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## Perceptions of drinking water safety and their associations with plain water intake among US Hispanic adults

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### Abstract

We described sociodemographic differences in perceptions of drinking water safety and examined associations between perceptions and plain water intake. We used the 2015 *Estilos* survey of 1,000 US Hispanic adults conducted in both Spanish and English. Outcome was water intake. Exposures were the level of agreement about water perceptions (My tap water is safe to drink; Community tap water is safe to drink; Bottled water is safer; I would buy less bottled water if my tap water was safe). Covariates were sociodemographics, region, Hispanic heritage, and acculturation. We used chi-square tests and multinomial logistic regression to examine associations of water perceptions and intake. Overall, 24% of Hispanic adults consumed water 1 time/day. Although 34% disagreed their home tap water was safe to drink, and 41% disagreed their community tap water was safe to drink, 65% agreed bottled water is safer than tap water, and 69% agreed they would buy less bottled water if they knew their tap water was safe. Perceptions differed by some covariates but were not significantly associated with plain water intake. In conclusion, negative perceptions of tap water were common among US Hispanic adults, which can inform efforts to increase awareness about safe public water systems.

### Keywords

Hispanic adults; perception; plain water; sociodemographics; tap water safety

## INTRODUCTION

Examining dietary intake patterns and factors influencing intake among the Hispanic populations in the United States is important, because the Hispanic population is the largest ethnic minority group in the United States (U.S. Department of Commerce 2016). Additionally, the Hispanic population has a higher prevalence of chronic diseases than non-Hispanic white counterparts (Dominguez *et al.* 2015; Hales *et al.* 2017; National Center for Health Statistics 2016). For example, according to 2015–2016 National Health and Nutrition Examination Survey (NHANES), 47% of US Hispanic adults (aged ≥ 20 years) had obesity (body mass index [BMI] ≥ 30 kg/m<sup>2</sup>), in contrast to 38% of non-Hispanic whites (Hales *et al.* 2017). Hispanic adults also had a higher prevalence of diabetes (physician-diagnosed or undiagnosed diabetes) than non-Hispanic white adults (17% versus 10%) in 2011–2014 based on the 2016 *Health, United States* report (National Center for Health Statistics 2016).

Frequent consumption of sugar-sweetened beverages (SSBs) is linked to adverse health consequences in adults such as obesity (Ebbeling *et al.* 2006; Malik *et al.* 2006; Malik & Hu 2012), type 2 diabetes (Malik *et al.* 2010; de Koning *et al.* 2011; Malik & Hu 2012), cardiovascular disease (de Koning *et al.* 2012; Huang *et al.* 2014), and dental caries (Bernabe *et al.* 2014). National data show that SSB intake is significantly higher among Hispanic adults than non-Hispanic whites (Rosinger *et al.* 2017). One strategy to reduce SSB intake is substituting intake of SSBs with plain water (i.e., without caloric sweeteners), which can help with managing body weight and reducing caloric intake (Wang *et al.* 2009; Tate *et al.* 2012; Muckelbauer *et al.* 2013). Although plain water intake can come from tap or bottled water sources, tap water is more environmentally friendly and less expensive compared to bottled water. Despite these benefits, according to 2011–2014 NHANES data, Hispanic adults were more likely to drink bottled water (OR = 2.37) and less likely to drink tap water (OR = 0.55) than non-Hispanic white counterparts (Rosinger *et al.* 2018).

A previous study of US adults found in stratified analyses that US Hispanic adults were more likely to mistrust the safety of their tap water and more likely to believe bottled water is safer than tap water compared with non-Hispanic whites (Onufrak *et al.* 2014). Additionally, US Hispanic adults who mistrusted their tap water had two times higher odds of drinking SSBs daily than Hispanics who did not (Onufrak *et al.* 2014). Because of higher bottled water intake, mistrust of tap water, and higher SSB intake among Hispanics (Onufrak *et al.* 2014; Rosinger *et al.* 2017, 2018), there is need to expand our knowledge on perceptions of drinking water safety among a large sample of Hispanic adults. Furthermore, it is possible that major national coverage of drinking water contamination, such as in Flint, Michigan in 2014 (Hanna-Attisha *et al.* 2016), has reduced trust in public water systems. Therefore, objectives of this cross-sectional study were to describe sociodemographic differences in perceptions of drinking water safety and to examine whether there are associations between such perceptions and plain water intake among US Hispanic adults.

## METHODS

### Sample and survey administration

We used the *Estilos* survey data, which were administered by Porter Novelli (a public relations company) through Offerwise (a Hispanic research company) during fall 2015. Porter Novelli developed the *Estilos* survey, which is an annual online survey of a sample of US Hispanic adults (≥ 18 years) intended to measure purchase decisions, use of technology or new media, opinions about health, sustainability, and food choices. QueOpinas Panel is the largest online US Hispanic panel with over 220,000 active panelists who are recruited nationwide through both English and Spanish network television, and survey participants were selected from this panel. The institutional review board approval was not needed for this project because CDC was not engaged in human subjects research as only deidentified data were provided to the CDC.

