CHAMPIONS for CHANGE
Network for a Healthy California

Education, Diet, and Environmental Factors Influence Sugar-Sweetened Beverage Consumption Among California Children, Teens, and Adults

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Summary

In California, approximately half of children, teens, and adults drink at least one serving of sugar-sweetened beverages (SSB) daily. This brief highlights the associations between SSB intake and demographic and socioeconomic factors; consumption of healthy and less healthy foods; health behaviors; psychosocial factors; and the home, work, and school environments. The California Department of Public Health's *Network for a Healthy California*, in partnership with the Public Health Institute and other organizations and in conjunction with the California Obesity Prevention Plan, supports the prioritization of public health efforts that aim to promote good nutrition, physically active lifestyles, and a healthy weight among low-income California families.

Background

Consumption of SSB promotes excess calorie intake with little to no nutritional value added.[1] In fact, SSB account for 22 percent of the empty calories (from solid fats and added sugars) consumed by children and teens.[2] Recent reviews provide compelling evidence that the consumption of SSB has contributed to the obesity epidemic in children and adults.[3, 4] Adults who drink one or more sodas per day are 27 percent more likely to be overweight than those drinking less.[5] In addition, evidence shows that over the past three decades, total calorie intake of children (2-18 years) has increased by approximately 184 calories per day.

The portion sizes of SSB increased simultaneously with the calories consumed during the meals and snacks including them.[6] The percentage of calories from SSB for a respective meal or snack also increased, providing evidence that SSB were directly related to the extra calories eaten at those times.[6] With a body of research pointing to the relationship between overweight, obesity and SSB intake, additional investigation into which demographic, socioeconomic, dietary, psychosocial, and environmental factors contribute to drinking SSB is vital for developing effective public health efforts.

Over the past decade, the passage of statewide legislation has banned the sale of sodas during school hours and mandated increased access to free drinking water during school meal times in all California public schools. These policy actions support the broader public health efforts needed to reduce SSB intake in California by making the healthy choice the easy choice. Key policy actions from 2001 through 2011 are highlighted below.

This research brief was developed by the California Department of Public Health's *Network for a Healthy California* to examine the risk factors for SSB consumption among children (9-11 years), teens (12-17 years), and adults (18 years and older) in California. In this analysis, SSB include sugary drinks such as regular soda, sweetened fruit drinks, flavored and sweetened bottled water or tea, and sports drinks; it excludes diet soda and flavored milks. It uses data from the *California Children's Healthy Eating and Exercise Practices Survey* (*CalCHEEPS*), the *California Teen Eating, Exercise, and Nutrition Survey* (*CalTEENS*), and the *California Dietary Practices Survey* (*CDPS*). For a full description of these surveys, see the Data Sources and Methods section at the end of this brief.

Key California Policy Actions and Dates

2001

- SB 19: Bans sale of food and beverages not meeting nutritional standards in elementary schools. Allows carbonated beverage sales in middle schools after the end of the last lunch period. Authorized study of nutritional standards in ten high schools and middle schools. Passed in 2001 but never implemented.

2003-2004

- SB 677: Bans sale of beverages not meeting nutritional standards in elementary, middle, and junior high schools. Passed in 2003. Became effective in 2004.

2005-2009

- Governor's Summit on Health, Nutrition, and Obesity held September 15, 2005.
- SB 281: Establishes the California Fresh Start Program, which provides an additional $.10 per meal for fruits and vegetables. Passed and immediately became effective in 2005.
- SB 12: Bans sale of food not meeting nutritional standards in public schools, including high schools. Passed in 2005. Became effective in 2007.
- SB 965: Bans sale of beverages not meeting nutritional standards in public schools, including high schools. Passed in 2005. Became effective in 2009.
- SB 441: Requires that at least 35 percent of food choices and one-third of beverage choices in vending machines on state property adhere to accepted nutritional guidelines. Passed in 2008. Became effective in 2011.
- AB 2084: Establishes standards for beverages served to children in California's licensed child care facilities and homes. Passed in 2010. Became effective in 2012

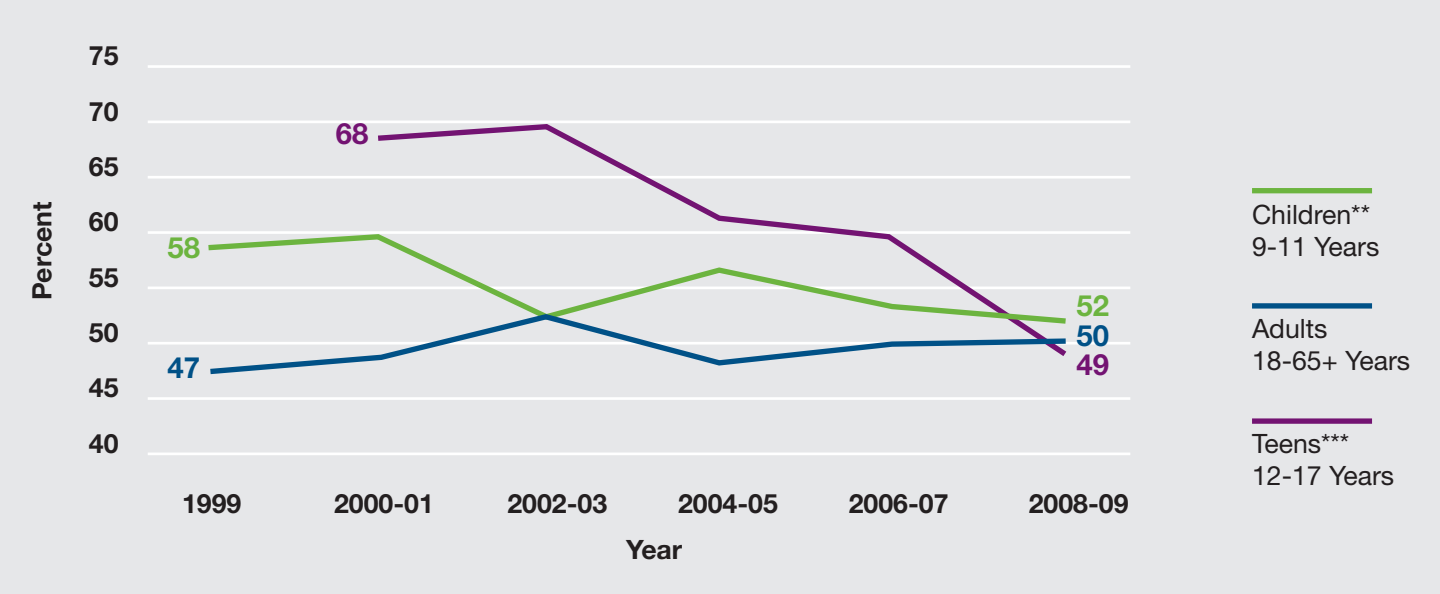
2010-2011

- SB 1413: Requires school districts to provide access to free, fresh drinking water during meal times in school food service areas. Passed in 2010. Became effective in 2011.

