Web Table 1. Search terms for low calorie (LCS) and caloric-sweeteners (CS); and food and beverage groups.

KEY WORD DESCRIPTIONS	SEARCH TERMS
Low calorie sweeteners (LCS)	Artificial sweetener, Litesse, aspartame, neotame, Equal, NutraSweet, Twinsweet, InstaSweet, NatraTaste, saccharin, Sweet'N Low, NectaSweet, sucralose, Splenda, Altern, Kaltame, ISOsweet, cyclamate, SugarTwin, Twin, Syclamate, acesulfame potassium, acesulfame K, Nutrinova, Sunett, Sweet One, stevia, candy leaf, sugar leaf, sweetleaf , rebiana, sorbitol, glucitol, erythritol, xylitol, mannitol, lactitol, maltitol, glycerol, hydrogenated starch hydrolysates, isomalt, isoglucose, lycasin, Tastes like Honey, Maltidex
Caloric sweeteners (CS)	Fruit juice concentrate, cane sugar, cane juice, cane syrup , turbinado, golden syrup, treacle, caramel, Sucanat, beet sugar, sugar beet, sucrose, table sugar, corn syrup, maltodextrin, TruSweet, C Sweet, Versatose, Clintose, Benchmate, CornSweet, high fructose corn syrup , honey, nectar, Honi-Bake, Honi-Flake, Sweet'N'Neat, agave nectar, agave syrup, agave sap, agave juice, molasses, maple, sorghum, malt, maltose, mizuame rice syrup, rice sugar, Sweet Dream, fructose, lactose, invert sugar, inverted sugar, sugar invert, Nulomoline, sucrovert, invertase, luo han guo, luo han kuo, tagatose, trehalose, brazzein, Cweet, pentadin, Oubli, mabinlin, monellin, thaumatin, curculin, lumbah, miraculin, monatin, inulin, osladin, licorice, glycyrrhizin, fructooligosaccharide, oligofructose, oligofructan, gomme, starch sweetener, syrup, luo han guo, luo han kuo, tagatose, trehalose, brazzein, Cweet, pentadin, Oubli, mabinlin, monellin, thaumatin, curculin, lumbah, miraculin, monatin, inulin, osladin, licorice, glycyrrhizin, fructooligosaccharide, oligofructose, oligofructan.
BEVERAGE CATEGORIES	DESCRIPTIONS
CS beverages	Includes any beverage, cola- or non-cola type, carbonated or still, containing CS
LCS beverages	Includes any beverage, cola- or non-cola type, carbonated or still, containing LCS
Juice	Includes 100% juice, and other juices and juice drinks containing LCS and CS
Milk and milk drinks, sweetened	Includes milk beverages containing LCS and CS
Milk, plain unsweetened	Includes plain high, low fat and skim milk without added sweeteners
Coffee/Tea, sweetened	Includes coffee and tea beverages containing LCS and CS
Coffee/Tea, unsweetened	Includes coffee and tea beverages without added sweeteners
Water and other beverages, unsweetened	Includes plain, carbonated or flavored water without added sweeteners
Alcohol	Wine, beer, alcoholic mixers
FOOD CATEGORIES	DESCRIPTIONS
Dairy, sweetened	Includes yogurt and other dairy containing LCS or CS
Dairy, unsweetened	Includes yogurt and other dairy without added sweeteners
Fruit, processed and sweetened	Includes canned, frozen, processed fruit containing LCS or CS
Plain fruits and vegetables	Includes plain (fresh/frozen/canned) fruit and vegetables
Ready-to-eat cereal, sweetened	Includes ready to eat cereal containing LCS or CS
Grains and breads	Includes plain pasta, rice, bread, unsweetened cereal
Desserts and sweeteners, LCS	Includes desserts and sweet snacks (cakes, cookies, pies, ice cream, candy) containing LCS
Desserts and sweeteners, CS	Includes desserts and sweet snacks (cakes, cookies, pies, ice cream, candy) containing CS
Salty snacks	Includes chips, crackers, pretzels
Cheese	Includes all types of cheese
Cooking fats and dressings	Includes cooking fats (oil, butter) and fat-based dressings and sauces
Nuts and seeds	Includes seeds, nuts and nut spreads without added sweeteners
Meat, fish, poultry, eggs	Includes fresh/frozen/processed meat, fish, poultry and eggs
Ready-to-eat mixed, frozen/fast food meals	Includes sandwiches, burgers, pizza, grain/meat based dishes, Mexican dishes

WEB APPENDIX 1

STUDY DESIGN AND POPULATION

We included purchasing data from the Homescan Consumer Panel dataset (The Nielsen Co.) (1) from 2000-2010. Homescan is an ongoing nationally representative longitudinal survey that captures household purchases of more than 600,000 barcoded products that are sold from all outlet channels, including grocery, drug, gas stations, mass-merchandise, club, supercenter, and convenience stores in 76 markets (metropolitan and non-metropolitan commercial areas) across the U.S. (2). Participating households are provided with home scanners with which they record food purchases for every shopping event. To better reflect individuals' dietary patterns, only single-person adult households were selected from 2000-2010 (n=136,011 observations from n=34,294 individuals) for the present study. Overall, kcal from Homescan food purchase data represent approximately two-thirds of the total caloric intake(3). The Homescan dataset has been used frequently by researchers to analyze food demand, consumption and sale strategies (2, 4).

FOOD GROUPING SYSTEM

Nutrition facts panel information on total kcal; kcal from carbohydrates, total sugar, total fat, protein and saturated fat; and ingredient lists were linked to each barcoded product reported in Homescan (2, 3). Information on ingredients lists was used to categorize all foods and beverages with sweeteners using keyword searches for caloric- (CS) and low-calorie sweeteners (LCS) (Supplemental Table 1). Following this approach, all carbonated beverages and sweetened-flavored waters, were classified as LCS or CS-beverages. Briefly, keyword searches included terms such as "sugar", "high fructose corn syrup", "sucralose" or "aspartame" among others and were performed on the ingredient lists available for each barcoded product (5). All foods and beverages purchased in Homescan were grouped into 9 beverage and 14 food groups (Supplemental Table 1). To ensure comparability across products, we applied weighted factors to those items sold as concentrates (e.g., beverage powders) to reflect the volume of the product in the "ready to drink/eat" form.

STATISTICAL ANALYSIS

Descriptive statistics

Households included in Homescan reported socio-demographic (SES) characteristics including gender, age, income, education and race/ethnicity. Race/ethnicity was used to classify participants as Hispanic, non-Hispanic White, non-Hispanic African-American and Others. The ratio of self-reported income to the poverty threshold was used to categorize income according to the percent of the poverty level: "Lower income, <185%", "Middle income, ≥185-<400%" and "Higher income, ≥400%".

Outcome specification

As primary outcomes, we used continuous measures (kcal/day) of dietary quality including total energy from all purchases; total energy excluding LCS- and CS-beverages; total energy from beverages and foods, and total energy and % energy from macronutrients (i.e., carbohydrates, total sugar, total fat, protein and saturated fat). As secondary outcomes, we used continuous measures (kcal/day) of purchases of other foods and beverages groups. We used measures of purchases per year to calculate estimates of kcal per day.

Exposure specification

Continuous measures of LCS- and CS-beverage purchases (servings/day) were used as main exposures. Estimates were obtained by dividing the total volume (mL) of beverages purchased per day by the standard serving size of a can (355 mL).

