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Mothers' Nutritional Knowledge and Children's Consumption of Sugar Sweetened Beverages: Evidence from Mexico City.

Susan W. Parker [*] Julia Dayton Eberwein [†] Jody Sindelar [‡§]

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Abstract

Childhood obesity is an important public health concern in Mexico, with sugar-sweetened beverages (SSBs) playing a significant role in caloric intake among young children. This study examines the relationships among mothers' nutritional knowledge, parenting behaviors, socio-economic status and their children's consumption of SSBs in Mexico City. Using survey data from 800 mother-child dyads, we analyze the impact of maternal education, health nutritional knowledge, and parenting practices on children's consumption of SSBs. While soda consumption averages 4 servings per week for the children in our sample, the consumption of "aguas frescas" (sugar-sweetened fruit flavored water) is three times as high. Mothers recognize the unhealthiness of soda, but most view consumption of "aguas frescas" as a healthier alternative. Overall, maternal education and nutritional knowledge are not strongly associated with the consumption of SSBs by their children. However, parenting practices, such as using food as a reward, are strongly related to children's beverage consumption.

[*]University of Maryland
[†]The World Bank
[‡]Yale University
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1. Introduction

Children's health and human capital accumulation are affected by their nutrition and weight, with overweight and obesity as key concerns. Mexico currently has one of the highest levels of overweight and obesity in the world, and rates of childhood overweight and obesity in Mexico have grown at an alarming rate (Collaboration et al., 2016; Phelps et al., 2024). Among children aged 5-11, the proportion overweight or obese increased from 25.5% in 1999 to 34.2% in 2023 (Shamah-Levy et al., 2023).[1] The co-existence of both childhood overweight/obesity and stunting highlights the complex nutritional transition occurring in Mexico. The rapid transition from undernutrition (stunting) to obesity illustrates Mexico's complex nutritional landscape (Rivera et al., 2008). Childhood obesity may be harmful to children's current health and may instigate a trajectory of poor health including diabetes and hypertension. Such obesity and related illnesses may reduce educational achievement and lower future productivity.

Consumption of sugar-sweetened beverages (SSBs) may play a critical role in the increase in Mexican child obesity. Levels of consumption of Coca Cola in Mexico are among the highest in the world and are central in the Mexican diet and culture for all ages (Theodore et al., 2019). In addition, sugar-sweetened drinks including bottled fruit juices and soft drinks are common and account for about 20–30% of the calories consumed by even very young children in Mexico (Barquera et al., 2010). Consumption of high-caloric beverages by young children nearly doubled from 1999 to 2014 prior to implementation of a national soda and sugar tax (Barquera et al., 2008). These empty calories rob children of the opportunity to consume needed nutrients, result in weight gain, and can promote hyperactivity so that children are less able to concentrate on learning at school.

In many households, traditional drinks called "aguas frescas" are consumed in addition to sodas, further exacerbating caloric intake (Jiménez-Aguilar et al., 2021). "Aguas frescas," which translates to "fresh waters" or "cool waters," are a blend of fresh fruits, cereals, flowers, or seeds with water and a sweetener, typically sugar. This low-cost beverage is popular at home and at street markets. Bottled fruit juices are also popular in Mexico. Unfortunately, water piped into homes by the government is not generally potable in Mexico City.

These empty calories rob children of the opportunity to consume needed nutrients, result in weight gain and can promote hyperactivity so that children are less able to concentrate on learning at school. Thus, the ubiquity of sugar sweetened beverages (SSBs) in the Mexican diet is likely a significant factor contributing to the high overweight and obesity rates (Gračner, 2021). A recent study suggests that 7% of all deaths in Mexico are now directly related to consumption of SSBs (Braverman-Bronstein et al., 2020).

Another part of the explanation of the rapid growth in overweight and obesity in Mexico is that the Mexican food markets have imported characteristics of the US market with high availability and active marketing of low cost, highly caloric, highly processed, hyper-palatable foods in addition to sodas and other high sugar sweetened beverages (SSB). Mexico also has its traditional street and other foods which can also be highly caloric, readily available, and relatively cheap. The combination of traditional Mexican street foods and drinks and hyperpalatable American fast foods likely contributes to a toxic, obesogenic environment in Mexico.

We focus on mothers as they are the key decision-makers and agents for their children's nutrition, and more so at an early age of the child, starting with the decisions to breast-feed. Given the strong influence mothers have on their children's diets, understanding how maternal characteristics shape dietary patterns is crucial. This paper asks and addresses whether mothers' characteristics and behaviors can protect their young children from sugar-sweetened beverages. We carry out a survey of 800 mothers/child dyads that are

[1] An innovative nationwide tax was implemented in Mexico in 2014 which imposed a tax of 1 peso per liter of sugar sweetened beverages. Initial studies suggested significant reductions in the purchase of SSB and calories consumed of SSBs Colchero et al. (2017). However, Aguilar et al. (2021) demonstrate that purchases increased of non-taxed food and drinks implying no change in the number of calories purchased as a result of the imposition of the tax.

representative at the level of the greater metropolitan area of Mexico City in October 2015. In our survey, 88% of mothers report being those mainly responsible for their children's diet (10% are grandmothers, 0.5% are fathers).

We focus on the effect of mother's: SES, nutritional knowledge, and parenting practices on children's consumption of sugar sweetened beverages. Specifically, we examine the impact of mother's: 1) knowledge and attitudes about nutrition and causes of diabetes; 2) parenting practices (e.g. offering foods, encouraging good nutrition, using food as a reward); and 3) mother's socio-economic factors including: education, age, education, and work.

Our findings show that children between the ages of 4 to 9 in Mexico City consume large quantities of different types per week of SSBs per week. While consumption of soda is significant at about 4 servings per week, the consumption of "aguas frescas" is three times as high and represents about half of all SSB consumption, suggesting policies to reduce consumption of SSBs in Mexico should focus additional attention on aguas frescas. Our results suggest that mothers' education, nutritional knowledge and particularly parenting practices all play roles in affecting the consumption of SSBs by their children.

2. Background

Levels of overweight and obesity in children in Mexico have generally increased since the late 1990s. Among children under the age of 5 years, the rate of both overweight and obesity was 8.8% in 1999, increased to 9.7% in 2012 (the closest year to our survey) and declined to 6.7% in 2023 (Shamah-Levy et al., 2023). Among children aged 5 to 11 years, 26.9% were overweight or obese and this share rose to 34.4% in 2012 (the year closest to our survey) and has remained relatively stable since (34.2% in 2023) (Shamah-Levy et al., 2023).

Particularly striking are the high levels of obesity among children under the age of five. Small children do not yet prepare or buy any of their own food and presumably can only eat food they are provided by others. This naturally implies a focus on the quality of food and beverages provided to small children by their caregivers. In our survey, the overwhelming majority (88%) of mothers report they are the main ones responsible for their children's diet. Of those remaining, 10% are grandmothers, 0.5% are fathers. We thus study the factors that affect the quality of food and beverages that mothers provide to their children.

The effect of mother's nutritional knowledge on children's obesity has been previously studied but to our knowledge the bulk of existing studies have focused on the United States and other developed countries. Our study innovates by focusing on the importance of nutritional knowledge in a poorer country where education levels and human capital are significantly lower, policies are different as is the high average level of consumption of SSBs, with a different set of sugary beverages commonly consumed. In addition, policies are different, likely with lower emphasis on public health policies.

Most studies of the effects of mothers on child nutrition focus on the direct effects of mothers' education on their child's nutrition (Wolfe and Behrman, 1983). Perhaps the study most similar to ours is Variyam et al. (1999), who study how mother's nutritional knowledge affects the quality of food intake of children using information on nutrients contained in children's diet in the United States. They treat mother's nutritional knowledge as endogenous and instrument using mother's education, effectively assuming that mother's education only affects child nutrition through nutritional knowledge. They find that mother's knowledge positively affects quality of food intake for children aged 2 to 5 but not for children older than five. They suggest that nutritional education programs should be directed towards mothers of small children and directly towards children for those who are already in school.