Sugar-Sweetened Beverage Intake in California

In 2008 and 2009, Californians averaged about a serving[a] of SSB per day (0.8 to 1.1 servings). Half of those surveyed reported drinking SSB on a typical day. Trends across age groups over the past ten years show significant decreases in the percent of children and teens who reported drinking SSB on an average day (Figure 1).

Figure 1. Consumption of Any Sugar-Sweetened Beverages Among Californians from 1999 to 2009



Source: 1999-2009 CalCHEEPS, 2000-2008 CalTEENS, and 1999-2009 CDPS.
*Notes: ** p<.01, *** p<.001. "Any" sugar-sweetened beverages includes half a serving or more.*

Risk Factors for Drinking Sugar-Sweetened Beverages

The findings presented in this research brief focus on the significant relationships identified between demographic, socioeconomic, dietary, psychosocial, and environmental factors and the consumption of SSB in 2006 and 2007. This analysis determined the unique contribution of each factor controlling for all of the other variables examined. The complete set of variables tested for each survey, including non-significant results, is provided in Appendices 1-3. The final regression results are presented in Appendices 4-7.

Demographic and Socioeconomic

Four demographic and socioeconomic risk factors were identified among children, teens, and adults in California: gender, age, race/ethnicity, and education level (Table 1).

Males — Adult and teenage males drank over one-third of a serving more SSB than females on a typical day.

Teens, 14 to 15 Years — Age was associated with daily SSB intake, but only among teens, such that 14- to 15-year-old teens reported drinking one-quarter of a serving more SSB than 12-13 year olds.

Minority Children — Latino and African American children drank over one-third of a serving more SSB per day compared to White children.

Lower Education — As parent education level[b] decreased, children drank more SSB. Children whose parents had a

[a] A serving was defined as a single glass, can, or bottle of SSB. Serving size was not collected.
[b] Parent education included three categories: a high school education or less for both parents, one parent attended college, and both parents attended college.

high school education or less drank nearly one-quarter of a serving more SSB than those with one parent attending college and just under half of a serving more SSB than those whose parents both had some college or higher education. Adults with less than a high school education drank almost one-third of a serving more SSB than those with some college education and nearly half a serving more than those with a college education.

Although significant relationships existed between household poverty status and SSB intake, the association did not remain significant in the regression analysis among children, teens, or adults (Table 1).

Table 1. Demographic and Socioeconomic Factors Related to Sugar-Sweetened Beverage Intake

Factor *(compared to)*	**Children**[‡] (servings)	**Teens** (servings)	**Adults** (servings)
Gender *(Females)*	ns	Males (0.49)***	Males (0.35)***
Age *(12-13 Years)*	ns	14-15 Years (0.24)* 16-17 Years (ns)	ns
Race/Ethnicity *(White)*	Latino (0.38)*** Black (0.42)* Asian/Other (ns)	ns	ns
Education Level *(compared to)*	**Parent Education** *(No College)* Some College: One Parent (-0.22)* Two Parents (-0.43)***	na	**Adult Education** *(Not High School Grad)* High School Grad (ns) Some College (-0.31)* College Grad (-0.44)**
Household Poverty Status	ns	ns	ns

*Notes: * p<.05, ** p<.01, *** p<.001; ns = not significant.*
na = question was not asked on the survey.
[‡] Results from the diary sample are displayed when the same factors exist in both the diary and phone regression models.

Foods and Beverages

In children, teens, and adults, intake of foods and beverages, both healthy and less healthy, showed strong relationships with SSB consumption (Tables 2 and 3).

Fruits and Vegetables — In children, eating vegetables was linked to lower SSB consumption. However, for every serving of fried vegetables[c] reported, there was nearly one-third of a serving more SSB consumed. While vegetables did not appear in the final adult model, adults who ate fruit drank slightly less SSB. No associations between SSB and fruits or vegetables were observed in teens.

Milk and Water — Contrary to expectations, children's milk[d] consumption was associated with higher SSB intake, with children drinking one-tenth of a serving more SSB for every serving of milk reported (Table 3). Milk consumption included flavored milks and milkshakes which may have contributed to the significant relationship between drinking milk and SSB. In contrast, water consumption was related to slightly lower SSB consumption in teens (Table 2).

High Calorie, Low Nutrient Foods — Children, teens, and adults all showed multiple positive associations between drinking SSB and eating foods such as fried foods, desserts, pastries, sweets, candy, and fast food (Table 3).

- **Candy and Added Sugar Foods** — Teens who ate candy drank one-fifth of a serving more SSB. Children and adults

[c] French fries made up the majority of the fried vegetables reported.
[d] Milk includes all types of milk (whole, 2%, 1%, and fat-free), flavored milk, and milkshakes.

who ate sweets like desserts, ice cream, and candy drank more SSB, and adults who ate breakfast pastries drank nearly one-third of a serving more SSB.

- **Chips and Fried Foods**[e] — Chips and fried foods, French fries, and deep-fried food were each independently associated with SSB consumption in children, teens, and adults respectively. For every serving of chips and fried vegetables reported, children drank about one-fifth to one-third of a serving more SSB. Teens who reported eating French fries drank three-fifths of a serving more SSB than teens who reported not eating any French fries. Adult deep-fried food consumption was linked to nearly one-third of a serving higher SSB intake and though only marginally significant, adult chip and fried snack food consumption was also associated with higher SSB consumption.

- **Fast Food** — Fast food consumption showed a clear gradient toward higher SSB intake in both teens and adults. Teens who ate fast food drank three-fifths of a serving more SSB and adults drank just under half a serving more.

Attitudes and Health Behaviors

In addition to dietary intake, several health behaviors and psychosocial factors surrounding health behavior were associated with SSB consumption in children, teens, and adults.

Parent and Teacher Behavior — The children's analysis revealed relationships between SSB consumption in children and the behavior of adults around them. Children whose parents ate high-fat foods reported that they drank a tenth of a serving more SSB (0.11 serving, p=.05). In addition, children who indicated that their teachers used high calorie, low nutrient "treats" as student rewards reported more than a quarter of a serving higher SSB intake (0.25 serving, p<.05).

