Prices of Healthy and Unhealthy Beverages in High and Low Per Capita Income Areas

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Abstract

To better understand availability and price of beverages in Hawai'i, the prices of healthy (milk, orange juice, unsweetened tea, unsweetened coffee, diet soda) and unhealthy beverages (regular soda, fruit drink, sports drink, sweetened tea, flavored water) were collected and the beverage prices in lower per capita income areas and higher per capita income areas were compared. Cross-sectional data on prices of healthy and unhealthy beverages were collected from supermarkets, convenience stores, and quick serve restaurants from two lower per capita income areas (Waimanalo and Wai'anae) and two higher per capita income areas (Hawai'i Kai and Manoa) on O'ahu, Hawai'i from May 15 to June 10, 2012.

Using composite data from across all areas, there was a significant difference of $0.58 (95% CI 0.46, 0.70) between the healthy beverages' mean price per 20 ounces ($1.76 $\pm$ $0.86) and the unhealthy beverages' mean price per 20 ounces ($1.18 $\pm$ $0.38) (P <.001). Although there was no statistically significant difference between per capita income areas, the lower per capita income areas' mean price per 20 ounces of healthy beverages was slightly higher and mean price per 20 ounces of unhealthy beverages was slightly lower than the higher per capita income areas. Pricing strategies that enable healthy beverages to be less expensive than unhealthy beverages is one method to increase consumption of healthy beverages and decrease consumption of unhealthy beverages. Reduction in unhealthy beverage consumption is needed to help reduce obesity, especially in the lower per capita income areas that have higher obesity prevalence.

Introduction

In O'ahu, lower per capita income areas tend to have higher obesity prevalence. In 2010, East Honolulu (including Hawai'i Kai, Kahala, and Wai'alae) had a per capita income of $48,993 and this area had an obesity prevalence of 18.8%. In contrast, Wai'anae had a per capita income of $18,097 and the area of Wai'anae/Nanakuli had an obesity prevalence of 50.1%.[1-3] A study conducted on the island of O'ahu suggests that obesity prevalence may vary by geographical area due to varying degrees of obesogenic environmental factors.[4]

Sugar-sweetened beverages (SSBs) are one of the largest contributors to caloric intake.[5] Over the years, increased consumption of SSBs has had a significant effect on the growing obesity epidemic.[6,7] Several studies link SSB consumption with weight gain, including a longitudinal study conducted in O'ahu indicating soda (an SSB) intake is positively associated with weight gain among adolescent girls.[8] A reduction in SSB consumption may be one strategy to decrease obesity prevalence.[9,10]

Recent studies have shown that beverage prices have an impact on purchasing behavior.[10-12] For instance, when the price of a high caloric beverage increases by 20%-35%, the consumption of that beverage decreases which may, eventually, decrease the prevalence of obesity.[10-13] In particular, lower per capita income areas may be more affected by price changes due to their lower disposable incomes.[13]

To better understand obesity prevalence in O'ahu, this study investigated the prices of healthy and unhealthy beverages and compared the prices within lower and higher per capita income areas. Considering that prices may influence beverage purchase behavior and that O'ahu has a high overall obesity prevalence and an even higher obesity prevalence in lower per capita income areas, the hypotheses of this study are Unhealthy beverages cost less than healthy beverages in general and; Unhealthy beverages in lower per capita income areas cost less than unhealthy beverages in higher per capita income areas.

Methods

Data on the prices of beverages were collected from May 15 to June 10, 2012. Four geographic areas on the island of O'ahu (Hawai'i Kai, Manoa, Waimanalo, and Wai'anae) were selected for assessment. Hawai'i Kai and Manoa were the higher per capita income areas, and Waimanalo and Wai'anae were the lower per capita income areas that were selected based on convenience.[1] Within each area, at least one supermarket (a store having at least five aisles of household staple foods), convenience store (a 7-eleven or other gas station/mart), and quick serve restaurant (L&L Hawaiian Barbeque, McDonald's, Burger King, or Zippy's) were assessed. In total, 8 supermarkets (2 in Hawai'i Kai, 2 in Manoa, 1 in Waimanalo, and 3 in Wai'anae), 5 convenience stores (1 in Hawai'i Kai, 2 in Manoa, 1 in Waimanalo, and 1 in Wai'anae), and 10 quick serve restaurants (4 in Hawai'i Kai, 1 in Manoa, 2 in Waimanalo, and 3 in Wai'anae) were selected based on availability.

