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State-Level Differences in Sugar-Sweetened Beverage Consumption by Income Among Children Aged 1–5 Years, United States, 2021–2023

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Abstract

Background: Sugar-sweetened beverage (SSB) consumption among young children can be associated with obesity and other adverse health outcomes. Consumption varies by socioeconomic factors such as household income and geographic region, although how these factors might jointly affect SSB consumption is unknown. We evaluated state-level associations between income-to-poverty (IPR) ratio and SSB consumption among children aged 1–5 years in the United States.

Methods: We conducted a pooled cross-sectional study of 55,399 children 1–5 years using 2021–2023 National Survey of Children’s Health data. We estimated prevalence of SSB consumption ≥ 4 times per week by household IPR ($<130\%$, $130\text{--}349\%$, $\geq 350\%$) and state. Multivariable logistic regression evaluated the association between IPR and SSB consumption after adjusting for age, sex, and race and ethnicity.

Results: Nationally, 21.1% (95% confidence interval [CI]: 20.2–21.9%) of children consumed SSBs ≥ 4 times per week, and this varied significantly by IPR ($<130\%$: 33.1% [95% CI: 30.7–35.6%], $130\text{--}349\%$: 22.4% [95% CI: 21.0–23.9%], $\geq 350\%$: 12.1% [95% CI: 11.2–13.0%]). Substantial geographic variation was observed; SSB consumption ranged from 8.6% (95% CI: 6.4–11.3%) in Vermont to 33.7% (95% CI: 28.9–38.8%) in Mississippi. In multivariable models, children from households with a lower IPR ($<130\%$ compared with $\geq 350\%$) had significantly higher SSB consumption for most states, although the magnitude of this association differed by state.

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Authors’ Contributions

Conceptualization: A.K.K. J.L.S. P.D.; Data curation: A.K.; Formal analysis: A.K.; Methodology: A.K.K. J.L.S. L.V.M. M.E.G. P.D.; Writing - Original Draft: A.K.K.; Writing - Review & Editing: A.K.K. J.L.S. L.V.M. M.E.G. P.D.

Ethical Considerations

Because this study used deidentified data from public sources, this research was considered exempt from institutional review board approval.

Consent to Participate

As this was a retrospective study, all participant information was de-identified and consent was not required.

Consent for Publication

Not applicable

Author Disclosure Statement

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Conclusion: To reduce SSB consumption among young children, findings highlight the need for potential interventions tailored to the needs of those residing in low-income households.

Keywords

sugar-sweetened beverage; children; nutrition; states; obesity; income

Introduction

Sugar-sweetened beverages (SSBs) are the largest contributor of added sugars among children and do not contribute to a healthy dietary pattern, as in general they are calorically dense with few nutrients¹. Increased SSB consumption among young children is associated with adverse health outcomes. For example prior studies have shown an 83% increased odds of dental caries and twice the odds for obesity at 6 years old, for 10–12 month old infants who consumed ≥ 3 SSBs per week compared with none^{2,3}. Childhood obesity, affecting approximately one in five children⁴, can in turn be associated with other outcomes such as type 2 diabetes, asthma, and non-alcoholic fatty liver disease⁵. Moreover, dietary habits developed in early life might continue into adulthood^{6,7}, allowing the risk of adverse health outcomes from SSB consumption to persist later in life.

Differences in SSB consumption have been observed across a variety of characteristics, such as income and state^{8,9}. For example, a study using data from the National Survey of Children's Health (NSCH) during 2021–2022 reported the prevalence of consuming SSBs at least weekly at 57.1% nationally but up to 79.3% in state-specific estimates for children aged 1–5 years⁹. Another study using NSCH data evaluated trends of consumption during 2021–2023 and reported significant increases in three states and significant decreases in four states and the District of Columbia¹⁰. Another study evaluated SSB consumption among children aged 2–11 using data from the 1999–2008 National Health and Nutrition Examination Survey⁸. This study found that children in households with the lowest income to poverty ratios (IPR; <135% and 135–300% vs. >300%) had a significantly higher prevalence of consuming ≥ 500 kcal from SSBs over a single 24 hours period.

While these studies provide valuable insight into SSB consumption among children by income and geographic region, no studies have assessed the prevalence of SSB consumption within a state by income. State-level information about differences in SSB consumption by income might then be used to tailor state programs designed to decrease SSB consumption among children. Therefore, we evaluated the prevalence of high SSB consumption among US children by income and state.

Methods

Study Sample

This study used data from the 2021–2023 NSCH, a nationally representative annual cross-sectional survey of households with non-institutionalized children ≤ 17 years old in the US (<https://www.census.gov/programs-surveys/nsch.html>). The Health Resources and Services Administration (HRSA) directs the survey and the US Census Bureau conducts data

collection, sampling randomly selected eligible households in all 50 states and the District of Columbia from the US Census Bureau Master Address File. A parent or caregiver answered age-specific (≤ 5 years, 6–11 years, 12–17 years) questionnaires about a randomly selected child in the household. Questionnaire topics included the child's physical and mental health, healthcare access and utilization, parent/caregiver sociodemographic information, and neighborhood and community characteristics. The current analysis comprised children aged 1–5 years since the questionnaire asked about specific dietary behaviors for this age range only. Because this study used deidentified data from public sources, it was considered not to be human subjects research and did not require Institutional Review Board approval.

