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## The relationship between alcohol price and brand choice among underage drinkers: Are the most popular alcoholic brands consumed by youth the cheapest?

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### Abstract

We examined the influence of price on alcohol brand choice among underage youth. Using a national sample of 1,032 youth ages 13–20, recruited from a national internet panel in 2011–2012, we compared differences in mean prices between popular and unpopular brands; examined the association of price and brand popularity using logistic regression; and rank ordered the average price of top brands. Lower brand-specific prices were significantly associated with higher levels of past 30-day consumption prevalence. However, youth did not preferentially consume the cheapest brands. These findings indicate that youth have preferences for certain brands, even if those brands cost more than competing brands. Our study highlights the need for research on the impact of brand-specific alcohol marketing on underage drinking.

### Keywords

Alcohol; alcohol brands; price; underage drinking; surveillance; youth

### INTRODUCTION

Low alcohol prices are a potent risk factor for excessive drinking, underage drinking, and adverse alcohol-attributable outcomes (Grossman, Chaloupka, & Sirtalan, 1998; Laixuthai & Chaloupka, 1993; Anderson, Chisholm, & Fuhr, 2009a; Wagenaar, Salois, & Komro, 2009; Daley, Stahre, Chaloupka, & Naimi, 2012, Stockwell, Auld, Zhao & Martin, 2012; Hahn et al., 2012). For this reason increasing state-level alcohol excise taxes has been recommended as a key strategy for controlling alcohol-related harm and remains an important public health strategy (e.g., Rice & Drummond, 2012). While price or tax increases may decrease overall youth consumption, a related question, for which there is far

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### CONFLICTS OF INTEREST

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less research is to what extent pricing influences the alcohol brand choices made by underage drinkers.

The most basic law of economics connects the price of a product to the demand for that product (Chaloupka, Grossman, & Saffer, 2002). As a result, decreases in the monetary price of alcohol would be expected to increase alcohol consumption and its adverse consequences. A major reason why brand-specific alcohol price data are so important is that they may inform the development and assessment of minimum alcohol price policies, which are thought to influence the entry point for alcohol use among youth (Donaldson & Rutter, 2011; Groves, 2010). Numerous studies have demonstrated that alcohol prices are inversely correlated with alcohol consumption (Wagenaar et al., 2009, 2010) and that increased prices lead to reductions in both frequency of drinking and prevalence of heavy drinking among youth (Chaloupka et al., 2002; Grossman et al., 1994; Wagenaar et al., 2009). A recent study reported that a 25-cent-per drink alcohol tax would result in a 9.2% reduction in alcohol consumption, including an 11.4% reduction in heavy drinking (Daley, Stahre, Chaloupka, & Naimi, 2012). This finding has particularly profound implications for reducing alcohol use and its adverse consequences among youth (Black et al., 2011; Meier et al., 2009; Purshouse et al., 2010). Importantly, if youth are drinking cheaper alcohol brands, then it becomes critical to use interventions that would raise the price of alcohol (e.g., through excise taxes and minimum pricing). If price is not the only factor in determining youth brand choices, then it becomes imperative to examine other factors, such as marketing, in order to understand the sources of underage drinking.

Only a few investigators have examined whether price influences the type of alcoholic beverages that drinkers choose to consume (Jones & Barrie, 2011). A study using Swedish price and sales data for 1984–1994 suggested that price influences brand choices among adults—for example, price increases causing consumers to switch to less expensive brands (Gruenewald, Ponicki, Holder, Romelsjö, 2006). A focus group study in Australia reported that undergraduate youth drinkers (ages 18 and older) spoke of their limited financial resources, which led them to choose drinks that give them the greatest “bang for your buck” (Jones & Gregory, 2009, p. 233).

Other qualitative research has been equivocal about whether price is a key factor influencing youth brand choices. Among a sample of young drinkers (ages 13 to 16) in the northwest part of England, Brain, Parker, and Carnwath (2000) found that taste was the single most important factor in drink choice, followed by strength of alcohol content. Interestingly, the more frequently these youth reported drinking alcohol, the less importance they assigned to taste, and the greater importance they assigned to both strength and price. This study also noted the prominence of “designer drinks” (namely premixed cocktails, alcopops, and premium beers, ciders, and wines) among their brand choices. The authors concluded that youth brand choice involves a complex interplay of price, marketing, product features, and availability.

In a qualitative study involving 824 Australian adolescents (ages 12 to 17), only 30% reported that price was a factor driving the popularity of “ready-to-drink” (RTD) alcohol products (Hughes, et al, 1997). In a more recent qualitative study of 187 Australian youth

(ages 13 to 17), Hemphill, Munro, and Oh (2007) reported that price was not a major reason for youth choosing to consume a particular alcoholic drink, although it was more important for younger than for older drinkers.