Porter Novelli determined an overall sample size of 1,000 Hispanics. During October and November 2015, the *Estilos* survey was sent to a random sample of 3,414 adult panelists (≥ 18 years). Offerwise determined preset quotas (caps) for age, language, acculturation, region, sex, and heritage based on US Census American Community Survey (ACS) proportions to create a more representative sample. Of these panelists, a total of 2,414 respondents were excluded due to various reasons: incomplete surveys ( $n = 256$ ), straight-lined answers ( $n = 27$ ), no response ( $n = 1,866$ ), and dismissed before entering the survey due to filled sample quotas ( $n = 265$ ), yielding a final sample of 1,000 Hispanics. When comparing the analytic sample with those who did not respond or who were excluded, the analytic sample contained a slightly higher proportion of older adults (aged ≥ 55 years), males, college graduates, those with married/domestic partnership, and those with annual house income of ≥ \$70,000 (chi-square tests,  $P < 0.05$ ). The median survey completion time was approximately 37 minutes, and respondents could exit the survey at any time. The survey was administered in both English and Spanish. Respondents who finished the survey received 750 cash-equivalent reward points (worth about \$15). The data were weighted based on sex, age, region, household income, household size, education, census region, Hispanic heritage (Mexican and non-Mexican), and acculturation. The ACS was used to provide weighting proportions for all variables but acculturation. Acculturation proportions were not measured in ACS, so it was set to match the overall Offerwise panel proportions (25% low, 50% medium, and 25% high acculturation).

### Outcome variables

The outcome variable was frequency of plain water intake, which was determined by the following question: ‘During the past month, how often did you drink a glass or bottle of plain water? Include tap, water fountain, bottled, and unflavored sparkling water.’ This question was slightly modified from a previous survey (Onufrak *et al.* 2014). Response choices were none, 1–6 times/week, 1 time/day, 2 times/day, 3 times/day, 4 times/day. To compute daily plain water intake, 1–6 times/week was changed to 0.5 times/day (3.5 times per week divided by 7 days/week) and 4 times/day was changed to 4 times/day. We created three mutually exclusive categories (1, 2–3, or 4 times/day) for plain water intake. These cutoffs were based on the plain water intake distribution of the study sample to evenly

distribute the data in each category and based on cutoffs used in previous studies (Goodman *et al.* 2013; Onufrak *et al.* 2014).

### Exposure variables

The exposure variables were four perceptions of drinking water determined by the following questions: ‘My tap water at home is safe to drink’, ‘My community tap water such as in parks is safe to drink’, ‘Bottled water is safer than tap water’, and ‘I would buy less bottled water if I knew my local tap water was safe.’ For each question, response choices were ‘strongly disagree’, ‘somewhat disagree’, ‘neither agree nor disagree’, ‘somewhat agree’, and ‘strongly agree’. These questions were almost identical to those used in a previous study (Onufrak *et al.* 2014). For current analysis, we created three categories for each water perception question: strongly/somewhat agree, neither, and strongly/somewhat disagree.

### Covariates

Mutually exclusive response categories were created for each covariate. Sociodemographic variables were age (18–34 years, 35–54 years, and ≥55 years), sex, education level (<high school, high school, some college, and college graduate), and marital status (married/domestic partnership and not married). Not married included widowed, divorced, separated, or never married. Annual household income was grouped as <\$24,999, \$25,000–\$44,999, \$45,000–\$69,999, or \$70,000. Weight status was categorized as underweight/normal weight (BMI <25 kg/m<sup>2</sup>), overweight (BMI 25 to <30 kg/m<sup>2</sup>), or having obesity (BMI ≥30 kg/m<sup>2</sup>) (National Heart Lung and Blood Institute 1998) using self-reported weight and height data. Census region of residence was categorized as Northeast, Midwest, South, and West (United States Census Bureau 2017), and Hispanic heritage was grouped as Mexican and non-Mexican. Offerwise developed an acculturation level scale based on four variables: years living in the USA (0–4, 5–9, 10–14, 15–19, ≥20 years), language spoken at home (Spanish only, Spanish mostly, Spanish and English equally, English mostly, and English only), cultural self-identification (much closer to Hispanic/Latino culture, somewhat closer to Hispanic/Latino culture, equally close to both cultures, somewhat closer to US culture, and much closer to US culture), and use of Spanish language media (Spanish media only, Spanish media mostly, equally Spanish and English media, English media mostly, and English media only). Each of five response options had points ranging from 1 to 5. One point meant assimilated (or acculturated to the US/English culture) and 5 points meant adherence to the traditional Latino/Spanish culture (or unacculturated to the US/English culture). All points from the four questions were summed to generate a composite score of acculturation, which was then grouped into three categories: traditional (16–20 points), bicultural (9–15 points), and assimilated (<9 points). This acculturation measurement and scoring is consistent with other acculturation scales in previous studies (Ayala *et al.* 2008; Park *et al.* 2016).