Teen Knowledge and Attitudes — Teens who said that they know how to select healthy items from a menu reported almost one-third of a serving lower mean SSB consumption (-0.31 serving, p<.01), and teens who said that they "feel guilty" for not eating healthy reported drinking over one-quarter of a serving less SSB (-0.27 serving, p<.01).

Table 2: Foods Associated with Lower Sugar-Sweetened Beverage Intake

	Children‡ (servings)	Teens (servings)	Adults (servings)
Vegetables	(-0.08)*	ns	ns
Fruit	ns	ns	(-0.05)*
100% Fruit Juice	(-0.16)~	ns	ns
Water	na	(-0.05)*	na

*Notes: * p<.05; ~ p=.052 (marginal); ns = not significant.*
na = question was not asked on the survey.
‡ Results from the diary sample are displayed when the same factors exist in both the diary and phone regression models.

Table 3. Foods Associated with Higher Sugar-Sweetened Beverage Intake

	Children‡ (servings)	Teens (servings)	Adults (servings)
Milk	(0.11)**	ns	ns
Desserts, Pastries, & Candy	(0.15)***	Candy (0.21)* Dessert (ns)	Pastry (0.29)* Dessert (0.19)*
Chips & Fried Foods	(0.20)***	ns	Deep-Fried Food (0.29)* Fried Snack Food (0.21)~
French Fries & Fried Vegetables	(0.32)**	French Fries† (0.59)***	na
Fast Food	ns	(0.61)***	(0.5)*

*Notes: * p<.05, ** p<.01, *** p<.001; ~ p=.056 (marginal); ns = not significant.*
na = question was not asked on the survey.
† A subgroup of the teen sample was not asked the question about eating French fries. This group is not displayed but was included in the analysis in order to allow examination of this variable.
‡ Results from the diary sample are displayed when the same factors exist in both the diary and phone regression models.

[e] Fried foods include pork rinds, cheese puffs, chicken nuggets, fried chicken, fried shrimp, and onion rings, along with snack food self-identified as fried.

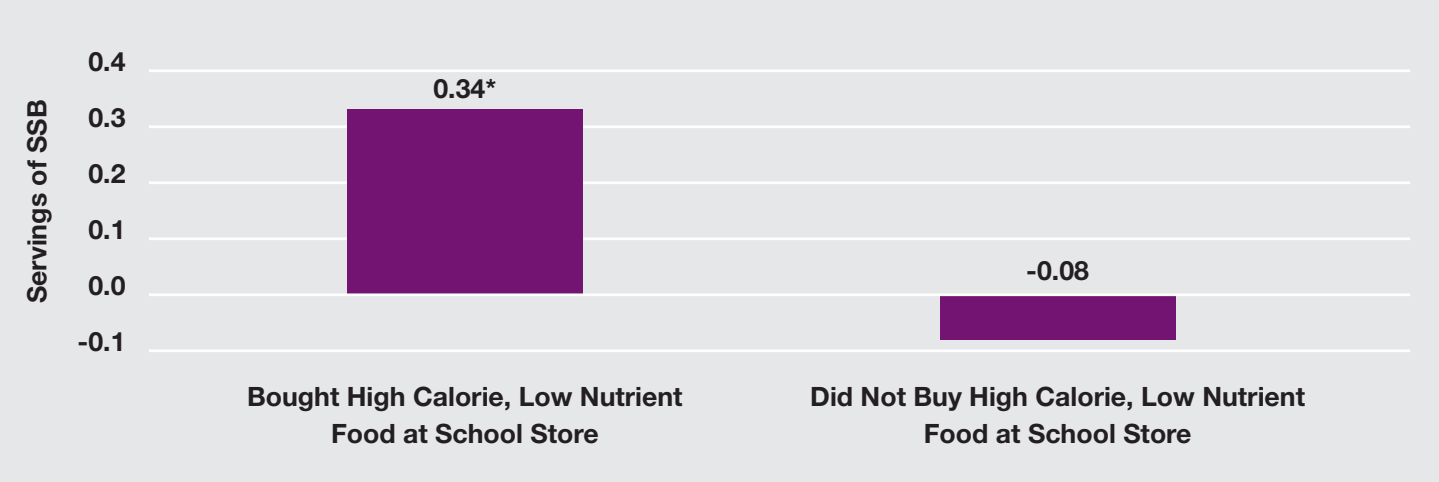
Health Risk Behaviors — Among adults, several less desirable health risk behaviors clustered together. Smoking status and time spent watching television were both positively associated with SSB intake. Adults who smoked reported drinking nearly half a serving more SSB than non-smokers (0.47 serving, p<.001). Compared to adults who watched 1.0 hour of television daily, adults who watched 2.7 hours a day reported drinking nearly a tenth of a serving more SSB (0.07 serving, p<.01).

School, Work, and Home Environments

School — Children and teens spend much of their day at school, often eating one or more meals each day on school grounds; therefore, authors examined the school food environment for associations with SSB intake. As mentioned above, teachers' use of "treats" as student rewards is associated with a quarter of a serving greater SSB intake in 9- to 11-year-old children. Among teens, a complex relationship between SSB consumption and student purchasing at school stores emerged (Figure 2). Teens who reported having a store at school that sells any of a variety of high calorie, low nutrient (HCLN) foods or beverages were asked whether they had purchased any of these foods or beverages from their school store the previous day. Teens who had purchased these items reported one-third of a serving higher intake of SSB than those attending a school without a store selling HCLN items. Students who had a school store selling HCLN foods, but did not purchase these items from it, did not differ from students attending a school with no such store.

Work — Just as children and teens spend a substantial part of their day in school, many adults work outside of the home (45% of *CDPS* respondents) and purchase meals or snacks at or near their worksites. Based on self-identified employment status, adult survey respondents were asked several questions relating to their workplace environment. Compared to the 55 percent of respondents who worked at home, were retired, not employed, or students, respondents who indicated that there were vending machines at their worksite drank two-fifths of a serving more SSB (Figure 3). Working adults with no vending machines at work drank about the same amount of SSB as adults not working outside the home.