Brain et al. (2000), found that taste was the most important determinant, and suggested that the pooling of money by adolescents may mitigate the price of alcohol as a barrier to purchase. There is another important factor to consider in the United States: because inflation-adjusted alcohol prices have dropped significantly over the past three decades, thereby making alcohol far more affordable (Godfrey, 1990; Chaloupka, Grossman, & Saffer, 2002; Xu & Chaloupka, 2011), price may play a lesser role in brand choice than was previously believed to be the case.

Research has shown that youth exposure to alcohol marketing has been linked to increased earlier initiation of drinking and increased consumption among young people (Anderson, et al., 2009a; Jernigan, D.H., 2011). These findings support a theory of brand capital in which it is through the creation of brands that companies develop product “personalities” that appeal to a specific target audience, in this case, underage drinkers (Saffer, 2002). The theory posits that advertising functions by creating positive images, associations, and expectancies for a specific brand (i.e., brand capital) and that, in turn, this brand capital is directly linked to the market share of a given brands. Accordingly, brand choice among underage drinkers is directly influenced by alcohol products with higher levels of brand capital through positive overtones and personalities portrayed through advertising of those particular products.

In sum, there is very little empirical evidence demonstrating that price is driving the specific brand choices made by underage youth. Even so, the popular perception remains that young people “actively search for the highest number of SD [standard drinks] per dollar” (Jones & Barrie, 2011, p. 10). Using a national U.S. sample, the aim of the present paper is to examine two hypotheses: 1) underage drinkers are primarily influenced by low alcohol pricing; and 2) the most popular alcoholic brands consumed by youth are also the cheapest. Based on fundamental economic theory, we expect that youth brand choices are mainly influenced by low alcohol pricing and that the most popular alcohol brands consumed by youth are also the cheapest.

## METHODS

### Design Overview

Using a pre-recruited, randomly selected internet-panel maintained by Knowledge Networks in Palo Alto, CA (Knowledge Networks, 2012), we obtained a sample of 1,032 underage youth, ages 13–20, from December 2011 through May 2012, who had consumed at least one drink of alcohol in the past 30 days.

Through an online, self-administered survey, the respondents identified each brand of alcohol they had consumed during the past 30 days, and then reported the number of days on which they consumed each brand and the typical number of drinks of that brand they had on those days.

Boston University Medical Center's Institutional Review Board (IRB) approved the sampling protocol and survey methodology.

## Sample

Knowledge Networks maintains a pre-recruited panel of approximately 50,000 adults (including young adults ages 18–20) 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 over-sampled. 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 ages 13–17 and young adults ages 18–20 via email to participate in our internet survey. For the 18–20 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 if the panelist consumed alcohol in the past 30 days and was thus eligible for the survey.

For the 13–17 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 one teen was randomly selected 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 one 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.

The final sample consisted of 1,031 respondents: 41.5% were male; 11.4% were ages 13 to 15 years, 44.7% 16 to 18 years and 43.9% 19 to 20 years; and 57.4% were White, non-Hispanic, 20.8% Hispanic, 12.2% Black and 9.6% Other. Of the respondents 22.8% lived in a household with an annual income of less than \$15,000; 26.2% \$15,000 to \$39,000; 35.4% \$40,000 to \$99,999; and 15.6% \$100,000 or more. The vast majority reported internet access (90.6%). Of respondents, 28.6% reported having consumed alcohol on 1 day in the past 30 days, 29.9% 2–3 days; 20.1% 4–7 days and 21.4% 8 or more days. Approximately half the sample (49.7%) reported heavy episodic drinking (consuming five or more drinks in a row) in the past 30 days.

## Response Rate

For respondents ages 18–20, the overall response rate was 43.4%. Of those eligible households with one or more teenagers ages 13–17, 49.2% of the parents gave consent for a survey invitation to be sent to their child. The overall response rate for these younger youth was 44.4%.

Siegel et al. (2013) provides more information regarding how these response rates were calculated and procedures for handling a small number of outlying responses.

## Survey Instrument

We developed the internet-based survey instrument to assess brand-specific alcohol consumption among underage youth. The brand survey was validated against GfK MRI's Survey of the Adult Consumer, a written survey of a representative sample of approximately 10,000 US adults used to ascertain the prevalence of use of various consumer products, including past-30-day consumption of 132 spirits brands. The correlation between our estimates and those from GfK MRI was high ( $r=.86$ ,  $P=.0006$ ), and the correlation between prevalence rank was similarly high (Spearman's  $\rho = .82$ ,  $P = .0021$ ).