Measurements

Sociodemographic variables characterizing the child included: age, sex (female, male), race and ethnicity (Hispanic, non-Hispanic [NH] Asian, NH Black, NH White, NH Other [American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, Two or More Races]). Other information, that was used to describe the sample, included highest educational attainment of a parent or caregiver (less than high school, high school, some college/Associate's degree, college degree or higher), health insurance status (yes, no), and household language (non-English, English).

Income to poverty ratio (IPR) was calculated as the ratio of total family income divided by the family poverty threshold, an income level defined by the US Census Bureau based on household size, state and number of children ¹¹. IPR also provides thresholds to qualify for federal assistance programs. For the current study, thresholds for family income-to-poverty ratio were $<130\%$, $130\text{--}349\%$, and $\geq 350\%$, which will be hereafter referred to as low, middle, and high IPR, respectively. Thresholds were selected based on the eligibility threshold to receive Supplemental Nutrition Assistance Program (SNAP) benefits ($<130\%$) and because 350% provides a relatively equal statistical distribution. To measure SSB consumption, parents/caregivers were asked: "During the past week, how many times did this child drink sugary drinks such as soda, fruit drinks, sports drinks, or sweet tea? Do not include 100% fruit juice." Parents/caregivers could select one of the following responses: This child did not drink sugary drinks, 1–3 times during the past week, 4–6 times during the past week, 1 time per day, 2 times per day, 3 or more times per day. Given the possible thresholds from these responses, we compared children who consumed SSBs ≥ 4 times per week with those who consumed <4 times per week to provide a balanced data distribution as previously done ¹². Sensitivity analyses using a more modest threshold of consuming SSBs ≥ 1 time per week were also conducted.

Statistical Analysis

Cochran-Mantel-Haenszel tests for trend were used to test for statistical significance of a linear association between prevalence of ≥ 4 times per week SSB consumption and IPR, overall and by state. Multivariable logistic regression models estimated odds ratios and corresponding confidence intervals (CI) to evaluate the association between IPR and SSB consumption, overall and by state. Model 1 adjusted for age, and Model 2 further adjusted for sex and race and ethnicity. Potential confounders for these models ^{13, 14} were chosen a priori as variables associated with SSB consumption and/or IPR ¹⁵. Parsimonious models

were selected to avoid model convergence issues that arose from adding additional variables such as parental education due to small sample sizes for some covariate patterns (e.g. race and ethnicity, and state). We considered analyses statistically significant if they had a two-sided p-value <0.05. Sample weights were adjusted for nonresponse and analyses accounted for the complex designs and were used to produce nationally representative estimates. We used SAS 9.4 (SAS Institute, Cary, North Carolina) for data management and SUDAAN 11.0.4 (RTI International, Research Triangle Park, North Carolina) for biostatistical analyses.

Results

Among the 56,220 children aged 1–5 years, 821 were missing data on SSB consumption, resulting in an analytic cohort of 55,399 children. HRSA provides imputed data¹⁶ for sex (n=25; 0.05%), race and ethnicity (n=777; 1.4%), and IPR (n=9,743; 17.6%). Children with any imputed data were more likely to be Hispanic or NH Black, less likely to be NH White, and more likely to have lower parental educational attainment, not have health insurance, and reside in a non-English speaking household. Other variables with missing data, which were not used for the primary analyses, were health insurance status (n=139; 0.3%) and household language, (n=226; 0.4%).

For children aged 1–5 years, overall and across IPR, approximately 20% were of each age and approximately 51% were male (weighted estimates; Table 1). Sociodemographic characteristics varied by IPR. For example, among children with a low IPR, those whose parent/caregiver reported Hispanic ethnicity comprised the largest group (39.5% [95% CI: 37.1–42.0%]), while those who reported NH White race were the largest group among those with a middle IPR (49.5% [95% CI: 47.9–51.0%]) and high IPR (61.5% [95% CI: 60.2–62.9%]). In addition, children with a parent/caregiver whose highest educational attainment was a college degree or higher comprised 86.2% (95% CI: 85.1–87.3%) of those with a high IPR, 50.0% (95% CI: 48.4–51.7%) with a middle IPR and 17.5% (95% CI: 16.1–19.1%) with a low IPR.

Figure 1 and Supplementary Table S1 show the prevalence of ≥ 4 times per week SSB consumption, by IPR and state. Overall, 21.1% (95% CI: 20.2–21.9%) of children consumed SSBs ≥ 4 times per week, with a significant inverse association between IPR and SSB consumption (low IPR: 33.1% [95% CI: 30.7–35.6%]; middle IPR: 22.4% [95% CI: 21.0–23.9%]; high IPR: 12.1% [95% CI: 11.2–13.0%]; p-trend: <0.001). Overall and across IPR categories, states in Southern regions generally had the highest prevalence of ≥ 4 times per week SSB consumption. The majority of states and the District of Columbia (n=36) showed a significant inverse association between IPR and SSB consumption based on Cochran-Mantel-Haenszel tests for trend. Of the 15 states without a statistically significant trend test, eleven followed a similar pattern in their point estimates, with higher SSB consumption among children with a low IPR compared with those with a high IPR. The four remaining states (Montana, Oklahoma, South Dakota, Vermont) did not show a linear pattern in prevalence of SSB consumption by IPR. Some states had a significant linear trend but non-linear patterns in prevalence of SSB consumption by IPR. For example, the District of Columbia had approximately the same prevalence (low IPR: 35.3% [22.0–