### Statistical analysis

Chi-square tests were used to examine bivariate relationships among sociodemographic variables, perceptions of drinking water safety, and plain water intake. A *P* value of <0.05 indicated statistical significance. We used multinomial logistic regression models to calculate adjusted odds ratios (aORs) and 95% confidence intervals (CIs) for the odds of

consuming plain water ( 1 or 2–3 times/day) by perceptions of drinking water safety. Consuming plain water 4 times/day was the reference group. Each multinomial logistic regression model included one perception of drinking water because of potential collinearity among the four perceptions of drinking water and controlled for age, sex, education level, marital status, annual household income, weight status, census region of residence, Hispanic heritage, and acculturation. We used the Statistical Analysis Software (SAS; version 9.4, SAS Institute Inc., Cary, NC) for all statistical analyses and included proper survey procedures to account for the sample weight by using SURVEYFREQ and SURVEYLOGISTIC with WEIGHT statements.

## RESULTS

Sociodemographic characteristics are shown in Table 1. Overall, 24.4% of Hispanic adults reported drinking plain water 1 time/day, 33.4% drank plain water 2–3 times/day, and 42.2% drank plain water 4 times/day during the past month. Plain water intake significantly differed by education and acculturation only ( $\chi^2$  tests,  $P < 0.05$ ). For instance, the proportion of Hispanic adults who drank plain water 1 time/day was highest among those with only a high school diploma (36.7%) and those less acculturated (or traditional, 27.4%) (Table 1).

Overall, 33.8% of Hispanic adults did not agree that their tap water at home was safe to drink, and 40.6% did not agree that their community tap water such as in parks was safe to drink (Table 2). Level of trust of home tap water safety varied by education, annual household income, and acculturation level ( $\chi^2$  tests,  $P < 0.05$ ); mistrust was most common among those with only a high school diploma (39.3%), those with household income \$24,999/year (41.2%), and those less acculturated (or traditional, 39.6%) or bicultural (38.6%). Level of trust of community tap water safety differed significantly by sex, education, and annual household income ( $\chi^2$  tests,  $P < 0.05$ ); mistrust was most common among females (47.3%), those with only a high school diploma (45.4%), and those with household income \$24,999/year (46.3%) (Table 2).

Overall, 64.7% of Hispanics agreed that bottled water was safer than tap water and 68.8% agreed that they would buy less bottled water if they knew their local tap water was safe. The perception that bottled water is safer than tap water and buying less bottled water if respondents knew that tap water was safe did not significantly vary by covariates (Table 3). Plain water intake was not significantly associated with perceptions of drinking water safety among Hispanic adults based on  $\chi^2$  tests and multinomial logistic regression models after controlling for all covariates (Table 4) as well as partially adjusted for age, sex, education, income, and acculturation (data not shown).

## DISCUSSION AND CONCLUSION

Our study findings suggest that one in three US Hispanic adults did not agree that their tap water at home was safe to drink and two in five did not agree that their community tap water such as in parks was safe to drink. Almost two in three agreed that bottled water was safer than tap water and more than two in three agreed that they would buy less bottled water if

they knew their local tap water was safe. In our study, perceptions of drinking water safety significantly differed by certain covariates; however, drinking water safety perceptions were not associated with plain water intake. Furthermore, low plain water intake was common among US Hispanic adults in our study. For example, 24.4% of US Hispanic adults drank a bottle or glass of plain water 1 time a day. Even though direct comparisons cannot be made because of differences in survey methods (e.g., mail survey versus online survey) and study populations, a previous study showed that 18.5% of US adults reported drinking a bottle or glass of plain water 1 time a day in 2010 (Onufrak *et al.* 2014).

In the present study, a large proportion of US Hispanic adults mistrusted their tap water and believed that bottled water was safer than tap water. A previous study conducted in 2010 reported that 16.0% of Hispanic adults disagreed their local tap water was safe to drink and 34.1% agreed that bottled water was safer than tap water (Onufrak *et al.* 2014). Our prevalence estimates among US Hispanics using nearly the same questions in 2015 were approximately twice as high, with 33.8% disagreeing that their local tap water was safe to drink and 64.7% agreeing that bottled water was safer than tap water. Although direct comparisons cannot be made, it seems that mistrusting their tap water and believing bottled water is safer than tap water may have become more prevalent among US Hispanics over the last five years. This could be, in part, because of timing of data collection. For example, the survey data in this study were collected in fall 2015 when major national coverage was beginning on drinking water contamination in Flint, Michigan in 2014 (Hanna-Attisha *et al.* 2016). Such widespread publicity may have had negative influences on perceptions of tap water quality in other communities throughout the United States.