Endogenous Variables

Endogeneity arises in a model when one or more explanatory variables are correlated with the error term in the equation for the outcome of interest, a problem that might be due to reverse causality or unmeasured confounding(6-8). In our context, amount of LCS- and CS-beverages purchased are potentially endogenous variables (even though they are lagged in our longitudinal models) because purchases of sweetened beverages and purchases of other foods and beverages are choice variables to the consumers that may be influenced by the same set of time invariant unobservable factors that influence the outcome of interest (i.e., an individual/household might choose to consume a specific type of beverage and also a specific type of diet). In other words, purchases of LCS- and CS-beverages are potentially endogenous variables in our models if a particular dietary pattern is linked to a particular beverage pattern or vice versa (reverse causality). In addition, endogeneity might be caused by unmeasured confounding if there are unobserved common factors (e.g., obesity, diabetes, or individual preferences) that affect both beverage and dietary patterns. This unobserved heterogeneity is captured in the error term in the equation for the outcome of interest. In consequence, endogeneity could contribute to biased and inconsistent associations if these issues are not adequately addressed in the model (9, 10).

Instrumental variables

In econometrics and more recently in epidemiology, instrumental variables (IVs) are used to control for endogeneity bias (6). Reliable IVs are exogenous variables that should be both theoretically justified and statistically associated with endogenous explanatory variables in the model, conditional on the other covariates, but have no direct effect on the outcome of interest (other than through the endogenous explanatory variables), and in addition should not be correlated with the error term (6). At minimum, one needs as many valid IVs as there are endogenous explanatory variables in the model, but additional valid IVs may lead to more stable parameter estimates.

For the present analyses, several potential market-level IVs were considered suitable: food and LCS- and CS-beverage prices; the % market sales of LCS- and CS-beverages in each market; and the average number of shopping trips per year. Using information on prices paid by participating households, we created the weighted average price per 100 mL for LCS- and CS-beverages for each market. Prices used in this study are real prices adjusted by the inflation rate and cost of living (scaled using the first quarter of 2000 in Los Angeles). We also calculated the proportion of beverage sales of both LCS- and CS-beverages in each market and finally the average number of yearly household shopping trips for each market. If these instruments are exogenous to the outcomes and vary over space and time, then they will be ideal instruments.

To test the validity of our proposed IVs, it is necessary to investigate if our IVs meet two essential criteria:

> *Theoretical validity of IVs:* The above-mentioned market-level IVs were selected a priori because theoretically, these variables would be associated with individual/household consumption of LCS- and CS-beverages under the assumption that individual/household's environment (i.e. LCS- and CS-beverage prices) affects behavior. In addition, these market-level variables are outside the control of the individual so they would have an indirect effect on dietary behavior that is mediated through its association with LCS- and CS-beverage consumption in the model. In consequence, these market-level IVs could be assumed to be exogenous and not correlated with the unobserved error terms (8).

Increases in LCS- and CS-beverage prices will increase the marginal cost of intake of beverages, and the consequent decrease in beverage consumption could affect energy intake and purchases of foods and beverages (11). Theoretically, LCS- and CS-beverage prices could be important determinants of energy intake and food patterns but potentially exogenous and will not be correlated with the error terms in the models. Our model is based on Grossman's human capital model where households/individuals attempt to maximize utility subject to a budget constraint (12, 13). Utility is a function of health and other goods; and arguments in the health production function would be medical care and consumption of other health related inputs. We assume that diet quality and purchasing behavior enter as arguments into the health production function. When utility is maximized, the result is a series of demand equations for consumption goods, including diet quality and purchasing behavior, which will be functions of prices that enter through the budget constraint along with other exogenous variables that influence individuals' tastes and preferences. In this basic model of household behavior, prices are taken as given and are exogenous to the household, an assumption that is standard in the economic literature (12-14). In our context, although it might be possible that a group of households determine prices in any given market, since prices are set at the market level, it is reasonable to think that any particular individual/household would have a negligible influence on the market price.

Other market-level measures were considered as potentially exogenous, including food and beverage expenditures ($), average yearly household shopping trips and % market sales of LCS- and CS-beverages. Together with prices, state/county-level consumption/sales of alcohol and tobacco are also considered standard IVs in the economic literature of substance abuse (15). In our particular study, if we consider a model where we investigate the association between LCS- and CS-beverage purchases and purchases of desserts, we could assume that % market sales of LCS-beverages would help predict the individual-level explanatory endogenous variable (LCS-beverage purchases) but would not correlate with the individual-level outcome (dessert purchases) because there is no strong biological or theoretical mechanism to relate them.

Statistical strength of IVs: We investigated the association between our endogenous explanatory variables, our outcomes and our proposed IVs using random-effects longitudinal models controlling for year, market, gender, age, race/ethnicity, education and income (Table 2 in the main manuscript). We found several IVs that were associated with the explanatory endogenous variables (LCS- and CS-beverage purchases) but were not directly associated with the outcomes of interest. The % market sales of LCS- and CS-beverages were found to be potentially valid IVs for the explanatory endogenous variables because they were significant predictors of LCS- and CS-beverages but were not associated with the other outcome variables. Number of grocery trips/year was found to be a potentially valid IV for the outcomes in the main model (e.g., total energy, etc) because it was a significant predictor of our outcomes of interest but it was not associated with LCS- and CS-beverage purchases.

In summary, for the IVs to be considered potentially valid in the main models, they must satisfy the two conditions explained above: 1) exogeneity of IVs (unlikely correlation between our IVs and error terms in the main equation); and 2) relevancy of IVs (in explaining variability in our endogenous exposures) as was empirically tested in Table 2. The first assumption cannot be empirically tested because it involves correlation between IVs and an unobserved error. We considered our market-level IVs to be potentially exogenous because these variables outside the control of the individual. Finally, although the assumption of exogeneity cannot be directly be tested, there is the possibility of testing whether our IVs are uncorrelated with the error term, if there are more than one potential IVs available and in the context where at least one IV has been adequately identified and justified (See Specification tests that follow).

However, although all of these requirements should be met in order to have confidence in our IV approach, there is still the possibility that our IVs are weak given that many of these theoretical and empirical requirements are difficult to test and sometimes unmet. In this adverse scenario, the consequences of using an IVs approach could be worse than using ordinary least squares models for our estimates of association.

Empirical Model: Dynamic Panel Model

There are several considerations to account for when modeling the dynamics of diet and beverage consumption. For example, we assumed that one period model (e.g. diet at time *t*) depends on past values of the outcome (e.g. diet at time *t-1*) plus other explanatory covariates (e.g. beverage at time *t-1*). In order to better establish temporality and causality, our empirical dynamic model relates diet in the current year to its own lagged value in the previous year along with lagged measured LCS- and CS-beverage consumption, other time-varying and time-invariant covariates and the error terms (Equation 1):

$$D_{it} = \alpha D_{i,t-1} + \beta B_{i,t-1} + \gamma X_i + \pi Z_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

$$i = 1, \ldots N \text{ individuals}; t=1, \ldots, T \text{ years}$$

Where D_{it} denotes diet in the current wave; $D_{i,\,t-1}$ denotes diet in the prior wave; $B_{i,\,t-1}$ correspond to continuous lagged values of beverage consumption (servings of LCS- and CS-beverages per day); X_i is a vector of time invariant covariates (gender, race); Z_{it} denotes other time-varying control variables, such as age, education and income; α, β, γ, π indicate the vectors of coefficients for the explanatory variables. The error terms are μ_i which represents unobserved time invariant individual characteristics; and ε_{it} that represents the time varying error term. The β coefficients can be interpreted in this model as the change in the outcome variable for every increase in one serving/day of LCS- or CS-beverages in the previous year.