Using several sources, we initially identified 898 major brands of alcohol within 16 different alcoholic beverage types. The brands included in the data set included: (1) 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; (2) the complete list of alcohol brands measured by GfK Mediamark Research & Intelligence in its Survey of the Adult Consumer; (3) an extensive list of alcoholic energy drinks compiled by the National Association of Attorneys General; and (4) all alcohol brands reported by participants in two pilot studies of youth alcohol brand preference (Siegel et al., 2011a, 2011b).

The survey employed the National Institute of Alcohol Abuse and Alcoholism (NIAAA) definition of a "standard drink," which is a drink size that contains 14 grams of pure alcohol (NIAAA, 2012). Thus, a "drink" was defined 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.

## Pricing Data

For alcohol pricing, we relied on the brand list developed from an earlier study (DiLoreto et al., 2012), which catalogued the prices for 898 alcohol brands across 17 different alcoholic beverage types. We later obtained pricing data for 53 additional alcoholic brands mentioned by the survey respondents, using similar methods.

The final pricing data, merged with the survey data, included a total of 951 alcohol brands: 325 table wines, 144 beers, 95 vodkas, 80 cordials/liqueurs, 62 flavored alcoholic beverages,

56 rums, 38 tequilas, 30 whiskeys, 27 gins, 26 scotches, 23 bourbons, 15 brandies, 10 spirits-based energy drinks, 10 cognacs, 5 low-end fortified wines, and 5 grain alcohols.

For some analyses, we placed the alcohol brands into four main beverage categories: beer, wine, spirits (bourbon, brandy, cognac, cordials/liqueurs, gin, rum, scotch, tequila, vodka, whiskey, and grain alcohol), and flavored alcoholic beverages.

**Sources of Pricing Information**—We identified an online price database for 15 of 18 control states (Alabama, Idaho, Iowa, Maine, Michigan, Montana, New Hampshire, North Carolina, Ohio, Oregon, Pennsylvania, Utah, Vermont, Virginia, and Washington). Each state database specified a uniform price for certain alcohol products sold in the state. In addition, we identified a total of 136 online alcohol stores through several mechanisms, including internet searches for popular online alcohol stores, lists of online alcohol stores registered in control states, and internet searches for specific alcohol brands.

**Confirmation of Online Prices**—A detailed description showing that online prices correspond very closely to actual shelf (retail) prices is reported elsewhere (Siegel et al., 2011a; 2012). Due to the possibility that online prices may differ from in-store prices, the previously published study verified in-store prices for one product (1800 Silver Tequila, 750 ml) at 25 randomly selected license state stores (half of the total sample) by calling each store. For 23 of the 25 stores (92%), the in-store price was identical to the online price. For the other two stores, the online price was either 5.0% or 9.7% higher than the in-store price. The average product price obtained from the 25 online price quotes differed from the average of the actual in-store prices by only 0.48%.

**Pricing Procedure**—We collected pricing information during 2011, using the most recent prices listed for that year. We recorded the posted retail prices found at each store, which includes federal and state alcohol excise taxes but not state or local sales taxes. We excluded sales taxes because they typically do not apply to alcohol exclusively.

At each store, we priced each a brand by identifying the cheapest item for that brand, taking into account the volume size and the percentage of alcohol by volume. For example, if a store offered Corona Extra at \$10.00 for a six-pack and \$18.00 for a twelve-pack, then the twelve-pack was priced out because it was available at a cheaper price per unit volume. For each brand priced at a given store, we recorded the specific brand name, total volume, price, and percent alcohol by volume.

Importantly, the majority of the online stores were websites for actual liquor stores that posted brand-specific prices online. Thus, these represent actual prices that consumers would experience if shopping at these stores. Of the 136 online stores, only 13 (9.6%) were online-only stores without a brick-and-mortar retail store that sells alcohol.

## Pricing Measures & Analysis Variables

**Price per Ounce**—At each store, we calculated the price per ounce of alcohol for each available brand by multiplying the beverage's total volume in ounces by the percentage alcohol by volume, and then dividing that figure into the beverage's retail price.

**Average Price per Standard Drink**—For each brand, we determined the average price per standard drink by determining the mean for each brand across all of the stores at which that brand was available. To determine the average price for an alcoholic beverage type (e.g., beer, flavored alcoholic beverages, spirits, wine) or for any other combination of brands, we counted each brand within that type or combination only once. As a result, these averages do not reflect the average of brand prices weighted by market share.

**Prevalence of Past 30-day Consumption**—We defined the prevalence of past 30-day consumption of each alcohol brand as the proportion of respondents who reported having consumed the brand in the past 30 days.