51.3%]; middle IPR: 37.6% [22.6–55.4%]) of children consuming SSBs ≥ 4 times per week among households with a low or middle IPR, while the prevalence dropped sharply to 4.7% in households with a high IPR. Two other states showed a similar pattern (Missouri and Maryland). Supplementary Table S2 presents sensitivity analyses, showing the prevalence of ≥ 1 time per week SSB consumption, by IPR and state. Overall, the pattern of results was similar, with prevalence estimates shifted higher due to the lower threshold of consumption, and some additional states now showing a statistically significant linear trend.

Table 2 shows odds ratios for the association between differing levels of IPR and ≥ 4 times per week SSB consumption overall and by state, from both age-adjusted models (Model 1) and models further adjusted for sex and race and ethnicity (Model 2). With few exceptions, such as for the District of Columbia, ORs were higher when comparing low vs. high IPR than when comparing middle vs. high IPR for both overall and state-specific estimates. In Model 1, in the overall population, children from households with a low and medium IPR were significantly more likely to consume SSBs ≥ 4 times per week compared with those from households with the highest IPR: (IPR low vs. high: OR=3.64 [95% CI: 3.14–4.22]; IPR medium vs. high: OR=2.09 [95% CI: 1.85–2.36]). In Model 2, results were attenuated, although were still significant (IPR low vs. high: OR= 2.92 [95% CI: 2.51–3.41]; IPR medium vs. high: OR=1.89 [95% CI: 1.67–2.14]).

State-specific ORs were also attenuated in Model 2; however, odds ratios for 29 states remained statistically significant when comparing low to high IPR. State-specific odds ratios varied considerably. For example, in Model 2, the 29 states that showed a significant association between IPR (low vs. high) and SSB consumption had odds ratios ranging from 2.09 (95% CI: 1.14–3.84) in West Virginia to 7.64 (95% CI: 2.85–20.49) in Virginia. Similarly, in Model 2, the odds ratios for the 19 states that showed a significant association between IPR (medium vs. high) and SSB consumption had odds ratios ranging from 1.76 (95% CI: 1.01–3.08) in South Dakota to 6.91 (95% CI: 2.57–18.56) for the District of Columbia.

Discussion

Among young children during 2021–2023, nationally about 1 out of 5 children were drinking SSBs most days a week (≥ 4 times) with differences noted by state and IPR. Overall and for the majority of states, higher IPR was associated with a lower percentage of children drinking SSBs ≥ 4 times a week, though the prevalence and magnitude of this association substantially varied by state. Most states showed a significant linear association between increasing IPR and lower SSB consumption.

The association between lower IPR and higher SSB consumption might be partially explained by demographic factors, evidenced by a weaker association in multivariable models adjusting for age, sex, and race and ethnicity compared with models adjusting only for age. For example, race and ethnicity are associated with both IPR and SSB intake, as shown by the unequal distribution of the study sample across IPR and racial and ethnic groups, as well as a prior study in the NSCH population¹² and other studies of children in the United States^{17, 18}. Other socioeconomic factors might include parental educational

attainment, household language, food security, rurality, and participation in food assistance programs¹². Some of these factors can vary by state, potentially affecting differences in state-level estimates of SSB consumption. A prior study estimated the volume of SSBs sold by state using commercial data from 2019¹⁹. Highest SSB sales were generally in Midwestern and Southern states and the lowest in New England and Western states. These findings were largely consistent with the current study, with differences possibly attributable to methodological differences including the use of sales data and inclusion of SSBs typically not consumed by young children.

Although there is a lack of relevant studies investigating state-by-state differences in SSB consumption in young children, we can hypothesize possible explanations from related studies. For example, the proportion of the population in each state residing in rural areas can differ, as can the sociodemographic profile of rural populations in each state, with rural areas in the South typically characterized higher prevalence of factors that can be associated with worse diet quality such as less healthcare access and greater food insecurity^{20, 21}. High SSB consumption in Southern areas could also be attributed to other factors associated with diet quality such as cultural influences²² and an adverse food environment²³. Licensing regulations to restrict serving foods and beverages with added sugars in child care facilities can also vary by state, although states fully meeting these standards comprised both states with high and low SSB consumption in the current study²⁴. Participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), a food assistance program for income-eligible families with children 5 years and under²⁵, has been associated with reduced added sugar intake²⁶. However, state-specific participation rates do not show a clear overlap with the pattern of SSB consumption in the current study²⁷. Given these, and other potential determinants of SSB consumption among young children in each state, it is difficult to discern how the complex interplay of these factors might affect the association between IPR and SSB consumption.