There are several challenges to account for in this model: 1) endogeneity (i.e., correlation between explanatory variables and μ_i); 2) double endogeneity (i.e., correlation between explanatory variables and ε_{it}); 3) autocorrelation (i.e. serially correlated ε_{it} and μ_i for the same individual due to the time invariant unobserved heterogeneity, which will result in incorrect standard errors). At minimum, we expect to find that lagged diet is correlated with μ_i so that IVs have to be used to account for it. One option is to calculate a first difference or differenced equation so that μ_i and other time invariant covariates are dropped (Equation 2):

$$\Delta D_{it} = \alpha\, [\Delta D_{i,t-1}] + \beta\, [\Delta B_{i,\,t-1}] + \pi Z_{it} + \Delta\varepsilon_{it} \quad (2)$$

$$i = 1, \ldots N \text{ individuals}; t=1, \ldots, T \text{ years}$$

Given the challenges discussed in relation to endogeneity and auto-correlated errors over time, the estimation method used in this study was the system generalized method of moments (GMM) estimator developed by Blundell and Bond (16, 17). This generalized method of moments system is more efficient than other approaches because it estimates Equations 1 and 2 simultaneously by employing a large set of moment conditions and includes simultaneously two transformations of the equation of interest, the regression-in-differences (Equation 2) and the regression-in-levels (Equation 1). In Equation 2, the μ_i and other time invariant observed variables are dropped. However, additional IVs should be used to account for the potential correlation between the explanatory variables and ε_{it}. We used lagged second and third differences of the endogenous explanatory variables (i.e., $\Delta B_{i,\,t-2}$ and $\Delta B_{i,\,t-3}$) as IVs in Equation 2, under the assumption that there is no second order autocorrelation (i.e. $\Delta B_{i,\,t-2}$ is correlated with $\Delta B_{i,\,t-1}$ but not correlated to $\Delta\varepsilon_{it}$) so that the lagged differences can be used as valid IVs. Since these explanatory variables are time varying, each additional wave adds additional instruments. As was previously discussed, it is highly likely that the endogenous explanatory variables will be correlated with μ_i in Equation 1 and with ε_{it} in Equation 2. Then, market-level IVs (prices, shopping trips and % market sales) that were found to be valid IVs were additionally used as lagged IVs for the explanatory endogenous variables in both Equations 1 and 2. The main advantage of our conceptual dynamic model and our statistical approach with IVs is that confounding due to endogeneity and unobserved heterogeneity may be effectively controlled, allowing us to obtain valid estimates of the true relation between dietary quality and sweetened beverage consumption.

Specification Tests

In order to test the assumption that our IVs are truly exogenous and as a result are orthogonal and not correlated with the error terms, we used the Sargan-Hansen *J* test of over-identifying restrictions (18). The main limitation of this test is that it cannot identify if all IVs used in the main models are truly exogenous, so this test is reliable when at least one valid IVs is adequately identified, justified and its strength has been proved. A rejection of the null hypothesis of over-identification means that our IVs do not satisfy the orthogonality conditions (IVs are not truly exogenous) so that they are being incorrectly excluded from the regression and the model is incorrectly specified. Failure to reject the null hypothesis (p>0.05) indicates that the assumption made about the exogeneity of the our IVs is valid, given that there are more than one IV available and at least one of them is theoretically exogenous and helps predict the endogenous explanatory variable. Secondly, we performed the Arellano-Bond test to investigate if there is a second order autocorrelation in Equation 2, which would invalidate the use of lagged values of the endogenous explanatory variables as IVs in Equation 2 (18). Although first order autocorrelation is expected because of the first differencing, failure to reject the null hypothesis of no second order autocorrelation (p>0.05) would validate the use of the second/third lags of our explanatory variables as IVs.

Final model

All analyses were performed using Stata 12 (StataCorp, Stata Statistical Software, Release 12, 2011). As was described above, our two-step dynamic model with generalized method of moments estimator includes a series of variables: lagged measures of the dependent variable (e.g., total energy, etc.); lagged main exposures (LCS- and CS-beverage purchases), IVs (one year lag market-level variables; second year and third year lags of the main exposures) and confounders (age, gender, education, race/ethnicity, income and year). These variables were controlled for because they were found to be differentially associated with LCS- and CS-beverage consumption over this period of time (19). Estimates are presented as β (SE) and means (SE). Robust standard errors are obtained from dynamic models. The β coefficients for the main exposures in the dynamic models can be interpreted as the increase in the outcome variable for every additional serving/day of LCS- or CS-beverages in the previous year. Model parameters were used to predict the mean energy purchased for each type of beverage consumer. For example, we specified an increase in 1 serving/day of LCS-beverages but 0 of CS-beverages for LCS-beverage consumers and vice-versa for CS-beverage consumers. For non-consumers, we specified 0 servings/day of each LCS- and CS-beverages. A two sided p-value of <0.05 was set to denote statistical significance. Finally, we provided a comparison model that assumes exogeneity of the main exposures to show how failure to correct endogeneity can affect the findings.

References

1. The Nielsen Co. Nielsen Consumer Panel and Retail Measurement. http://wwwnielsencom/us/en/measurement/retail-measurementhtml Accessed Novemeber 1, 2012.
2. Ng SW, Popkin BM. Monitoring foods and nutrients sold and consumed in the United States: Dynamics and Challenges. *J Acad Nutr Diet* 2012;112(1):41-5 ed.
3. Slining MM, Ng SW, Popkin BM. Food companies' calorie-reduction pledges to improve U.S. diet. *Am J Prev Med* 2013;44(2):174-84.
4. Harris JM. Using Nielsen Homescan Data and Complex Design Techniques to Analyze Convenience Food Expenditures. 2005.
5. Ng SW, Slining MM, Popkin BM. Use of Caloric and Noncaloric Sweeteners in US Consumer Packaged Foods, 2005-2009. *J Acad Nutr Diet* 2012;112(11):1828-34 e6.
6. Greenland S. An introduction to instrumental variables for epidemiologists. *Int J Epidemiol* 2000;29(4):722-9.
7. Johnston KM, Gustafson P, Levy AR, et al. Use of instrumental variables in the analysis of generalized linear models in the presence of unmeasured confounding with applications to epidemiological research. *Stat Med* 2008;27(9):1539-56.
8. Wooldridge JM. *Econometric analysis of cross section and panel data*. Cambridge, Mass.: MIT Press; 2002.

9. Zohoori N. Dies endogeneity matter? A comparison of empirical analyses with and without control for endogeneity. *Ann Epidemiol* 1997;7(4):258-66.
10. Zohoori N, Savitz DA. Econometric approaches to epidemiologic data: relating endogeneity and unobserved heterogeneity to confounding. *Ann Epidemiol* 1997;7(4):251-7.
11. Andreyeva T, Long MW, Brownell KD. The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food. *American journal of public health* 2010;100(2):216-22.
12. Grossman M. On the concept of health capital and the demand for health. *The Journal of Political Economy* 1972:223-55.
13. Grossman M. The human capital model. *Handbook of health economics* 2000;1:347-408.
14. Strauss J, Thomas D. Human resources: Empirical modeling of household and family decisions. *Handbook of development economics* 1995;3:1883-2023.
15. French MT, Popovici I. That instrument is lousy! In search of agreement when using instrumental variables estimation in substance use research. *Health Economics* 2011;20(2):127-46.
16. Blundell R, Bond S. Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics* 1998;87(1):115-43.
17. Blundell R, Bond S, Windmeijer F. Estimation in dynamic panel data models: improving on the performance of the standard GMM estimator. 2001.
18. Arellano M, Bond S. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies* 1991;58(2):277-97.
19. Piernas C, Ng SW, Popkin B. Trends in purchases and intake of foods and beverages containing caloric and low-calorie sweeteners over the last decade in the United States. *Pediatr Obes* 2013.

Web Table 2. Population distributions by beverage consumer profile in the Homescan population from 2000-2010[a].