**Popular vs. Unpopular Alcoholic Beverage Brands**—We defined a brand's volume-based market share (referred to hereafter simply as "market share") as the percentage of all standard drinks consumed during the past 30 days by all respondents combined that was attributable to that brand. For the purpose of capturing the top brands by market share, we categorized "popular brands" as those with a market share  $\geq 0.87\%$  and "unpopular brands" as those with a market share of  $< 0.87\%$ . Using this split, the 27 popular brands were Bud Light, Budweiser, Smirnoff Malt, Coors, Miller Lite, Corona Light, Natural Light, Coors Light, Corona, Keystone Light, Mike's, Grey Goose, Heineken, Natural Ice, Jack Daniel's, Guinness, Captain Morgan, Agwa de Bolivia, Smirnoff, Barefoot, Czechvar, Absolut, Bacardi, Blue Moon, Jack Daniel's Cocktails, Four Loko, and Jose Cuervo.

## Analyses

A t-test was first used to compare differences in mean prices per ounce of total volume between popular and unpopular brands across alcoholic beverage types (Beer, Flavored Alcoholic Beverages, Spirits, and Wine). Logistic regression was then performed to examine the association of alcoholic beverage price and brand popularity across the beverage types. We analyzed the rank order for average price per ounce of alcohol for the top 25 brands, as determined by past 30-day consumption prevalence. Lastly, we rank order for average price per ounce of alcohol for brands by alcoholic beverage type. Correlations between rank based on popularity (consumption prevalence) and rank based on price were performed using Spearman's rho ( $\rho$ ), across all brands of the specified type.

## RESULTS

A comparison of the average price per ounce of alcohol by popular versus unpopular alcoholic brands consumed is presented in Table 1. Across all brands for all types of alcohol, the average price of popular brands was \$1.80 compared with \$3.40 for unpopular brands ( $p < .001$ ). The median price of popular brands was \$1.60 compared with \$2.53 for unpopular brands.

By beverage type, the average price for popular beer brands was \$1.71 compared to \$1.98 for unpopular brands ( $p=0.12$ ). For spirits, the price differential was small and non-significant: the average price for popular brands was \$2.02 compared to \$2.15 for unpopular ones ( $p=0.80$ ). For wine, the average price per ounce of alcohol for the popular brand ( $n=1$ ) was \$1.91, compared to \$5.49 for unpopular brands.

As shown in Table 2, logistic regression demonstrated a statistically significant association between lower overall beverage price per ounce of alcohol and brand popularity (overall OR =0.59,  $P<0.01$ ). The statistically significant relationship did not hold in separate analyses for the beer, spirits and wine categories using a 99% confidence level ( $\alpha = 0.01$ ).

### Brand-Specific Price Analyses

Table 3 presents the rank order for average price per ounce of alcohol for the top 25 brands, as determined by past 30-day consumption prevalence. Overall, the median price per ounce of alcohol for the top 25 brands was \$1.74 compared to \$2.53 for all other brands (see footnote in Table 3).

Note, however, that the most commonly consumed brands were not necessarily the cheapest brands. The brand with the highest prevalence was Bud Light (27.9% prevalence), with an average price per ounce of alcohol of \$1.60, ranking it as the 253<sup>rd</sup> cheapest of 951 alcohol brands. Ranked second, Smirnoff Malt Beverages (flavored alcoholic beverage; 17% prevalence) was the 455<sup>th</sup> cheapest with an average price per ounce of alcohol of \$2.38. Third on the list, Budweiser (14.6% prevalence) ranked the 186<sup>th</sup> cheapest brand with an average price of \$1.29. The least expensive brand on the top 25 list was Four Loko (flavored alcoholic beverage; prevalence 6.1%), which ranked as the 89<sup>th</sup> cheapest brand with an average price of \$0.89.

Table 4 examines the average price of the top brands for each alcoholic beverage type. The most commonly consumed beer brand was Bud Light (27.9% prevalence), which ranked 38<sup>th</sup> cheapest among 144 beer brands and 253<sup>rd</sup> among all 951 alcohol brands. The least expensive beer on the top ten list was Natural Light (4.0% prevalence), which ranked 20<sup>th</sup> cheapest among 144 beer brands and 166<sup>th</sup> among all 951 alcohol brands.

Among flavored alcoholic beverages (FABs), the mostly commonly consumed brand was Smirnoff Malt Beverages, (17.0% prevalence), which ranked 28<sup>th</sup> cheapest among the 62 FAB brands and 455<sup>th</sup> among all 951 alcohol brands. The least expensive of the frequently consumed FAB brands was Four Loko (6.0% prevalence), which ranked 9<sup>th</sup> cheapest among 62 FAB brands and 89<sup>th</sup> among all 951 alcohol brands.

