

Substantial decline in sugar-sweetened beverage consumption among California's children and adolescents

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Introduction: Few studies have looked at changes among risk factors that might help explain why childhood obesity prevalence in the US has leveled off in recent years. We present an analysis of the California Health Interview Survey (CHIS) that examines trends in childhood and adolescent obesity as well as trends in sugar-sweetened beverage (SSB) consumption.

Method: We compared 3 separate cross-sectional samples (2003, 2005, and 2007) from biennial CHIS for 3 age groups, age 2–5, age 6–11 and age 12–17. We calculated the prevalence of high SSB consumption (defined as having more than one SSB during the previous day). 2 measures of obesity were used – weight-for-age at or above the 95th percentile on national growth charts for children aged 2–11, and body mass index for age at or above the 95th percentile on national growth charts for adolescents aged 12–17. Logistic regression analysis is used to estimate adjusted odds ratios of high SSB consumption in 2005 and 2007 compared with the baseline year of 2003.

Results: From 2003 to 2007, each age group experienced a substantial decline in high SSB consumption (16.4%–5.0% for age 2–5, $P < 0.001$; 22.5%–9.9% for age 6–11, $P < 0.001$; 35.7%–25.7% for age 12–17, $P < 0.001$). Declines in the prevalence of children's obesity were significant among children age 2–5 ($P < 0.001$) and age 6–11 ($P < 0.05$) but not among adolescents ($P = 0.42$). Children and teenagers in 2005 and 2007 were significantly less likely than those surveyed in 2003 to have high SSB consumption after adjusting for gender, age, race/ethnicity, poverty level, and parental education ($P < 0.001$).

Conclusion: Policy actions may have impacted the prevalence of SSB consumption in the population. Further research is needed to examine the contribution of declining SSB consumption on the leveling off of obesity trends and the extent to which these declines are attributable to new policies and programs.

Keywords: obesity, soft drink, sugar, overweight, children, policy

Introduction

In light of a substantial body of research linking the intake of sugar-sweetened beverages (SSBs) with overweight and obesity,¹ the public health community has supported policies, such as restrictions on the sale of sodas on school campuses, to decrease SSB consumption among children and adolescents. The Alliance for a Healthier Generation, for instance, has been working with leading members of the beverage industry to shift the product mix of beverages made available in schools nationwide to include lower-calorie and smaller-portion beverages. As a result, the total beverage calories shipped to schools declined 58% between 2004 and the 2007–2008 school year.² Legislative efforts to reduce consumption of SSBs have focused on introducing taxes on sugar or sodas, and imposing restrictions on SSB sales on school campuses. In California,

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these efforts have resulted in the passage of California Senate Bill 677 in 2003 that banned soda sales at elementary and middle schools and limited their sale at high schools. Besides restricting the availability of SSB, these efforts may also be affecting consumption by raising public awareness of the health effects of SSBs.

The prevalence of overweight among US children and adolescents appears to be leveling off.³ A similar trend has been observed in states like California.⁴ However, few studies have looked at recent changes among risk factors that might help explain these encouraging developments in overweight and obesity trends. In this paper, we present an analysis examining trends in total SSB consumption based on data from the California Health Interview Survey (CHIS),⁵ a biennial telephone interview survey designed to represent the population of California. We also present trends in childhood and adolescent obesity, and milk consumption to see if a shift in SSB consumption is accompanied by changes in obesity prevalence and changes in milk consumption. To the best of our knowledge, this study is the first surveillance report that documents SSB consumption trends based upon population-representative health survey data in the United States.

Methods

Trends in SSB consumption, milk consumption, and childhood and obesity prevalence were based on 3 separate cross-sectional samples (2003, 2005, and 2007) from the biennial CHIS,⁵ a population health survey that has consistently measured SSB consumption from 2003 and 2007. Trends were analyzed for 3 separate age groups, age 2–5, age 6–11 and age 12–17. Beverage consumption variables included the crude prevalence of high SSB consumption (defined as percent of people having more than one soda or other sweetened drinks during the prior day), the mean SSB consumption on the prior day and the prevalence of milk consumption (defined as percentage of people having milk on the prior day). Two measures of obesity were used – weight-for-age (WTA) at or above the 95th percentile on national growth charts for children aged 2–11 and body mass index (BMI) for age at or above the 95th percentile on national growth charts for adolescents aged 12–17. We use WTA rather than BMI for those aged 2–11, since BMI derived from parent-reported weights and heights could be systematically biased,⁶ while no such biases have been noted for the adolescent population. We then use *t*-tests to compare the mean SSB intake and proportional tests to compare the prevalence of high SSB intake, milk intake, and obesity.

Logistic regression analysis is used to estimate adjusted odds ratios of consuming high levels of SSBs in 2005 and 2007 compared with the baseline year of 2003, and we control for age, gender, race/ethnicity, poverty status, and parental education in our analysis.

Results

Table 1 shows the prevalence of Californian children's SSB and milk consumption in 2003, 2005, and 2007. From 2003 to 2007, each age group experienced a substantial decline in high SSB consumption (16.4%–5.0% for age 2–5, $P < 0.001$; 22.5%–9.9% for age 6–11, $P < 0.001$; 35.7%–25.7% for age 12–17, $P < 0.001$). This decline in SSB consumption is accompanied by a decrease in total milk intake (75.0%–69.2% for age 2–5, $P < 0.001$; 62.4%–55.6% for age 6–11, $P < 0.001$; CHIS does not provide milk intake information for adolescents). Declines in the prevalence of children's obesity were significant among children age 2–5 ($P < 0.001$) and age 6–11 ($P < 0.05$) but not among adolescents ($P = 0.42$).