	2000-2010		YEAR										
	n	%	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Consumer profiles													
Neither LCS nor CS beverages	13,282	9.3%	8.9%	8.0%	8.1%	7.7%	8.1%	8.0%	9.0%	10.6%	11.0%	11.8%	11.1%
LCS beverages only	17,317	11.1%	9.1%	9.2%	8.0%	8.4%	10.7%	13.2%	11.5%	13.1%	12.0%	12.7%	13.2%
CS beverages only	35,410	28.3%	32.7%	32.7%	31.4%	31.4%	26.9%	24.3%	25.2%	25.4%	27.8%	26.7%	27.6%
Both LCS and CS beverages	70,002	51.3%	49.3%	50.1%	52.5%	52.6%	54.3%	54.5%	54.3%	51.0%	49.2%	48.8%	48.1%
LCS consumers													
Non consumers	48,692	37.6%	41.5%	40.7%	39.5%	39.0%	34.9%	32.3%	34.2%	35.9%	38.9%	38.5%	38.7%
>0 to <1 servings/day	71,548	50.7%	48.1%	49.3%	49.3%	49.1%	52.5%	54.6%	53.3%	52.0%	49.5%	50.1%	49.3%
>=1 servings/day	15,771	11.7%	10.3%	10.0%	11.2%	11.9%	12.6%	13.1%	12.4%	12.1%	11.7%	11.4%	12.1%
CS consumers													
Non consumers	30,599	20.4%	18.0%	17.2%	16.1%	16.0%	18.8%	21.2%	20.5%	23.7%	23.0%	24.5%	24.3%
>0 to <1 servings/day	92,835	68.0%	69.0%	69.5%	71.1%	71.5%	70.4%	67.2%	68.3%	65.9%	65.2%	64.9%	65.4%
>=1 servings/day	12,577	11.6%	13.0%	13.2%	12.9%	12.4%	10.8%	11.5%	11.2%	10.4%	11.8%	10.7%	10.4%

[a]Using sample weights to account for selection probability and sampling design

Web Table 3. Changes in energy and macronutrients among individuals in the Homescan population, from 2000-2010[a].

	YEAR												
Total Daily Energy, kcal/day [mean (SE)]	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change2 000-10	*P* trend[b]
Total energy	1894.44	1890.31	1902.64	1882.26	1858.84	1822.45	1774.16	1724.13	1687.89	1657.94	1609.19	-285.26	<0.001
	(8.08)	(7.81)	(7.46)	(7.31)	(7.21)	(6.79)	(6.56)	(6.47)	(6.44)	(6.48)	(6.50)		
Total energy excluding LCS/CS beverages	1835.45	1832.67	1842.51	1812.95	1795.35	1763.09	1724.05	1679.05	1644.57	1617.27	1573.23	-262.22	<0.001
	(7.82)	(7.56)	(7.23)	(7.08)	(6.98)	(6.57)	(6.35)	(6.27)	(6.24)	(6.28)	(6.29)		
Total energy from LCS/CS beverages	57.55	56.56	59.18	68.64	62.89	58.64	49.82	44.97	43.60	40.97	36.46	-21.09	<0.001
	(0.97)	(0.94)	(0.89)	(0.88)	(0.87)	(0.81)	(0.77)	(0.76)	(0.76)	(0.77)	(0.76)		
Total energy from food	1596.57	1598.59	1607.06	1587.96	1577.22	1552.08	1516.01	1481.20	1458.57	1437.27	1396.87	-199.71	<0.001
	(7.14)	(6.91)	(6.60)	(6.47)	(6.38)	(6.01)	(5.80)	(5.73)	(5.70)	(5.74)	(5.75)		
Total energy from all beverages	297.03	291.05	294.98	293.97	281.33	270.00	258.00	242.91	229.58	220.96	212.81	-84.22	<0.001
	(2.02)	(1.96)	(1.87)	(1.83)	(1.80)	(1.69)	(1.63)	(1.61)	(1.60)	(1.61)	(1.61)		
Total energy from beverages excluding LCS/CS	238.82	234.01	235.38	225.00	218.14	210.98	208.04	197.86	186.08	180.08	176.49	-62.33	<0.001
	(1.67)	(1.61)	(1.54)	(1.51)	(1.49)	(1.39)	(1.34)	(1.33)	(1.32)	(1.33)	(1.33)		
Total Daily Macronutrients, kcal/day [mean (SE)]	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change 2000-10	*P* trend[b]
Carbohydrates (kcal/day)	1018.52	1008.50	1013.63	988.49	965.11	947.61	919.02	896.31	879.26	863.76	842.29	-176.24	<0.001
	(4.58)	(4.43)	(4.23)	(4.14)	(4.08)	(3.84)	(3.71)	(3.66)	(3.64)	(3.67)	(3.68)		
Carbohydrates (%)	53.86	53.54	53.42	52.60	51.97	52.12	52.03	52.26	52.34	52.31	52.66	-1.21	<0.001
	(0.11)	(0.11)	(0.10)	(0.10)	(0.10)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)		
Sugar (kcal/day)	529.24	519.90	525.90	512.55	497.18	486.09	468.49	444.97	438.84	423.60	412.15	-117.08	<0.001
	(2.75)	(2.66)	(2.54)	(2.49)	(2.46)	(2.31)	(2.23)	(2.20)	(2.19)	(2.20)	(2.21)		
Sugar (%)	27.77	27.35	27.52	27.06	26.57	26.53	26.27	25.75	25.85	25.44	25.57	-2.20	<0.001
	(0.09)	(0.09)	(0.08)	(0.08)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)		
Protein (kcal/day)	182.00	186.04	188.63	190.43	193.04	189.15	187.94	184.91	180.73	179.64	175.75	-6.25	<0.001
	(1.47)	(1.42)	(1.35)	(1.33)	(1.31)	(1.22)	(1.17)	(1.15)	(1.14)	(1.15)	(1.15)		
Protein (%)	9.88	10.22	10.19	10.43	10.75	10.70	11.08	11.16	11.19	11.19	11.47	1.58	<0.001
	(0.16)	(0.16)	(0.15)	(0.15)	(0.15)	(0.14)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)		
Total fat (kcal/day)	649.69	656.67	664.79	666.49	668.02	656.37	639.78	622.18	610.98	604.75	583.81	-65.88	<0.001
	(3.20)	(3.10)	(2.96)	(2.90)	(2.86)	(2.69)	(2.60)	(2.56)	(2.55)	(2.57)	(2.57)		
Total fat (%)	33.89	34.29	34.51	35.06	35.60	35.62	35.65	35.61	35.73	36.00	35.82	1.93	<0.001
	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)		
Saturated fat (kcal/day)	213.69	214.45	219.43	221.06	220.12	215.57	213.56	206.05	201.33	199.89	193.85	-19.84	<0.001

	(1.10)	(1.06)	(1.01)	(0.99)	(0.98)	(0.92)	(0.89)	(0.88)	(0.87)	(0.88)	(0.88)		
Saturated fat (%)	11.16	11.22	11.42	11.66	11.76	11.73	11.93	11.82	11.79	11.90	11.89	0.73	<0.001
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)		

[a]Using random effects longitudinal linear models; adjusted for gender, age, race/ethnicity, education and income; [b]*P* for linear trend, *Wald test P*<0.05

Web Table 4. Changes in beverage groups (kcal and grams per day) among individuals in the Homescan population, from 2000-2010[a].