Laz et al. (2015) studies the relationship between self-reported indicators of nutritional knowledge of

women and healthy behaviors for overweight women in Texas. Those women with higher scores on nutritional knowledge have healthier behaviors related to weight loss attempts, measured by eating less food, switching to foods with lower calories and eating more fruits and vegetables.

Recent literature has developed on how to measure parental practices with respect to food and their impact on children's food consumption patterns. This literature focuses on indicators of how parents interact with children with respect to food, for instance measuring practices such as insisting children finish what is on their plates, providing dessert as a reward, parents eating sweets but not allowing children access to similar food. The literature classifies these measures of parental practices into three types: 1) authoritarian- parents direct or command children in terms of what they eat; b) permissive -letting the child eat what he wants; and 3) authoritative -using negotiation and information to affect children's eating (Nicklas et al., 2001). We are unaware of studies of these variables and the impact of parenting practices in a developing country context; thus, we aim to provide some initial insights.

3. Conceptual framework and hypotheses.

The conceptual framework for this study focuses on the role of mother- and household-specific factors as well as the policy environment on the child's consumption of sweetened-sugary beverages (SSBs). As portrayed in Figure 1, our conceptual framework posits that mother- and household-specific socioeconomic characteristics affect other critical factors that ultimately affect the child's consumption of SSBs. Our conceptual framework is based on an underlying household production function in which a mother's knowledge affects her children's health (Rosenzweig and Schultz, 1982, 1983). First, mother-specific SES characteristics directly affect mother's knowledge of the nutritional content of alternative drinks which in turn affect mother's feeding and parenting practices (Variyam et al., 1999). Other SES factors also directly affect mothers' parenting and feeding practices. These parenting practices in turn have a direct impact on the child's consumption of SSBs. Also, there may be a direct impact of SES on child's consumption via higher income levels affecting the affordability of beverages which may in turn affect beverage type offered by the mother.

We hypothesize that the mother's SES has both direct and indirect impacts on the mother's feeding and parenting practice patterns. One indirect effect occurs through the impact of SES on mother's knowledge. We hypothesize that higher SES would improve mothers' knowledge of nutrition and parenting practice. These improvements would in turn improve the mother's feeding and parenting practices. These both are hypothesized to lower the intake of SSBS of her children. However, we are agnostic as to the net impact of higher SES on SSBs because higher income can increase the affordability of sodas, purchased potable water, and sugar, possibly offsetting the impact of greater nutritional knowledge and better beverage-related parenting likely associated with mother's higher SES. Even an increase in the purchase of potable water is ambiguous on its impact on SSBs because potable water is used to make sweetened beverages at home or could be the source of a drink of plain water. Thus, the determination of the impact of SES becomes an empirical issue which we investigate. Note that the piped water available in Mexico City households is not generally potable (Mazari-Hiriart et al., 2005).

We hypothesize that the policy environment also would likely affect children's consumption of SSBs by affecting the prices and availability of alternative beverages. Soda taxes would increase the price of soda and could have a disproportionate impact on lower income families, possibly resulting in substitution to greater consumption of agua frescas.[2]

Guided by our conceptual framework, we test the following hypotheses:

[2]We do not control for the policy environment in Mexico City as it is similar across the city-for example, all of Mexico City has a sugar tax and none have potable water piped into their abodes.

H1: Lower SES, and lower maternal education in particular, are associated with higher child consumption of SSBs.

H2: Children of mothers with greater nutritional knowledge on SSBs will have lower consumption of these beverages.

H3: Alternative parenting practices will be associated with higher or lower consumption of SSBs among children. Permissive parenting practices such as allowing unrestricted access to sweets or using dessert as a reward and modeling unhealthy practices (e.g., drinking soda or eating candy with the child) are predicted to increase the consumption of SSBs of their children. Authoritative parenting practices—such as communicating the health benefits of fruits and vegetables—are predicted to reduce children's SSB consumption.

4. Data and methods

Survey

Our analysis uses a door-to door survey of 800 mothers/child dyads that are representative at the level of the greater metropolitan area of Mexico City. The survey was carried out between October 17th and October 31st 2015 and had a response rate of approximately 90%. The survey asks about current and historical consumption of sodas of one of their children between the ages of 4 to 9. The survey includes sections about the mother; her education, her knowledge of and attitudes towards nutrition, barriers to change, and beliefs in the importance of nutrition. The survey also asks about background socioeconomic and demographic characteristics including the mother's childhood social and economic context and her work life, family structure and socio-economic status. Finally, adapting the parenting practice questions from Vereecken et al. (2004) we ask about parental parenting practices with respect to providing beverages and food to children; this allows the classification of questions into practices which are characterized as *authoritarian, permissive or authoritative*.

Methods

We estimate a series of multivariate linear regression models to examine the association between maternal factors and children's consumption of sugar-sweetened beverages (SSBs), including soda, bottled juice, fresh juice, sweetened milk, aguas frescas and other sweetened beverages. Outcomes of interest are the number of servings per week consumed by the child for each of the six sugar sweetened beverage types.

Our modeling strategy involves stepwise specifications to assess the contribution of different categories of explanatory variables. In the first specification, we include only child and maternal socioeconomic status (SES) variables such as age, education, marital status, employment, income, and whether the mother was raised in an urban environment. Subsequent models introduce additional controls:

- Model 2 adds maternal nutritional knowledge, including awareness of sugar content in beverages
- Model 3 incorporates parenting practice variables adapted from the literature on food-related parenting behaviors.
- Model 4 includes household-level control variables such as grandmother's education, household assets, and maternal obesity.

Using these data, we analyze factors that affect the quantities of consumption of sugar-sweetened beverages of young children, focusing attention on the impacts of 1) mother education, 2) mother's nutritional knowledge and 3) mother's parenting practices on children's consumption of SSBs. To measure mother's nutritional knowledge, we construct aggregate indices of maternal nutritional knowledge using responses on the

quantity of sugar mothers believe to be in the six beverages groups we study and select indicators of maternal knowledge related to the quantity of sugar in beverages. We also construct a simple index of the causes of diabetes identified correctly by the mother. Finally, we construct three aggregate indices to measure maternal parenting practices with respect to food and drink (permissive, authoritarian and authoritative). We now detail the construction of these indices.

To measure maternal nutritional knowledge related to beverages, we constructed an index based on responses to six survey items, which asked mothers to rate how healthy various drinks are, on a 4-point scale ranging from 1 (very unhealthy) to 4 (very healthy). For drinks widely considered unhealthy—such as soda, flavored drinks, and sweetened beverages—we reverse-coded responses so that higher values reflect better nutritional understanding (i.e., correctly identifying these as unhealthy). For drinks more likely to be perceived as healthy (fresh or bottled juices), we maintained the original scale (Malik and Hu, 2015; Agarwal et al., 2019). All variables were then standardized to a 0–1 scale, with 1 indicating the highest level of knowledge. Finally, we created a composite maternal beverage knowledge index by averaging the standardized scores across the six items.

To measure parenting styles, we constructed three composite indexes—permissive, authoritarian, and authoritative—based on responses to nine survey items in our survey that capture common parental feeding practices. Each item is measured on a 5-point Likert scale, where higher values reflect greater agreement with the practice. We first reverse-coded items that reflect undesirable or non-nutritive practices so that higher values consistently indicate more positive behaviors. Specifically, for the permissive parenting index, we reverse-coded "gives candy whenever the child wants", "gives dessert even if the child doesn't like the meal", and "eats candy in front of the child", then averaged the responses to create the composite. For the authoritarian parenting index, we reverse-coded "makes the child eat even when not hungry", "forces the child to eat food they dislike", and "punishes the child for not finishing the plate." In contrast, the authoritative parenting index was computed as the average of "rewards the child for eating fruits/vegetables", "explains that fruits and vegetables help them grow," and "tells the child that soft drinks are harmful," without reverse-coding, as these behaviors are positively framed. All indexes were computed using the means of the available items per respondent.[3].

Other independent variables include mother's socio-economic characteristics including her education, labor market participation, current obesity level and background variables including the age at which she first had soda, whether she grew up in rural areas and her mother's education. We also include children's characteristics, including birthweight, age and gender and household-level socioeconomic variables including having in the household a refrigerator, stove, cell phone and internet.

