Sugar-Sweetened Beverages and Weight Gain in 2- to 5-Year-Old Children

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KEY WORDS

sugar sweetened beverages, weight gain, obesity, preschool

ABBREVIATIONS

CI—confidence interval
ECLS-B—Early Childhood Longitudinal Survey–Birth cohort
NCES—National Center for Education Statistics
SES—socioeconomic status
SSB—sugar-sweetened beverage

Each of the authors participated in the design and analysis of the research; Drs DeBoer and Scharf were responsible for the write-up; and Dr DeBoer had primary responsibility for the final content. All authors read and approved of the final manuscript.

www.pediatrics.org/cgi/doi/10.1542/peds.2013-0570

doi:10.1542/peds.2013-0570

Accepted for publication May 30, 2013

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PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: Supported by National Institutes of Health grant 5K08HD060739-03 (MDD). Funded by the National Institutes of Health (NIH).

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

COMPANION PAPER: A companion to this article can be found on page 566, and online at www.pediatrics.org/cgi/doi/10.1542/peds.2013-1799.

WHAT'S KNOWN ON THIS SUBJECT: Sugar-sweetened beverage (SSB) consumption in school-age children and adolescents is linked to heavier weight, and decreased SSB consumption results in less weight gain. Reports regarding these associations among children aged 2 to 5 years have been mixed.

WHAT THIS STUDY ADDS: Preschool-aged and kindergarten children drinking SSB compared with infrequent/nondrinkers had higher BMI *z* scores. SSB consumption is also associated with higher weight status among children aged 2 to 5 years.

abstract

BACKGROUND AND OBJECTIVE: Although sugar-sweetened beverage (SSB) consumption has been tightly linked to weight status among older children, the data regarding these relationships in children aged 2 to 5 years have been mixed. Our objective was to evaluate longitudinal and cross-sectional relationships between SSB consumption and weight status among children aged 2 to 5 years.

METHODS: We assessed SSB consumption and BMI *z* scores among 9600 children followed in the Early Childhood Longitudinal Survey—Birth Cohort, using linear and logistic regression and adjusting for race/ethnicity, socioeconomic status, mother's BMI, and television viewing.

RESULTS: Higher rates of SSB consumption were associated with higher BMI *z* scores among children age 4 ($P < .05$) and 5 ($P < .001$) but not yet at 2 years. Children aged 5 years who drank SSB regularly (compared with infrequent/nondrinkers) had a higher odds ratio for being obese (1.43, confidence interval 1.10–1.85, $P < .01$). In prospective analysis, children drinking SSB at 2 years (compared with infrequent/nondrinkers) had a greater subsequent increase in BMI *z* score over the ensuing 2 years ($P < .05$).

CONCLUSIONS: Similar to what is seen among older children, children aged 2 to 5 years drinking SSB demonstrate both prospective and cross-sectional correlations with higher BMI *z* score. Pediatricians and parents should discourage SSB consumption to help avoid potential unhealthy weight gain in young children. From a public health standpoint, strong consideration should be made toward policy changes leading to decreases in SSB consumption among children. *Pediatrics* 2013;132:413–420

The epidemic of early childhood obesity has led to the consideration of ways to restrain excessive early weight gain.[1] Multiple sources have noted that the trends toward increasing obesity rates worldwide have paralleled an increase in sugar in food sources.[2–4] A common source of excess sugar consumption comes from sugar-sweetened beverages (SSBs), such as sugar soda and juices with added sugar content, containing 22 to 39 g of sugar per serving.[3,5,6]

Because of the potential effects of sugar-containing drinks on unnecessary weight gain (as well as dental carries[7]) the American Academy of Pediatrics has recommended that young children refrain from intake of SSB.[8] Although some analyses of children aged 2 to 5 years have reported associations of SSB with higher weight status,[9–14] other studies, including 2 notable ones financed in part by the beverage industry,[15,16] have reported that SSB intake at young ages was not associated with higher weight gain.[17–19] These previous studies regarding these relationships in children aged 2 to 5 years either reported only cross-sectional data,[13–15,20] reported from regional populations,[9,12] or had smaller sample sizes, limiting the ability to account for potential confounding effects.[10,11,17–19]

To help clarify the effects of SSB on early childhood weight status, our goal was to evaluate children aged 2 to 5 years for the association of consumption of SSB on weight status and on longitudinal weight gain. We evaluated children participating in the Early Childhood Longitudinal Survey—Birth cohort (ECLS-B), a representative survey of the US population of children born in 2001.[21,22] Our hypothesis was that SSB consumption would be associated with overweight and obesity, as well as increased weight gain over time, potentially representing sources of calories that, if eliminated, could assist in restraining obesity.