		YEAR												
Beverage Groups [mean (SE)]	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change 2000-10	*P* trend[b]
CS beverages	Kcal/day	57.2	56.2	58.8	68.3	62.2	58.1	49.4	44.5	43.1	40.5	35.9	-21.4	<0.001
		(1.0)	(0.9)	(0.9)	(0.9)	(0.9)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)		
	Grams/day	151.1	149.1	149.6	149.3	138.4	126.6	120.9	112.9	109.5	104.5	98.4	-52.7	<0.001
		(2.0)	(2.0)	(1.9)	(1.8)	(1.8)	(1.7)	(1.6)	(1.6)	(1.6)	(1.6)	(1.6)		
LCS-beverages	Kcal/day	0.3	0.3	0.3	0.3	0.7	0.6	0.4	0.5	0.5	0.5	0.6	0.3	<0.001
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)		
	Grams/day	124.6	126.2	135.1	143.3	147.9	150.8	146.9	136.1	127.1	125.7	126.9	2.4	0.003
		(2.4)	(2.3)	(2.2)	(2.1)	(2.1)	(2.0)	(1.9)	(1.9)	(1.9)	(1.9)	(1.9)		
Juice, sweetened	Kcal/day	63.6	61.3	59.8	57.8	55.5	53.1	49.6	46.7	43.9	42.5	40.3	-23.3	<0.001
		(0.6)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)		
	Grams/day	134.8	131.1	129.6	126.1	124.2	121.1	113.9	108.2	104.8	101.4	99.4	-35.4	<0.001
		(1.2)	(1.2)	(1.1)	(1.1)	(1.1)	(1.0)	(1.0)	(0.9)	(0.9)	(0.9)	(0.9)		
Milk and milk drinks, sweetened	Kcal/day	8.1	8.8	9.2	9.5	9.5	9.1	9.0	8.6	8.8	8.8	8.5	0.39	0.132
		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)		
	Grams/day	11.5	12.9	13.2	13.7	14.3	13.7	13.7	13.7	13.9	14.1	14.1	2.6	<0.001
		(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)		
Milk, plain unsweetened	Kcal/day	83.6	85.7	83.8	82.8	79.9	78.0	79.3	74.3	66.7	66.1	62.8	-20.8	<0.001
		(0.8)	(0.8)	(0.7)	(0.7)	(0.7)	(0.7)	(0.6)	(0.6)	(0.6)	(0.6)	(0.6)		
	Grams/day	175.5	170.0	166.7	161.8	157.9	154.4	152.9	145.3	139.1	137.8	130.4	-45.0	<0.001
		(1.3)	(1.3)	(1.2)	(1.2)	(1.2)	(1.1)	(1.1)	(1.1)	(1.1)	(1.1)	(1.1)		
Coffee/Tea, sweetened	Kcal/day	5.0	5.7	5.9	5.8	5.5	5.7	6.5	6.8	6.6	6.8	7.1	2.0	<0.001
		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)		
	Grams/day	31.5	33.3	36.2	36.7	36.5	37.4	43.1	47.1	46.2	53.2	52.5	21.0	<0.001
		(1.5)	(1.5)	(1.4)	(1.4)	(1.4)	(1.3)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)		
Coffee/Tea, unsweetened	Kcal/day	5.1	5.1	4.9	4.3	4.7	4.6	4.5	3.9	4.4	3.5	3.4	-1.8	<0.001
		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)		
	Grams/day	320.2	313.7	310.8	311.6	308.0	289.7	284.3	276.8	268.4	255.2	252.7	-67.5	<0.001
		(3.2)	(3.1)	(3.0)	(2.9)	(2.9)	(2.7)	(2.6)	(2.6)	(2.5)	(2.6)	(2.6)		
Water and other flavored beverages, unsweetened	Kcal/day	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	<0.001
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)		
	Grams/day	38.1	43.4	48.6	55.2	56.9	65.0	69.2	69.0	65.6	59.9	59.2	21.1	<0.001
		(1.5)	(1.5)	(1.4)	(1.4)	(1.3)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)		
Alcohol	Kcal/day	54.1	53.7	53.0	53.1	51.2	49.3	49.1	48.0	46.3	44.0	43.6	-10.6	<0.001
		(1.1)	(1.0)	(1.0)	(1.0)	(1.0)	(0.9)	(0.9)	(0.9)	(0.9)	(0.9)	(0.9)		

Grams/day	89.4 (2.1)	89.0 (2.0)	87.3 (1.9)	87.3 (1.9)	83.5 (1.9)	79.5 (1.8)	78.5 (1.7)	76.5 (1.7)	72.7 (1.7)	69.9 (1.7)	68.6 (1.7)	-20.8	<0.001

[a]Using random effects longitudinal linear models; adjusted for gender, age, race/ethnicity, education and income; [b]*P* for linear trend, *Wald test* $P<0.05$

Web Table 5. Changes in food groups (kcal and grams per day) among individuals in the Homescan population, from 2000-2010[a].

		YEAR												
Food Groups [mean (SE)]	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change 2000-10	*P* trend[b]
Dairy, sweetened	Kcal/day	36.6	37.3	38.3	38.8	38.9	39.4	40.3	40.0	39.6	39.8	42.6	6.0	<0.001
		(0.6)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.4)	(0.4)	(0.4)	(0.4)		
	Grams/day	22.3	22.8	23.5	24.2	24.9	26.4	27.6	27.7	27.8	28.6	30.0	7.6	<0.001
		(0.4)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)		
Dairy, plain and unsweetened	Kcal/day	9.1	8.8	9.3	10.1	10.2	10.0	10.1	9.8	9.8	10.2	10.3	1.2	<0.001
		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)		
	Grams/day	6.1	5.9	6.2	6.7	6.9	6.9	7.0	6.8	6.9	7.2	7.3	1.2	<0.001
		(0.2)	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)		
Fruit, processed and sweetened	Kcal/day	9.9	10.0	10.2	10.4	10.4	10.6	10.5	10.6	10.3	9.9	9.6	-0.3	0.058
		(0.2)	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)		
	Grams/day	11.5	11.6	11.9	12.0	11.7	11.8	11.4	11.2	11.1	10.5	9.8	-1.6	<0.001
		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)		
Plain fruits and vegetables	Kcal/day	48.3	47.8	58.8	57.0	56.6	49.9	48.9	53.0	53.2	51.2	50.9	2.6	0.018
		(0.5)	(0.5)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)		
	Grams/day	97.0	96.7	98.5	100.4	100.2	101.3	100.7	97.1	96.7	98.2	97.5	0.5	0.174
		(0.8)	(0.8)	(0.7)	(0.7)	(0.7)	(0.6)	(0.6)	(0.6)	(0.6)	(0.6)	(0.6)		
Ready-to-eat Cereal, sweetened	Kcal/day	83.6	79.2	79.9	80.5	79.6	80.0	81.3	80.8	81.3	80.1	77.5	-6.0	0.004
		(0.8)	(0.8)	(0.8)	(0.7)	(0.7)	(0.7)	(0.7)	(0.6)	(0.6)	(0.7)	(0.7)		
	Grams/day	21.0	20.8	21.1	21.3	21.1	21.6	22.0	21.9	22.1	22.1	21.2	0.2	<0.001
		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)		
Grains and breads	Kcal/day	118.6	115.6	112.9	106.2	100.8	98.1	93.0	90.9	88.8	86.7	87.6	-30.9	<0.001
		(1.0)	(1.0)	(0.9)	(0.9)	(0.9)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)		
	Grams/day	37.0	36.2	34.6	32.3	30.6	29.5	27.9	27.2	26.8	26.0	25.3	-11.7	<0.001
		(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)		
Desserts and sweeteners, LCS	Kcal/day	7.6	10.0	11.2	12.8	17.3	17.9	14.6	15.7	14.7	14.8	15.5	8.0	<0.001
		(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)		
	Grams/day	4.4	5.4	6.3	7.4	9.9	10.6	9.2	9.8	9.3	9.4	9.5	5.0	<0.001
		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)		
Desserts and sweeteners, CS	Kcal/day	656.1	653.9	649.2	627.5	608.8	595.4	584.3	567.1	558.7	542.0	522.8	-133.3	<0.001
		(3.6)	(3.5)	(3.3)	(3.3)	(3.2)	(3.0)	(2.9)	(2.9)	(2.9)	(2.9)	(2.9)		
	Grams/day	199.1	197.2	195.6	191.8	186.2	182.1	180.5	174.3	170.9	167.0	161.7	-37.4	<0.001
		(1.0)	(1.0)	(0.9)	(0.9)	(0.9)	(0.9)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)		
Salty Snacks	Kcal/day	40.5	43.9	45.6	44.9	45.9	48.3	46.7	44.8	44.0	44.2	47.5	7.0	<0.001
		(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)		
	Grams/day	9.5	10.0	10.4	10.4	10.9	11.3	11.2	10.8	10.6	10.6	11.1	1.6	<0.001
		(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)		
Cheese	Kcal/day	53.9	53.5	54.4	57.2	58.7	58.5	58.5	56.2	54.8	58.9	56.9	3.1	<0.001
		(0.5)	(0.5)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)		
	Grams/day	20.6	20.5	20.7	21.5	22.0	21.9	21.8	20.8	20.2	21.7	20.8	0.2	0.590