5. Results

Descriptive results

The sample characteristics are shown in Table 1 (mothers) and Table 2 (children and household). The children in the sample ranged from 4 to 9 years of age, with an average age of 6.4 years, and are equally divided between boys and girls. The average age children started consuming soda was 2.5 years. Three-quarters of the children's mothers were married, and 15% were employed as salaried workers. About 15% of mothers had completed primary school or less education, 40% had completed middle school, with the

[3]Cronbach's alpha ranges from 0.27 to 0.57, which is expected given the small number of components from our short form parenting questionnaire and that the items capture distinct parenting practices rather than a single latent trait. The indexes are therefore used as parsimonious proxies to summarize related practices and reduce dimensionality. We also estimate specifications separately for each component which are very consistent with the main results in Table 3

remainder having high school education or above. About one third of the mothers were obese. Most report having refrigerators in their household, and about half had an oven and internet. About 35% report working outside the home.[4]

The most common parenting practices related to eating were recorded. These reveal that over 85% of mothers reported telling their children that fruit and vegetables will make them strong, and 80% told their children soda was bad for them. Almost two thirds (61%) of the mothers reported that children must eat (always or almost always) whether they are hungry or not. Half of mothers always or nearly always also reported children must finish their food whether they like the food or not. Smaller percentages were reported for variables measuring using food as a reward or as a punishment. One quarter of the mothers promised dessert for those children who did not want to eat, and 21% of mothers report always or nearly always punishing their child if they did not finish their food. About one fifth of mothers reported drinking soda and eating candy with their child, and 16% said their child has permission to eat candy, chips, and soda whenever s/he wants.

We now turn to a description of children's beverage consumption and mother's reported belief on the healthiness and sugar content of diverse SSBs as well as the causes of diabetes. (Figures 2 through 5). Figure 2 shows the average number of servings per week consumed by children for our six dependent variables, measuring different sugar sweetened beverages as well as the other principal, non SSB beverages consumed by children in our sample, natural water and unflavored milk. The two most prevalent types of beverage consumption are water, at about 20 servings per week, and milk, at about 13 servings per week. However, Figure 2 also shows an important amount of SSB consumption. The figure shows that "aguas frescas" has by far the highest consumption level of the SSBs, at approximately 12 servings per week. Soda servings are about 4 per week on average, with the other four categories averaging about 2 servings per week (fresh juice, bottled juice, sweetened milk and other SSBs). Summing together the different SSBs shows that on average SSB consumption for children between the ages of 4 to 9 in Mexico City is on average 24 servings per week. This amounts to a substantial fraction of all beverage consumption by small children. About half of the SSB consumption are aguas frescas, underscoring the centrality of aguas frescas in children's beverage intake.

Figure 3 illustrates mothers' perceptions of the healthiness of different beverages their children might consume. For each beverage type, responses are categorized into four groups: "very healthy," "somewhat healthy," "not very healthy," and "not healthy." The figure shows that soda is overwhelmingly viewed as unhealthy, with nearly all mothers rating it as either "not healthy" or "not very healthy." In contrast, fresh juice is most commonly rated as "very healthy", indicating strong 14 beliefs in its nutritional value despite its potential sugar content. Interestingly, aguas frescas are generally perceived as healthy, with the majority of mothers classifying them as either "somewhat healthy" or "very healthy." Aguas frescas are typically similar to sodas in terms of sugar content and health risks (Rivera et al., 2008). Bottled juice and sweetened milk are also commonly viewed as somewhat healthy, though with more variation in responses.

Figure 4 displays mothers' perceptions of the sugar content in various types of beverages consumed by children. For each beverage type, the bars in the table are divided into four categories representing mothers' beliefs: whether the beverage contains "a lot," "some," "a little," or "none" sugar. The figure shows that nearly all mothers recognize soda as containing "a lot" of sugar, with over 80% responding as such. Similar patterns, though slightly less pronounced, are seen for bottled juice and other sugar-sweetened beverages (SSBs). However, perceptions diverge significantly for aguas frescas and fresh juice. Aguas frescas, despite their high average consumption among children, are not widely perceived as sugar-rich: only a minority of mothers believe they contain "a lot" of sugar, with most responding "some" or "a little." Note that mothers are

[4]INEGI, 2015 reports a somewhat higher labor market participation in 2015 for women based on data from the ENOE (Survey of Employment and Occupation) in Mexico City is 50.5% for women aged 15 and over. Labor force participation is captured in our data through the reporting of principal occupation, so is likely to underestimate total labor force participation because the question does not permit two principal occupations (for instance working and studying). Comparison of other characteristics including education distribution, proportion married are similar to those reported in INEGI, 2015.

more likely to control the amount of sugar at home but not when purchased outside of the home. Similarly, many mothers appear to underestimate the sugar content of fresh juice.

Figure 5 presents the distribution of mothers' beliefs regarding the causes of diabetes. The most frequently mentioned causes were "type of diet" (50.1%) and "excess sugar" (45.9%), indicating that at least half of mothers correctly identify dietary behaviors as contributing factors to diabetes.

Correlates of sweetened beverage consumption

In this section, we present our main regression results of consumption of SSBs of children. We report in Table 3 the variables reflecting our main hypotheses on the impact of mothers' characteristics on children's consumption of SSB, including the impacts of: 1) mother's education, 2) mother's nutritional knowledge and 3) mothers' parental practices. We have six dependent variables measuring child's weekly consumption of servings of: 1) soda, 2) bottled juice, 3) aguas frescas, 4) fresh juice, 5) sweetened milk and 6) other SSBs. These are regressed on a set of independent variables, including mother's socioeconomic characteristics, mother's nutritional knowledge, mother's parenting behaviors and a set of controls. We perform four stepwise specifications. See Appendix Tables 2 through 7 which show the stepwise specifications in columns 1-4 with column 4 showing the full and preferred specification. Table 3 summarizes our main results with our preferred specification for of the six dependent variables. All models are weighted and include the controls of child's age, gender,birthweight and household socio economic variables. Given our number of indicators, we also carry out multiple hypothesis testing, in particular calculating adjusted p values using the Benjamini-Hochberg false discovery rate (Benjamini and Hochberg, 1995). Statistical inference is based on the adjusted q values and we report both the raw p and the adjusted q values in Appendix Table 1.[5]

Table 3 shows that consumption of soda shows a strong negative gradient with maternal education. Children of mothers with only primary education consume over 3 more servings of soda per week than those whose mothers have more than a high school education. Additionally, permissive and authoritative parenting practices are significantly associated with greater soda consumption, as is the behavior of mothers consuming soda and candy with their children. Knowledge about the link between sugar and diabetes is associated with lower soda consumption.

Permissive parenting practices and co-consumption of candy and soda also show positive associations with juice intake. For aguas frescas, the relationship is more nuanced. Maternal education has a negative (though not always significant) association with consumption, and authoritative parenting is associated with lower intake. Interestingly, mothers' knowledge of sugar content in SSBs shows a positive association, perhaps reflecting substitution of juice for soda. Sweetened milk and fresh juice show fewer strong associations.

Parenting practices—particularly permissive and authoritarian styles—show significant effects across drink types. Notably, authoritative practices are associated with significantly lower consumption of fresh juice, bottled juice, aguas frescas, and 'other flavored drinks' but significantly higher consumption of sodas. Permissive parenting is significantly associated with greater consumption of bottled and fresh juices. These findings reinforce the central role of parenting behavior in shaping children's beverage consumption, even after controlling for knowledge and socioeconomic status.

Finally, we also examine the extensive margin by estimating linear probability models for any SSB consumption.[6] These results allow us to assess whether our main results reflect changes in the likelihood of consuming SSBs, rather than only changes in consumption intensity among children The estimates are qualitatively similar to those for consumption frequency and generally suggest both intensive and extensive impacts on SSB consumption for those variables where significant associations are reported. These results are reported in Appendix Table 8.

[5] Appendix Table 8 provides unweighted regression results, which are overall similar to those presented in Table 3

[6] With the exception of bottled juice at 40%, the majority of our sample reports nonzero weekly servings for each SSB.