As approximately three-quarters of beverage intake among young children occurs at home²⁸, parents and caregivers have an important role in reducing their children's SSB intake by providing healthier alternatives such as water or unflavored milk²⁹. Two randomized controlled trials (RCT) and one pre-post study in the US have investigated at-home parental educational interventions targeting dietary behavior or healthy lifestyle behaviors in general^{30–32}. One study reported a significant positive association between the intervention and reduction in SSB intake³², while findings were suggestive of a positive association but non-significant for the other two studies^{30, 31}. Although these findings show promise, the limited evidence base makes it unclear if parental educational interventions at home might reduce SSB consumption in young children, or how this association might differ by income. Moreover, prior studies have shown a significant correlation between parents' and young children's SSB consumption, attributed to factors such as SSB availability at home and parental modeling of children's dietary behaviors^{33, 34}. Interventions to reduce SSB consumption in young children might therefore be tailored for the family or household environment, although the majority of prior studies have not evaluated such interventions^{33, 34}.

Given the current study's finding of income having an association with SSB consumption, interventions focused on cost are of particular interest. For example, federal programs such as SNAP provide food assistance for income-eligible families. RCTs among individuals eligible for or near-eligible for SNAP suggest a modest but statistically significant reduction in SSB consumption or purchases when using SNAP benefits with restrictions on SSB purchases compared with control groups without restrictions^{35–37}. The RCTs further investigated the effectiveness of combining SNAP restrictions with incentives for fruit and vegetable purchases, compared with either intervention alone, although they report inconsistent results. Other studies showing a significant association between SSB restrictions and reductions in SSB consumption or purchases include two microsimulations of children and adults from the National Health and Nutrition Examination Survey^{38, 39} and a mixed-methods study of SNAP-eligible adults⁴⁰. Since SNAP usage can be associated with increased consumption of SSBs⁴¹, some stakeholders support limiting usage of SNAP benefits for purchasing unhealthy foods such as SSBs⁴². In 2025, the United States Department of Agriculture approved waivers to allow 18 states to restrict purchases of at least one type of SSB (e.g. soda, energy drinks)⁴³. Monitoring the implementation and evaluating the effects of those waivers could provide valuable insights for future efforts to improve diets and reduce SSB consumption.

Early care and education (ECE) facilities, commonly called childcare, is another setting in which interventions can shape young children's dietary behaviors^{44, 45}. Policy levers include childcare regulations promulgated by states to limit SSB consumption while in ECE programs. For example, 34 states had early care and education licensing regulations that required adherence to Child and Adult Care Food Program (CACFP) meal patterns which restricts providing SSBs to children⁴⁶, regardless of participation in the CACFP. Increasing participation in CACFP within states could also be beneficial since the CACFP eligibility criteria aims to support low-income families. States might also consider independently adopting nutrition guidelines to reduce SSB consumption among young children in childcare settings, such as in current childcare regulations in California, which prohibit serving SSBs in childcare facilities. A study that evaluated this policy found a modest but statistically significant reduction from 6.6% of facilities providing SSBs to young children, to 2.6% four years after implementation⁴⁷.

Educational interventions in the ECE setting could also play a role in decreasing SSB consumption. A systematic review on strategies to reduce SSB consumption in young children reported that among 27 studies, interventions most often significantly associated with reduced consumption had characteristics that included: being tailored for groups at high-risk such as families with low incomes, occurring in childcare, and focusing specifically on SSBs or oral hygiene⁴⁸. However, as few studies in the US have empirically evaluated the association between educational interventions in ECE settings and reduction in SSB consumption in young children^{48–50}, such interventions can be more thoroughly evaluated to expand the evidence base.

The healthcare setting provides another environment for interventions to reduce SSB consumption among children through provider training, child and parent education, and referrals to clinical, community, and other programs⁴⁸. Studies in the US have

assessed such interventions primarily in families with low incomes, targeting healthy eating, obesity prevention, oral hygiene and/or healthy behaviors in general. Four studies reported significant reductions in SSB consumption post-intervention^{51–54}, and two found no significant association^{55, 56}, with the former group of studies typically involving interventions of greater intensity and/or duration. However, studies have not evaluated healthcare-based interventions to reduce SSB consumption for young children outside of experimental interventions with limited duration.

The primary strengths of this study are the nationally representative sample and the sufficient sample size for state-level estimates of SSB consumption in young children. This study also has limitations. The self-reported data on both IPR and SSB consumption is subject to misclassification, such as from recall bias, social desirability bias, or from collecting data on frequency but not amount of SSB consumption. Furthermore, based on the phrasing used in the questionnaire, consumption of some SSBs might not have been captured, such as toddler drinks and flavored milk, which can lead to underestimation of SSB consumption. Similarly, the questionnaire did not collect more detailed information on children's SSB consumption that could inform interventions. For example, parents may not have correctly identified some SSBs due to misconceptions about sugar content, a barrier that may be addressed by educational interventions and clearer messaging on sugar content^{57, 58}. Because this is an observational study, residual confounding might affect the results. Some states such as New Hampshire, North Dakota, South Dakota, and Vermont, included statistically unreliable estimates of SSB consumption due to small samples for some strata of covariates (e.g. certain combinations of IPR category, SSBs ≥ 4 times per week, and state), possibly precluding the ability to detect statistically significant associations between IPR and SSB consumption. Similarly, additional covariates such as parental educational attainment, which is associated with children's SSB consumption^{12, 51}, were not adjusted for due to model convergence issues. Lastly, because the NSCH questionnaire only collected information on dietary intake among children aged 1–5 years, results may not be generalizable to older children.