Data collection was conducted throughout the week at various times by a University of Hawai'i at Manoa researcher using data collection forms. Beverages were first classified as healthy or unhealthy based on the 2010 Dietary Guidelines for Americans relating to nutrient density.[14] Healthy beverages included milk (2% white milk, 1% white milk, chocolate skim milk), 100 % orange juice, unsweetened tea, diet soda, and unsweetened coffee. Unhealthy beverages (beverages containing added sugar) included regular soda, fruit drinks, sweetened tea, sports drinks, and flavored water. Ready to drink sweetened coffee and energy drinks were treated as separate categories consistent with the beverage industry classification of these as functional drinks, and water was also considered separately consistent with the beverage industry's classification of bottled water.[15] Up to three brands of beverages were chosen in each category; for each beverage category, the three cheapest brands were selected based on the prices of the smallest available size of that particular beverage. However, because multiple brands and sizes of soda and water were available, soda and water brands were selected based on two criteria. First, the selection process was

limited only to soda brands that were available in at least three different sizes; then, among these, the three with the lowest cost at the smallest size were included in the assessment. Similarly, the criteria used to select the brands of water were first availability in at least two different sizes, and then lowest cost at the smallest size. Once the beverage brands were selected, the prices and ounces of all available sizes (bottled, canned, and fountain drinks) of these beverage brands were collected. The goal was to ascertain the regular prices of these beverages (not sales prices) by checking the price labels and/or menus.

Mean price per 20 ounces was the primary unit used to compare the data since 20 ounces was the most common beverage size. Since both the price and size of each beverage was recorded, a beverage's price per ounce was easily calculated by dividing its price by its size in ounces; the calculated price per ounce was averaged across all available sizes for a particular beverage. A beverage's price per 20 ounces was then calculated by multiplying 20 by the previously calculated average price per ounce value.

The mean prices per 20 ounces of healthy and unhealthy beverages were compared in general and by per capita income area using analysis of variance (ANOVA), independent samples t-tests, and descriptive statistics. These data analyses were performed using SPSS Statistics version 20, and $P \leq .05$ was considered statistically significant.

Results

From the 23 stores assessed in this study, a total of 1,067 beverage prices were recorded providing information on various beverage categories (Table 1). These beverage prices were collected from beverages ranging in size from 8 ounces to 288 ounces (data not shown). A detailed list of beverages by size can be found in Table 2. By beverage classification, there were 401 healthy beverages (median price per 20 ounces = $1.69; interquartile range (IQR) of prices per 20 ounces = $1.10), 489 unhealthy beverages (median price per 20 ounces = $1.12; IQR of prices per 20 ounces = $0.61), 76 sweetened coffees (median price per 20 ounces = $2.16; IQR of prices per 20 ounces = $1.80), 40 energy drinks (median price per 20 ounces = $2.74; IQR of prices per 20 ounces = $0.73), and 61 waters (median price per 20 ounces = $0.82; IQR of prices per 20 ounces = $0.53) sampled in this study (Table 3).

The mean price per 20 ounces for healthy beverages was approximately $1.76 ± 0.86 and for unhealthy beverages was approximately $1.18 ± 0.38 (Table 3). The difference between the healthy beverages' mean price per 20 ounces and the unhealthy beverages' mean price per 20 ounces of $0.58 (95% CI 0.46, 0.70) was statistically significant ($P<.001$; Table 3).

In higher per capita income areas, healthy beverages cost $0.54 more per 20 ounces than unhealthy beverages ($P < .001$) (Table 4). In lower per capita income areas, healthy beverages cost $0.62 more per 20 ounces than unhealthy beverages ($P<.001$; Table 4). The cost difference between healthy and unhealthy beverages was not statistically significant between income areas ($P = .53$; Table 4), and neither was the mean price of unhealthy beverages ($P = .34$; Table 4). Although not statistically significant, healthy beverages were slightly more expensive and unhealthy beverages were slightly less expensive in lower compared to higher per capita income areas.