Table 4 also shows the same pattern for spirits: within this type, the most commonly consumed brands are not the cheapest. For example, the rum brand with the highest prevalence (10.4%) was Captain Morgan, which ranked 25<sup>th</sup> cheapest among 56 rum brands and 190<sup>th</sup> among all 951 alcohol brands. Similarly, the top tequila brand was Jose Cuervo (8.0% prevalence), which ranked 7<sup>th</sup> among 38 tequila brands and 200<sup>th</sup> among all 951 alcohol brands. The vodka brand with the highest prevalence was Smirnoff (12.7% prevalence), which ranked 33<sup>rd</sup> among 95 vodka brands and 133<sup>rd</sup> among all 951 alcohol brands.

The last column in Table 4 reports, for each alcoholic beverage type, the correlation between rank based on popularity (prevalence) and rank based on price. A higher popularity rank is associated with having a lower price (an inverse price rank). There is a statistically significant association between popularity rank and price rank for the following beverage



categories: beer, certain spirits (brandy, rum, tequila, vodka), and table wine, but not for flavored alcoholic beverages, alcoholic energy drinks, grain alcohol, and fortified wine.

## DISCUSSION

A popular perception is that price is the primary determinant of brand choice among underage drinkers (Jones & Barrie, 2011). In this study, we set out to examine two hypotheses: 1) underage drinkers are influenced by low alcohol pricing; and 2) the most popular alcoholic brands consumed by youth are also the cheapest. The first hypothesis was supported by the data: there exists an inverse relationship between brand price and brand-specific consumption prevalence. The second hypothesis was not supported: we found, contrary to our expectations, that the most popular youth brands were not the cheapest brands on the market. For example, the top brand, Bud Light with a 27.9% prevalence, was ranked the 253<sup>rd</sup> cheapest brand with an average price of \$1.60 per ounce of ethanol; the second leading brand, Smirnoff Malt Beverages (17.0% prevalence), was ranked the 455<sup>th</sup> cheapest brand with an average price of \$2.38; and Budweiser (14.6% prevalence) was ranked the 186<sup>th</sup> cheapest brand with an average price of \$1.29. These results are important as they suggest that youth are sensitive to alcohol branding. They are not simply drinking what they can come by cheaply, but rather they are responsive to the brand itself. Consistent with previous qualitative research, our findings indicate that youth brand choice involves a complex interplay of factors, including price and marketing.

So that additional research is needed to identify other factors that drive brand selection and therefore attenuate the relationship between price and consumption prevalence. One possibility is advertising and marketing. For instance, a relatively expensive but still popular brand like Patron tequila relies heavily on marketing to build its market share, whereas a far less popular brand like Burnett's vodka does not have a prominent advertising profile, but does have a low price point to attract its customers. Another potentially important factor that may influence brand selection is the physical availability of brands. Advertising increases social availability (e.g., the perception that drinking a particular brand is popular), but is not necessarily associated with a brand's physical availability in the marketplace.

Unfortunately, very little is known about which factors are actually driving brand choice among underage drinkers. With new forms of social media marketing, particularly platforms such as Facebook and Twitter, that have changed the marketing landscape by promoting interaction and conversation among youth (Nicholls 2012), the need for additional research on the potential role of advertising and marketing is increasingly urgent. Additional macro-level factors, such as the state of the economy, also remain critical in examining the role of pricing in brand choice among underage drinkers. For example, under conditions of a poor or weak economy (i.e., recent U.S. recessions), the influence of price on brand choice may become more essential. Further research will be undertaken using these data to investigate the role of other factors together with price in brand choice among underage drinkers.

### Limitations

There are some limitations that should be taken into account when interpreting the results of this study. First, due to the resource-intensive work involved in pricing out 951 brands, we

were able to examine pricing data at only a limited number of stores. We were not able to price out every brand at every one of the 179 stores whose price lists we examined. Our decision was to develop a comprehensive database that included all major brands rather than to obtain an extremely high level of precision for a smaller subset of brands. Second, we were unable to visit each store in person to confirm the listed prices and therefore relied upon the accuracy of the stores' web sites. We also were unable to confirm the timeliness of web site updates, so some price data might not have reflected the most recent price changes. Third, we did not systematically sample stores within states. Some states were overrepresented and others were not included. Therefore, we cannot state that these data are fully representative of the nation as a whole. Finally, our pricing data include discounts for pre-packaged bulk purchases, such as a 12-pack of beer, but did not include discounts for high-volume purchases of individual bottles of wine or spirits. Multi-unit discounts may not reflect the actual prices encountered by youth who are unable to afford bulk purchases. Fourth, we were not able to measure how widely available all 951 brands are across the U.S, and therefore we cannot account for the brands' physical availability. Fifth, prices for a given brand may fluctuate considerably over time and by geographic location.