6. Discussion

Principle findings

The paper adds to the literature on how mothers influence their children's consumption of unhealthy beverages. Using data from urban Mexico City from 2015, we find that children in the sample consumed on average 24 servings of sugar-sweetened beverages, including 4 portions of soda a week and 12 portions of aguas frescas even though more than 80% of mothers reported telling their children that sodas are unhealthy. Interestingly the average age children began consuming soda was 2.5. The early age of consuming soda supports that soda consumption in children in Mexico may be a lifetime habit and suggests that if soda consumption were not introduced early, soda consumption might be mitigated.

We assessed the association between mother's socioeconomic status, her knowledge of nutrition and her parenting behaviors, while controlling household characteristics. The most striking finding was that some of the mother's parenting practices, and to a lesser extent, her nutritional knowledge was associated with consumption of unhealthy beverages, especially of soda, above and beyond the influence of socioeconomic status, including mother's education.

The results for aguas frescas consumption are important because this beverage is widely consumed in Mexico (Barquera et al., 2008) and often considered a healthy substitute for soda, even for small children although Rivera et al. (2008) classify aguas frescas in the least healthy category of beverages, together with sodas. Overall, our results suggest consumption of aguas frescas is the drink of choice for young children in Mexico City and there are few socioeconomic variables that predict lower consumption of aguas frescas. That half of all SSB consumption of small children comes from aguas frescas suggests that reduction of early consumption of aguas frescas deserves policy attention and 18 innovative interventions might make a difference, for instance promoting the consumption of natural water or highlighting the importance of not adding sugar to homemade drinks. Because aguas frescas are generally homemade, they are not subject to Mexico's tax on sugar sweetened beverages.

Mother's socioeconomic status. The findings showed that few socioeconomic characteristics of the mother were associated with child consumption of sugary beverages. One exception was education, which had a large effect on servings of soda consumed weekly by children; children of mothers with lower levels of education had higher soda consumption. However, there was no effect of mother education on servings of other sugar sweetened beverages.

Mother's knowledge of nutrition and causes of diabetes. Overall, across specifications there is little evidence for mother's nutritional knowledge affecting the consumption of some sugary beverages, but not the consumption of soda. That soda is so widely available and heavily marketed may explain part of this differential. In addition, the knowledge-action gap may explain why knowledge did not translate into action (Feil et al., 2023). This type of gap is often attributed in behavioral economics to a person operating in a so-called 'hot period' of low self-control (Loewenstein, 1996), which may be especially relevant regarding sweet and sugary beverages as the mother may be consuming with their child. Knowledge of the causes of diabetes was not associated with reduced consumption on SSBs in general.

Mother's parenting practices. The indices measuring parenting food practices reveal several interesting, significant associations. Overall, permissive parenting practices are associated with significantly increased consumption of SSBs, with the highest effects for the consumption of soda. On the other hand, authoritative parenting practices were generally associated with lower consumption of SSBs, although with an unexpected positive coefficient on soda (significant at the 10% level). Finally, authoritarian parenting practices had no significant associations with SSB consumption. Overall, these results are largely consistent with previously

published studies (Pickard et al., 2024).[7]

Limitations. We recognize limitations in our study. First, as with many surveys that rely on self-reports, there is the possibility of recall bias and social desirability bias (Edwards, 1957). However, in our study, social desirability bias would likely affect both mothers' possible over-reporting of their knowledge that SSBs are harmful to health and as well as under-reporting of their children's consumption of SSBs, so the net effect would be unclear. Second, recent research has suggested that the relationship between parental practices and child eating habits is bidirectional in that children's eating behaviors may influence parents to adopt certain feeding practices (Costa and Olivera 2023), although measuring this was outside the scope of our study. Further, the survey was conducted in daytime so mothers who worked outside of the house were likely less surveyed. Finally, this cross-sectional study only allows us to infer associations between variables rather than show clear causation and suggests the need for future studies to study causation (Oster, 2025). Future studies/data collection might also consider the collection of data at multiple levels e.g. neighborhood characteristics, school characteristics in the context of the Social Ecological Model to study child obesity in Mexico (see Ohri-Vachaspati et al. (2015) for an example in the context of the United States).

Policy implications

Mexico could increase the impact of their soda tax by either or both increasing the current per ounce tax rate and/or adding a tax on the *percentage of sugar* in SSBs. Mexico's 2014 excise tax was implemented as a one-peso-per-liter excise tax on SSBs. The tax increased the price of sodas by 11%, with a slightly smaller price increase for other SSBs. This price increase due to the tax reduced purchases of SSBs and increased purchases of bottled water, with lower socioeconomic groups reducing their consumption the most (Colchero et al., 2017).

Taxing sugar content directly might more effectively lower consumption of sugar in drinks (World Health Organization, 2016; Allcott et al., 2019). However, adopting a tax directly on sugar content as well as per ounce could reduce soda consumption and also produce additional government revenue to fund other policies to reduce consumption. Currently, three countries rely exclusively on a tax on sugar content in drinks (Cook Islands, Mauritius, and South Africa) while two countries apply both sugar- and volume-specific taxes (Poland and Sri Lanka) (Hattersley and Mandeville, 2023).

Notably since the 2014 tax, Mexico has implemented several additional policies aimed at improving diets and reducing SSB consumption following Chile's example (Correa et al., 2019). These include a tax on 'non-essential foods' (aka ultra processed foods) (Taillie et al., 2017), a front of package food warning labels policy, media marketing campaigns to promote understanding of the warning labels and promote healthier diets, and school-based guidelines for serving healthy foods and beverages (Batis et al., 2016; Global Food Research Program, UNC–Chapel Hill, 2025; Taillie et al., 2017). In 2025 Mexico banned the sale and promotion of sugary drinks and junk food within school premises (Mexico Business News, 2025); these rules took effect on March 29, 2025.

Yet, despite implementation of the above policies, results from our study suggest that additional types of policies might be effective. The significant association of mother's parenting practices and child's beverage consumption suggests implementation of programs, media campaigns, and educational policies to encourage parents to set appropriate limits and to model low consumption of SSBs. Limits 21 could be used at school as well. Mexico could also limit advertising of SSBs to children following Chile's success (Taillie et al., 2017) and/or enact an overall marketing ban on sodas and other SSBs.

That aguas frescas (and bottled juices) were viewed as healthy by mothers suggests the need to focus

[7] In the future it will be interesting to compare our results with those using the new Scale on Parental Feeding Behavior (ECOPAL) that was recently designed for the urban Mexico setting but to our knowledge no results have yet been published (González-Torres et al. 2023).

on educating children and mothers about the health risks of sugar in these beverages, and the importance of consuming plain water. These efforts might be achieved through public health information campaigns, school-based programs for parents and children, and other training and educational initiatives. It will also be important to expand access to safe and free drinking water to all and especially in daycares, nurseries, elementary school, public play spaces, and other areas frequented by children.

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Table 1: *Descriptive Statistics: Mother level*

	Mean	**Standard deviation**
Mother's age	32.19	7.62
Hours worked outside home (per week)	13.54	24.12
Working outside home	0.34	0.47
Mother married	0.73	0.44
Mother raised in urban environment	0.84	0.37
Primary or less education	0.15	0.36
Secondary education	0.39	0.49
High school	0.36	0.48
Grandmother completed primary education	0.55	0.50
Grandmother completed secondary education	0.20	0.40
Mom's parenting practices		
My child has permission to eat candy, chips, and soda whenever he/she wants)	0.16	0.37
If my child doesn't want to eat, I tell him/her he will get dessert	0.25	0.43
I drink soda and eat candy with my child	0.20	0.40
Child must eat even if not hungry	0.63	0.48
Child must eat food even if doesn't like it	0.52	0.50
Punish child if doesn't finish food	0.22	0.41
My child gets a prize if he/she eats fruits and vegetables	0.21	0.41
I tell my children fruits and vegetables will make him grow	0.87	0.34
I tell my child sodas are unhealthy	0.80	0.40
Observations	772	

Source: Authors' calculations using the Survey of Child Consumption of Sugar Sweetened Beverages in Mexico City, 2015.

