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Price of Four Loko in Large U.S. Cities, 2018

Matthew E. Rossheim, PhD^{a,*}, Dennis L. Thoms, PhD^b, Ryan D. Treffers^c, Pamela J. Trangenstein^d, Kayla K. McDonald^a, Reema Ahmad^a, Sieka S. Siklo^a, Kwynn M. Gonzalez-Pons^e, Sumihiro Suzuki^f, David H. Jernigan, PhD^g

^aDepartment of Global and Community Health, George Mason University, VA

^bDepartment of Health Behavior and Health Systems, University of North Texas Health Science Center School of Public Health, Fort Worth, TX

^cPacific Institute for Research and Evaluation, Santa Cruz, CA

^dAlcohol Research Group, Emeryville, CA

^eCollege of Social Work, University of Utah, Salt Lake City, UT

^fDepartment of Biostatistics and Epidemiology, University of North Texas Health Science Center School of Public Health, Fort Worth, TX

^gDepartment of Health Law, Policy & Management, Boston University, Boston, MA

Abstract

Background—Supersized alcopops are flavored alcoholic beverages that contain up to 5.5 standard alcoholic drinks in a single can. Limited research suggests Four Loko – the most commonly consumed supersized alcopop by underage drinkers – is among the least expensive ready-to-drink alcohol products on the U.S. market. This is a public health concern because alcohol prices are inversely associated with consumption and related harms, particularly among youth. This study investigated Four Loko’s retail price per volume of alcohol in large U.S. cities.

Methods—This study used multi-stage random sampling to collect data in the largest city of each state and Washington, D.C. A simple random sample of five ZIP codes from each city was selected and entered into Four Loko’s website product locator. Within ZIP codes, up to four stores were randomly selected and contacted by telephone. Retailers were interviewed about Four Loko in regard to: availability, volume, alcohol-by-volume, price for one can, and discounts for purchasing more than one can.

Results—The sample included 344 retail stores with Four Loko in stock. Average price per standard alcoholic drink (i.e., 14g of absolute alcohol) was \$0.54 for Four Loko products. Taking into account volume, price, and discounts, an average of 17 standard alcoholic drinks could be purchased via Four Loko with \$10. Adjusted analysis using linear regression showed that availability of bulk price discounts and higher alcohol-by-volume (14% versus 12%) were associated with lower price per drink.

*Corresponding author. Department of Global and Community Health, George Mason University, 4400 University Drive, MS5B7, Fairfax, VA 22030; Tel.: +1 941 323 0778; Fax: 703 993 1908; mrosshei@gmu.edu.

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Discussion—This study verifies that Four Loko is among the least expensive ready-to-drink alcohol available for purchase in the U.S. Given that consuming a single supersized alcopop constitutes binge drinking and is therefore unsafe, regulatory agencies should consider a variety of steps to reduce the availability and alcohol-by-volume of these products and increase their retail price in order to reduce and prevent unsafe alcohol consumption.

Keywords

Alcohol Pricing; Flavored Alcoholic Beverages; Flavored Malt Beverages; Convenience Stores; Gas Stations

Background

Supersized alcopops are ready-to-drink flavored alcoholic beverages (FABs) with high alcohol content (Rossheim & Thombs, 2013). They contain approximately three times the alcohol-by-volume (abv) of regular beers (12% to 14% versus 4% to 6%) and are sold in containers with twice the liquid volume. As a result, a single can of supersized alcopop has the same alcohol content as a six-pack of beer. Supersized alcopops are commonly consumed by underage drinkers, with more than 1 in 12 underage drinkers in the United States (U.S.) consuming a supersized alcopop within the past 30 days (Fortunato et al., 2014). Within this class of beverages, Four Loko is the most commonly consumed brand; roughly 1 in 16 underage drinkers consumed a Four Loko beverage in the past 30 days (Siegel et al., 2013). Moreover, when young people – 13 to 20 years old – have the opportunity to select the type of alcohol they drink, they drink Four Loko more often than when they are not able to select the brand of alcohol they drink (Roberts et al., 2014).

Given its high alcohol content, consuming just one can of Four Loko on a single occasion constitutes binge drinking, and is therefore an unsafe practice (Federal Trade Commission [FTC], 2013). Consuming a single Four Loko can result in a blood alcohol concentration (BAC) level well in excess of the legal per se driving limit (0.08 g/dL), whereas consuming multiple cans puts them at risk of alcohol poisoning (Rossheim & Thombs, 2017). Despite these risks, an analysis of YouTube videos indicates that people often chug an entire can of Four Loko, and sometimes two or three cans of Four Loko, in just a few minutes (Rossheim et al., under review).