We found that mistrust of both home and community tap water was most prevalent among the lowest income group and those with only a high school diploma. Moreover, mistrust of home tap water was more common among those less acculturated (or traditional Latino/Spanish culture) or bicultural in the present study. Culturally appropriate intervention efforts on improving perceptions of tap water safety might be important among Hispanics. Additionally, intervention efforts could focus on educating Hispanics who have access to potable tap water about other aspects of bottled water. For example, that bottled water is more expensive than tap water; and other negative impacts of using bottled water include waste and lack of fluoride in most bottled waters as fluoridated tap water can prevent dental caries (Iheozor-Ejiofor *et al.* 2015).

Although we found no significant association between plain water intake and perceptions of drinking water safety, a previous study reported that the odds of low plain water intake (1 time/day) was 1.9 times higher among Hispanic adults who disagreed their local tap water was safe than among Hispanics who agreed (Onufrak *et al.* 2014). Based on a study using 2011–2014 NHANES data, even though overall plain water intake did not differ between non-Hispanic white adults and Hispanic adults after controlling for covariates, the main source of plain water was bottled water among US Hispanics, whereas tap water was the main source of plain water among non-Hispanic whites (Rosinger *et al.* 2018). Thus, future studies might consider capturing bottled water intake separately from tap water intake, because this could help to distinguish how perceptions of tap water or bottled water safety impact different sources of plain water.

A strength of this study is the use of a large, nation-wide sample of US Hispanic adults. However, our findings are subject to limitations. First, causality or the directionality of associations cannot be determined, because the *Estilos* survey is a cross-sectional survey. Second, social desirability and/or recall bias could potentially exist, because the *Estilos* survey collects self-reported data. Third, our findings might not be generalizable to all Hispanic adults living in the USA, because survey participants were chosen from an online panel and those who participate in the online panel may be different from those who do not on factors related to perceptions about water and/or water consumption. Additionally, compared to those who were excluded, the study sample had a slightly higher proportion of older adults, males, college graduates, those with married/domestic partnership, and those with annual household income of  $\leq$  \$70,000. However, the data were weighted to be comparable to the distribution from the US Census ACS. Fourth, *P* values were not adjusted for multiple comparisons, which might increase false-positive hypothesis tests. Finally, plain water intake was not captured by water sources (i.e., tap water versus bottled water), and water questions were not validated.

In conclusion, negative perceptions of tap water were common among US Hispanic adults. About 34% of US Hispanic adults in this survey did not agree that their tap water at home was safe to drink and 41% did not agree that their community tap water such as in parks was safe to drink. In addition, about 65% agreed that bottled water was safer than tap water and 69% agreed that they would buy less bottled water if they knew their local tap water was safe. Tap water perceptions significantly differed by certain covariates; however, drinking water safety perceptions were not significantly associated with plain water intake. Our findings can inform culturally appropriate interventions to improve awareness about safe public water systems among the Hispanic populations.

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Respondent characteristics and their associations with plain water intake<sup>a</sup> among US Hispanic adults participating in the *Estilos* survey, 2015<sup>a</sup>

**Table 1 |**

Characteristic	All, %	Plain water intake during the past 30 days <sup>b</sup> , % ± SE				P value <sup>c</sup>
		1 time/day	2–3 times/day	4 times/day		
<b>Total sample (n = 1,000)</b>	100	24.4 ± 2.5	33.4 ± 2.9	42.2 ± 2.8	-	0.39
<b>Age</b>						
18–34 years	41.4	27.8 ± 4.4	31.9 ± 4.7	40.4 ± 4.3		
35–54 years	38.3	24.6 ± 3.6	36.4 ± 4.6	39.0 ± 3.9		
55 years	20.3	17.1 ± 5.0	30.7 ± 6.3	52.3 ± 7.2		
<b>Sex</b>						0.57
Male	50.6	26.5 ± 3.9	34.2 ± 4.2	39.3 ± 4.2		
Female	49.4	22.3 ± 3.2	32.5 ± 4.1	45.2 ± 3.8		
<b>Education level</b>						0.01
< High school	34.7	18.8 ± 3.7	39.2 ± 5.9	42.1 ± 5.3		
High school graduate	27.2	36.7 ± 6.0	27.6 ± 5.0	35.7 ± 5.1		
Some college	17.6	20.6 ± 4.8	24.0 ± 4.1	55.5 ± 5.5		
College graduate	20.5	20.8 ± 3.7	39.3 ± 5.9	40.0 ± 5.9		
<b>Marital status</b>						0.72
Married/domestic partnership <sup>d</sup>	60.3	24.0 ± 3.4	35.2 ± 3.7	40.8 ± 3.4		
Not married	39.7	24.9 ± 3.7	30.6 ± 4.8	44.5 ± 4.9		
<b>Annual household income</b>						0.08
\$24,999	28.3	27.5 ± 3.5	24.5 ± 3.0	48.0 ± 4.1		
\$25,000–\$44,999	25.9	21.3 ± 4.1	34.1 ± 6.1	44.6 ± 5.5		
\$45,000–\$69,999	18.3	13.5 ± 4.2	44.4 ± 7.8	42.1 ± 6.9		
\$70,000	27.5	31.3 ± 6.6	34.4 ± 6.0	34.3 ± 6.2		
<b>Weight status (n = 964)<sup>e</sup></b>						0.23
Underweight/normal weight	42.2	27.1 ± 4.6	36.9 ± 5.1	36.0 ± 4.2		
Overweight	33.2	21.4 ± 4.0	27.7 ± 4.4	51.0 ± 5.1		
Obesity	24.6	21.8 ± 4.2	36.6 ± 5.7	41.5 ± 5.3		
<b>Census region of residence</b>						0.93