Another important limitation of this study is that the response rates—43% for 18- to 20-year-olds and 44% for 13- to 17-year-olds—create the possibility of non-response bias, a form of selection bias. Hence, it is possible that the sample may not be an entirely representative national sample.

A comparison of respondents and non-respondents did show that Black and lower-income youths were less likely to have responded to the survey. The potential concern is that non-response bias led to an under-representation of Black and lower-income respondents in the survey, meaning that our estimates of brand consumption prevalence may be biased towards White, middle- and upper-income youth. To reduce the potential for non-response bias, we adjusted estimates, via post-stratification, by weighting the survey responses from Black and lower-income respondents more heavily, but these results should still be interpreted with caution.

Importantly, our conclusion only relates to the role of price in brand decisions among youth, and not to the role of price in influencing levels of alcohol consumption and alcohol-related consequences, which has clearly been established in other papers. In addition, lack of statistical power is a concern, especially for the comparisons of prices within beverage types. The overall beverage comparison is confounded by the fact that beer and spirits are generally more popular among youth and coincidentally less expensive than wines and FAB.

Our study limitations, however, do not threaten our overall conclusions regarding the role of alcohol branding and pricing in youth alcohol consumption. The novel and important contribution to the existing literature is that youth are not strictly driven by price and have strong preferences for certain brands, even if those brands cost much more than competing brands. Our findings do not negate the importance of raising alcohol prices as an intervention for policy makers, but rather point to the need for additional research on the impact of brand-specific alcohol marketing on underage drinking.

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## GLOSSARY

<b>Internet panel</b>	An internet panel is a sample of individuals who agree to participate in online survey research. The panel may be recruited by probability or nonprobability sampling methods
<b>Prevalence of Past 30-day Consumption</b>	The prevalence of past 30-day consumption of each alcohol brand is the proportion of respondents who reported having consumed the brand in the past 30 days
<b>Popular &amp; Unpopular Alcoholic Beverage Brands</b>	A brand's volume-based market share is the percentage of all standard drinks consumed during the past 30 days by all respondents combined that was attributable to that brand. "Popular brands" were categorized as those with a market share $\geq 0.87\%$ and "unpopular brands" as those with a market share of $< 0.87\%$ .

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**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 five or more drinks in a row. Proportions in the table are unweighted.

**Table 2**

Logistic regression for the association of alcoholic beverage price per ounce and brand popularity, based on past 30-day consumption<sup>#</sup>

	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Total (n=951)	0.59*	(0.42–0.85)
Beer (n=144)	0.47	(0.22–0.84)
Flavored Alcoholic Beverage (n=62)	0.87	(0.31–2.49)
Spirits (n=415)	0.81	(0.73–0.93)
Wine (n=325)	0.22	(0.66–0.93)

\* p<.01

<sup>#</sup>“Popular brands” is a dichotomous variable (0 = less popular brands; 1 = more popular brands). Popular brands are defined as those with a market share ≥ 0.87%, and unpopular brands as those with a market share of < 0.87%.

**Table 3**

Average price and pricing rank for the 25 most frequently consumed alcohol brands

Rank/Brand	Alcohol Use Prevalence in the Past 30 Days	Alcohol Type	Average Price per Ounce of Alcohol (\$)	Consumption Prevalence Rank*
1. Bud Light	27.9%	Beer	\$1.60	253
2. Smirnoff Malt Beverages	17.0%	FAB <sup>+</sup>	\$2.38	455
3. Budweiser	14.6%	Beer	\$1.29	186
4. Smirnoff Vodkas	12.7%	Vodka	\$1.01	133
5. Coors Light	12.7%	Beer	\$1.54	240
6. Jack Daniel's Bourbons	11.4%	Bourbon	\$1.77	280
7. Corona Extra	11.3%	Beer	\$2.10	383
8. Mike's	10.8%	FAB <sup>+</sup>	\$1.98	350
9. Captain Morgan Rums	10.4%	Rum	\$1.31	190
10. Absolut Vodkas	10.1%	Vodka	\$1.57	248
11. Heineken	9.7%	Beer	\$1.95	337
12. Bacardi Rums	9.3%	Rum	\$1.00	130
13. Blue Moon	8.2%	Beer	\$1.92	323
14. Bacardi Malt Beverages	8.0%	FAB <sup>+</sup>	\$2.13	396
15. Jose Cuervo Tequilas	8.0%	Tequila	\$1.36	200
16. Miller Lite	7.4%	Beer	\$1.49	226
17. Grey Goose Vodkas	6.7%	Vodkas	\$2.62	515
18. Malibu Rums	6.3%	Rum	\$2.17	404
19. Four Loko	6.1%	FAB <sup>+</sup>	\$0.82	89
20. Keystone Light	6.0%	Beer	\$1.18	161
21. Hennessy Cognac	5.6%	Cognac	\$2.83	568
22. Patron Tequilas	5.5%	Tequila	\$4.14	774
23. Bailey's Irish Cream	5.2%	Cord/Liq <sup>#</sup>	\$4.31	793
24. Corona Extra Light	5.2%	Beer	\$2.38	454
25. UV Vodkas	5.1%	Vodka	\$0.97	124