Population estimates of harm attributable to supersized alcopop consumption are unknown. Nevertheless, limited research suggests that consumption of these products is associated with greater odds of both heavy episodic drinking and the experience of alcohol-related injuries (Albers et al., 2015). Moreover, data from the Drug Abuse Warning Network (DAWN) indicate that in 2011 (the last year data were collected) approximately 5,500 emergency department visits occurred nationwide involving Four Loko consumption by underage drinkers and/or people using them concurrently with illicit substances (Rossheim et al., 2015). These findings are not surprising given the high alcohol content of supersized alcopops. However, since the aforementioned studies were conducted, the alcohol concentration of available Four Loko products has increased from 12% to 14% (Rossheim & Thombs, 2013).

In 2015, 17 State Attorneys General sent a letter to Phusion Projects, LLC (the manufacturer of Four Loko), requesting that the alcohol content of Four Loko be reduced (State Attorneys General, 2015). Phusion Projects, LLC, not only ignored the government request, but has since offered four new flavors with even greater alcohol content (14% abv), equivalent to 5.5 standard drinks (Four Loko Website, 2019a). This increase in alcohol content can now result in markedly higher BAC levels for consumers, especially young people (Rossheim & Thombs, 2017). However, it is unclear whether this increase in alcohol content actually reduced the products' "retail price per ounce of alcohol" (i.e., unit price). This issue is of critical importance because an alcohol price reduction (per ounce of alcohol) could increase consumption among underage drinkers.

An abundance of research shows that alcohol prices are inversely associated with consumption and related harm (Wagenaar, Tobler, & Komro, 2010), and due to their more limited income, young people are especially sensitive to alcohol prices (Chaloupka, Grossman, & Saffer, 2002). In addition, limited research shows that young people can more accurately recall the price of alcopops they purchased compared to beer, suggesting that they may be even more sensitive to alcopop prices and discounts (Jensen et al., 2017). To the extent of our knowledge, only one study has assessed the price of Four Loko in the marketplace (DiLoreto et al., 2012). However, this study was limited by relying on a small sample ($n = 10$) that was restricted to alcohol control states and online stores (DiLoreto et al., 2012). Nevertheless, this study found that Four Loko was among the least expensive ready-to-drink alcohol products available in the retail market (Youth Alcohol Brands, 2019). In addition to their sweet flavors, youth-oriented marketing, and packaging that resembles energy drinks (Mart, 2011), the low price of supersized alcopops helps explain why young people frequently consume them.

The current study investigated the price of Four Loko among a large sample of retailers across the U.S. We examined the price of Four Loko per standard alcoholic drink and compared our findings to previous price estimates after adjusting for inflation between studied time periods. Specifically, we tested whether the new 14% abv Four Loko products were less expensive per standard alcoholic drink than the original 12% abv products. In addition, we assessed whether bulk price discounts offered by some retail stores resulted in lower prices and more total alcohol that could be purchased via Four Loko assuming a budget of \$10.

Methods

Sampling Design

To increase the likelihood of obtaining a representative sample of urban retail stores, this study used multi-stage random sampling. The study sample was limited to Washington, D.C. and the city with the largest population in each U.S. state. Large cities were selected because (1) ZIP codes in these cities were likely to have more retailers that sell Four Loko than ZIP codes in smaller cities and (2) these cities contain a large proportion of the U.S. population. That is, in 2017, an estimated one in eight Americans (12.1%) lived in these 51 cities (United States Census Bureau 2019a,b).

A census of ZIP codes in each city was gathered from the U.S. Postal Service (United States Postal Service, 2019). For each city, a simple random sample of five ZIP codes was selected. These ZIP codes were entered into the Four Loko website product locator (Four Loko Website, 2019b) to identify retail stores with that ZIP code that sell Four Loko products. If there were not stores that sold Four Loko products in a selected ZIP code, another ZIP code was randomly selected so that data were included for up to five ZIP code areas in each city. Consistent with previous research (Rossheim et al., 2015), Oklahoma and Utah were the only states with no stores selling Four Loko. Hence, cities in these states were excluded, resulting in an analytic sample that included data from 49 cities. For each ZIP code included in the sampling frame, the research team selected a random sample of up to four retail stores to contact by telephone. We created the sampling frame and called retail stores in September 2018.

