questions. *Br J Addict* 86:409–417.
- Saffer H (2002) Alcohol advertising and youth. *J Stud Alcohol* 14(Suppl): 173–181.
- Serdula MK, Mokdad AH, Byers T, Siegel PZ (1999) Assessing alcohol consumption: beverage-specific versus grouped-beverage questions. *J Stud Alcohol* 60:99–102.
- Siegel M, DeJong W, Naimi TS, Heeren T, Rosenbloom DL, Ross C, Ostroff J, Jernigan DH (2011a) Alcohol brand preferences of underage youth: results from a pilot survey among a national sample. *Subst Abuse* 32:191–201.
- Siegel M, DiLoreto J, Johnson A, Fortunato EK, DeJong W (2011b) Development and pilot testing of an internet-based survey instrument to measure the alcohol brand preferences of U.S. youth. *Alcohol Clin Exp Res* 35:765–772.
- Siegel MB, Naimi TS, Cremeens JL, Nelson DE (2011c) Alcoholic beverage preferences and associated drinking patterns and risk behaviors among high school youth. *Am J Prev Med* 40:419–426.
- Smith TW (2003) An experimental comparison of Knowledge Networks and the GSS. *IJPOR* 15:167–179.
- Tanski SE, McClure AC, Jernigan DH, Sargent JD (2011) Alcohol brand preference and binge drinking among adolescents. *Arch Pediatr Adolesc Med* 165:675–676.
- Werch C, Jobli EC, Moore MJ, DiClemente CC, Dore HS, Brown CH (2006) Do alcohol consumption patterns of adolescents differ by beverage type? *J Child Adolesc Subst Abuse* 15:45–62.
- Yeager DS, Krosnick JA, Chang LC, Javitz HS, Levendusky MS, Simpser A, Wang R (2011) Comparing the accuracy of RDD telephone surveys and internet surveys conducted with probability and non-probability samples. *Public Opin Q* 75:709–747.