Characteristic	Plain water intake during the past 30 days <sup>b</sup> , % ± SE				P value <sup>c</sup>
	All, %	1 time/day	2–3 times/day	4 times/day	
Northeast	14.0	29.1 ± 5.7	26.1 ± 5.3	44.9 ± 6.4	
Midwest	9.2	24.8 ± 8.2	31.2 ± 7.9	44.0 ± 8.8	
South	36.7	23.0 ± 4.9	33.5 ± 5.7	43.5 ± 5.4	
West	40.2	23.9 ± 3.5	36.3 ± 4.4	39.8 ± 4.0	
<b>Hispanic heritage</b>					0.17
Mexican	63.9	23.6 ± 3.4	37.1 ± 3.9	39.3 ± 3.5	
Non-Mexican	36.1	25.8 ± 3.6	26.8 ± 3.6	47.4 ± 4.6	
<b>Acculturation level<sup>f</sup></b>					0.04
Traditional	25.0	27.4 ± 4.8	22.0 ± 4.0	50.6 ± 5.3	
Bicultural	50.0	21.7 ± 2.9	33.9 ± 3.9	44.4 ± 3.8	
Assimilated	25.0	26.6 ± 6.7	43.8 ± 7.2	29.6 ± 5.6	

<sup>a</sup>Weighted percent may not add up to 100% because of rounding.

<sup>b</sup>Determined by the question, ‘During the past month, how often did you drink a glass or bottle of plain water? Include tap, water fountain, bottled, and unflavored sparkling water.’

<sup>c</sup> $\chi^2$  tests were used for each variable to examine differences across categories.

<sup>d</sup>Widowed, divorced, separated, or never married.

<sup>e</sup>Weight status was based on calculated body mass index (BMI) (kg/m<sup>2</sup>): underweight/normal weight, BMI <25; overweight, BMI 25 to <30; Obesity, BMI ≥ 30.

<sup>f</sup>Based on years living in the USA, language spoken at home, cultural self-identification, and use of Spanish language media.

Table 2 |

Respondent characteristics by tap water safety perception among US Hispanic adults participating in the *Estilos* survey, 2015<sup>a</sup>

Characteristic	My tap water at home is safe to drink, % ± SE			My community tap water such as in parks is safe to drink, % ± SE			P value <sup>b</sup>
	Disagree	Neither	Agree	Disagree	Neither	Agree	
<b>Total sample (n = 1,000)</b>	33.8 ± 2.6	26.6 ± 2.7	39.6 ± 2.9	40.6 ± 2.8	28.3 ± 2.6	31.1 ± 2.9	-
<b>Age</b>			0.56				0.22
18–34 years	31.2 ± 3.8	29.0 ± 4.5	39.8 ± 4.7	35.3 ± 4.1	32.7 ± 4.4	32.0 ± 4.7	
35–54 years	39.6 ± 4.1	23.7 ± 3.8	36.7 ± 4.3	48.0 ± 4.3	25.8 ± 3.9	26.1 ± 4.1	
55 years	28.0 ± 6.9	27.1 ± 6.1	44.9 ± 7.2	37.3 ± 7.2	23.8 ± 5.6	38.9 ± 7.1	
<b>Sex</b>			0.08				0.01
Male	27.5 ± 3.7	29.2 ± 3.7	43.4 ± 4.5	34.0 ± 4.0	27.5 ± 3.5	38.5 ± 4.6	
Female	40.2 ± 3.7	24.0 ± 3.9	35.8 ± 3.7	47.3 ± 3.9	29.1 ± 4.0	23.6 ± 3.1	
<b>Education level</b>			0.002				0.04
< High school	36.0 ± 4.9	36.8 ± 5.9	27.3 ± 5.0	39.6 ± 5.1	36.9 ± 5.7	23.5 ± 5.0	
High school graduate	39.3 ± 5.5	23.4 ± 4.0	37.2 ± 6.1	45.4 ± 5.7	27.5 ± 4.4	27.1 ± 6.0	
Some college	28.7 ± 4.3	18.0 ± 4.0	53.3 ± 5.5	41.0 ± 5.2	18.8 ± 3.8	40.1 ± 5.9	
College graduate	26.9 ± 5.8	21.0 ± 3.7	52.1 ± 5.9	35.4 ± 5.9	22.9 ± 3.7	41.7 ± 5.9	
<b>Marital status</b>			0.95				0.49
Married/domestic partnership <sup>c</sup>	34.4 ± 3.1	26.6 ± 3.5	39.0 ± 3.7	41.9 ± 3.5	29.6 ± 3.5	28.5 ± 3.6	
Not married	32.7 ± 4.6	26.6 ± 4.1	40.7 ± 4.9	38.6 ± 4.8	26.3 ± 3.8	35.2 ± 4.9	
<b>Annual household income</b>			0.002				0.02
\$24,999	41.2 ± 3.9	34.4 ± 4.2	24.4 ± 3.0	46.3 ± 4.0	31.7 ± 4.0	22.0 ± 3.1	
\$25,000–\$44,999	34.1 ± 4.9	30.2 ± 5.6	35.7 ± 5.6	36.5 ± 5.1	36.8 ± 5.6	26.7 ± 5.6	
\$45,000–\$69,999	33.9 ± 6.6	25.0 ± 7.8	41.1 ± 7.2	42.0 ± 7.1	27.6 ± 7.8	30.4 ± 6.5	
\$70,000	25.6 ± 5.8	16.3 ± 3.7	58.1 ± 6.3	37.6 ± 6.3	17.2 ± 3.7	45.2 ± 6.7	
<b>Weight status (n = 964)<sup>d</sup></b>			0.13				0.35
Underweight/normal weight	25.5 ± 3.4	30.0 ± 4.7	44.5 ± 5.0	36.4 ± 4.3	25.8 ± 4.3	37.8 ± 5.2	
Overweight	38.5 ± 5.0	23.6 ± 4.1	37.9 ± 5.1	44.4 ± 5.1	27.5 ± 4.3	28.1 ± 4.6	
Obesity	41.6 ± 5.4	25.0 ± 5.4	33.4 ± 4.9	43.2 ± 5.5	31.5 ± 5.4	25.3 ± 4.4	
<b>Census region of residence</b>			0.88				0.89