		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)		
Cooking fats and dressings	Kcal/day	208.3	209.2	207.0	203.4	199.5	200.0	192.0	185.3	180.4	183.7	171.5	-36.8	<0.001
		(1.5)	(1.4)	(1.4)	(1.3)	(1.3)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)		
	Grams/day	62.8	62.8	62.5	61.0	61.0	60.8	58.8	57.0	55.8	56.8	54.5	-8.3	<0.001
		(0.4)	(0.4)	(0.4)	(0.4)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)		
Nuts and seeds	Kcal/day	36.3	36.0	38.5	44.2	50.4	47.6	46.7	47.3	46.2	46.2	44.6	8.3	<0.001
		(0.8)	(0.8)	(0.7)	(0.7)	(0.7)	(0.7)	(0.6)	(0.6)	(0.6)	(0.6)	(0.6)		
	Grams/day	6.5	6.6	7.0	8.1	9.0	8.6	8.2	8.3	8.1	8.2	8.0	1.6	<0.001
		(0.2)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)		
Meat, fish, poultry and eggs	Kcal/day	97.5	103.7	106.3	109.4	110.6	107.8	104.5	99.3	99.8	96.5	94.1	-3.4	<0.001
		(0.8)	(0.8)	(0.8)	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)		
	Grams/day	56.8	57.5	59.2	60.8	61.0	59.1	57.7	55.2	55.1	54.4	52.8	-4.0	<0.001
		(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.3)	(0.3)	(0.3)	(0.3)		
Ready-to-eat mixed, frozen and fast food meals	Kcal/day	159.1	161.0	158.0	161.2	164.6	165.2	163.6	161.7	159.0	156.9	154.0	-5.1	<0.001
		(1.1)	(1.1)	(1.1)	(1.0)	(1.0)	(1.0)	(0.9)	(0.9)	(0.9)	(0.9)	(0.9)		
	Grams/day	132.8	133.4	130.9	132.2	133.3	132.2	130.6	130.2	129.1	127.7	126.1	-6.7	<0.001
		(0.9)	(0.9)	(0.8)	(0.8)	(0.8)	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)		

[a] Using random effects longitudinal linear models; adjusted for gender, age, race/ethnicity, education and income;

[b] *P* for linear trend, *Wald test P*<0.05

Web Table 6. Changes in market-level variables in the Homescan population, from 2000-2010[a].

INSTRUMENTAL VARIABLES Market Level [mean (SE)]	YEAR 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change 2000-10	P trend[b]
Average prices ($/100 gr or mL)													
Food price index	98.29	97.72	98.71	100.85	101.03	103.85	105.87	110.52	114.72	119.08	118.17	19.88	<0.001
	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)		
LCS-beverage prices	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.03	<0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
CS-beverage prices	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.02	<0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Average household purchases per year ($)													
Total Food	1882.51	1879.97	1910.63	1972.18	2017.68	2066.70	2190.43	2243.57	2353.50	2377.08	2354.14	471.63	<0.001
	(8.56)	(8.56)	(8.56)	(8.50)	(8.50)	(8.50)	(8.50)	(8.50)	(8.50)	(8.50)	(8.50)		
Total Beverages	490.47	481.85	479.66	493.63	500.55	520.62	547.13	567.60	577.97	562.84	559.30	68.83	<0.001
	(2.80)	(2.80)	(2.80)	(2.78)	(2.78)	(2.78)	(2.78)	(2.78)	(2.78)	(2.78)	(2.78)		
Total LCS/CS beverages	130.87	129.20	134.41	140.31	140.11	149.66	159.09	158.61	155.64	155.96	151.06	20.19	<0.001
	(1.14)	(1.14)	(1.14)	(1.13)	(1.13)	(1.13)	(1.13)	(1.13)	(1.13)	(1.13)	(1.13)		
Average household grocery trips per year													
Number of trips/year	115.61	113.95	113.79	113.63	112.03	107.57	105.10	102.50	101.99	101.97	100.80	-14.80	<0.001
	(0.31)	(0.31)	(0.31)	(0.31)	(0.31)	(0.31)	(0.31)	(0.31)	(0.31)	(0.31)	(0.31)		
Proportion of market sales (%)													
LCS-beverage purchases	33.97	33.79	35.19	36.98	40.07	41.04	40.47	40.13	39.26	40.22	41.48	7.52	<0.001
	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)		
CS-beverage purchases	57.98	56.57	54.21	51.13	46.90	43.37	41.82	40.19	40.98	40.90	39.81	-18.16	<0.001
	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)		

[a] Adjusted for market;
[b] P for linear trend, Wald test P<0.05

Web Table 7. Dynamic Modeling of the Association between 1-Serving per Day Increases in the Consumption of Beverages Sweetened With Caloric Sweeteners and Low-Calorie Sweeteners and Dietary Quality and Macronutrients, Homescan 2000-2010

Outcomes at time t	*Lagged Endogenous Explanatory Variables*						Overall statistic	Sargan-Hansen test [b] *P* value	Arellano-Bond test of autocorrelation [c] *P* value	
	Outcome		*LCS-beverages*		*CS-beverages*					
	β	[SE]	β	[SE]	β	[SE]	$\chi^2(15)$	χ^2 (25)	AR(1)	AR(2)
Total Daily Energy (kcal/day)										
Total energy	0.39	0.18*	86.01	29.61*	112.95	55.31*	1383.19*	24.19	-4.91*	1.44
Total energy excluding LCS/CS-beverages	0.31	0.18	92.51	29.24*	73.03	37.23*	1139.45*	26.84	-4.58*	0.78
Total energy from food	0.23	0.15	99.41	27.96*	84.59	32.68*	903.96*	25.34	-4.64*	0.07
Total energy from all beverages	0.53	0.22*	-3.54	7.20	23.58	32.14	899.35*	21.79	-6.76*	0.91
Total energy from beverages excluding LCS/CS	0.74	0.11*	-2.17	4.77	-3.24	5.21	804.99*	32.71	-8.65*	1.34
Total Daily Macronutrients (kcal/day)										
Carbohydrates	0.34	0.17*	42.29	15.91*	85.94	38.29*	1107.54*	25.11	-5.50*	1.28
Sugar	0.26	0.20	19.41	9.65*	80.38	35.88*	1034.46*	19.55	-6.11*	0.83
Protein	0.37	0.17*	10.46	5.15*	8.88	5.06	363.40*	17.61	-3.10*	-1.36
Total fat	0.25	0.16	45.41	14.01*	38.54	17.31*	764.00*	23.04	-5.10*	0.28
Saturated fat	0.37	0.18*	14.10	5.57*	11.01	6.51	695.81*	21.93	-6.62*	0.94
Total Daily Macronutrients (%)										
Carbohydrates	0.42	0.16*	-0.39	0.28	0.41	0.44	240.43*	36.18	-2.22*	0.51
Sugar	0.54	0.18*	-0.24	0.29	0.32	0.59	505.72*	36.49	-6.62*	1.83
Protein	0.19	0.13	0.34	0.23	0.18	0.21	62.16*	22.08	-1.88	-0.18
Total fat	0.69	0.09*	0.24	0.22	0.13	0.23	901.23*	32.28	-10.92*	5.28*
Saturated fat	0.62	0.12*	0.15	0.11	0.15	0.10	363.81*	23.80	-13.51*	2.14*

Abbreviations: CS: caloric sweetened; LCS: low-calorie sweetened

*$P<0.05$

[a] Values are expressed as β (standard error) and were obtained from a generalized method of moments 2-step system dynamic panel model with the following instrumental variables: a) Average no. of household grocery trips/year; % market sales of LCS beverages and CS beverages (specified for the level equation and differenced equation); b) Second and third lags of LCS- and CS-beverage purchases (specified for the differenced equation). Total number of instruments = 41. Models were adjusted for age, gender, education, race/ethnicity, income and year.