Table 1. Price of Beverages per 20 Ounces					
Beverage Classification	Beverage Category	N[a]	Mean Price ($) ± SD	Median Price ($)	Interquartile Range
Healthy Beverages	Coffee (Unsweetened)	46	1.88 ± 0.43	1.82	0.56
	Diet Soda	171	1.20 ± 0.43	1.09	0.74
	Milk	60	2.70 ± 0.97	2.50	1.43
	Orange Juice	55	2.64 ± 0.65	2.45	1.13
	Tea (Unsweetened)	69	1.55 ± 0.62	1.55	0.64
Unhealthy Beverages	Flavored Water	17	1.69 ± 0.25	1.79	0.40
	Fruit Drink	107	1.17 ± 0.33	1.16	0.49
	Soda	238	1.19 ± 0.41	1.17	0.66
	Sports Drink	73	1.15 ± 0.33	1.12	0.50
	Tea (Sweetened)	54	1.09 ± 0.36	0.96	0.43
Coffee (Sweetened)	Coffee (Sweetened)	76	2.65 ± 1.15	2.16	1.80
Energy Drinks	Energy Drink	40	2.82 ± 0.48	2.74	0.73
Water	Water	61	0.98 ± 0.54	0.82	0.53
Total/Mean/Median/Interquartile Range		1067	1.55 ± 0.84	1.39	0.94

[a] N represents the number of beverage prices recorded

Table 2. Size of Beverages in Ounces					
Beverage Classification	Beverage Category	N[a]	Mean Size (ounces) ± SD	Median Size (ounces)	Interquartile Range
Healthy Beverages	Coffee (Unsweetened)	46	17.00 ± 4.16	16.00	8.00
	Diet Soda	171	38.14 ± 30.22	32.00	24.00
	Milk	60	34.67 ± 38.71	16.00	40.00
	Orange Juice	55	24.96 ± 18.75	16.00	15.00
	Tea (Unsweetened)	69	24.90 ± 14.27	21.00	20.50
Unhealthy Beverages	Flavored Water	17	22.82 ± 5.25	20.00	0.00
	Fruit Drink	107	31.76 ± 21.18	22.00	32.50
	Soda	238	38.87 ± 36.30	32.00	24.00
	Sports Drink	73	29.73 ± 11.09	32.00	12.00
	Tea (Sweetened)	54	30.76 ± 14.51	23.00	22.00
Coffee (Sweetened)	Coffee (Sweetened)	76	17.53 ± 6.99	16.00	8.50
Energy Drinks	Energy Drink	40	16.79 ± 2.44	16.00	0.00
Water	Water	61	30.65 ± 23.24	20.00	34.10
Total/Mean/Median/Interquartile Range		1067	31.13 ± 26.61	22.00	18.00

[a] N represents the number of beverages recorded

Table 3. Price Per 20 Ounces by Beverage Classification					
Beverage Classification	N[f]	Mean Price ($) ± SD	Median Price ($)	Interquartile Range	Difference of Means (Healthy Beverages - Unhealthy Beverages)
Healthy Beverages[a]	401	1.76 ± 0.86	1.69	1.10	
Unhealthy Beverages[b]	489	1.18 ± 0.38	1.12	0.61	0.58 (95% CI 0.46, 0.70)[g]
Coffee (Sweetened)[c]	76	2.65 ± 1.15	2.16	1.80	
Energy Drinks[d]	40	2.82 ± 0.48	2.74	0.73	
Water[e]	61	0.98 ± 0.54	0.82	0.53	

[a] Healthy beverages: milk, orange juice, unsweetened tea, unsweetened coffee, diet soda. [b] Unhealthy beverages: regular soda, fruit drinks, sports drinks, sweetened tea, flavored water. [c] Specialty coffees: sweetened canned coffees, flavored iced coffee, flavored lattes, etc. [d] Energy drinks: non-nutrient additive functional beverages (ginseng, ginkgo biloba, etc). [e] Water: bottled water. [f] N represents the number of beverage prices recorded. [g] The difference between healthy and unhealthy beverages' mean prices per 20 ounces is statistically significant (*P*<.001).