As most states showed significantly higher SSB consumption among young children from households with lower IPRs, findings demonstrate the need for effective interventions to reduce SSB consumption in young children. Parents and children can encounter potential interventions in a variety of settings to reduce SSB consumption, particularly for families with low incomes. Interventions can be at a policy-level such as modifications to food assistance programs, focus on young children such as in the childcare setting, focus on providing education to parents, as well as focus on the family and home environment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Data availability

The data used for this study are publicly available

online at: <https://mchb.hrsa.gov/data-research/national-survey-childrens-health/nsch-questionnaires-datasets-supporting-documents>

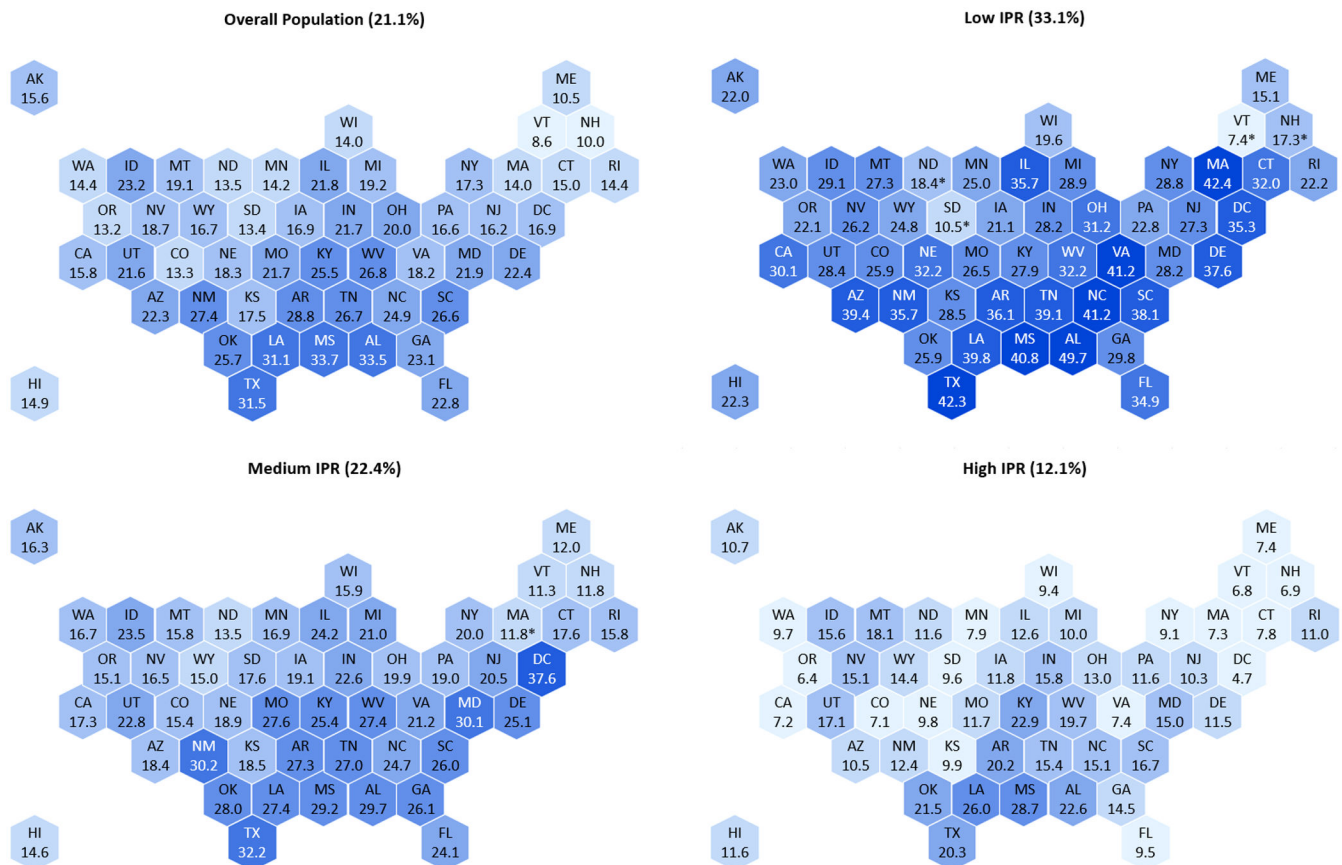
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**Figure 1 -**

Percentage of Children Aged 1–5 Years Who Consume Sugar-Sweetened Beverages ≥ 4 Times per Week, By State and Income-to-Poverty Ratio, National Survey of Children's Health 2021–2023

Prevalence estimates for consumption of SSBs ≥ 4 times per week is shown by both state and IPR, with darker shades of blue corresponding to higher prevalence. Results denoted with an asterisk may not be statistically reliable due to a relative standard error of greater than 0.30.