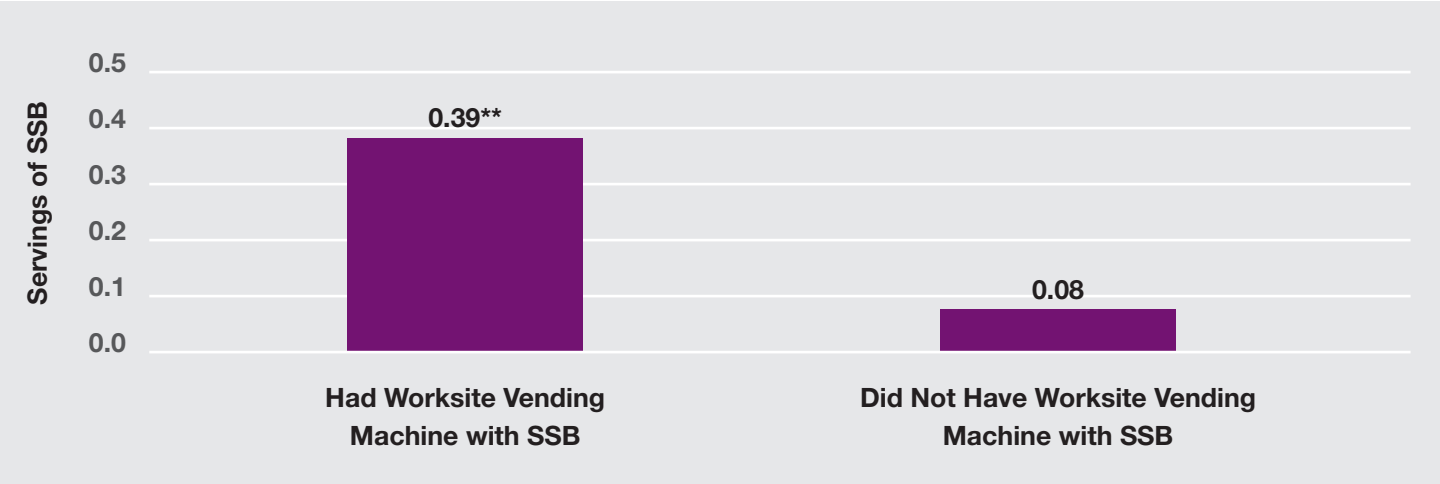
Figure 2. Teens' Purchases at School Stores that Sell High Calorie, Low Nutrient Foods Are Associated with SSB Intake



Source: 2006 CalTEENS.
*Notes: * p<.05. All serving differences and significance levels reported are in comparison to the reference group: teens attending schools without a store that sells specific high calorie, low nutrient foods. One-quarter (24%) of the teens surveyed were not currently attending school at the time of interview (e.g., due to school breaks). This group is not displayed, but was included in the analysis (0.04 serving).*

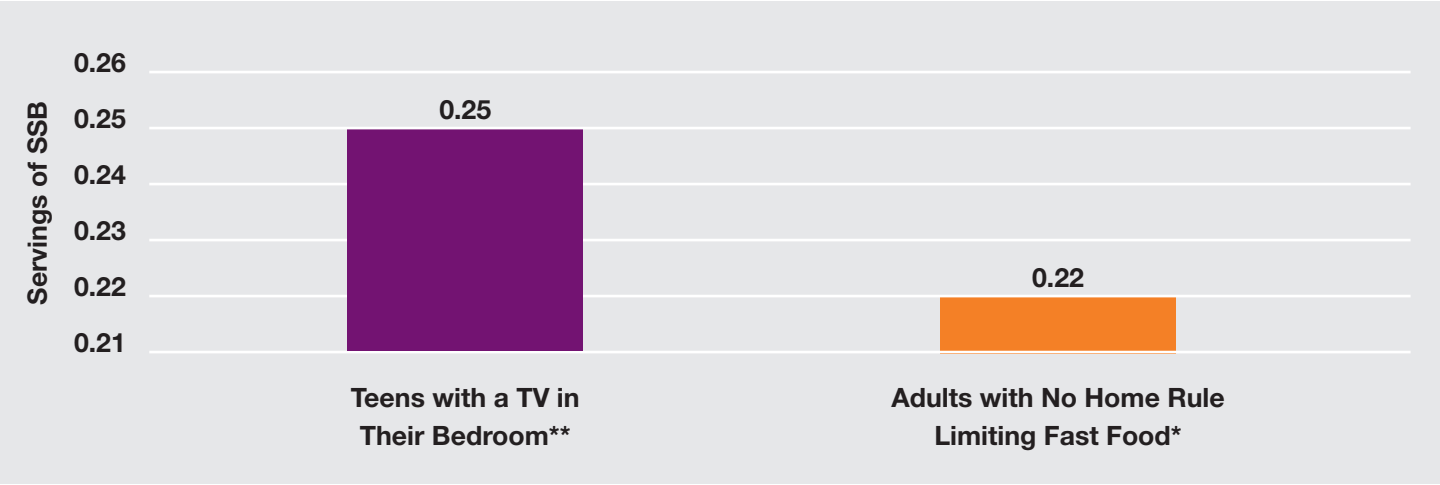
Home — Factors in the home environment were associated with how much SSB both teens and adults drank (Figure 4). Teens with a television in the bedroom drank a quarter of a serving more SSB than teens with no television in their room. Adults with a family or household rule restricting how often they ate fast food drank more than a fifth of a serving less SSB than adults with no such family rule.

Figure 3. SSB Vending Machines in the Worksite Are Associated with SSB Intake



Source: 2007 CDPS.
*Notes: ** p<.01. All serving differences and significance levels reported are in comparison to the reference group: adults who worked from home, were retired, not employed, or students.*

Figure 4. Factors in the Home Environment Are Associated with Higher SSB Intake



Source: 2006 CalTEENS, 2007 CDPS.
*Notes: * p<.05, **p<.01.*

Summary and Conclusions

With the goal of informing public health efforts to reduce the negative impact of SSB consumption on obesity, this research has identified several socioeconomic, psychosocial, and environmental risk factors for higher SSB intake among Californians. Although any individual variable may have only a small association with SSB intake, when all of the variables discussed in this brief were considered as a whole, they explained over one-fifth of children's (23%) and teens' (21%) SSB intake, and nearly one-sixth of the consumption in adults (15%).

Demographic and socioeconomic results indicate that male gender and low education status (self or parent) are risk factors for higher SSB intake. Although gender and educational attainment are not modifiable risk behaviors, they provide clear direction for designing health promotion initiatives that reduce SSB consumption.

- These findings point to the importance of targeted interventions that test and incorporate specific messaging and strategies for boys and their parents, beginning in childhood before their dietary practices deteriorate entering adolescence, and to shape their health priorities as parents.
- For adults, particularly parents, with a high school education or less, careful consideration of literacy level and improved access to information will help maximize the effectiveness of nutrition education campaigns. This emphasis should also apply to language and concepts used in media messaging.