Table 2: *Descriptive Statistics: Child level*

	Mean	**Standard deviation**
Child characteristics		
Age	6.40	1.78
Female	0.49	0.50
Birthweight (grams)	2890.54	868.62
Age child began drinking soda	2.56	1.46
Household characteristics		
Hh income<3200 pesos monthly	0.48	0.50
Refrigerator	0.90	0.30
Cell phone	0.84	0.37
Oven	0.55	0.50
Internet	0.45	0.50
Observations	772	

Source: Authors' calculations using the Survey of Child Consumption of Sugar Sweetened Beverages in Mexico City, 2015.

Table 3: *Weighted OLS multiple regression of weekly servings of sugar-sweetened beverages consumed by child*

VARIABLES	Soda	Bottled juice	Aguas frescas	Sweetened milk	Fresh juice	Other flavored drinks
Mother education level:						
Primary or less	3.304**	0.545	-2.565	-0.223	-1.248	0.843
	(1.069)	(0.700)	(2.035)	(0.896)	(0.926)	(0.753)
Secondary	1.816	0.120	-1.158	0.443	-0.104	0.718
	(0.919)	(0.598)	(1.738)	(0.765)	(0.791)	(0.643)
High school	1.399	0.051	-0.264	-0.349	0.547	-0.090
	(0.886)	(0.576)	(1.674)	(0.737)	(0.762)	(0.620)
Mother nutritional knowledge (index):						
Sugar in SSBs	2.346	0.476	5.162	3.868	-4.020	1.368
	(2.407)	(1.572)	(4.571)	(2.013)	(2.080)	(1.692)
Causes of diabetes	-0.952	0.400	-1.565	1.998	0.386	0.609
	(1.345)	(0.872)	(2.537)	(1.117)	(1.154)	(0.939)
Mother parenting practices index:						
Permissive	1.951***	0.707**	-0.882	0.241	0.394	1.355***
	(0.358)	(0.234)	(0.680)	(0.299)	(0.309)	(0.252)
Authoritarian	0.256	-0.130	-0.221	0.082	0.461	0.034
	(0.259)	(0.169)	(0.490)	(0.216)	(0.223)	(0.181)
Authoritative	0.734*	-0.423	-2.439***	-0.366	-0.824**	-0.468
	(0.333)	(0.217)	(0.631)	(0.278)	(0.287)	(0.234)
Constant	-9.635***	2.257	19.431***	1.824	3.914	0.402
	(2.988)	(1.961)	(5.704)	(2.512)	(2.595)	(2.111)
Observations	758	758	758	758	758	758
R-squared	0.120	0.059	0.058	0.053	0.062	0.097

Notes: Standard errors in parentheses. Statistical significance is assessed using BH-adjusted q-values (false discovery rate control): $^{***}q < 0.01$, $^{**}q < 0.05$, $^{*}q < 0.10$. Raw and adjusted p-values are reported in Appendix Table A.3. Omitted education category is greater than high school. Other variables included in the regressions: Child variables: child age, child gender, birthweight. Mom variables: mom age, labor force participation, hours worked outside home, mom married, mom raised in urban environment, grandmother education, age drinking soda for first time. Household variables: household income, cell phone, oven, internet.