Measures

We interviewed the person answering the telephone at each retail location about Four Loko in regard to the following: (a) availability, (b) volume, (c) percent abv, (d) price for an individual can, and (e) discounts for purchasing more than one can. We used this information to construct the measures described below.

Alcohol-by-volume

Retailers were asked about the percent alcohol-by-volume of the Four Loko that they had in stock. Because the majority of retailers (97%) reported carrying Four Loko with 12% and/or 14% abv, we restricted our analysis sample to these outlets. If an outlet carried both 12% and 14% abv Four Loko, information (i.e., volume, price, and price discount data) was recorded related to the higher abv products. We created a binary (yes/no) variable to identify whether the outlets sold the 14% abv version of Four Loko.

Price discounts

We asked each retail location if they offered a discount for purchasing more than one can of Four Loko. We dichotomized (yes/no) these data to identify outlets offering these types of promotions.

Price

We asked each retailer for the price of a single can of Four Loko as well as whether they offered a discount for buying more than one at once (i.e., bulk purchases). We calculated the price per standard drink by dividing the total price by the number of standard alcoholic drinks contained within the can(s) purchased. A standard alcoholic drink in the U.S. equates to 14 g of absolute alcohol, which is the alcohol content of a 12 oz 5% abv beer or 1.5 oz 40% abv shot of liquor (NIAAA, 2019). Therefore, for 23.5 oz Four Loko products, 12% and 14% abv products would have the equivalent alcohol content of 4.7 and 5.5 standard alcoholic drinks, respectively. If retailers provided several prices, we used price data for the least expensive price per can (i.e., using single can prices for 249 stores and multiple-can discounted prices for the 95 stores that offered them).

Data Analysis

Price data collected from these calls were compared to 2011 data (DiLoreto et al., 2012) that were adjusted for inflation using the Bureau of Labor Statistics' Consumer Price Index inflation calculator (Bureau of Labor Statistics, 2019). T-tests were used to compare mean price of Four Loko between stores that (a) carried 14% versus 12% abv Four Loko and (b) offered versus did not offer discounts for purchasing more than one can. However, prices varied substantially between states. Therefore, we also used a linear regression model to repeat these comparisons after adjusting for state-level price differences. We modeled the expected mean price as a function of abv and bulk price offerings, and adjusted for state-level price differences by including dummy variables for each of the 49 states. We tested the regression assumptions using q-normal and kernel density plots, and there was no evidence that the models violated any assumptions. We also conducted sensitivity analyses that (a) removed outliers and (b) examined potential differences between stores that sold versus did not sell liquor.

Results

Sample

Each of the 49 cities included in this study had at least one retail store in which the interviewee reported selling Four Loko with 12% abv or higher. Among the 822 retail locations called, 510 answered the telephone and were identified as the correct retail outlet in the Four Loko product locator. Among these outlets, 83% ($n = 424$) reported having Four Loko products in stock. Although we have minimal data on the retail locations that we did not reach, the 424 outlets we successfully contacted appeared representative of the original 822 outlets in terms of the nine geographic census regions. However, an examination of chi-squared test residuals suggests that the sample somewhat over-represents the Mountain and West North Central regions and under-represents the Northeast and East South Central regions ($|\text{residuals}| > 2$). Among this subset of 424 outlets that sold Four Loko, 371 (87.5%) provided information on the abv of the Four Loko products available at their location. Based on this, we restricted our sample to the 359 outlets (97% of 371) that reported carrying Four Loko with 12% ($n = 143$, 39.8%) or 14% ($n = 216$, 60.2%) abv. Price data were obtained for 344 of these 359 stores (96%). All store interviewees reported carrying the regular 23.5 oz can (as opposed to the 16 oz "Poco Loko"). Overall, among retail outlets with 12% or 14% abv Four Loko in stock, 96% of interviewees provided sufficient data to be included in the final analytic sample ($n = 344$).

Price Discounts

Among the 344 stores with available price data, 95 (27.6%) offered price discounts for purchasing multiple Four Loko products at one time. Most commonly, these stores provided discounts for purchasing two cans at one time ($n = 87$, 91.6%), though some offered discounts for purchasing more than two cans ($n = 8$, 8.4%). Across the stores with discounts, the mean and median discounts per can were \$0.42 and \$0.49, respectively. The most common discount ($n = 23$) was selling two \$2.99 cans for \$5.

Price

Across both the 12% and 14% abv products, both the mean and median price of a can of Four Loko were \$2.79 ($SD = 0.37$). However, these products had alcohol content ranging from 4.7 to 5.5 standard alcoholic drinks. Both the mean and median price per standard alcoholic drink were \$0.54 ($SD = 0.08$).