Low IPR: $<130\%$, Medium IPR: $130\text{--}349\%$, High IPR: $\geq 350\%$

Abbreviations: IPR = income to poverty ratio, SSB = sugar-sweetened beverage

Table 1 -
 Characteristics of Children Aged 1–5 years in the National Survey of Children’s Health, 2021–2023
 (n=55,399)

Characteristic	Overall		Income to Poverty Ratio					
			Low (<130%)		Medium (130–349%)		High (≥350%)	
	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n
Age, years								
1	18.7 (17.9–19.5)	7,698	18.0 (16.2–19.9)	1,188	18.0 (16.6–19.5)	2,631	19.8 (18.7–21.1)	3,879
2	19.8 (19.1–20.5)	13,005	19.7 (17.7–21.8)	1,931	19.5 (18.2–20.8)	4,256	20.2 (19.3–21.1)	6,818
3	20.4 (19.6–21.1)	11,499	20.5 (18.5–22.6)	1,775	20.3 (19.0–21.6)	3,885	20.4 (19.4–21.4)	5,839
4	20.9 (20.1–21.7)	11,504	21.0 (19.0–23.1)	1,814	21.8 (20.5–23.1)	4,074	20.0 (19.0–21.0)	5,617
5	20.2 (19.5–20.9)	11,693	20.9 (18.9–22.9)	1,951	20.4 (19.1–21.8)	4,115	19.6 (18.6–20.6)	5,628
Sex								
Female	48.8 (47.8–49.7)	27,028	47.8 (45.3–50.3)	4,187	48.8 (47.0–50.5)	9,151	49.4 (48.1–50.6)	13,690
Male	51.2 (50.3–52.2)	28,371	52.2 (49.7–54.7)	4,472	51.2 (49.5–53.0)	9,809	50.6 (49.4–51.9)	14,090
Race or Ethnicity								
Hispanic	26.3 (25.4–27.3)	7,770	39.5 (37.1–42.0)	2,149	26.9 (25.2–28.6)	2,967	17.4 (16.2–18.7)	2,655
NH Asian	4.7 (4.4–5.1)	3,151	3.7 (3.1–4.5)	468	4.0 (3.5–4.7)	941	6.0 (5.5–6.6)	1,742
NH Black	11.9 (11.2–12.6)	2,961	20.7 (18.9–22.6)	1,158	12.5 (11.3–13.7)	1,106	5.7 (5.0–6.5)	697
NH White	49.2 (48.3–50.1)	36,642	29.5 (27.7–31.5)	4,054	49.5 (47.9–51.0)	12,331	61.5 (60.2–62.9)	20,258
NH Other	7.9 (7.5–8.3)	4,875	6.6 (5.7–7.6)	830	7.1 (6.5–7.8)	1,616	9.4 (8.7–10.1)	2,429
Household Language								
Non-English	15.3 (14.4–16.2)	4,659	27.9 (25.4–30.6)	1,512	15.6 (14.0–17.3)	1,712	6.9 (6.1–7.7)	1,436
English	84.2 (83.3–85.1)	50,514	71.5 (68.8–74.0)	7,105	83.9 (82.1–85.5)	17,161	92.7 (91.9–93.4)	26,248
Missing	0.5 (0.4–0.6)	226	0.6 (0.3–1.0)	42	0.5 (0.4–0.8)	87	0.4 (0.3–0.6)	97
Parent Educational Attainment								
Less than high school	7.5 (6.8–8.4)	1,025	19.9 (17.5–22.6)	632	5.7 (4.5–7.2)	311	1.3 (0.9–1.9)	82
High school	18.1 (17.3–18.9)	6,109	38.2 (35.8–40.6)	2,743	18.9 (17.5–20.3)	2,636	4.6 (3.8–5.5)	730
Some college/ Associate’s Degree	18.3 (17.7–19.0)	10,367	24.4 (22.6–26.2)	2,824	25.4 (24.0–26.8)	5,181	7.9 (7.2–8.7)	2,363
College degree or higher	56.0 (55.1–57.0)	37,898	17.5 (16.1–19.1)	2,460	50.0 (48.4–51.7)	10,832	86.2 (85.1–87.3)	24,606
Child Insured								

Characteristic	Overall		Income to Poverty Ratio					
			Low (<130%)		Medium (130–349%)		High (≥350%)	
	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n
No	5.8 (5.3–6.4)	1,910	10.2 (8.6–12.2)	584	6.1 (5.2–7.1)	789	2.8 (2.3–3.4)	537
Yes	93.8 (93.2–94.4)	53,350	89.3 (87.3–91.0)	8,034	93.5 (92.5–94.4)	18,124	97.0 (96.4–97.5)	27,192
Missing	0.4 (0.3–0.5)	139	0.5 (0.3–0.9)	41	0.4 (0.2–0.7)	47	0.2 (0.1–0.4)	51

Sums may not add to the same total n due to imputation of multiple replicates of income-to-poverty ratio, which results in fractional sums. Sample sizes shown are unweighted counts. NH Other race includes: American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, Two or More Races

Percentages shown are weighted estimates.