Figure 1: Conceptual Framework

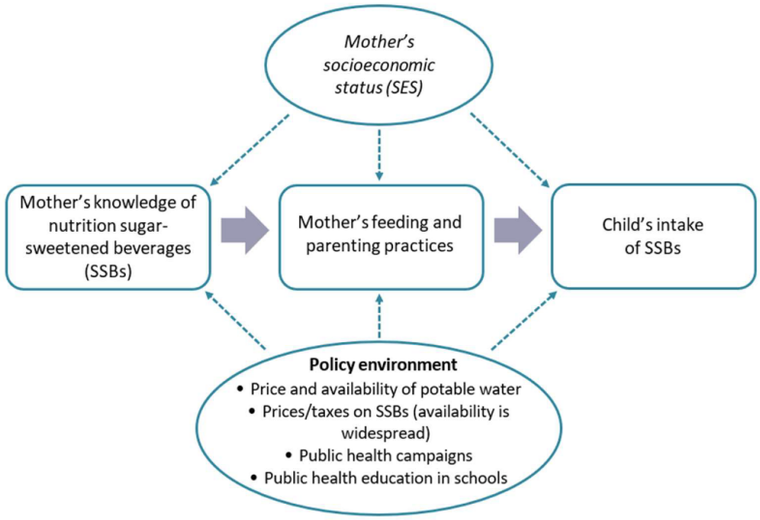

Figure 1

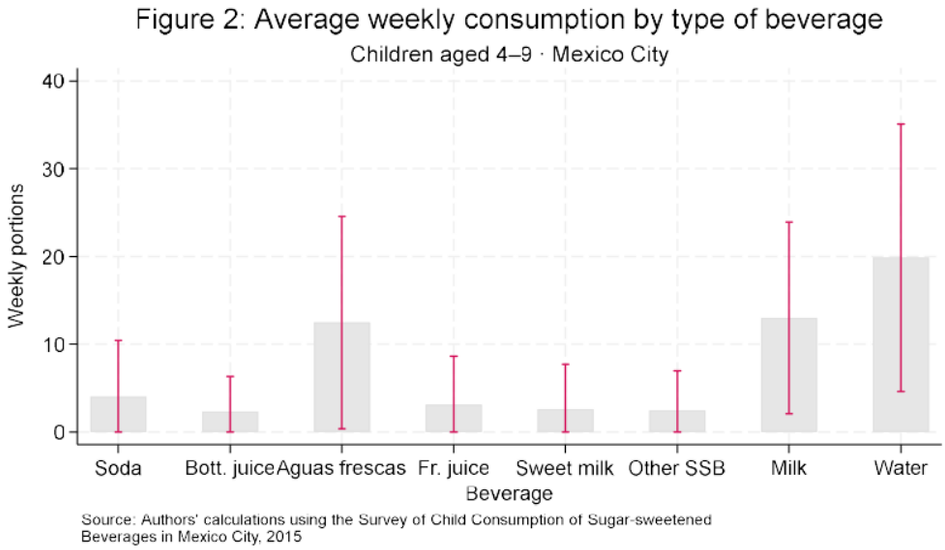

Figure 2

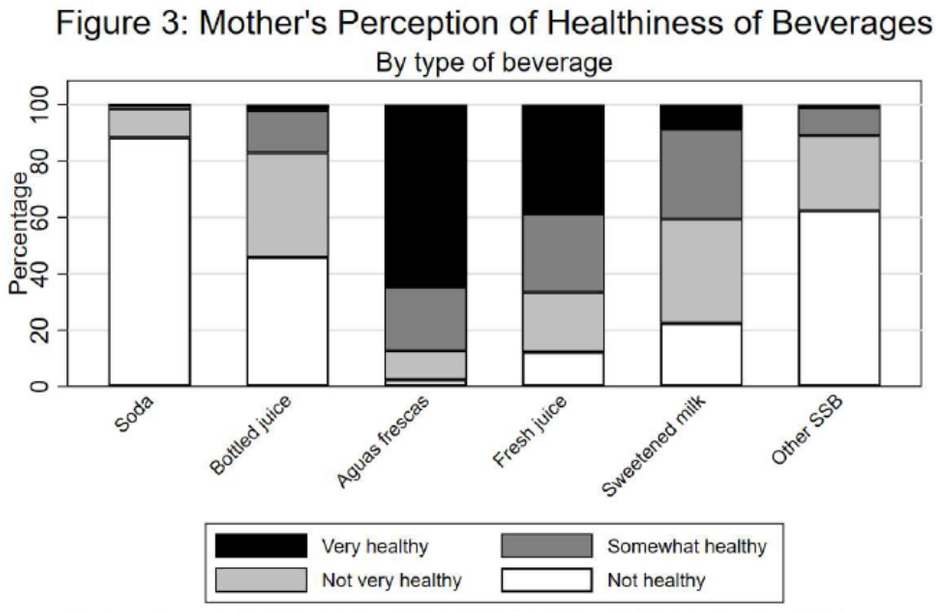

Figure 3

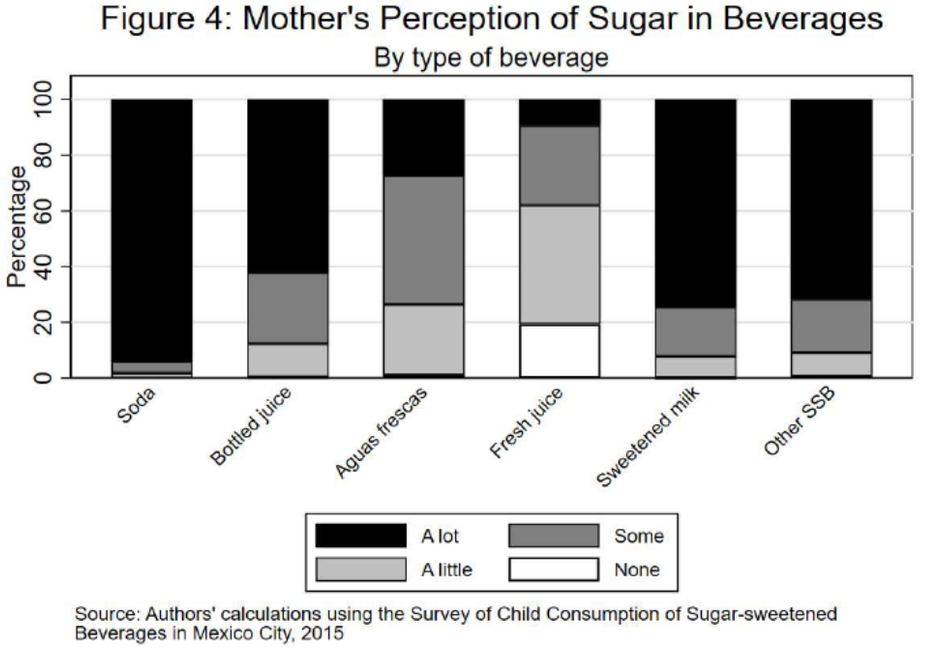

Figure 4

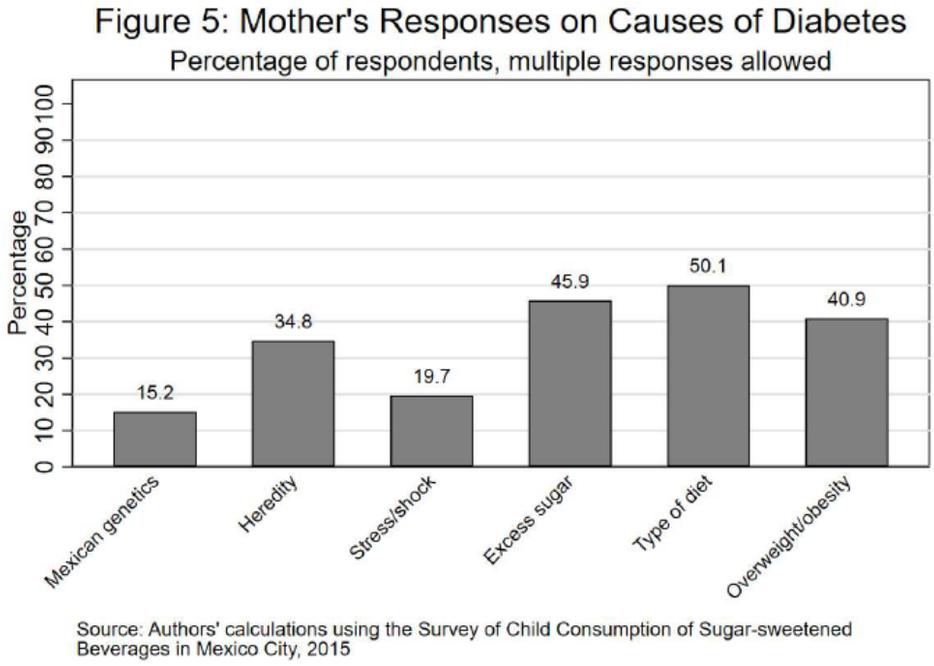
Figure 5: Mother's Responses on Causes of Diabetes
Percentage of respondents, multiple responses allowed
Percentage
0 10 20 30 40 50 60 70 80 90100
15.2
34.8
19.7
45.9
50.1
40.9
Mexican genetics
Heredity
Stress/shock
Excess sugar
Type of diet
Overweight/obesity
Source: Authors' calculations using the Survey of Child Consumption of Sugar-sweetened Beverages in Mexico City, 2015

Figure 5

Appendix

Appendix Table 1: *Raw and Adjusted p-values for Table 3*

Panel: Soda		
Variable	**p-value**	**q-value (BH)**
Primary or Less	0.0043	0.0173
Secondary)	0.0645	0.1291
High School	0.1374	0.2198
Sugar in SSBs	0.2658	0.3042
Causes of Diabetes	0.4894	0.4894
Permissive	0.0000	0.0000
Authoritarian	0.2662	0.3042
Authoritative	0.0280	0.0747
Panel: Bottled Juice		
Variable	**p-value**	**q-value (BH)**
Primary or Less)	0.0517	0.2068
Secondary	0.4391	0.8781
High School	0.6465	0.9288
Sugar in SSBs	0.7621	0.9288
Causes of Diabetes	0.9288	0.9288
Permissive	0.0026	0.0206
Authoritarian	0.8403	0.9288
Authoritative	0.4367	0.8781
Panel: Aguas frescas		
Variable	**p-value**	**q-value (BH)**
Primary or Less)	0.1950	0.5184
Secondary	0.2592	0.5184
High School	0.5053	0.7166
Sugar in SSBs	0.5375	0.7166
Causes of Diabetes	0.8750	0.8750
Permissive	0.0001	0.0010
Authoritarian	0.6517	0.7448
Authoritative	0.2080	0.5184
Panel: Fresh Juice		
Variable	**p-value**	**q-value (BH)**
Primary or Less)	0.0391	0.1431
Secondary	0.1782	0.3244
High School	0.2028	0.3244
Sugar in SSBs	0.4733	0.6310
Causes of Diabetes	0.8951	0.8951
Permissive	0.0042	0.0339
Authoritarian	0.7379	0.8433
Authoritative	0.0536	0.1431

Panel: Sweetened Milk

Variable	p-value	q-value (BH)
Primary or Less)	0.0741	0.2966
Secondary	0.4219	0.8032
High School	0.5628	0.8032
Sugar in SSBs	0.6364	0.8032
Causes of Diabetes	0.8033	0.8033
Permissive	0.0551	0.2966
Authoritarian	0.7028	0.8032
Authoritative	0.1883	0.5021

Panel: Other Flavored Drinks

Variable	p-value	q-value (BH)
Primary or Less)	0.0456	0.1824
Secondary	0.2647	0.5294
High School	0.4191	0.6705
Sugar in SSBs	0.5166	0.6888
Causes of Diabetes	0.8851	0.8851
Permissive	0.0000	0.0000
Authoritarian	0.8536	0.8851
Authoritative	0.2632	0.5294

Notes: This table reports raw p-values and Benjamini–Hochberg–adjusted q-values corresponding to the coefficients reported in Table 3. Adjustments are performed within outcome-specific hypothesis families (family size = 8). Statistical inference in the main text is based on q-values.