Abv formulation and bulk discounting were associated with lower prices per standard drink. In particular, stores that offered multi-can price discounts had average prices per standard alcoholic drink ($M = \$0.51$, $SD = 0.07$) that were roughly \$0.05 less expensive than stores that did not offer such discounts ($M = \$0.56$, $SD = 0.09$; $t(342) = 5.2$, $p < 0.0001$). The mean price of 12% ($M = \$2.81$, $SD = 0.38$) and 14% ($M = \$2.78$, $SD = 0.36$) abv Four Loko cans did not significantly differ ($t(342) = 0.6$, $p = 0.57$). However, the price per standard alcoholic drink of 14% abv Four Loko products ($M = \$0.51$, $SD = 0.07$) was \$0.09 lower than the price of 12% abv products ($M = \$0.60$, $SD = 0.08$, $t(342) = 11.5$, $p < 0.0001$). Thus, the average price of Four Loko was \$0.14 lower per standard alcoholic drink in stores that carried 14% abv Four Loko and offered multi-can price discounts ($M = \$0.477$, $SD = 0.05$) compared to locations that sold 12% abv Four Loko and did not offer multi-can price discounts ($M = \$0.614$, $SD = 0.08$, $t(158) = 11.5$, $p < 0.0001$).

Taking into account volume, price, and discounts, with \$10, a consumer could purchase an average of 17 standard alcoholic drinks via Four Loko ($SD = 3.4$; median = 16.5; range = 9.4 – 27.5). Bulk price discounting made it possible for consumers with \$10 to purchase an additional Four Loko in more than 20% of outlets surveyed (e.g., being able to buy four cans of Four Loko instead of three cans). At approximately 20% of stores, consumers could purchase between 22.0 and 27.5 standard alcoholic drinks for \$10 via Four Loko. In comparison, a person could only purchase roughly 9.3 standard alcoholic drinks by spending \$10 on Bud Light beer at a retail store (Youth Alcohol Brands, 2019; \$1.60/ounce of alcohol adjusted for inflation = \$1.79/ounce of alcohol; \$10/\$1.79 per ounce of alcohol = 5.587 oz of alcohol/0.6 oz of alcohol per std drink = 9.3 standard drinks).

The price of Four Loko also differed by geographic location. The average price per ounce of alcohol in Four Loko was greater than \$1.00 in California, Alabama, Massachusetts, Connecticut, Vermont, New York, and Maine. Average price per ounce of alcohol in Four Loko was less than \$0.70 in Tennessee, Michigan, and Wisconsin.

Multivariable Model

The linear regression model (adjusted $R^2 = 0.50$, $F(50,293) = 7.87$, $p < 0.0001$) indicated that stores with the 14% abv had an average price per standard alcoholic drink that was \$0.09 lower than stores that only offered the 12% formulation ($B = -0.09$, 95% CI = -0.07 , -0.10 , $p < 0.001$) after adjusting for state and bulk promotions. In addition, stores that offered bulk discounts had prices that were roughly \$0.05 lower per standard alcoholic drink than stores without these promotions ($B = -0.05$, 95% CI = -0.03 , -0.06 , $p < 0.001$). Inferences from our model did not change under sensitivity analyses when outliers ($n = 21$) with higher price per standard alcoholic drink were removed, nor when adjusting for the sale of liquor.

Discussion

This study confirmed that Four Loko is still being sold in 48 states and Washington, D.C. (Rossheim et al., 2015). Furthermore, in each of these states, retailers claimed to sell Four Loko with 12% abv or higher. Appropriate regulatory agencies should determine whether these practices are in compliance with state alcohol regulations – including proper classification as a beer-type product and pricing practices.

The most alarming findings from this study indicate that many U.S. retail outlets now sell Four Loko products in the new 14% abv formulation. To deter youth from consuming dangerous quantities of Four Loko (Rossheim et al., under review), appropriate regulatory agencies should consider placing limits on the alcohol content of ready-to-drink alcohol products or, as has been done with other alcohol products in numerous jurisdictions, simply banning these products altogether (Grossman et al., 2018). Legislatures should also consider pricing policies that increase the price of these products including raising their tax rate, reclassifying their beverage-type, and establishing a minimum unit price for alcohol. Reclassification of supersized alcopops as distilled spirits would reduce their availability at the retail locations where youth most often obtain alcohol (Rossheim, Thombs, & Treffers, 2018). Given the large between-State variation in the price per ounce of alcohol in Four Loko, more research is needed to examine the impact that increased excise taxes could have on retail price. In addition, State Attorneys General should take immediate action to require Phusion Projects, LLC to reduce the alcohol content of their ready-to-drink products.