\* Rank by average price per ounce of alcohol, looking across all brands (1 = cheapest brand; 951 = most expensive brand)

<sup>+</sup> FAB = flavored alcoholic beverages

<sup>#</sup> Cordials/Liqueurs

Note: Median price per ounce of alcohol for the top 25 brands is \$1.74 compared to \$2.53 for all other brands; mean price per ounce of alcohol for the top 25 brands is \$1.91 compared to \$3.39 for all other brands.



**Table 4**  
Average price and pricing ranks for the most frequently consumed alcohol brands by alcoholic beverage type

	Alcohol Use Prevalence in the Past 30 Days	Average Price per Ounce of Alcohol (\$)	Pricing Rank within Alcohol Type	Overall Pricing Rank	Spearman's Rank Correlation
<b>Beer (n=144)</b>					
0.42*					
1. Bud Light	27.9%	\$1.60	38	253	
2. Budweiser	14.6%	\$1.29	28	186	
3. Coors Light	12.7%	\$1.54	34	240	
4. Corona Extra	11.3%	\$2.10	81	383	
5. Heineken	9.7%	\$1.95	67	337	
6. Blue Moon	8.2%	\$1.92	61	323	
7. Miller Lite	7.5%	\$1.49	33	226	
8. Keystone Light	6.0%	\$1.18	18	161	
9. Corona Extra Light	5.2%	\$2.38	113	454	
10. Natural Light	4.0%	\$1.19	20	166	
<b>FAB (n=62)</b>					
-0.04					
1. Smimoff Malt	17.0%	\$2.38	38	455	
2. Mike's	10.8%	\$1.98	27	350	
3. Barcardi Malt	8.0%	\$2.13	34	396	
4. Four Loko	6.0%	\$0.82	9	89	
5. Bartles & Jaymes	4.8%	\$2.94	53	605	
<b>Spirits (n=415)</b>					
0.24*					
<b>Alcoholic Energy Drink (n=10)</b>					
-0.05					
1. P.I.N.K.	2.0%	\$3.28	7	660	
2. Everglo	1.4%	\$5.31	10	857	
3. 3AM Vodka	1.3%	\$2.07	2	376	
4. Vicious Vodka	1.1%	\$2.88	6	587	

	Alcohol Use Prevalence in the Past 30 Days	Average Price per Ounce of Alcohol (\$)	Pricing Rank within Alcohol Type	Overall Pricing Rank	Spearman's Rank Correlation
5. V2Vodka	0.9%	\$2.35	5	529	
<b>Bourbon (n=23)</b>					
1. Jack Daniels	11.5%	\$1.74	14	280	0.22
2. Jim Beam	4.0%	\$1.17	9	158	
3. Wild Turkey	2.0%	\$1.46	12	218	
4. Old Crow	1.2%	\$0.75	4	71	
5. Jeremiah Weed	0.8%	\$1.35	11	197	
<b>Brandy (n=15)</b>					
					0.79
1. E. & J Gallo	2.8%	\$0.90	3	109	
2. Christian Brothers	1.5%	\$0.87	1	100	
3. Banker's Club	1.0%	\$0.89	2	107	
4. Paul Masson Brandy	0.5%	\$0.97	4	125	
5. Allen's Brandy	0.4%	\$1.15	7	155	
<b>Cognac (n=10)</b>					
					0.47
1. Hennessy	5.7%	\$2.83	3	568	
2. Remy Martin	0.8%	\$3.00	5	615	
3. Courvoisier	0.7%	\$2.47	1	479	
4. Martelli	0.6%	\$3.96	9	759	
5. Alize Cognac	0.3%	\$2.84	4	576	
<b>Cordials/Liqueurs (n=80)</b>					
					0.11
1. Baileys	5.2%	\$4.31	63	793	
2. Kahlua	2.5%	\$3.03	49	623	
3. Amaretto di Amore	1.5%	\$2.10	28	384	
4. Dekuyper	1.1%	\$1.30	7	187	
5. 99 Liqueurs	0.9%	\$1.37	10	202	