METHODS

Data Set

The ECLS-B is a large multisource, multimethod study sponsored by the National Center for Education Statistics (NCES), US Department of Education.[21,22] The NCES ethics review board approved the study, and all participants gave informed consent. The ECLS-B was designed by NCES to examine a large range of influences on childhood early experiences. It includes a nationally representative sample of children born in 2001 who were selected based on a random sampling of >14 000 birth certificates, with a final sample of ~10 700 completed parent interviews, a 77% response rate. Participants were then examined longitudinally at ages 9 months, and 2, 4, and 5 years. The study sampled births within primary sampling units from the National Center for Health Statistics vital statistics program, stratified by geographic region, median household income, proportion minority population, and metro versus nonmetro area. The researchers obtained a final sample of ~10 700 completed parent interviews. The current analysis includes data from both the evaluations at ages 2, 4, and 5 years to enable prospective analysis in this age range.

Measures

During the 2-, 4-, and 5-year-old waves of the ECLS-B, parents were interviewed in their home by trained assessors. The primary caregiver (most often the mother) completed a computer-assisted interview. Beverage intake was calculated from parental responses to several questions. The parents were instructed that a serving size of 8 ounces is equal to 1 glass. SSB was clarified as "soda pop (for example, Coke, Pepsi, or Mountain Dew), sports drinks (for example, Gatorade) or fruit drinks that are not 100% fruit juice (for example, Kool-Aid, Sunny Delight, Hi-C, Fruitopia, or Fruitworks)." At the 2-year visit parents were asked separate questions regarding whether their child usually drinks SSB with meals and SSB with snacks. If the parent answered yes to SSB consumption at either meals or snacks, the child was categorized as an SSB regular drinker; if the parent answered no to SSB consumption at meals/snacks, the child was categorized as a SSB infrequent/nondrinker. At the 4-year visit, parents were asked in separate questions how many times their child drank SSB. Categories for frequency of consumption of servings (in 8-ounce increments) included no intake during the past 7 days, 1 to 3 times during the past 7 days, 4 to 6 times during the past 7 days, once daily, twice daily, 3 times daily, ≥4 times daily. For all analyses at the 2-year time point and for dichotomous analyses at 4 and 5 years, children drinking ≥1 serving of SSB daily were categorized as regular drinkers and those drinking <1 serving daily were categorized as infrequent/nondrinkers as performed previously.[9] Servings of milk were similarly defined as equating to 8-ounce servings and quantified in terms of frequency by the same scale as described for SSB, as reported previously.[22]

Direct measurements of height and weight were obtained by trained researchers by using a standardized protocol. The children were dressed in light clothing and did not wear shoes. A portable stadiometer (Model 214 Road Rod by SECA, Birmingham, UK) was used to measure height and a digital scale (SECA) for weight. Measurements were taken twice and, if they were within 5% of each other, their average was used; otherwise, a third measurement was taken, and the 3 measurements were averaged. From these measures, BMI was calculated as weight in kilograms divided by height in meters squared and converted to age and gender specific percentiles and *z* scores by using the

2000 Centers for Disease Control and Prevention growth charts for the United States.[23] Weight categories were normal weight (up to 85th percentile), overweight (>85th to 95th percentile), and obese (>95th percentile).[1] For the 2-year time point, children <24 months old were excluded because BMI is not a validated measure below this age. Maternal height was self-reported. Maternal weight was measured in light clothing at each wave of the study by using a digital scale (SECA). Maternal BMI was calculated from height and most recent measured weight or reported prepregnancy weight if no measured weights were available.

During the parent interview, parents identified the gender and race/ethnicity of their child. Race/ethnicity was grouped into 5 categories: white, African American, Asian, Hispanic, and other. A measure of socioeconomic status (SES) was calculated by the NCES based on 5 items: family income, maternal education, maternal occupation, paternal education, and paternal occupation. For analysis, participants were categorized into SES quintiles (1 reflecting the lowest SES and 5 the highest SES).[24] The parents also were asked to respond to the question: "On average, about how many hours a day does your child watch television or videos in your household each weekdays?"