Appendix Table 2: Weighted OLS multiple regression of weekly servings of soda consumed by child

VARIABLES	1	2	3	4
Mother's socioeconomic and education				
Mom´s age	-0.057*	-0.055	-0.037	-0.040
	(0.034)	(0.034)	(0.034)	(0.033)
Hours worked	0.006	0.005	0.004	0.004
	(0.015)	(0.015)	(0.015)	(0.015)
Working outside home	-0.591	-0.514	-0.690	-0.518
	(0.788)	(0.791)	(0.772)	(0.779)
Married	-0.593	-0.548	-0.653	-0.611
	(0.557)	(0.558)	(0.544)	(0.545)
Mom born in urban area	1.107*	0.989	0.779	0.479
	(0.656)	(0.662)	(0.651)	(0.662)
Mom completed primary	3.622***	3.561***	2.878***	3.048***
	(1.018)	(1.019)	(1.004)	(1.074)
Mom completed secondary	1.983**	1.959**	1.459*	1.687*
	(0.891)	(0.891)	(0.875)	(0.919)
Mom completed HS	1.570*	1.583*	1.232	1.301
	(0.898)	(0.898)	(0.880)	(0.885)
Mother nutritional knowledge (indices)				
Nutrition knowledge index		3.687	2.716	2.569

		(2.424)	(2.370)	(2.404)
Diabetes knowledge index		-0.789	-0.963	-0.934
		(1.370)	(1.340)	(1.342)
Maternal parenting practices				
Permissive			1.990***	1.876***
			(0.355)	(0.359)
Authoritarian			0.240	0.278
			(0.258)	(0.258)
Authoritative			0.790**	0.719**
			(0.326)	(0.332)
Background and household control variables				
Age mom began drinking soda				0.011
				(0.076)
Grandma completed primary				-0.243
				(0.587)
Grandma completed secondary				0.124
				(0.710)
Mom is obese				1.057**
				(0.511)
Household income				0.236
				(0.539)
Refrigerator				0.761
				(0.766)
Cellular				-1.659**
				(0.677)
Oven				0.522
				(0.522)
Internet				1.130**
				(0.490)
Child characteristics				
Age	0.600***	0.604***	0.591***	0.581***
	(0.143)	(0.143)	(0.140)	(0.140)
Female	-0.954**	-0.988**	-0.935**	-1.046**
	(0.467)	(0.467)	(0.456)	(0.461)
Birthweight	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.924	-2.076	-9.679***	-9.535***
	(2.176)	(2.436)	(2.808)	(2.982)
Observations	758	758	758	758
R-squared	0.052	0.055	0.105	0.125

Notes: Standard errors in parentheses. Omitted education category is greater than high school.
* $p < 0.01$, ** $p < 0.05$, *** $p < 0.1$

Appendix Table 3: Weighted OLS multiple regression of weekly servings of bottled juice consumed by child.

VARIABLES	(1) 1	(2) 2	(3) 3	(4) 4
Mother's socioeconomic and education				
Mom´s age	-0.012	-0.013	-0.006	0.003
	(0.021)	(0.021)	(0.022)	(0.023)
Hours worked	-0.003	-0.003	-0.004	-0.003
	(0.010)	(0.010)	(0.010)	(0.010)
Working outside home	0.759	0.723	0.701	0.770
	(0.501)	(0.504)	(0.500)	(0.506)
Married	-0.768**	-0.766**	-0.767**	-0.770**
	(0.354)	(0.355)	(0.352)	(0.354)
Mom born in urban area	0.520	0.493	0.349	0.224
	(0.417)	(0.422)	(0.421)	(0.431)
Mom completed primary	0.758	0.787	0.447	0.493
	(0.647)	(0.649)	(0.650)	(0.698)
Mom completed secondary	0.169	0.189	-0.050	0.097
	(0.567)	*(0.568)*	*(0.566)*	*(0.597)*
Mom completed HS	0.197	0.191	-0.022	0.025
	(0.571)	(0.572)	(0.570)	(0.575)
Mother nutritional knowledge (indices)				
Sugar in SSBs		0.430	0.243	0.284
		(1.543)	(1.533)	(1.563)
Causes of diabetes		0.726	0.492	0.392
		(0.872)	(0.867)	(0.872)
Mother's parenting practices				
Permissive			0.767***	0.696***
			(0.229)	(0.234)
Authoritarian			-0.169	-0.147
			(0.167)	(0.168)
Authoritative			-0.376*	-0.448**
			(0.211)	(0.216)
Background and household control characteristics				
Age mom began drinking soda				-0.055
				(0.050)
Grandma completed primary				-0.365
				(0.381)
Grandma completed secondary				0.342
				(0.462)
Mom is obese				0.431
				(0.332)
Household income				0.060
				(0.351)
Refrigerator				-0.128
				(0.498)

Cellular				-0.709
				(0.440)
Oven				0.224
				(0.322)
Internet				0.233
				(0.318)
Child characteristics				
Age	-0.019	-0.020	-0.023	-0.023
	(0.091)	(0.091)	(0.090)	(0.091)
Female	0.094	0.091	0.067	0.011
	(0.297)	(0.298)	(0.295)	(0.300)
Birthweight	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	2.566*	2.132	1.794	2.594
	(1.384)	(1.551)	(1.817)	(1.939)
Observations	758	758	758	758
R-squared	0.022	0.023	0.044	0.057

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix Table 4: Weighted OLS multiple regression of weekly servings of aguas frescas consumed by child.

VARIABLES	(1) 1	(2) 2	(3) 3	(4) 4
Mother's socioeconomic and education				
Mom´s age	-0.104*	-0.102	-0.098	-0.068
	(0.062)	(0.062)	(0.063)	(0.066)
Hours worked	-0.022	-0.023	-0.023	-0.018
	(0.028)	(0.028)	(0.028)	(0.028)
Working outside home	-0.888	-0.810	-0.596	-0.840
	(1.456)	(1.465)	(1.453)	(1.471)
Married	-0.289	-0.240	-0.084	-0.131
	(1.030)	(1.032)	(1.024)	(1.029)
Mom born in urban area	0.488	0.354	0.402	0.359
	(1.214)	(1.226)	(1.225)	(1.251)
Mom completed primary	-2.341	-2.404	-2.480	-2.591
	(1.882)	(1.887)	(1.889)	(2.029)
Mom completed secondary	-1.071	-1.093	-1.094	-1.171
	(1.648)	(1.650)	(1.646)	(1.736)
Mom completed HS	-0.129	-0.115	-0.278	-0.277
	(1.661)	(1.662)	(1.656)	(1.672)
Mother nutritional knowledge (indices)				
Sugar in SSBs		4.108	4.978	5.064
		(4.487)	(4.458)	(4.541)
Causes of diabetes		-0.746	-1.134	-1.569
		(2.537)	(2.521)	(2.535)
Mother's parenting practices				
Permissive			-0.912	-0.888
			(0.667)	(0.679)
Authoritarian			-0.210	-0.230
			(0.486)	(0.488)
Authoritative			-2.394***	-2.452***
			(0.613)	(0.628)
Background and household control characteristics				
Age mom began drinking soda				0.132
				(0.144)
Grandma completed primary				-1.482
				(1.109)
Grandma completed secondary				1.609
				(1.341)
Mom is obese				0.541
				(0.966)
Household income				0.967
				(1.019)
Refrigerator				-0.010
				(1.448)

Cellular				0.211
				(1.280)
Oven				-0.667
				(0.936)
Internet				0.349
				(0.925)
Child characteristics				
Age	0.627**	0.631**	0.635**	0.599**
	(0.265)	(0.265)	(0.263)	(0.265)
Female	-1.572*	-1.610*	-1.729*	-1.947**
	(0.864)	(0.865)	(0.859)	(0.872)
Birthweight	0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	13.537***	12.204***	20.679***	19.602***
	(4.023)	(4.510)	(5.281)	(5.634)
Observations	758	758	758	758
R-squared	0.022	0.024	0.045	0.058

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix Table 5: Weighted OLS multiple regression of weekly servings of sweetened milk consumed by child.