The current study casts light on Four Loko retail pricing practices, which helps explain why youth have a preference for these products. This study is consistent with previous investigations that found Four Loko to be among the least expensive ready-to-drink alcohol products available in the retail market (DiLoreto et al., 2012). Adjusting for inflation, the average price per ounce of Four Loko in the DiLoreto and colleagues (2012) study (\$0.82 in 2011) would be approximately \$0.92 in September 2018, i.e., when data for the present study were collected (Bureau of Labor Statistics, 2019). Consistent with these previous estimates, we found that the overall average price per ounce of alcohol in Four Loko was \$0.91 (SD = 0.14). However, this overall price may obscure how price trends for the 12% and 14% abv formulations differ. In particular, the new 14% abv Four Loko cost \$0.16 less per ounce of alcohol ($M = \$0.84$, $SD = \$0.11$) compared to the 12% abv Four Loko products ($M = \$1.00$, $SD = \$0.14$), $t(342) = 11.5$, $p < 0.0001$). Thus, although the inflation-adjusted prices of 12% abv Four Loko are \$0.08 more expensive than they were in 2011 per ounce of alcohol, the new 14% abv Four Loko products are \$0.08 less expensive than the inflation-adjusted 2011 price.

The price of Four Loko (per ounce of alcohol) is roughly one-half the average price of beer and other FABs (DiLoreto et al., 2012, Table 1). Thus, the popularity of these products among underage drinkers is likely driven – in part – by their low price per standard drink. Of public policy importance, the low price of Four Loko also suggests that it may be misclassified as a beer-type product, which would have major tax and distribution consequences for the producer as well as public health implications (Rossheim, Thombs, & Treffers, 2018). When compared to other alcohol products with similar abv (i.e., 13–15%

abv), the average price of 14% abv Four Loko (\$0.84 per ounce of alcohol) is closer to the price of low-end fortified wine (range \$1.03-\$1.15) than that of other FABs (range \$1.63-\$2.66) (DiLoreto et al., 2012, Table 4, inflation-adjusted). There has been a history of so-called FABs being in violation of the law – specifically, the U.S. federal rule defining the amount of flavors and other non-beverage materials containing alcohol that can be added to a beer or malt product and still have it considered a beer or malt product by the Alcohol and Tobacco Tax and Trade Bureau (TTB) for the purposes of production, taxation, composition, labeling, and advertising (TTB, 2005). While malt products with such a high abv can be produced, it is difficult to do so without increasing the strong malt flavor of those products. Given that Four Loko has very little malt taste, it is plausible that a substantial amount of non-malt-derived alcohol has been added to these products, in possible violation of the TTB rule. Moreover, Four Loko's low price per volume of alcohol compared to beers of similar abv suggests that it is likely to be in violation of these federal regulations. Therefore, it is urgently important that the TTB objectively test the formulation of Four Loko (Rossheim, Thombs, & Treffers, 2018).

The finding that 14% abv Four Loko products cost less per standard alcoholic drink than the 12% abv products suggests that policies reducing the products' abv may also increase their retail price per standard drink. The findings of this study suggest that bulk purchase discounts are not uncommon. This is concerning given the strong associations between price and consumption (Wagenaar, Tobler, & Komro, 2010), as well as the reality that consuming even one of these products on a single occasion is an unsafe practice (FTC, 2013). The appropriate regulatory agencies should consider prohibiting bulk purchase discounts on Four Loko at the retail level.

Limitations

Our findings should be interpreted with two limitations in mind. First, our sample was restricted to large U.S. cities, which was necessary for feasibly obtaining a large sample. Thus, future research is needed to establish the prices of Four Loko in less populous areas. Second, we relied on employee self-reports rather than in-person observations of Four Loko products available for sale in stores, or surveys of prices available on websites as has been done previously (DiLoreto et al., 2012). The use of telephone sampling afforded us the opportunity to obtain data from a geographically diverse sample of retail stores; however, this may introduce error that would not be present with in-person or web-based observations. Finally, given the limited amount of time available on these calls, we only asked questions about the highest abv product that the store carried. It is therefore possible that we did not identify the least expensive alcohol available via Four Loko at these locations.

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