Data Analysis

All statistical analyses were performed by using SAS software, Version 9.2 (SAS Institute, Cary, NC). To account for the complex survey design, SAS survey procedures were used along with sampling weights and information on stratification and clustering provided by the NCES. All statistical significance tests were 2-sided with a significance level of α = .05. Unweighted sample sizes were rounded to the nearest 50 in compliance with the NCES rules. Differences in proportions of regular SSB consumption between groups by subject characteristic were analyzed via χ^2 analysis. Using multivariable linear regression models, we performed both cross-sectional and longitudinal analyses as follows. First we regressed (1) BMI *z* score at age 2-, 4-, and 5-years on SSB daily consumption cross-sectionally and (2) longitudinal change in BMI *z* score (either 4-year BMI *z* score minus 2-year BMI *z* score or 5-year BMI *z* score minus 4-year BMI *z* score) on baseline SSB categories (ie, among children reported to drink SSB at 2 and 4 years, respectively). In evaluating longitudinal changes in BMI *z* score, we used baseline SSB drinking status as performed previously[25] to minimize reverse causality. Thus, change in BMI *z* score between ages 2 and 4 years was compared between children reported at 2 years to be daily drinkers of SSB and those reported to be infrequent/nondrinkers; change in BMI *z* score between ages 4 and 5 years was compared between children who at 4 years were daily drinkers of SSB versus infrequent/nondrinkers. Multivariable logistic regression models were used to examine the odds of being overweight/obese across the SSB categories in cross-sectional analysis. β coefficients, odds ratios, and confidence intervals are reported in tables. All cross-sectional multivariable models were adjusted for gender, race, and SES, with additional models adjusted for amount of maternal BMI[26,27] and television viewing[28,29] given the potential effects of these items on SSB consumption and/or weight status.

RESULTS

Demographics

We analyzed data from 10 700 participants of ECLS-B, of whom 7600 at the 2-year wave were ≥24 months and had complete data on BMI and SSB intake and of whom 8550 and 6800 had complete data on these parameters at the 4- and 5-year waves, respectively. A total of 9600 children had adequate data to be included in at least one of the analyses. Demographic characteristics are shown in Supplemental Table 4, and additional covariates by SSB intake are shown in Table 1. There was a relatively low degree of SSB consumption at age 2 years that subsequently increased at age 4 years and 5 years (9.3% drinking ≤1 serving daily at 2 years, 13% at 4 years, and 11.6% at 5 years). Consumption varied significantly by racial/ethnic group at 4 and 5 years (with higher rates of regular SSB consumption among non-Hispanic black and Hispanic children, $P < .0001$) and by SES (with higher rates of regular SSB consumption among the lowest SES group, $P < .0001$).

Multiple subject characteristics differed by SSB consumption status (Table 1). At each of the ages tested, a greater proportion of children drinking ≥1 serving of SSB daily (compared with infrequent/nondrinkers) had a mother who was overweight/obese ($P < .001$). Additionally, compared with those drinking <1 serving of SSB daily, a greater proportion of children drinking SSB daily at 4 and 5 years watched ≥2 hours of television daily and a greater proportion drank ≤1 serving of milk daily (data not shown). In a fully adjusted model (gender, race, SES), children drinking ≥1 serving of SSB daily were more likely to watch ≥2 hours of television daily at both age 4 years (odds ratio 1.43, confidence interval [CI] 1.17–1.74, $P < .001$) and 5 years (1.76, CI 1.31–2.37, $P < .001$) and were more likely to drink lower amounts of milk at 4 years (1.36, CI 1.01–1.45, $P < .05$) but not 5 years (1.11, CI 0.91–1.37, $P = .30$).