Evidence shows that over the past three decades, total calorie intake of children (2-18 years) has increased by approximately 184 calories per day. Portion sizes of SSB increased simultaneously with increased calorie content of the meal or snack with which it was eaten. Results from the regression analysis exploring foods and beverages, both healthy and less healthy, indicate multiple links with SSB consumption. Most relationships were in the expected direction: consuming healthy foods was related to drinking less SSB, and consuming less healthy foods clustered together with drinking more SSB. In line with these findings, the *California Obesity Prevention Plan* (*COPP*) and the 2010 *Dietary Guidelines for Americans* (*DGA*) provide several key strategies to prioritize in public health efforts that aim to support good nutrition and promote healthy weight.[7,8] These include:

- Decreasing consumption of SSB;
- Choosing water, fat-free milk, 100% fruit juice, or unsweetened tea and coffee;
- Increasing fruit and vegetable intake;
- Decreasing consumption of high energy-dense foods by eating fewer sweets, French fries, and other fried foods;
- Cooking and eating more meals at home instead of eating out, and choosing healthy options when dining out.

In this study, risk factors for higher SSB intake also included more screen time and having a television in one's bedroom. This supports the finding that more screen time is associated with less health dietary behavior.[9] Strong evidence also shows that more screen time, particularly television viewing, is associated with overweight and obesity across the lifespan.[10-12] In addition, children with televisions in the rooms where they sleep have higher BMIs than those without.[13]

- These findings support the *COPP* and *DGA* recommendation to limit screen time.
- Parent education about the obesity risk associated with televisions in bedrooms is another strategy.[7]
- Public health efforts should promote desirable and fun physically active alternatives to screen time, which may have the added health benefits of increasing physical activity.[14]

Results linking psychosocial and environmental risk factors in schools and worksites with SSB intake point to the importance of school, worksite, and community wellness efforts. There is a critical need for public health promotion to ensure the availability and consumption of water and healthy beverages; to limit access to SSB and less healthy foods; and to engage schools, worksites, and other community partners to be champions for these changes in their neighborhoods.

Public health wellness strategies to reduce SSB intake described in the *California Obesity Prevention Plan* include:

Support Healthy Lifestyle Behaviors Through Nutrition Education and New, Healthy Social Norms in Schools.

- Provide quality nutrition and health education meeting state standards to all schoolchildren in pre-K through grade 12;
- Establish and maintain a school health or wellness council that meets regularly and includes school staff, students, parents, and community partners;
- Market the school meal program and eliminate the marketing of unhealthy foods and beverages on school grounds.

Provide Access to Healthy Foods and Beverages and Limit Access to Unhealthy Foods and Beverages.

Schools and Community-Based Youth Organizations

- Provide free access to fresh drinking water in eating areas;
- Ensure that competitive foods and beverages are compliant with or exceed California school food and beverage standards and work toward the reduction or elimination of the sale of competitive foods and beverages;
- Market and sell only healthy foods and beverages to children and youth at community, faith-based, and youth organizations;
- Leverage Farm-to-School programs and the California School Garden Network to increase schoolchildren's access to fresh fruits and vegetables;
- Promote alternatives to foods and beverages offered in fundraisers, at celebrations, and used as incentives.

ReThink Your Drink
Healthy Beverage Campaign

- Grassroots, partnership-driven
- Healthy beverage social marketing
- Skills-based nutrition education
- Media and public relations
- Promotion of healthy communities

www.californiaprojectlean.org/ryd/what.html

Worksites and Communities

- Implement the California state vending law in state worksites and disseminate as a model workplace policy;
- Disseminate model workplace policies that have been successfully implemented in California and across the nation;
- Promote workplace policies addressing foods and beverages in the cafeteria, at meetings and events, and in vending machines;
- Partner with local growers to locate farmers' markets near worksites;
- Limit the availability and portion sizes of less healthy foods and beverages and increase healthy foods and beverages at sports, movie, and other entertainment venues.

Local Government

- Implement local ordinances to restrict mobile vending of high calorie, low nutrient foods near schools and public playgrounds;
- Adopt land use and zoning policies that restrict fast food establishments and mini-markets near schools and public playgrounds;
- Identify planning and zoning opportunities to increase access to healthy foods and beverages through store placement in underserved communities and mobile vendors prioritizing healthy options.

The following school, worksite, and community wellness efforts can be implemented to support those outlined in the *COPP*:

- Prioritize health education in the classroom and cafeteria, specifically nutrition competencies;
- Use price incentives to promote the purchase of healthy food and beverage options;
- Utilize joint use agreements for sports, cooking or home economics classes, and play groups;
- Support community youth and adult sports leagues;
- Promote volunteerism, especially the clean-up and beautification of parks and other areas designated for community activities and play.

Californians can make healthy eating, physical activity, and other healthy lifestyle behaviors the foundation of daily living. In order to support this, comprehensive public health efforts are needed that promote a reduction in SSB intake by addressing price, access, and marketing where Californians live, work, and play.

Resources for Implementing Community Change

The following Web sites provide tangible resources to facilitate healthy changes in the local community, schools, and worksites:

Reducing Sugar-Sweetened Beverage Intake
www.californiaprojectlean.org/ryd/what.html
www.kickthecan.info
www.banpac.org/resources_sugar_savvy.htm
www.cdc.gov/healthyweight/healthy_eating/drinks.html
www.fewersugarydrinks.org
www.potterloveswater.com
www.cdph.ca.gov/programs/wicworks/Pages/WICRethinkYourDrink.aspx

California Obesity Prevention Program
www.cdph.ca.gov/programs/COPP/Pages/default.aspx

Making it Happen! School Nutrition Success Stories from the Centers for Disease Control and Prevention
www.cdc.gov/healthyyouth/mih/index.htm

Sugar-Sweetened Beverage Model Policies
www.publichealthadvocacy.org/_PDFs/beverage_policiesLocalPolicies_WaterSoda_Nov2010.pdf
www.publichealthadvocacy.org/_PDFs/beverage_policiesCABeveragePolicies_Cities_Counties.pdf

***Network* Worksite Program Fit Business Kit**
www.cdph.ca.gov/programs/cpns/Pages/WorksiteFitBusinessKit.aspx

California Project LEAN School, Parent, Promotora, and Youth Engagement
www.californiaprojectlean.org/doc.asp?id=20

***Network* Regional Physical Activity Resource Directories**
www.cdph.ca.gov/programs/cpns/Pages/RegionalNetworks.aspx

Network Fruit, Vegetable, and Physical Activity Toolbox for Community Educators
www.network-toolbox.net

Harvest of the Month
www.harvestofthemonth.com

USDA's MyPlate
www.choosemyplate.gov

Data Sources and Methods

CalCHEEPS is a self-administered, parent-assisted mail survey with a follow-up telephone interview for a subset of the mail survey respondents conducted in English. The mail survey consists of a two-day food and activity diary. The telephone interviews collect children's unassisted knowledge, attitudes, and beliefs about diet and exercise. In total, 823 children returned the diary in 2007, and 327 completed the telephone interview, with response rates of 22 percent and 44 percent, respectively. The data were weighted to reflect California households with children between the ages of 9 and 11 based on race/ethnicity, federal poverty level (FPL), and SNAP participation from the March 2006 Current Population Survey (U.S. Census Bureau).