	Alcohol Use Prevalence in the Past 30 Days	Average Price per Ounce of Alcohol (\$)	Pricing Rank within Alcohol Type	Overall Pricing Rank	Spearman's Rank Correlation
<b>Gin (n=27)</b>					
1. Seagram's Gin	3.7%	\$0.84	14	97	0.31
2. Bombay Sapphire	1.3%	\$1.32	20	235	
3. Aristocrat Gin	0.7%	\$0.56	2	13	
4. Plymouth	0.6%	\$2.60	23	506	
5. Tanqueray	0.6%	\$1.44	19	214	
<b>Grain Alcohol (n=5)</b>					
1. Everclear 190	3.2%	\$0.63	2	34	0.20
2. Everclear 151	1.5%	\$0.82	5	91	
3. Gem Clear	0.5%	\$0.52	1	6	
4. Golden Grain	0.3%	\$0.66	3	45	
5. Clear Spring	0.2%	\$0.77	4	81	
<b>Rum (n=56)</b>					
1. Captain Morgan	10.4%	\$1.31	25	190	0.45*
2. Bacardi	9.3%	\$0.99	20	130	
3. Malibu	6.3%	\$2.17	45	404	
4. Sailor Jerry	1.8%	\$1.22	23	173	
5. Cruzan	1.1%	\$1.22	22	172	
<b>Scotch (n=26)</b>					
1. Johnnie Walker	1.4%	\$2.00	11	354	-0.00
2. Cuty Shark	0.6%	\$1.59	7	251	
3. Chivas Regal	0.4%	\$2.83	12	567	
4. J & B	0.4%	\$1.78	8	291	
5. Balvenie	0.3%	\$4.49	22	814	
<b>Tequila (n=38)</b>					
					0.44*

	Alcohol Use Prevalence in the Past 30 Days	Average Price per Ounce of Alcohol (\$)	Pricing Rank within Alcohol Type	Overall Pricing Rank	Spearman's Rank Correlation
1. Jose Cuervo	8.0%	\$1.36	7	200	
2. Patron	5.5%	\$4.14	26	774	
3. 1800 Tequila	4.9%	\$1.96	11	341	
4. Don Julio	1.2%	\$4.25	28	788	
5. Fat Ass	1.2%	\$3.93	25	755	
Vodka (n=95)					
					0.30*
1. Smirnoff	12.7%	\$1.01	33	133	
2. Absolut	10.1%	\$1.57	48	248	
3. Grey Goose	6.7%	\$2.62	70	515	
4. UV	5.1%	\$0.97	32	124	
5. Ciroc	4.9%	\$2.89	80	592	
Whiskey (n=30)					
					0.43**
1. Crown Royal	3.0%	\$2.25	26	424	
2. Jameson Irish	1.7%	\$1.98	20	349	
3. Canadian Club	0.9%	\$1.09	16	150	
4. Black Velvet	0.8%	\$0.80	11	86	
5. Windsor	0.5%	\$0.68	7	53	
Table Wine (n=325)					
					0.61*
1. Barefoot	4.4%	\$1.92	25	321	
2. Andre	2.7%	\$2.20	35	416	
3. Yellow Tail	2.3%	\$1.76	18	285	
4. Arbor Mist	2.1%	\$3.17	116	643	
5. Sutter Home	1.9%	\$2.33	42	443	
Fortified Wine (n=5)					
					-0.10
1. Wild Irish Rose	1.0%	\$0.92	3	118	

	Alcohol Use Prevalence in the Past 30 Days	Average Price per Ounce of Alcohol (\$)	Pricing Rank within Alcohol Type	Overall Pricing Rank	Spearman's Rank Correlation
2. Mad Dog	0.9%	\$1.03	4	137	
3. Night Train	0.8%	\$1.04	1	108	
4. Thunderbird	0.5%	\$1.04	5	140	
5. Cisco	0.1%	\$0.91	2	114	

\*  $p < .001$

\*\*  $p < .01$

<sup>a</sup> Rank by average price per ounce of alcohol, looking within alcohol type (e.g., for beer, 1 = cheapest beer; 144 = most expensive beer)

<sup>b</sup> Rank by average price per ounce of alcohol, looking across all brands (1 = cheapest brand; 951 = most expensive brand)

<sup>c</sup> Spearman's Rho correlation coefficient for the association between rank based on popularity (consumption prevalence) and rank based on price, looking across all brands of the specified type. *Note:* A higher popularity rank is associated with having a lower price (an inverse price rank).