SSB Consumption and Weight Status Among US Children Aged 2 to 5

There was a high prevalence of overweight and obesity in the study population

TABLE 1 Participant Characteristics Overall and by SSB Intake

Variable	2 y			4 y			5 y		
	Total *N*[a] (weighted %[b] of category)	SSB Consumption, %		Total *N*[a] (weighted %[b] of category)	SSB Consumption, %		Total *N*[a] (weighted %[b] of category)	SSB Consumption, %	
		<1	≥1		<1	≥1		<1	≥1
Overall	7600	90.7	9.3	8550	87.0	13.0	6800	88.4	11.6
Wt status									
Normal wt	5350 (69.9)	91.0	9.0	5750 (67.7)	88.0	12.0	4600 (67.9)	89.6	10.4
Overweight	1150 (15.1)	89.9	10.1	1400 (16.3)	86.0	14.0	1150 (16.7)	88.2	11.8
Obese	1150 (15.1)	90.2	9.8	1350 (16.0)	83.9	16.1	1050 (15.4)	83.6	16.4
P value[c]			.17			<.05			<.001
Maternal BMI category									
Normal wt	3050 (41.8)	92.5	7.5	3500 (33.9)	92.1	7.9	2750 (40.1)	91.3	8.7
Overweight	1950 (26.7)	90.3	9.7	2350 (27.4)	88.3	11.7	1850 (27.1)	89.4	10.6
Obese	2250 (31.4)	89.1	10.9	2800 (32.7)	83.5	16.5	2250 (32.7)	84.5	15.5
P[c]			<.001			<.01			<.01
Television viewing, h									
<2	2800 (37.9)	90.9	9.1	4000 (44.2)	91.0	9.0	3450 (49.5)	92.9	7.1
≥2	4600 (62.1)	90.7	9.3	4950 (55.8)	83.9	16.1	3550 (50.5)	84.1	15.9
P[c]			.37			<.0001			<.0001
Milk intake[d]									
<1				1300 (14.5)	81.8	18.2	1150 (16.2)	81.6	18.4
1				1450 (16.1)	86.5	13.5	1150 (16.6)	89.1	10.9
2				2700 (29.9)	88.9	11.1	2200 (31.5)	90.3	9.7
≥3				3500 (39.5)	88.0	12.0	2500 (35.7)	88.0	12.0
P[c]						<.01			.21

[a] All *n*s are rounded to the nearest 50 in compliance with NCES rules.
[b] All percents are weighted to population.
[c] χ^2 test comparing rates of SSB consumption between groups.
[d] Information on number of milk servings not available at 2-y time point.

(Table 1). At age 2 years there was not yet an association between SSB consumption and increased odds of overweight or obesity (Table 2). At both age 4 and 5 years regular drinkers of SSB (≥1 serving daily) as compared with infrequent/nondrinkers (<1 serving daily) had a higher odds of being overweight and obese in an unadjusted logistic regression analysis. At age 4 these associations were not present after adjustment for potential confounders (Table 2). By age 5, SSB regular drinkers had higher adjusted odds of obesity (adjusted odds ratio 1.43, $P < .01$).

Cross-Sectional Associations of SSB Consumption Amount and BMI *z* Score

Figure 1 displays mean BMI *z* scores (adjusted for gender, race/ethnicity, and SES) by quantity of SSB consumption. At both age 4 and 5 years, drinkers of higher volumes of SSB had higher BMI *z* scores relative to infrequent/nondrinkers. Using linear regression increasing quantity of SSB consumption (in 8-ounce increments) was associated with higher BMI *z* scores at 4 and 5 years, both before and after adjustment for multiple potential confounders (Table 3). When the data were expressed as consumption of ≥1 serving versus <1 serving daily, children drinking ≥1 serving had similar adjusted mean BMI *z* scores at 2 years (0.362 ± 0.087 vs 0.461 ± 0.039, $P >$ .05) but higher BMI *z* scores at 4 years (0.756 ± 0.048 vs 0.644 ± 0.024, $P <$ .05) and 5 years (0.849 ± 0.051 vs 0.662 ± 0.018, $P < .01$).

Longitudinal Change in BMI by SSB Consumption

We next evaluated for the association of SSB consumption on increase in BMI *z* score longitudinally, both between 2 to 4 years and between 4 to 5 years. Compared with infrequent/nondrinkers of SSB, children drinking ≥1 SSB serving daily at age 2 years had a greater increase in BMI *z* score by age 4 years (Fig 2). When considering children between 4 and 5 years of age, those drinking SSB daily at age 4 years had a similar change in BMI *z* score between 4 and 5 years old compared with infrequent/nondrinkers (Fig 2).