Table 4. Price Per 20 Ounces for Healthy and Unhealthy Beverages in Higher and Lower Per Capita Income Areas						
Beverage Classification	Per Capita Income Area	N[e]	Mean Price ($) ± SD	Median Price ($)	Interquartile Range	Mean Difference (Lower - Higher Per Capita Income Areas)
Healthy Beverages[a]	Higher Per Capita Income Areas[c]	217	1.74 ± 0.85[f]	1.62	1.01	
	Lower Per Capita Income Areas[d]	184	1.79 ± 0.88[g]	1.69	1.16	0.05 (95% CI -0.12, 0.22)[h]
Unhealthy Beverages[b]	Higher Per Capita Income Areas[c]	271	1.20 ± 0.38[f]	1.22	0.59	
	Lower Per Capita Income Areas[d]	218	1.17 ± 0.39[g]	1.09	0.63	0.03 (95% CI -0.03, 0.10)[i]

[a] Healthy beverages: milk, orange juice, unsweetened tea, unsweetened coffee, diet soda (water excluded). [b] Unhealthy beverages: regular soda, fruit drinks, sports drinks, sweetened tea, flavored water (sweetened coffee and energy drinks excluded). [c] Higher per capita income areas: Hawai'i Kai and Manoa. [d] Lower per capita income areas: Waimanalo and Wai'anae. [e] N represents the number of beverage prices recorded. [f] The difference between the higher per capita income areas' healthy and unhealthy beverages' mean prices per 20 ounces is statistically significant (*P*<.001). [g] The difference between the lower per capita income areas' healthy and unhealthy beverages' mean prices per 20 ounces is statistically significant (*P*<.001). [h] The difference between the higher per capita income areas' and lower per capita income areas' healthy beverages' mean prices per 20 ounces is not statistically significant (*P*=.53). [i] The difference between the higher per capita income areas' and lower per capita income areas' unhealthy beverages' mean prices per 20 ounces is not statistically significant (*P*=.34).

Discussion

The price of unhealthy beverages was significantly less than the price of healthy beverages in both the higher and lower per capita income areas. The average 20 ounce unhealthy beverage cost approximately 58 cents less than the average 20 ounce healthy beverage. According to several studies, this price difference may affect an individual's choice of beverage and may affect a lower income individual's choice of beverage to a greater extent.[11,13] Increased price-driven consumption, especially by lower income individuals, may increase obesity prevalence.[10-13] Given the slightly larger price difference between healthy and unhealthy beverages in lower compared to higher per capita income areas and the fact that lower per capita income areas

tend to be more greatly affected by price differences, it is possible that price factors are contributing to the greater obesity prevalence in lower per capita income areas in Oʻahu.[13]

The mean price of water was cheaper per 20 ounces than the mean price of unhealthy beverages. However, one reason unhealthy beverages may be consumed more than water and other healthy beverages is that unhealthy products are advertised more than healthy products.[16,17] Increasing the advertising of healthy beverages (including water) while decreasing the advertising of unhealthy beverages (including sweetened coffee and energy drinks) may assist in reducing the prevalence of obesity.

This study has several limitations. Only four different areas in Oʻahu were sampled in this study, so the data may not be representative of the entire state of Hawaiʻi. Further, beverage prices from each outlet were only assessed once and prices change over time.

In conclusion, the mean price of healthy beverages was significantly higher than the mean price of unhealthy beverages in four areas sampled on the island of Oʻahu. Other studies have shown that unhealthy sugar-sweetened beverages may be positively associated with weight gain[6, 8] and that beverage prices affect what individuals consume and may affect lower per capita income individuals to a greater extent.[11, 13] Hence, a pricing strategy in Hawaiʻi that enables healthy beverages to be less expensive than unhealthy beverages may influence individuals, especially those with lower incomes, to consume fewer unhealthy beverages and could reduce obesity in the state of Hawaiʻi.[10,13]

Conflict of Interest

None of the authors indentify any conflict of interest.

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