CalTEENS and *CDPS* are random-digit-dial (RDD) and Medi-Cal list-assisted telephone interviews conducted in English and Spanish. The telephone interviews collect information from teens and adults regarding dietary intake, physical activity, weight status, and knowledge, attitudes, and beliefs about diet and exercise. In total, 1,225 teens and 1,468 adults completed the telephone interview in 2006 and 2007, respectively. Cooperation rates were 54 percent and 52 percent respectively for the adult RDD and Medi-Cal samples, and 59 percent and 43 percent for teens. The weighting procedure included standard RDD and population adjustments. The data were post-stratified to adjust for variability in sex, age, and race/ethnicity between the sample and the population. The California population data are from the 2000 United States Census (U.S. Census Bureau).

CalTEENS also included a callback study to collect a few additional variables. During the callback project, attempts were made to contact all *CalTEENS* participants; 294 participants (24%) were unable to be reached. The only variable used in this report from the callback study was teen intake of French fries.

This study used bivariate analyses to identify potential determinants of SSB intake among children, teens, and adults. Appendices 1-3 provide a complete list of the variables examined. Analyses of *CalCHEEPS* and *CDPS* were conducted using PASW Statistics 17.0 with the add-on regression module (SPSS Inc., 2009, Chicago, IL); *CalTEENS* was analyzed using SAS software Version 9.1 (SAS Institute Inc., 2002-2008, Cary, NC). SSB and milk intake were capped at 10 servings; sedentary and physical activity minutes were log transformed. Variables with a p-value $< .10$ were included in the regression analyses.

The regression analysis was conducted in two parts. First, the authors identified the primary risk factors from the independent variables italicized in Appendices 1-3. Least squares (OLS) regressions were produced using backwards stepwise techniques with mean servings of SSB as the dependent variable. Variables were included in the models with a p-value $\leq .05$ and removed if they were $> .10$. Second, the primary risk factors identified in the first stepwise regressions were simultaneously entered into OLS regressions controlling for gender, age, and race/ethnicity. The final regression models provide the coefficients for mean servings of SSB adjusting for demographics. The regression results are presented in Appendices 4-7.

Limitations

CalCHEEPS utilizes a market research panel, not random sampling, which limits the external validity of the instrument. It is a complex and lengthy survey, and is only conducted in English. A limitation of the *CDPS* and *CalTEENS* is the inability of a single 24-hour recall to directly estimate the distribution of usual intakes in a population due to within-person variance. With all three instruments there is both a self-report bias and a social desirability bias.

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Appendix 1: List of All *CalCHEEPS* Variables Tested Using Bivariate Analysis, by Instrument

Dependent Variable	Mail Survey (n)	Phone Survey (n)
How many servings of regular soda, sweetened fruit drinks, flavored/sweetened bottled water/tea, and sports drinks did you drink? (mean servings)	823	327
Independent Variables		
Demographic and Socioeconomic Factors		
Gender (boy and girl)	***823***	327
Age (mean years)	823	327
Race/Ethnicity (White, Latino, African American, and Asian/Other)	***823***	327
Household Poverty Status (FS participant, ≤ 130% FPL–no FS, > 130% to ≤ 185% FPL, and > 185% FPL)	823	***327***
Parent Education (≤ high school for both parents [0], > high school for one parent [1], and > high school for both parents [2])	***821***	***327***
Dietary Intake and Practices		
How many servings of fruit did you eat? (mean servings)	***823***	327
How many servings of 100% fruit juice did you drink? (mean servings)	823	***327***
How many servings of vegetables (without fried) did you eat? (mean servings)	***823***	***327***
How many servings of fried vegetables did you eat? (mean servings)[1]	***823***	***327***
How many servings of milk did you drink? (mean servings)	***823***	***327***
How many servings of sweets did you eat? (mean servings)	***823***	***327***
How many servings of chips and other fried foods did you eat? (mean servings)	***823***	***327***
Where did you get the food for (meal/snack)? Marked fast food restaurant.[3]	***823***	***327***
Where did you get the food for breakfast? Marked school breakfast.[4]	***823***	327
Where did you get the food for lunch? Marked school lunch.[4]	823	327
Physical Activity and Screen Time		
How many minutes did you spend exercising or being physically active? (mean minutes)	823	***327***
How many minutes did you spend watching TV/videos/DVD's or playing computer/video games for fun (i.e. screen time)? (mean minutes)	***821***	326
Behavioral Capability		
During this school year, have you had any lessons about food, nutrition, and your health?[4]	823	***327****
Food Modeling[2]		
Your parents eat high-fat foods like French fries, chips, or desserts.		***325***
Your friends usually eat healthy foods.		322
Family Norms[3]		
Thinking of yesterday, did your family sit down and eat a meal together?		327
Family Rules and Home Environment		
Your parents limit the amount of chips, soda, or sweets you can eat each day?[2]		325
Do your parents limit the amount of time you spend watching TV or playing video games to less than two hours a day?[3]		323
Do you have a television in your bedroom?[3]		326
School Environment		
Does your school have a soda vending machine that students can use?[3]		325
Does your school cafeteria have a salad bar?[3]		318
Does your school cafeteria usually serve students fast food made by restaurants like McDonald's, Burger King, Taco Bell, or Pizza Hut?[3]		319
Does your teacher reward students by giving out treats like candy, cookies, soda, or chips?[3]		***323***
Does your school have sodas, sports drinks, cookies, chips, or candy that students can buy after school?[3]		323
Does your school cafeteria serve at least two different fresh fruits every day at lunch?[3]		316
Did you get to taste any fruits or vegetables in the classroom this year?[4]		319

Gender, age, race/ethnicity and household poverty status were included in the stepwise regression model as statistical controls.

[1] This primarily includes French fries and other fried potatoes.

[2] Response options: disagree a lot [1], disagree a little [2], agree a little [3], and agree a lot [4].

[3] Response options: yes [1] and no [0].

[4] Response options: yes [1] and no [2].

** Marginal significance observed at p<.10.*

Italicized variables had significant bivariate relationships with SSB intake and were included in the stepwise regression models. Fruit, juice, and vegetables were included in the model regardless of the bivariate significance.