DISCUSSION

Concerns regarding SSB consumption have gained significant attention recently, exemplified by the controversial banning of the sale of large-volume servings of sugar-containing sodas by the New York City Board of Health[30] and support for added taxes on SSBs by the American Medical Association. Two recent randomized trials helped to clarify the effect of SSB on weight gain in school-age children and adolescents.[31,32]

TABLE 2 Logistic Regression of SSB Intake on Obesity Status by Age

SSB	Overweight[a] OR (CI)	Obese[a] OR (CI)
Age 2 y		
Model 0 (no adjustments)	1.13 (0.93–1.39)	1.13 (0.84–1.51)
Model 1 (adjusted for gender, race/ethnicity, SES, mother's BMI)	0.99 (0.80–1.24)	1.00 (0.71–1.41)
Model 2 (adjusted for gender, race/ethnicity, SES, mother's BMI, television viewing)	1.0 (0.80–1.24)	1.01 (0.72–1.42)
Age 4 y		
Model 0 (no adjustments)	1.25 (1.05–1.48)	1.35 (1.10–1.66)
Model 1 (adjusted for gender, race/ethnicity, SES, mother's BMI)	1.14 (0.96–1.35)	1.18 (0.96–1.46)
Model 2 (adjusted for gender, race/ethnicity, SES, mother's BMI, television viewing)	1.12 (1.12–1.33)	1.17 (0.94–1.46)
Age 5 y		
Model 0 (no adjustments)	1.31 (1.10–1.55)	1.65 (1.29–2.12)
Model 1 (adjusted for gender, race/ethnicity, SES, mother's BMI)	1.16 (0.97–1.41)	1.43 (1.11–1.84)
Model 2 (adjusted for gender, race/ethnicity, SES, mother's BMI, television viewing)	1.12 (0.92–1.37)	1.43 (1.10–1.85)

OR, odds ratio.
a Odds of overweight or obesity among drinkers of ≥1 serving daily of SSB in adjusted models. Weight status at 2 y old is only available for those >24 mo because BMI is not a validated measure before that age.

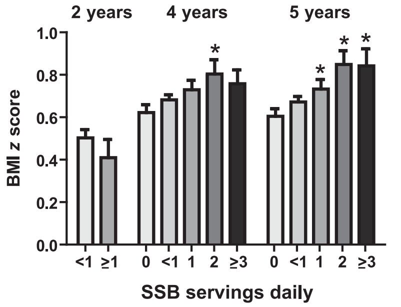

FIGURE 1
Mean BMI *z* scores by amount of SSB intake at 2, 4, and 5 years old. Data shown are adjusted for race/ethnicity and SES. *P* values for BMI *z* score comparisons: *$P < .05$ for difference in BMI *z* score for SSB daily amount versus nondrinkers.

However, although a consensus has been emerging regarding the effect of SSB on weight gain among older children,[33] the effect of SSB consumption on weight status among children aged 2 to 5 years has remained mixed, with multiple studies suggesting against such an association,[11,15–19,34] others analyzing specific regional groups,[12,20] and others failing to adjust for socioeconomic factors.[10,11] Our study is unique in analyzing longitudinal and cross-sectional data of SSB consumption and weight status with adjustment for important potential confounders among a large, nationally representative cohort of children aged 2 to 5 years. Our findings demonstrate that compared with infrequent/nondrinkers, children drinking SSB daily at age 2 years exhibited a greater increase in BMI *z* score over time. In adjusted cross-sectional analyses, larger volumes of daily consumption of SSB were associated with higher BMI *z* scores, although association of daily consumption with obesity after adjustment for potential confounders was only noted at age 5 years. These data provide additional support that the excess weight gain associated with SSB consumption extends to these early age ranges, with a component of accumulation of excess weight over time.

The association of SSB consumption with additional weight gain is not surprising. Because SSBs contain sugar as their only calorie source, they are less likely to induce satiety compared with ingestion of protein or fat, and thus their consumption may result in inadequate calorie compensation, ultimately adding to the total calories consumed.[3,19,35,36] However, the complexity of these relationships is seen in that some[15] but not all researchers[37] have found such inadequate calorie compensation associated with SSB consumption among children aged 2 to 5 years. Overall, children drinking SSB on a regular basis have a 17% to 20% increase in total calorie consumption.[15,36] Without adequate adjustment in energy expenditure, these excess calories can be converted to fat mass. Because of these relationships, increasing amounts of SSB consumed by an individual child could be expected to be associated with higher weight gain. In our cross-sectional analysis, we noted a clear linear relationship between the quantity of SSB consumed and BMI *z* score, even after adjustment for confounders. Although we were limited by power to detect differences in the effects of higher quantities of SSB consumption on a longitudinal basis, we did note a higher increase in BMI *z* score between 2 and 4 years old among drinkers of ≥1 vs <1 SSB daily.