Characteristic	My tap water at home is safe to drink, % ± SE				My community tap water such as in parks is safe to drink, % ± SE			
	Disagree	Neither	Agree	P value <sup>b</sup>	Disagree	Neither	Agree	P value <sup>b</sup>
Northeast	38.2 ± 6.4	26.2 ± 5.3	35.7 ± 5.9		42.6 ± 6.5	29.9 ± 5.5	27.5 ± 5.3	
Midwest	40.0 ± 8.6	30.3 ± 8.6	29.7 ± 7.8		48.4 ± 8.9	29.8 ± 8.1	21.8 ± 7.4	
South	32.9 ± 5.0	24.8 ± 5.1	42.3 ± 5.6		40.7 ± 5.4	26.1 ± 5.0	33.2 ± 5.6	
West	31.5 ± 3.5	27.6 ± 3.9	40.9 ± 4.4		38.0 ± 3.9	29.3 ± 3.9	32.7 ± 4.3	
<b>Hispanic heritage</b>				0.21				0.27
Mexican	31.5 ± 3.1	29.7 ± 3.7	38.8 ± 3.8		37.7 ± 3.4	30.9 ± 3.6	31.4 ± 3.8	
Non-Mexican	37.8 ± 4.7	21.1 ± 3.2	41.1 ± 4.5		45.7 ± 4.6	23.6 ± 3.3	30.7 ± 4.4	
<b>Acculturation level<sup>c</sup></b>				0.001				0.07
Traditional	39.6 ± 5.0	29.4 ± 4.8	31.0 ± 5.2		50.0 ± 5.3	30.5 ± 4.7	19.5 ± 4.5	
Bicultural	38.6 ± 3.8	27.9 ± 3.8	33.5 ± 3.5		39.8 ± 3.7	28.8 ± 3.7	31.4 ± 3.6	
Assimilated	18.2 ± 4.5	21.2 ± 5.7	60.6 ± 6.7		32.7 ± 6.2	25.1 ± 5.8	42.2 ± 7.4	

<sup>a</sup>Weighted percent may not add up to 100% because of rounding.

<sup>b</sup> $\chi^2$  tests were used for each variable to examine differences across categories.

<sup>c</sup>Widowed, divorced, separated, or never married.

<sup>d</sup>Weight status was based on calculated body mass index (BMI) ( $\text{kg}/\text{m}^2$ ): underweight/normal weight, BMI <25; overweight, BMI 25 to <30; obesity, BMI 30.

<sup>e</sup>Based on years living in USA, language spoken at home, cultural self-identification, and use of Spanish language media.