Abbreviations: CI = confidence interval, NH = non-Hispanic

Table 2 -

Odds Ratios for the Association Between Income-to-Poverty Ratio and ≥ 4 Times per Week SSB Consumption Among Children Aged 1–5 years, By State, National Survey of Children's Health, 2021–2023

State	Model 1 (age)				Model 2 (age, sex, race or ethnicity)			
	IPR: Low vs. High		IPR: Medium vs. High		IPR: Low vs. High		IPR: Medium vs. High	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Overall	3.64 (3.14–4.22)	<0.001	2.09 (1.85–2.36)	<0.001	2.92 (2.51–3.41)	<0.001	1.89 (1.67–2.14)	<0.001
Alabama	3.47 (1.98–6.08)	<0.001	1.47 (0.91–2.38)	0.11	2.67 (1.49–4.77)	0.001	1.34 (0.82–2.19)	0.24
Alaska	2.36 (0.99–5.67)	0.05	1.58 (0.78–3.18)	0.20	1.93 (0.82–4.55)	0.13	1.26 (0.66–2.42)	0.48
Arizona	5.80 (2.88–11.68)	<0.001	1.87 (0.90–3.87)	0.09	4.65 (2.29–9.44)	<0.001	1.68 (0.85–3.31)	0.13
Arkansas	2.22 (1.18–4.17)	0.01	1.48 (0.80–2.74)	0.21	1.83 (0.94–3.57)	0.08	1.43 (0.79–2.58)	0.24
California	5.52 (3.25–9.39)	<0.001	2.68 (1.59–4.53)	<0.001	4.22 (2.47–7.23)	<0.001	2.30 (1.35–3.94)	0.002
Colorado	4.53 (2.21–9.29)	<0.001	2.25 (1.33–3.82)	0.003	3.67 (1.69–7.98)	0.001	2.06 (1.23–3.48)	0.007
Connecticut	5.16 (2.33–11.43)	<0.001	2.53 (1.10–5.83)	0.03	4.20 (1.73–10.21)	0.002	2.35 (1.01–5.50)	0.05
Delaware	5.24 (2.49–11.05)	<0.001	2.62 (1.41–4.87)	0.002	3.70 (1.74–7.84)	<0.001	2.38 (1.28–4.44)	0.006
District of Columbia	9.98 (4.17–23.87)	<0.001	11.54 (4.71–28.31)	<0.001	5.11 (1.90–13.73)	0.001	6.91 (2.57–18.56)	<0.001
Florida	5.56 (2.81–11.01)	<0.001	3.14 (1.62–6.08)	<0.001	4.42 (2.28–8.58)	<0.001	2.74 (1.38–5.45)	0.004
Georgia	2.36 (1.27–4.37)	0.007	2.04 (1.25–3.33)	0.005	2.52 (1.25–5.07)	0.01	2.13 (1.27–3.58)	0.004
Hawaii	2.24 (0.96–5.26)	0.06	1.33 (0.67–2.66)	0.41	2.00 (0.85–4.72)	0.11	1.18 (0.60–2.30)	0.63
Idaho	2.05 (1.00–4.22)	0.05	1.69 (0.97–2.93)	0.06	2.00 (0.95–4.19)	0.07	1.65 (0.94–2.88)	0.08
Illinois	3.75 (2.03–6.93)	<0.001	2.10 (1.13–3.88)	0.02	2.43 (1.20–4.91)	0.01	1.68 (0.88–3.19)	0.11
Indiana	2.14 (1.05–4.38)	0.04	1.58 (0.87–2.87)	0.13	1.60 (0.73–3.48)	0.23	1.49 (0.81–2.75)	0.20
Iowa	2.11 (1.06–4.21)	0.03	1.80 (1.07–3.05)	0.03	1.58 (0.81–3.10)	0.18	1.62 (0.95–2.77)	0.07
Kansas	4.01 (2.36–6.82)	<0.001	2.14 (1.30–3.53)	0.003	2.93 (1.69–5.09)	<0.001	1.77 (1.06–2.95)	0.03
Kentucky	1.32 (0.74–2.36)	0.35	1.13 (0.69–1.85)	0.62	1.32 (0.72–2.40)	0.37	1.15 (0.70–1.88)	0.59
Louisiana	1.90 (1.14–3.15)	0.01	1.05 (0.66–1.70)	0.82	1.36 (0.77–2.41)	0.29	0.92 (0.58–1.47)	0.73
Maine	2.22 (1.12–4.38)	0.02	1.71 (0.91–3.23)	0.10	2.22 (1.10–4.48)	0.03	1.70 (0.90–3.23)	0.10
Maryland	2.32 (1.06–5.09)	0.04	2.37 (1.27–4.45)	0.007	1.82 (0.78–4.22)	0.17	1.89 (1.02–3.52)	0.04