Previous groups of investigators have reported that SSB consumption was not associated with heavier weight status or weight gain among children in this age range, speculating that this was because of a degree of compensation in caloric intake[14] or because the study population had a low rate SSB consumption[17] or a low prevalence of overweight.[15] Along these lines, it is unclear why we noted an increase in BMI *z* score among SSB regular drinkers versus infrequent drinkers between age 2 and 4 years but not between 4 and 5 years. We did note that by 4 years of age, SSB regular drinkers had higher BMI *z* score which was maintained during this time and may have affected longer-term weight gain.

One important food source that appears to receive some degree of negative compensation in intake among children this age is milk.[38] Similar to other studies,[16,36,39] we found that regular drinkers of SSB were more likely to drink lower quantities of milk. In theory this could thus displace the satiation effect of milk on further food intake,[22,40] as well as underscore additional nutritional problems related to SSB consumption.[38]

We also found it notable that children drinking ≥1 SSB serving daily were more likely than infrequent/nondrinkers to watch ≥2 hours of television daily, as has been suggested by previous reports.[28,29] Television viewing is associated with exposure to commercials for SSB, potentially increasing the number of regular drinkers among children viewing larger amounts of television. Given that television viewing is also associated with both inactivity (and thus potential weight gain) and exposure to commercials for SSB and other calorie-dense foods, the potential exists for a confounding association of television viewing in the relationship between SSB consumption and childhood weight status. Nevertheless, adjustment for television viewing did not significantly alter the magnitude of our findings, suggesting independent associations of SSB and weight status.

These relationships between SSB consumption and lower milk intake and higher television viewing highlight the complexity of factors contributing to weight gain. The majority of our findings persisted despite adjustment for potential confounders including SES, race/ethnicity, and maternal obesity, although residual confounding may persist. Recent randomized trials offering sugar-free drinks to school-age children and adolescents demonstrated less weight gain among those offered sugar-free alternatives.[31,32] Clearly, similar trials among preschoolers and kindergarteners would help to clarify some of the role of SSB consumption in isolation and are needed.

This study had several limitations. SSB consumption quantity was based on parental report and not direct observation of intake. In addition, we did not have complete dietary information, preventing assessment of the effect of SSB intake on overall calorie intake, nor did we have data regarding physical activity to assess for potential compensation in energy expenditure. However, the study also had several strengths, including its longitudinal nature, the nationally representative sampling design, and the largest-to-date cohort of children aged 2 to 5 years analyzed for relationships between SSB consumption and weight gain. The longitudinal aspect of these data is noteworthy because it mitigates the potential that parents differentially over- or underreported SSB consumption according to their child's weight.

That these findings hold true in a nationally representative group of young

TABLE 3 Linear Regression of SSB Intake (Increasing Servings) on BMI *z* Score at Age 4 and 5 Years

	BMI *z* Score	
	Correlation Coefficient (SE)	*P*
Age 4 y		
Model 0 (no adjustments)	0.1672 (0.0488)	<.001
Model 1 (adjusted for gender, race/ethnicity, SES, mother's BMI)	0.1040 (0.0471)	.03
Model 2 (adjusted for gender, race/ethnicity, SES, mother's BMI, television viewing)	0.0966 (0.0476)	.05
Age 5 y		
Model 0 (no adjustments)	0.2470 (0.0564)	<.001
Model 1 (adjusted for gender, race/ethnicity, SES, mother's BMI)	0.1703 (0.0520)	.002
Model 2 (adjusted for gender, race/ethnicity, SES, mother's BMI, television viewing)	0.1819 (0.0533)	.001

Data in this format were not available at age 2 y.