Appendix 2: List of All *CalTEENS* Variables Tested Using Bivariate Analysis

Dependent Variable	Phone Survey (n)
Yesterday how many servings of regular soda (cola, lemon-lime) or sweetened beverage like Snapple, Kool-Aid, Arizona, Red Bull, Rockstar, or Sobe did you drink? (mean servings)	1,221
Independent Variables	
Gender (male and female)	***1,221***
Age (12-13, 14-15, and 16-17)	1,221
Race/Ethnicity (White, Latino, African American, and Asian/Other)	1,221
Household Poverty Status (FS participant, ≤ 130% FPL–no FS, > 130% to ≤ 185% FPL, and > 185% FPL)	1,140
About how much money do you have each week to spend on yourself any way you want to?	***1,215***
Dietary Intake	
Servings of vegetables eaten yesterday	1,221
Servings of fruit eaten yesterday	***1,221***
Servings of 100% juice drunk yesterday	1,221
Yesterday, did you eat or drink anything for breakfast?	***1,220***
Yesterday, how many servings of milk did you drink, including chocolate milk, fast food milkshakes, milk on cereal, or large coffee drinks such as a mocha or latté?	***1,221***
Yesterday, how many 20 ounce bottles of water did you drink?	***1,216***
Yesterday, how many times did you eat a meal or snack from a fast food restaurant like McDonalds, Taco Bell, Jack-in-the-Box, Pizza Hut, KFC, or Subway?	***1,215***
In a typical week, how many times do you eat a meal or snack from a fast food restaurant?[2]	***1,219***
How many servings of French fries did you eat yesterday?[1,3]	***1,225***
Yesterday did you eat any sweet snacks like cake, pie, cookies, or brownies?[1]	***1,223***
Yesterday did you eat any candy bars or packages of candy?[1]	***1,224***
Physical Activity and Sedentary Time	
Physical activity for 60 minutes or more yesterday	1,221
Yesterday, how many minutes or hours did you watch television or videos or play video or computer games that were for fun?	***1,218***
Do you have a television set in your bedroom?	***1,219***
Health Behaviors and Outcomes	
Think about the last 30 days. On how many of these days did you smoke?[1]	***1,225***
Are you dieting to lose weight now?[1]	464
How would you describe your health? (poor, fair, good, very good, or excellent)	1,220
Psychosocial & Cognitive Factors	
Do you feel guilty on days when you haven't eaten healthy food?[1]	***1,212***
Do you know how to pick out healthy foods from menus?[1]	***1,216***
In the last year, have you taken a class or course at school in which the health effects of good eating habits were discussed?[1]	1,192
Home Environment	
Do your parents or adults you live with limit how much soda you drink at home?[1]	***1,213***
Do you usually eat dinner with your family or the people you live with?[1]	***1,214***
Do your parents or the adults you live with notice when you haven't eaten healthy foods?[1]	***1,208***
School Environment	
Does your school serve food from fast food restaurants like Burger King, McDonald's or Taco Bell every day?[1]	984
Does your school have a soda vending machine that students can use?[1,2]	991
Does your school have a student store where chips, cookies, candy, or soda are sold?[1]	991
Yesterday (last day of school), did you buy chips, cookies, candy, or soda from the student store?[2]	***1,101***
School Meal Participation	
Did you eat a complete school breakfast yesterday?[1]	483
Did you eat a complete school lunch yesterday?[1]	361
During the school year, approx. how many times a week do you usually get a complete school breakfast?	991
During the school year, approx. how many times a week do you usually get a complete school lunch?	991

Gender, age, race/ethnicity and household poverty status were included in the stepwise regression model as statistical controls.

[1] Response options were coded for analysis as: Yes [1] and No [2].

[2] Variable had a significant bivariate relationship with SSB intake but was excluded from the stepwise regression model due to small sample size or overlap with another variable included in the model.

[3] Third category of respondents with missing data was created in order to allow examination of this variable in the analysis.

Italicized variables had significant bivariate relationships with SSB intake and were included in the stepwise regression models. Fruit, juice, and vegetables were included in the model regardless of the bivariate significance.

Appendix 3: List of All *CDPS* Variables Tested Using Bivariate Analysis

Dependent Variable	Phone Survey (n)
Yesterday, how many cans or glasses of regular carbonated soft drinks such as cola, lemon lime, or sweetened non-carbonated beverages such as Gatorade, Snapple, Sunny Delight, or Kool-Aid did you drink? (mean servings)	1,468
Independent Variables	
Demographic and Socioeconomic Factors	
Gender (male and female)	***1,468***
Age (18-24, 25-34, 35-50, 51-64, and 65+)	***1,467***
Race/Ethnicity (White, Latino, African American, and Asian/Other)	***1,465***
Household Poverty Status (FS participant, ≤ 130% FPL–no FS, > 130% to ≤ 185% FPL, and > 185% FPL)	***1,396***
Education (< high school, high school graduate, some college, and college graduate)	***1,464***
Dietary Intake	
Yesterday, how many servings of fruit did you eat? (mean servings)	***1,468***
Yesterday, how many servings of 100% juice did you drink? (mean servings)	1,468
Yesterday, how many servings of vegetables did you eat? (mean servings)	***1,468***
Yesterday, did you drink any milk or drinks made with milk, such as chocolate milk, fast food milkshake, chai, latte, or have milk on cereal?[1]	***1,467***
Yesterday, did you eat any breakfast pastries like doughnuts, danishes, sweet rolls, muffins, croissants, or pop tarts?[1]	***1,468***
Yesterday, did you eat any deep-fried foods like French fries, fried chicken, chicken nuggets, fried fish, fried shrimp, or onion rings?[1]	***1,468***
Yesterday, did you eat any potato chips, corn chips, cheese puffs, pork rinds, or other fried snack foods?[1]	***1,466***
Yesterday, did you eat any desserts like cake, pie, brownies, ice cream or chocolate candy bars?[1]	***1,468***
Yesterday, how many of your meals or snacks came from a fast food restaurant?[1]	***1,466***
Physical Activity and Sedentary Time	
Met recommendation for being regularly physically active, 5 days per week for 30 min per day.[1]	1,409
How much time did you spend watching TV yesterday? (mean minutes)	***1,467***
Health Behaviors	
Think about the last 30 days. On how many of these days did you smoke cigarettes or other tobacco products?[1]	***1,443***
When you eat out do you look for or ask about calorie information for the menu items you choose?[1]	***1,468***
Weight	
Do you consider yourself to be overweight, underweight, or about average for your height?[2]	1,465
Are you presently trying to lose weight?[1]	1,468
Family Rules	
Does your family (Do you) limit the amount of junk food, such as chips, candy, soda, etc., in the house?[1]	***1,459***
Does your family (Do you) limit the number of times per week or per month you eat at fast food restaurants?[1]	***1,463***
Work Environment	
Does your worksite have vending machines for employees to access food or beverages?[3]	***1,455***
Are there restaurants, fast food places, delis, catering trucks, or markets within walking distance of your worksite?[1]	1,468

Gender, age, race/ethnicity and household poverty status were included in the stepwise regression model as statistical controls.