[b] Sargan-Hansen test of overidentifying restrictions. Under P>0.05, the null hypothesis of overidentification indicates that the assumptions made about exogeneity and exclusion of the IVs are valid.

[c] Arellano-Bond test of autocorrelation (AR) of time varying error term in the differenced equation. Under P>0.05, the null hypothesis of no second order autocorrelation indicates that the second and third lags of our endogenous explanatory variables are valid IVs for the differenced equation.

Web Table 8. Dynamic Modeling of the Association between 1-Serving per Day Increases in the Consumption of Beverages Sweetened With Caloric Sweeteners and Low-Calorie Sweeteners and Dietary Purchasing Patterns, Homescan 2000-2010.

	Lagged Endogenous Explanatory Variables						Overall statistic	Sargan-Hansen test [b] *P* value	Arellano-Bond test of autocorrelation [c] *P* value	
Outcomes at time t	*Outcomes*		*LCS-beverages*		*CS-beverages*					
	β	[SE]	β	[SE]	β	[SE]	$\chi^2(16)$	χ^2 (14)	AR(1)	AR(2)
Beverage groups (kcal/day)										
Juice, sweetened	0.73	0.23*	-2.28	2.07	-1.52	2.20	684.84*	15.58	-7.68*	0.70
Milk and milk drinks, sweetened	-0.07	0.18	-0.48	0.78	1.24	0.94	37.33*	24.60	-1.86	-3.76*
Milk, plain unsweetened	0.36	0.17*	1.82	2.33	2.22	2.57	583.93*	25.60	-3.72*	-0.65
Coffee/Tea, sweetened	-0.44	0.31	0.69	0.71	-1.08	0.98	28.51	19.73	-0.04	-2.82*
Coffee/Tea, unsweetened	0.76	0.17*	-0.73	0.65	0.40	0.81	263.13*	13.87	-4.91*	2.45*
Water and other beverages, unsweetened	-0.24	0.49	0.00	0.05	0.05	0.05	18.25	13.49	-1.08	-1.05
Alcohol	0.88	0.10*	-1.80	2.21	-2.83	1.98	579.87*	25.23	-8.89*	0.35
Food groups (kcal/day)										
Dairy, sweetened	0.39	0.20	1.76	1.55	0.98	1.43	82.09*	24.66	-4.71*	-0.52
Dairy, plain and unsweetened	0.76	0.14*	0.92	0.58	0.82	0.53	802.56*	38.23*	-7.79*	0.06
Fruit, processed and sweetened	-0.21	0.21	-0.36	0.57	0.41	0.56	44.59*	17.30	-1.51	-2.96*
Plain fruits and vegetables	0.28	0.21	0.85	1.53	0.27	1.50	292.18*	23.79	-3.32*	1.03
Ready-to-eat Cereal, sweetened	0.05	0.15	8.13	3.39*	2.14	2.66	80.72*	22.92	-3.05*	-2.68*
Grains and breads	0.81	0.09*	-0.40	3.55	-1.40	3.52	1332.27*	27.96	-9.40*	4.41*
Desserts and sweeteners, LCS	0.39	0.13*	1.34	1.77	-1.29	1.23	186.39*	35.22	-6.45*	-0.55
Desserts and sweeteners, CS	0.24	0.19	40.18	14.04*	36.00	17.30*	601.28*	30.86	-4.51*	1.05
Salty Snacks	0.70	0.27*	1.66	2.74	0.04	2.57	158.59*	16.80	-5.04*	1.81
Cheese	0.45	0.20*	5.21	2.58*	3.92	2.85	202.39*	30.54	-8.16*	0.04
Cooking fats and dressings	0.89	0.22*	-2.22	7.00	-7.29	7.96	510.02*	27.80	-6.85*	4.12*
Nuts and seeds	0.53	0.23*	3.10	3.48	2.62	2.80	176.26*	17.11	-4.66*	-0.93
Meat, fish, poultry and eggs	0.80	0.08*	-1.71	3.15	-1.55	2.95	718.60*	17.66	-13.08*	2.99*
Ready-to-eat mixed, frozen/fast food meals	0.69	0.17*	6.37	3.93	5.78	4.78	732.81*	20.68	-7.31*	2.07*

Abbreviations: CS: caloric sweetened; LCS: low-calorie sweetened

*P<0.05

[a] Values are expressed as β (standard error) and were obtained from a generalized method of moments 2-step system dynamic panel model with the following instrumental variables: a) Average household grocery trips/year; % market sales of LCS beverages and CS beverages (specified for the level equation and differenced equation); b) Second and third lags of LCS- and CS-beverage purchases (specified for the differenced equation). Total number of instruments = 41. Models were adjusted for age, gender, education, race/ethnicity, income and year.

[b] Sargan-Hansen test of overidentifying restrictions. Under P>0.05, the null hypothesis of overidentification indicates that the assumptions made about exogeneity and exclusion of the IVs are valid.
[c] Arellano-Bond test of autocorrelation (AR) of time varying error term in the differenced equation. Under P>0.05, the null hypothesis of no second order autocorrelation indicates that the second and third lags of our endogenous explanatory variables are valid IVs for the differenced equation.

Web Table 9. Longitudinal Random Effects Models of the Association between one Daily Serving Increase in LCS- and CS-Beverages and Dietary Quality and Macronutrients, Homescan 2000-2010

Key Explanatory Variables	*Outcome (t-1)*			*LCS-beverages (t-1)*			*CS-beverages (t-1)*		
OUTCOMES (t)	β	[SE]	P value	β	[SE]	P value	β	[SE]	P value
Total Daily Energy (kcal/day)									
Total energy	0.696	0.002	<0.001	17.698	2.355	<0.001	16.484	2.930	<0.001
Total energy excluding LCS/CS-beverages	0.696	0.002	<0.001	18.789	2.295	<0.001	13.986	2.780	<0.001
Total energy from food	0.701	0.002	<0.001	20.259	2.107	<0.001	12.235	2.545	<0.001
Total energy from all beverages	0.752	0.002	<0.001	-2.422	0.569	<0.001	1.638	0.774	0.034
Total energy from beverages excluding LCS/CS	0.761	0.002	<0.001	-1.443	0.475	0.002	0.890	0.579	0.124
Total Daily Macronutrients (kcal/day)									
Carbohydrates	0.694	0.002	<0.001	7.745	1.314	<0.001	13.982	1.689	<0.001
Sugar	0.688	0.002	<0.001	1.729	0.773	0.025	15.523	1.057	<0.001
Protein	0.622	0.003	<0.001	4.121	0.513	<0.001	1.860	0.626	0.003
Total fat	0.685	0.002	<0.001	11.071	0.982	<0.001	9.150	1.190	<0.001
Saturated fat	0.699	0.002	<0.001	3.240	0.334	<0.001	3.325	0.406	<0.001
Total Daily Macronutrients (%)									
Carbohydrates	0.418	0.003	<0.001	-0.317	0.041	<0.001	0.919	0.049	<0.001
Sugar	0.614	0.003	<0.001	-0.275	0.029	<0.001	0.741	0.037	<0.001
Protein	0.227	0.002	<0.001	-0.073	0.070	0.302	-0.628	0.085	<0.001
Total fat	0.653	0.002	<0.001	0.225	0.023	<0.001	-0.130	0.028	<0.001
Saturated fat	0.711	0.002	<0.001	0.053	0.009	<0.001	0.007	0.011	0.513

CS: caloric sweetened; LCS: low-calorie sweetened

[a] Using a random effect model; adjusted for age, gender, education, race/ethnicity, income and year.