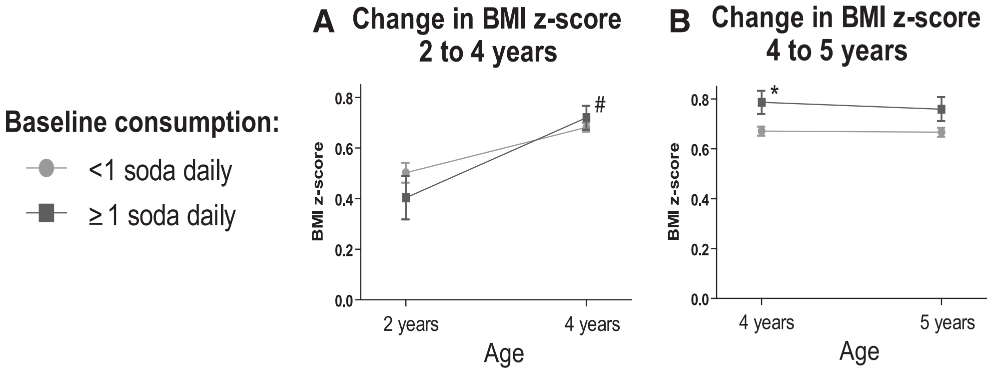

FIGURE 2
Change in BMI *z* score over time for daily drinkers of SSBs versus infrequent/nondrinkers. A, BMI *z* scores at age 2 years and 4 years for children drinking ≥1 SSB serving daily (vs <1) at age 2. B, BMI *z* scores at 4 years and 5 years for children drinking ≥1 SSB serving daily (vs <1) at 4 years. All values adjusted for race/ethnicity and SES. # $P < .05$ for longitudinal change in BMI *z* score for daily SSB drinkers versus nondrinkers; *$P < .05$ for cross-sectional BMI *z* score for daily SSB drinkers versus infrequent/nondrinkers.

children regarding a process of clear importance to public health further raises the need for pediatricians and care providers to strongly discourage SSB consumption in early childhood, with consideration paid to emphasize this point in groups with higher prevalence of SSB consumption (in the setting of maternal obesity and lower SES families). Additionally, from a public health standpoint, strong consideration should be made toward policy changes leading to decreases in SSB consumption among children. These policy changes may relate to advertising of SSB or additional curbing of access to SSB in schools and other environments.[41,42]

CONCLUSIONS

We found in a large cohort of children followed longitudinally from age 2 to 5 years that consuming SSB was associated with higher BMI *z* score and/or a greater increase in BMI *z* score over time. These findings were in contrast to some previous studies in this age range but consistent with findings from older children. As a means of protecting against excess weight gain, parents and caregivers should be discouraged from providing their children with SSB and consuming instead calorie-free beverages and milk. Such steps may help mitigate a small but important contribution to the current epidemic of childhood obesity.

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OLIVE OIL CONFUSION: *I use a lot of olive oil in my kitchen. I like the taste and the potential health benefits, and I have a few favorites that I use all the time. One reason I tend to stick to just a few is that I do not know how to interpret the vast differences in price for olive oils at our local supermarket. At the same store, I can buy extra virgin olive oil for as little as 8 dollars a liter to as much as 40 dollars a liter. The packaging does not give much information to justify the higher cost, why one brand is so inexpensive, or where the olives were picked. It turns out that I am not alone in my confusion. As reported by* Time *(Ideas: May 17, 2013), the labeling of olive oil is often confusing. Generally speaking, olive oil designated as virgin must have been extracted from olives by physical means without chemical treatment. Extra virgin oil has to meet specific standards governing attributes of the oil such as how much acidity is present. Unfortunately, designations for extra virgin olive oil used by The International Olive Council (IOC) based in Madrid are not used by the U. S. Department of Agriculture (USDA), which uses an entirely different set of criteria to define olive oils. A bigger issue is that random samplings of extra virgin olive oils over the past few years have shown that many fail to meet the standards set for extra virgin. The USDA invited olive oil brands to voluntarily comply with a quality monitoring program, but only one opted to do so. Policing of USDA or IOC standards is challenging, as most shippers do not grow the olives, many middlemen are involved, and the oil can turn rancid if exposed to high heat or prolonged direct light. While a single enforced international standard would be welcome, in the meantime, I recommend finding one or two extra virgin olive oils that taste good and storing the purchased oil appropriately.*

Noted by WVR, MD