[1] Response options: Yes [1] and No [2].

[2] Response options: Overweight [1], Underweight [2], and About Average [3].

[3] Response option: Yes [1], No [2], and Not Employed [3].

Italicized variables had significant bivariate relationships with SSB intake and were included in the stepwise regression models. Fruit, juice, and vegetables were included in the model regardless of the bivariate significance.

Appendix 4: Risk Factors for Sugar-Sweetened Beverage Intake, *CalCHEEPS* Mail Survey

	Simultaneous OLS Regression (n = 819)		
	Coeff.		***(SE)***
Constant	*1.207*		*(.629)*
Explanatory Variables			
Gender	-.127	ns	(.083)
Age	-.039	ns	(.059)
Race/Ethnicity[1]		***	
White (reference)	ref		
Latino	.378	***	(.097)
African American	.437	*	(.186)
Asian/Other	.158	ns	(.129)
Household Poverty Status[1]		ns	
Parent Education[1]		**	
No College (reference)	ref		
Some College: 1 Parent	-.223	*	(.120)
Some College: 2 Parents	-.430	***	(.126)
Servings of Vegetables	-.076	*	(.035)
Servings of Fried Vegetables	.321	**	(.114)
Servings of Milk	.108	**	(.034)
Servings of Sweets	.153	***	(.031)
Servings of Chips and Other Fried Foods	.195	***	(.051)
Model Fit			
R-Square		.134***	

[1] Race/ethnicity, household poverty status, and parent education entered as blocks. The F test was used to obtain the p-values for the global tests of significance for each block in the model.
** p < .05, ** p < .01, *** p < .001; ns = not significant.*
OLS = ordinary least squares.
SE = standard error.

Appendix 5: Risk Factors for Sugar-Sweetened Beverage Intake, *CalCHEEPS* Phone Survey

	Simultaneous OLS Regression (n = 322)		
	Coeff.		***(SE)***
Constant	*1.075*		*(.947)*
Explanatory Variables			
Gender	-.016	ns	(.111)
Age	-.037	ns	(.085)
Race/Ethnicity[1]		ns	
Household Poverty Status[1]		ns	
Parent Education[1]		*	
No College (reference)	ref		
Some College: 1 Parent	-.421	*	(.174)
Some College: 2 Parents	-.474	*	(.183)
Servings of 100% Fruit Juice	-.160	p=.052	(.082)
Servings of Vegetables	-.097	*	(.045)
Servings of Sweets	.174	***	(.038)
Servings of Chips and Other Fried Foods	.204	**	(.070)
Teacher Rewards Students with Treats	.252	*	(.110)
Parents Eat High-Fat Foods	.107	p=.050	(.055)
Model Fit			
R-Square		.232***	

[1] Race/ethnicity, household poverty status, and parent education entered as blocks. The F test was used to obtain the p-values for the global tests of significance for each block in the model.
** p < .05, ** p < .01, *** p < .001; ns = not significant.*
OLS = ordinary least squares.
SE = standard error.

Appendix 6: Risk Factors for Sugar-Sweetened Beverage Intake, *CalTEENS*

	Simultaneous OLS Regression (n = 1,101)		
	Coeff.		***(SE)***
Constant	*.808*	**	*(.281)*
Explanatory Variables			
Gender (male)	.487	***	(.081)
Age[1]		*	
12-13 years (reference)	ref		
14-15 years	.242	*	(.098)
16-17 years	.090	ns	(.102)
Race/Ethnicity[1]		ns	
Household Poverty Status[1]		ns	
School Store Purchases of HCLN Foods/Beverages[1]		*	
Yes	.335	*	(.160)
No	-.079	ns	(.118)
Not currently attending school	.035	ns	(.129)
No school store (reference)	ref		
TV in the Bedroom	.251	**	(.087)
Knows How to Choose Healthy Menu Items	-.306	**	(.110)
Feels Guilty for Not Eating Healthy	-.270	**	(.082)
Water Consumption (20 oz bottles)	-.053	*	(.023)
Ate Fast Food	.607	***	(.076)
Ate Dessert	.166	ns	(.087)
Ate Candy	.211	*	(.097)
Ate French Fries[1]		***	
Yes	.586	***	(.124)
No (reference)	ref		
Missing information	.332	**	(.106)
Model Fit			
R-Square		.208***	

[1] Age, race/ethnicity, household poverty status, school store purchases of HCLN foods/beverages, and ate French fries entered as blocks. The F test was used to obtain the p-values for the global tests of significance for each block in the model.
** p < .05, ** p < .01, *** p < .001; ns = not significant.*
OLS = ordinary least squares.
SE = standard error.
HCLN = high calorie, low nutrient.

Appendix 7: Risk Factors for Sugar-Sweetened Beverage Intake, *CDPS*

	Simultaneous OLS Regression (n = 1,332)		
	Coeff.		***(SE)***
Constant	.980	***	(.245)
Explanatory Variables			
Gender	.346	***	(.095)
Age[1]		ns	
Race/Ethnicity[1]		ns	
Education[1]		**	
Less than High School (reference)	ref		
High School Graduate	-.004	ns	(.144)
Some College	-.312	*	(.151)
College Graduate	-.437	**	(.167)
Household Poverty Status[1]		ns	
Worksite Vending Machine		**	
Yes	.391	**	(.121)
No	.084	ns	(.121)
Other[2] (reference)	ref		
Ate Fast Food	.465	*	(.141)
Fast Food Rule	-.223	ns	(.111)
Hours of Television	.069	**	(.025)
Servings of Fruit	-.050	*	(.021)
Smoke	.468	***	(.110)
Ate Breakfast Pastry	.288	*	(.128)
Ate Deep-Fried Food	.293	*	(.122)
Ate Fried Snack Food	.214	p=.056	(.112)
Ate Dessert	.187	*	(.093)
Model Fit			
R-Square		.157***	

[1] Age, race/ethnicity, education, household poverty status, and worksite vending machine entered as blocks. The F test was used to obtain the p-values for the global tests of significance for each block in the model.
[2] Other refers to adults working at home, retired, students, and not employed for wages.
** p < .05, ** p < .01, *** p < .001; ns = not significant.*
OLS = ordinary least squares.
SE = standard error.

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