	Model 1 (age)				Model 2 (age, sex, race or ethnicity)			
State	IPR: Low vs. High		IPR: Medium vs. High		IPR: Low vs. High		IPR: Medium vs. High	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Massachusetts	12.15 (4.56–32.38)	<0.001	2.01 (0.80–5.02)	0.13	7.55 (2.66–21.45)	<0.001	1.61 (0.62–4.20)	0.32
Michigan	3.56 (1.74–7.26)	<0.001	2.30 (1.27–4.18)	0.007	2.95 (1.38–6.30)	0.006	2.18 (1.20–3.98)	0.01
Minnesota	3.93 (1.90–8.12)	<0.001	2.25 (1.22–4.14)	0.009	2.89 (1.34–6.24)	0.007	1.93 (1.04–3.55)	0.04
Mississippi	1.75 (0.88–3.47)	0.11	1.00 (0.52–1.91)	0.99	1.18 (0.55–2.55)	0.67	0.90 (0.47–1.71)	0.74
Missouri	2.99 (1.36–6.59)	0.006	2.98 (1.67–5.30)	<0.001	2.44 (1.08–5.51)	0.03	2.69 (1.50–4.81)	<0.001
Montana *	-	-	-	-	-	-	-	-
Nebraska	4.18 (2.06–8.50)	<0.001	2.13 (1.18–3.85)	0.01	2.98 (1.41–6.30)	0.004	1.93 (1.05–3.54)	0.03
Nevada	1.96 (0.97–3.97)	0.06	1.08 (0.59–1.98)	0.80	1.83 (0.89–3.80)	0.10	1.02 (0.55–1.88)	0.95
New Hampshire	2.54 (0.81–7.90)	0.11	1.88 (0.90–3.94)	0.09	2.45 (0.78–7.68)	0.12	1.77 (0.86–3.65)	0.12
New Jersey	3.44 (1.45–8.14)	0.005	2.18 (1.13–4.22)	0.02	2.82 (1.18–6.78)	0.02	1.90 (1.00–3.63)	0.05
New Mexico	4.12 (2.23–7.60)	<0.001	3.35 (1.76–6.40)	<0.001	3.71 (1.96–7.03)	<0.001	3.23 (1.66–6.30)	<0.001
New York	3.98 (2.34–6.76)	<0.001	2.30 (1.42–3.72)	<0.001	2.95 (1.71–5.08)	<0.001	2.01 (1.23–3.29)	0.005
North Carolina	4.06 (1.89–8.73)	<0.001	1.87 (0.95–3.70)	0.07	3.31 (1.52–7.19)	0.003	1.53 (0.78–3.00)	0.21
North Dakota	1.74 (0.69–4.35)	0.24	1.22 (0.66–2.26)	0.52	1.14 (0.41–3.15)	0.8	1.06 (0.56–1.97)	0.86
Ohio	3.10 (1.87–5.12)	<0.001	1.70 (1.01–2.88)	0.05	2.65 (1.57–4.48)	<0.001	1.65 (0.97–2.78)	0.06
Oklahoma	1.34 (0.71–2.53)	0.37	1.45 (0.73–2.84)	0.28	1.42 (0.75–2.72)	0.28	1.49 (0.78–2.84)	0.23
Oregon	4.03 (2.18–7.46)	<0.001	2.64 (1.61–4.33)	<0.001	3.20 (1.72–5.93)	<0.001	2.30 (1.41–3.77)	0.001
Pennsylvania	2.06 (1.11–3.84)	0.02	1.77 (1.07–2.92)	0.03	1.62 (0.85–3.08)	0.14	1.56 (0.96–2.55)	0.07
Rhode Island	2.16 (0.93–4.99)	0.07	1.41 (0.69–2.89)	0.34	1.41 (0.56–3.53)	0.46	1.13 (0.54–2.37)	0.74
South Carolina	3.17 (1.72–5.83)	<0.001	1.70 (0.96–3.00)	0.07	2.60 (1.38–4.90)	0.003	1.71 (0.97–3.03)	0.07
South Dakota	1.02 (0.41–2.54)	0.96	1.92 (1.12–3.32)	0.02	0.72 (0.30–1.73)	0.47	1.76 (1.01–3.08)	0.048
Tennessee	3.80 (2.21–6.53)	<0.001	2.29 (1.47–3.57)	<0.001	3.10 (1.79–5.37)	<0.001	2.11 (1.37–3.24)	<0.001
Texas	2.93 (1.55–5.54)	0.001	1.83 (1.02–3.30)	0.04	2.18 (1.09–4.36)	0.03	1.61 (0.88–2.92)	0.12
Utah	1.98 (0.99–4.00)	0.05	1.42 (0.85–2.39)	0.18	1.73 (0.84–3.58)	0.14	1.39 (0.83–2.33)	0.21

	Model 1 (age)				Model 2 (age, sex, race or ethnicity)			
State	IPR: Low vs. High		IPR: Medium vs. High		IPR: Low vs. High		IPR: Medium vs. High	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Vermont	0.95 (0.24–3.74)	0.94	1.78 (0.84–3.81)	0.13	1.03 (0.25–4.25)	0.96	1.79 (0.83–3.86)	0.14
Virginia	8.81 (3.54–21.93)	<0.001	3.36 (1.69–6.67)	<0.001	7.64 (2.85–20.49)	<0.001	3.21 (1.63–6.32)	<0.001
Washington	2.94 (1.44–6.00)	0.003	1.91 (1.09–3.35)	0.02	2.44 (1.19–5.00)	0.01	1.77 (1.04–3.01)	0.04
West Virginia	2.00 (1.09–3.67)	0.03	1.59 (0.92–2.75)	0.10	2.09 (1.14–3.84)	0.02	1.60 (0.94–2.71)	0.08
Wisconsin	2.41 (1.12–5.18)	0.02	1.81 (1.05–3.11)	0.03	1.36 (0.57–3.25)	0.49	1.59 (0.97–2.61)	0.07
Wyoming*	-	-	-	-	-	-	-	-

Abbreviations: CI = confidence interval, IPR = income to poverty ratio, OR = odds ratio, SSB = sugar-sweetened beverage

Low IPR: <130%, Medium IPR: 130–349%, High IPR: ≥350%

*Results are suppressed since models did not converge due to small sample sizes in covariate strata