Table 3 |

Respondent characteristics by bottled water safety perceptions among US Hispanic adults participating in the *Estilos* survey, 2015<sup>a</sup>

Characteristics	Bottled water is safer than tap water, % ± SE				I would buy less bottled water if I knew my local tap water was safe, % ± SE			
	Disagree	Neither	Agree	P value <sup>b</sup>	Disagree	Neither	Agree	P value <sup>b</sup>
<b>Total sample (n = 1,000)</b>	11.9 ± 1.9	23.4 ± 2.6	64.7 ± 2.8	-	15.1 ± 2.2	16.1 ± 1.9	68.8 ± 2.7	-
<b>Age</b>				0.57				0.97
18–34 years	11.6 ± 3.3	22.1 ± 4.3	66.4 ± 4.7		11.6 ± 3.3	22.1 ± 4.3	66.4 ± 4.7	
35–54 years	12.0 ± 2.4	23.0 ± 3.5	65.0 ± 4.0		12.0 ± 2.4	23.0 ± 3.5	65.0 ± 4.0	
55 years	12.5 ± 4.7	26.7 ± 6.4	60.8 ± 7.1		12.5 ± 4.7	26.7 ± 6.4	60.8 ± 7.1	
<b>Sex</b>				0.29				0.07
Male	13.2 ± 3.1	26.4 ± 4.1	60.5 ± 4.4		19.1 ± 3.9	13.4 ± 2.4	67.5 ± 4.1	
Female	10.6 ± 2.0	20.3 ± 3.1	69.1 ± 3.5		11.2 ± 1.9	18.9 ± 2.9	70.0 ± 3.4	
<b>Education level</b>				0.05				0.83
<High school	15.2 ± 4.2	23.0 ± 4.2	61.8 ± 5.3		17.5 ± 4.3	14.1 ± 3.6	68.4 ± 5.1	
High school graduate	7.8 ± 2.3	27.7 ± 6.2	64.5 ± 6.1		12.5 ± 3.2	15.3 ± 3.5	72.3 ± 4.5	
Some college	16.9 ± 4.8	28.0 ± 5.5	55.1 ± 5.7		15.3 ± 4.3	21.8 ± 5.0	62.8 ± 5.7	
College graduate	7.5 ± 1.9	14.3 ± 2.5	78.2 ± 3.4		14.4 ± 5.9	15.8 ± 2.9	69.8 ± 5.7	
<b>Marital status</b>				0.77				0.66
Married/domestic partnership <sup>c</sup>	11.8 ± 2.2	24.8 ± 3.5	63.3 ± 3.7		13.6 ± 2.3	16.5 ± 2.3	69.9 ± 3.1	
Not married	12.0 ± 3.4	21.2 ± 3.6	66.8 ± 4.5		17.5 ± 4.3	15.5 ± 3.3	67.0 ± 4.8	
<b>Annual household income</b>				0.41				0.19
\$24,999	10.0 ± 2.4	26.4 ± 3.7	63.6 ± 4.0		12.6 ± 2.0	14.3 ± 3.0	73.0 ± 3.4	
\$25,000–\$44,999	16.8 ± 4.9	17.7 ± 3.7	65.5 ± 5.4		19.4 ± 5.0	17.4 ± 4.0	63.2 ± 5.6	
\$45,000–\$69,999	8.2 ± 3.0	31.7 ± 6.9	60.1 ± 7.2		5.9 ± 2.5	20.2 ± 5.2	73.9 ± 5.7	
\$70,000	11.8 ± 3.8	20.0 ± 6.2	68.2 ± 6.5		19.9 ± 5.8	14.0 ± 3.6	66.2 ± 6.2	
<b>Weight status (n = 964)<sup>d</sup></b>				0.95				0.79
Underweight/normal weight	11.6 ± 3.3	24.6 ± 4.5	63.8 ± 4.9		13.9 ± 3.3	16.4 ± 3.1	69.7 ± 4.2	
Overweight	11.5 ± 3.2	20.9 ± 4.1	67.7 ± 4.7		18.8 ± 4.8	15.2 ± 3.3	66.0 ± 5.1	
Obesity	12.9 ± 3.3	25.0 ± 4.8	62.1 ± 5.3		12.8 ± 3.1	14.8 ± 3.7	72.3 ± 4.6	
<b>Census region of residence</b>				0.56				0.08

Characteristics	Bottled water is safer than tap water, % ± SE				I would buy less bottled water if I knew my local tap water was safe, % ± SE			
	Disagree	Neither	Agree	P value <sup>b</sup>	Disagree	Neither	Agree	P value <sup>b</sup>
Northeast	9.9 ± 3.9	27.1 ± 6.0	62.9 ± 6.4		18.1 ± 4.6	18.9 ± 4.7	63.0 ± 6.0	
Midwest	12.3 ± 4.8	25.9 ± 8.0	61.8 ± 8.5		8.3 ± 3.7	32.0 ± 8.5	59.7 ± 8.7	
South	10.8 ± 3.0	27.9 ± 5.3	61.2 ± 5.5		14.8 ± 4.3	10.3 ± 2.4	74.9 ± 4.7	
West	13.5 ± 3.4	17.3 ± 2.9	69.2 ± 4.0		16.0 ± 3.4	16.8 ± 3.1	67.2 ± 4.1	
<b>Hispanic heritage</b>				0.88				0.34
Mexican	12.6 ± 2.6	22.9 ± 3.4	64.5 ± 3.7		13.2 ± 2.5	15.3 ± 2.3	71.5 ± 3.2	
Non-Mexican	10.8 ± 2.6	24.2 ± 3.9	65.1 ± 4.3		18.6 ± 4.2	17.5 ± 3.3	63.9 ± 4.6	
<b>Acculturation level<sup>e</sup></b>				0.75				0.45
Traditional	10.8 ± 3.7	24.0 ± 4.8	65.1 ± 5.3		11.5 ± 3.2	14.5 ± 3.2	74.0 ± 4.3	
Bicultural	12.1 ± 2.1	20.3 ± 2.8	67.5 ± 3.3		16.2 ± 3.3	14.2 ± 2.4	69.6 ± 3.7	
Assimilated	12.5 ± 5.0	28.8 ± 6.9	58.7 ± 7.2		16.6 ± 5.1	21.5 ± 5.0	61.9 ± 6.6	