Web Table 10. Longitudinal Random Effects Models of the Association between one Daily Serving Increase in LCS and CS Sugar-Sweetened Beverages and Dietary Purchasing Patterns, Homescan 2000-2010.

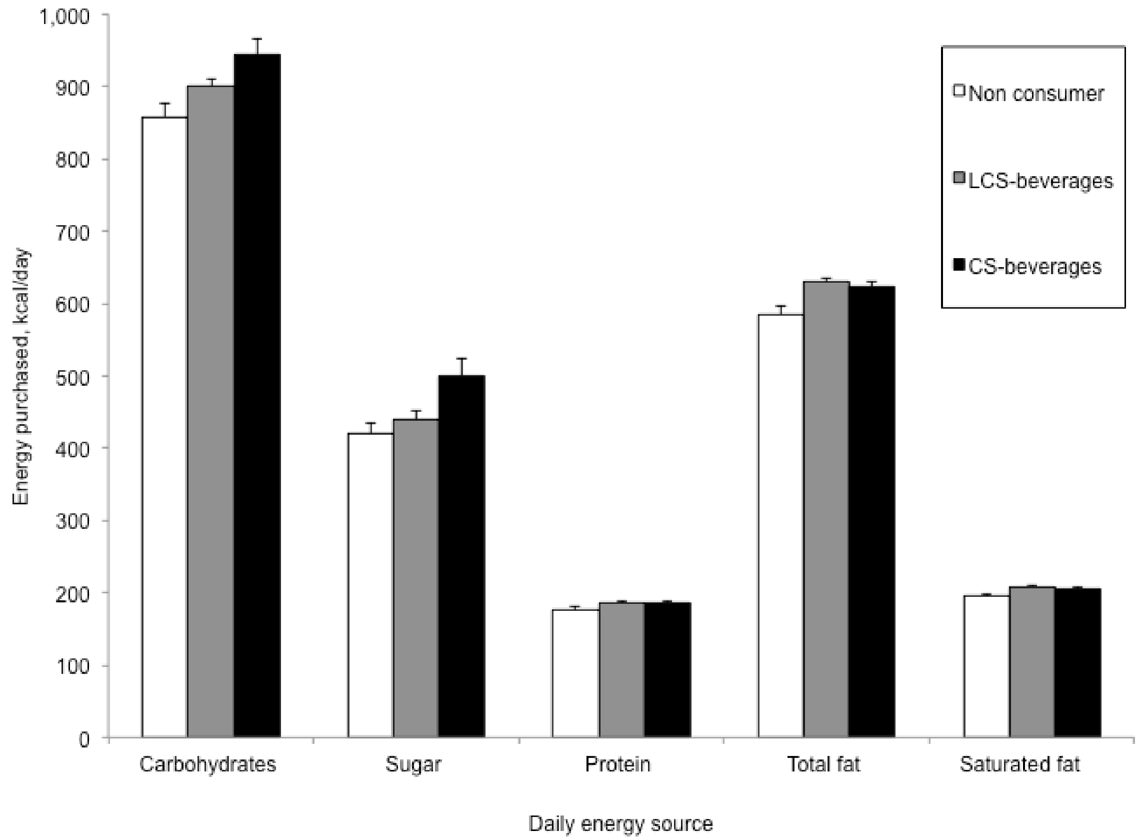
Key Explanatory Variables	*Outcomes (t-1)*			*LCS-beverages (t-1)*			*CS-beverages (t-1)*		
OUTCOMES (t)	**β**	[SE]	P value	**β**	[SE]	P value	**β**	[SE]	P value
Beverage groups (kcal/day)									
Juice, sweetened	0.717	0.002	<0.001	-0.654	0.160	<0.001	0.997	0.196	<0.001
Milk and milk drinks, sweetened	0.668	0.002	<0.001	0.004	0.075	0.953	0.363	0.092	<0.001
Milk, plain unsweetened	0.799	0.002	<0.001	-0.280	0.201	0.165	0.143	0.250	0.568
Coffee/Tea, sweetened	0.533	0.003	<0.001	-0.177	0.087	0.043	0.636	0.105	<0.001
Coffee/Tea, unsweetened	0.466	0.003	<0.001	-0.128	0.073	0.082	0.481	0.089	<0.001
Water and other beverages, unsweetened	0.040	0.004	<0.001	0.016	0.009	0.067	-0.002	0.010	0.821
Alcohol	0.841	0.002	<0.001	-0.428	0.288	0.138	-1.482	0.348	<0.001
Food groups (kcal/day)									
Dairy, sweetened	0.670	0.002	<0.001	0.092	0.185	0.620	-0.543	0.223	0.015
Dairy, plain and unsweetened	0.783	0.002	<0.001	-0.178	0.060	0.003	-0.112	0.073	0.126
Fruit, processed and sweetened	0.559	0.003	<0.001	0.125	0.057	0.028	0.233	0.070	0.001
Plain fruits and vegetables	0.673	0.002	<0.001	0.554	0.154	<0.001	-0.999	0.189	<0.001
Ready-to-eat Cereal, sweetened	0.685	0.002	<0.001	0.581	0.248	0.019	-0.986	0.302	0.001
Grains and breads	0.615	0.002	<0.001	-0.045	0.329	0.891	0.399	0.402	0.321
Desserts and sweeteners, LCS	0.648	0.002	<0.001	1.458	0.095	<0.001	-0.157	0.116	0.176
Desserts and sweeteners, CS	0.675	0.002	<0.001	14.694	1.051	<0.001	16.656	1.286	<0.001
Salty Snacks	0.650	0.002	<0.001	2.286	0.176	<0.001	2.016	0.215	<0.001
Cheese	0.721	0.002	<0.001	1.405	0.147	<0.001	0.270	0.178	0.128
Cooking fats and dressings	0.604	0.002	<0.001	2.845	0.503	<0.001	4.692	0.612	<0.001
Nuts and seeds	0.742	0.002	<0.001	1.340	0.231	<0.001	-0.774	0.286	0.007
Meat, fish, poultry and eggs	0.712	0.002	<0.001	1.492	0.254	<0.001	1.405	0.309	<0.001
Ready-to-eat mixed, frozen/fast food meals	0.688	0.002	<0.001	3.279	0.343	<0.001	3.361	0.419	<0.001

CS: caloric sweetened; LCS: low-calorie sweetened

[a] Using a random effect model; adjusted for age, gender, education, race/ethnicity, income and year;

WEB FIGURES

Web Figure 1. Mean energy (kcal/day) purchased from macronutrients by each beverage consumer profile in the Homescan Population, from 2000-2010 [a].



CS: caloric sweetened; LCS: low-calorie sweetened

[a] Using a generalized method of moments 2-step system dynamic panel model with the following instrumental variables: a) Average household grocery trips/year; % market sales of LCS beverages and CS beverages (specified for the level equation and differenced equation); b) Second and third lags of LCS- and CS-beverage purchases (specified for the differenced equation). Total number of instruments = 41. Models were adjusted for age, gender, education, race/ethnicity, income and year. Using margins commands after the fully adjusted models, we predicted the mean of the outcome for each beverage consumer profile: LCS-, CS- and non-beverage consumers. LCS-beverage consumers are considered those who purchased 1 serving/day of LCS-beverages but zero servings of CS-beverages and vice-versa for CS-beverage consumers. Nonconsumers are considered those with zero servings/day of both LCS- and CS-beverages.

Total daily carbohydrates, sugar and total fat was significantly different between nonconsumers and LCS- and CS-beverage consumers, $P<0.05$. Total daily protein and saturated fat was significantly different between nonconsumers and LCS-beverage consumers, $P<0.05$.