Table 2 shows that children and teenagers surveyed in 2005 and 2007 were significantly less likely than those surveyed in 2003 to have consumed more than 1 SSB on the prior day after adjusting for gender, age, race/ethnicity, poverty level, and parental education.

Discussion

Increased consumption of SSBs among children since the 1970s is widely considered to have accelerated increases in obesity among American children.^{7–9} Recently, it appears that both these trends are leveling off. Our analysis of the data from the CHIS shows a downward trend in the consumption of SSB among Californian children and adolescents, a trend independent of demographic and economic trends in the state. Given California's 2003 ban on SSB sales at public schools, our finding from CHIS is consistent with evidence from other states^{10,11} that the students in schools implementing a SSB ban consumed significantly less SSB than those in schools without an SSB ban. While there has been no significant change in adolescent obesity prevalence, the substantial decline in both childhood obesity and adolescent SSB consumption has the potential to lead to a decline in obesity prevalence among adolescents in future years.

There is insufficient information in the CHIS survey to determine whether a reduction in SSB intake can be attributed to the introduction of Senate Bill 677, which put restrictions on soda sales on school properties. Some researchers have shown that limits on the availability of SSBs in schools have only a small direct effect on consumption.^{12,13} How then

Table 1 Trends in SSB intake, milk intake, and obesity among Californian children and adolescents (by age)

	2003	2005	2007
Age 2–5			
Prevalence of 2 or more SSBs on the prior day	16.35% (14.07–18.63)	11.01% (9.44–12.58)	5.03% (3.70–6.36)
SSB intake (mean number of drinks the prior day)	0.66 (0.60–0.72)	0.49 (0.45–0.53)	0.29 (0.26–0.33)
Milk intake (% had milk the prior day)	75.07% (72.6–77.6)	72.11% (69.9–74.4)	69.19% (66.9–71.54)
Obese (% WTA > 95%)	15.69% (13.72–17.67)	13.26% (11.78–14.73)	11.15% (9.72–12.57)
Sample size	2,618	3,857	3,354
Age 6–11			
Prevalence of 2 or more SSBs on the prior day	22.46% (20.71–24.21)	15.96% (14.59–17.32)	9.86% (8.59–11.12)
SSB intake (mean number of drinks the prior day)	0.91 (0.85–0.96)	0.71 (0.67–0.75)	0.54 (0.50–0.58)
Milk intake (% had milk the prior day)	62.36% (60.54–64.17)	59.02% (57.02–61.02)	55.56% (53.52–57.59)
Obese (% WTA > 95%)	13.49% (12.05–14.93)	14.32% (12.61–16.04)	11.07% (9.77–12.37)
Sample size	4,532	5,502	4,899
Age 12–17			
Prevalence of 2 or more SSBs on the prior day	35.70% (33.52–37.89)	30.60% (28.79–32.40)	25.73% (23.83–27.63)
SSB intake (mean number of drinks the prior day)	1.41 (1.34–1.49)	1.19 (1.13–1.26)	1.00 (0.95–1.05)
Milk intake (% had milk the prior day)	NA	NA	NA
Obese (% BMI > 95%)	12.37% (10.88–13.86)	14.22% (12.47–15.96)	13.29% (11.55–15.03)
Sample size	4,010	4,029	3,638

Abbreviations: SSB, sugar-sweetened beverage; WTA, weight-for-age; BMI, body mass index; NA, not applicable.

do we explain the significant drop in SSB consumption? It is possible that discussion of the bill during the bill's passage and implementation increased public awareness of the issue that also contributed to declines in SSB consumption. While a reduction in the consumption of SSBs could result in increases in intake of other beverages, such as milk and juice, data from CHIS indicate that the decline in SSB intake is actually not accompanied by an increase

Table 2 Adjusted odds ratios of having more than 1 sugar-sweetened beverage (SSB) in the past day (California, by age)

	2003	2005	2007
Age 2–5			
Odds ratios of SSB (2 or more drinks yesterday)	ref	0.64 ^a	0.27 ^a
Age 6–11			
Odds ratios of SSB (2 or more drinks yesterday)	ref	0.65 ^a	0.38 ^a
Age 12–17			
Odds ratios of SSB (2 or more drinks yesterday)	ref	0.77 ^b	0.61 ^a

Note: Adjusted for gender, age, race/ethnicity, poverty level, and parental education.

^aP < 0.001; ^bP < 0.01.

in milk consumption. Thus, it is not likely that the trend in milk intake could explain the decrease in SSB intake. The decline in milk intake, which in itself could be a public health risk, is not likely to be reversed by the observed decline in SSB intake through the hypothesized displacement mechanism.¹⁴

The emerging data from California suggest that policy actions to control obesity are feasible and that they might have had relatively rapid impacts on the prevalence of health risk factors in the population. Further research is needed to examine the contribution of declining SSB consumption on the leveling off of obesity trends and the extent to which these declines are attributable to new policies and programs. Particularly valuable will be comparisons between states, comparisons with national data, and continued monitoring of trends in different socio-demographic population segments. A more detailed intake diary for children and adolescents before and after an SSB ban at schools will also be helpful in testing the causal link between SSB intervention and SSB consumption.

Disclosure

The authors report no conflicts of interest in this work.

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