<sup>a</sup>Weighted percent may not add up to 100% because of rounding.

<sup>b</sup> $\chi^2$  tests were used for each variable to examine differences across categories.

<sup>c</sup>Widowed, divorced, separated, or never married.

<sup>d</sup>Weight status was based on calculated body mass index (BMI) (kg/m<sup>2</sup>): underweight/normal weight, BMI <25; overweight, BMI 25 to <30; obesity BMI ≥ 30.

<sup>e</sup>Based on years living in USA, language spoken at home, cultural self-identification, and use of Spanish language media.

Table 4 |

Associations between perception of tap and bottled water safety and plain water intake<sup>a</sup> among US hispanic adults aged 18 years participating in the *Estilos* survey, 2015<sup>a</sup>

Perceptions of tap and bottled water safety	Bivariate analysis ( <i>n</i> = 1,000) <sup>b</sup>			Multinomial logistic regression analysis ( <i>n</i> = 964) <sup>c</sup>		
	Plain water Intake, % ± SE			Plain water Intake, aOR (95% CI)		
	1 time/day	2–3 times/day	4 times/day	P value <sup>d</sup>	1 time/day	2–3 times/day
<b>My tap water at home is safe to drink</b>						
Disagree	21.9 ± 3.6	25.2 ± 3.5	53.0 ± 4.4	0.09	0.65 (0.34, 1.25)	0.65 (0.35, 1.19)
Neither	25.1 ± 4.5	39.6 ± 6.3	35.3 ± 5.3		1.09 (0.55, 2.16)	1.25 (0.65, 2.42)
Agree	26.0 ± 4.7	36.2 ± 4.9	37.8 ± 4.5		1.00	1.00
<b>My community tap water such as in parks is safe to drink</b>						
Disagree	26.3 ± 3.8	26.0 ± 3.5	47.7 ± 4.2	0.28	1.07 (0.55, 2.21)	0.77 (0.41, 1.44)
Neither	22.6 ± 3.8	39.9 ± 5.8	37.5 ± 5.0		1.27 (0.64, 2.54)	1.41 (0.73, 2.74)
Agree	23.5 ± 5.5	37.0 ± 5.8	39.5 ± 5.4		1.00	1.00
<b>Bottled water is safer than tap water</b>						
Disagree	37.1 ± 8.1	23.4 ± 9.0	39.8 ± 7.7	0.32	1.00	1.00
Neither	24.9 ± 6.6	29.0 ± 5.4	46.1 ± 6.2		0.51 (0.20, 1.29)	1.13 (0.41, 3.10)
Agree	21.9 ± 2.7	36.8 ± 3.7	41.3 ± 3.5		0.54 (0.24, 1.21)	1.84 (0.75, 4.50)
<b>I would buy less bottled water if I knew my local tap water was safe</b>						
Disagree	28.2 ± 6.3	23.8 ± 7.6	48.0 ± 8.1	0.53	1.00	1.00
Neither	18.7 ± 3.9	36.9 ± 6.2	44.3 ± 6.3		0.65 (0.27, 1.56)	1.98 (0.78, 5.02)
Agree	24.9 ± 3.3	34.6 ± 3.6	40.5 ± 3.4		0.96 (0.46, 2.01)	1.83 (0.86, 3.88)

CI, confidence intervals; aOR, adjusted odds ratios

<sup>a</sup>Determined by the question, 'During the past month, how often did you drink a glass or bottle of plain water? Include tap, water fountain, bottled, and unflavored sparkling water.'

<sup>b</sup>Weighted percent may not add up to 100% because of rounding.

<sup>c</sup>The Outcome variable was plain water intake and the exposure variables were perceptions of tap and bottled water safety. The reference group was consuming plain water 4 times/day. Four multinomial logistic regression models were fit to include each variable separately and controlled for age, sex, education, marital status, annual household income, weight status, census region, Hispanic heritage, and acculturation.

<sup>d</sup> $\chi^2$  tests were used for each variable to examine differences across categories.