VARIABLES	(1) 1	(2) 2	(3) 3	(4) 4
Mother's socioeconomic and education				
Mom´s age	0.020	0.018	0.024	0.033
	(0.027)	(0.027)	(0.028)	(0.029)
Hours worked	-0.001	-0.000	-0.000	-0.000
	(0.012)	(0.012)	(0.012)	(0.013)
Working outside home	0.552	0.475	0.468	0.519
	(0.642)	(0.643)	(0.644)	(0.650)
Married	0.514	0.551	0.549	0.557
	(0.454)	(0.453)	(0.454)	(0.455)
Mom born in urban area	0.374	0.199	0.193	0.027
	(0.535)	(0.539)	(0.543)	(0.553)
Mom completed primary	-0.030	0.032	-0.124	-0.094
	(0.830)	(0.829)	(0.838)	(0.897)
Mom completed secondary	0.281	0.335	0.230	0.503
	(0.727)	(0.725)	(0.730)	(0.767)
Mom completed HS	-0.253	-0.265	-0.361	-0.284
	(0.733)	(0.730)	(0.734)	(0.739)
Mother's nutritional knowledge (indices)				
Sugar in SSBs		3.999**	3.907**	4.348**
		(1.971)	(1.977)	(2.007)
Causes of diabetes		2.053*	1.983*	2.019*
		(1.114)	(1.118)	(1.120)
Mother's parenting practices				
Permissive			0.242	0.270
			(0.296)	(0.300)
Authoritarian			0.140	0.123
			(0.215)	(0.216)
Authoritative			-0.138	-0.304
			(0.272)	(0.277)
Background and household control characteristics				
Age mom began drinking soda				-0.018
				(0.064)
Grandma completed primary				-1.449***
				(0.490)
Grandma completed secondary				-1.617***
				(0.593)
Mom is obese				0.112
				(0.427)
Household income				0.226
				(0.450)
Refrigerator				-0.403

				(0.640)
Cellular				-0.674
				(0.565)
Oven				0.188
				(0.413)
Internet				0.692*
				(0.409)
Child characteristics				
Age	0.035	0.034	0.031	0.018
	(0.117)	(0.116)	(0.117)	(0.117)
Female	0.015	-0.020	-0.018	-0.211
	(0.381)	(0.380)	(0.381)	(0.385)
Birthweight	-0.001	-0.001*	-0.001*	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	2.494	0.178	-0.664	0.981
	(1.775)	(1.981)	(2.342)	(2.489)
Observations	758	758	758	758
R-squared	0.014	0.023	0.026	0.047

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix Table 6: Weighted OLS multiple regression of weekly servings of fresh juice consumed by child.

VARIABLES	(1) 1	(2) 2	(3) 3	(4) 4
Mother's socioeconomic and education				
Mom´s age	-0.023	-0.025	-0.006	0.000
	(0.028)	(0.028)	(0.029)	(0.030)
Hours worked	0.024*	0.025*	0.025*	0.026*
	(0.013)	(0.013)	(0.013)	(0.013)
Working outside home	-1.085	-1.163*	-1.136*	-1.117*
	(0.665)	(0.667)	(0.660)	(0.670)
Married	-0.011	-0.057	-0.035	-0.018
	(0.471)	(0.470)	(0.465)	(0.469)
Mom born in urban area	-0.291	-0.169	-0.130	-0.089
	(0.554)	(0.559)	(0.556)	(0.570)
Mom completed primary	-0.886	-0.824	-1.236	-1.170
	(0.860)	(0.860)	(0.858)	(0.924)
Mom completed secondary	0.150	0.174	-0.087	-0.068
	(0.752)	(0.752)	(0.747)	(0.791)
Mom completed HS	0.818	0.805	0.528	0.586
	(0.758)	(0.757)	(0.752)	(0.762)
Mother's nutritional knowledge (indices)				
Sugar in SSBs		-3.810*	-3.878*	-3.732*
		(2.045)	(2.024)	(2.069)
Causes of diabetes		0.784	0.559	0.399
		(1.156)	(1.145)	(1.155)
Mother's parenting practices				
Permissive			0.353	0.412
			(0.303)	(0.309)
Authoritarian			0.474**	0.485**
			(0.221)	(0.222)
Authoritative			-0.797***	-0.787***
			(0.278)	(0.286)
Background and household control characteristics				
Age mom began drinking soda				0.028
				(0.066)
Grandma completed primary				-0.109
				(0.505)
Grandma completed secondary				0.620
				(0.611)
Mom is obese				-0.301
				(0.440)
Household income				-0.155
				(0.464)
Refrigerator				0.042
				(0.660)

Cellular				-0.188
				(0.583)
Oven				-0.463
				(0.426)
Internet				-0.361
				(0.421)
Child characteristics				
Age	0.035	0.031	0.023	0.019
	(0.121)	(0.121)	(0.119)	(0.121)
Female	-0.116	-0.081	-0.090	-0.048
	(0.394)	(0.394)	(0.390)	(0.397)
Birthweight	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	3.271*	4.473*	3.503	3.408
	(1.837)	(2.055)	(2.398)	(2.566)
Observations	758	758	758	758
R-squared	0.019	0.025	0.052	0.060

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix Table 7: Weighted OLS multiple regression of weekly servings of other flavored drinks consumed by child.

VARIABLES	(1) 1	(2) 2	(3) 3	(4) 4
Mother's socioeconomic and education				
Mom´s age	-0.047**	-0.048**	-0.033	-0.022
	(0.024)	(0.024)	(0.023)	(0.024)
Hours worked	0.011	0.012	0.011	0.009
	(0.011)	(0.011)	(0.010)	(0.011)
Working outside home	-0.494	-0.545	-0.612	-0.453
	(0.550)	(0.553)	(0.539)	(0.545)
Married	-0.264	-0.256	-0.283	-0.337
	(0.389)	(0.390)	(0.380)	(0.381)
Mom born in urban area	1.020**	0.963**	0.766*	0.736
	(0.458)	(0.463)	(0.455)	(0.463)
Mom completed primary	1.454**	1.494**	0.862	0.838
	(0.711)	(0.713)	(0.701)	(0.751)
Mom completed secondary	0.888	0.918	0.474	0.716
	(0.622)	(0.623)	(0.611)	(0.642)
Mom completed HS	0.228	0.221	-0.157	-0.092
	(0.627)	(0.628)	(0.614)	(0.619)
Mother's nutritional knowledge				
Sugar in SSBs		1.093	0.606	-1.349
		(1.694)	(1.654)	(1.681)
Causes of diabetes		1.094	0.759	0.608
		(0.958)	(0.936)	(0.938)
Mother's parenting practices				
Permissive			1.428***	1.428***
			(0.247)	(0.251)
Authoritarian			0.009	0.032
			(0.180)	(0.181)
Authoritative			-0.323	-0.470**
			(0.227)	(0.232)
Background and household control characteristics				
Age mom began drinking soda				-0.049
				(0.053)
Grandma completed primary				-0.719*
				(0.410)
Grandma completed secondary				-0.224
				(0.497)
Mom is obese				0.831**
				(0.357)
Household income				-0.562
				(0.377)
Refrigerator				-0.474

				(0.536)
Cellular				-0.732
				(0.474)
Oven				-0.032
				(0.346)
Internet				0.153
				(0.342)
Child characteristics				
Age	0.138	0.137	0.128	0.134
	(0.100)	(0.100)	(0.098)	(0.098)
Female	-0.124	-0.134	-0.144	-0.210
	(0.326)	(0.327)	(0.319)	(0.323)
Birthweight	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	2.267	1.439	-1.349	0.435
	(1.520)	(1.703)	(1.960)	(2.085)
Observations	758	758	758	758
R-squared	0.024	0.026	0.079	0.097

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix Table 8: *Unweighted OLS multiple regression of weekly servings of sugar-sweetened consumed by child.*

	Weekly portions					
VARIABLES	Soda	Bottled juice	Aguas frescas	Sweetened milk	Fresh juice	Other flavored drinks
Mother education level:						
Primary or less	3.362**	0.626	-2.475	-0.616	-0.999	0.577
	(1.043)	(0.659)	(2.032)	(0.867)	(0.907)	(0.731)
Secondary	1.726**	0.147	-1.347	0.196	-0.181	0.356
	(0.866)	(0.544)	(1.678)	(0.716)	(0.748)	(0.603)
High school	1.426*	0.218	-0.697	-0.587	0.582	-0.190
	(0.823)	(0.517)	(1.594)	(0.680)	(0.711)	(0.573)
Mother nutritional knowledge (index):						
Sugar in SSBs	2.304	2.152	7.794*	4.874**	-3.265	2.531
	(2.410)	(1.518)	(4.683)	(1.997)	(2.089)	(1.684)
Causes of diabetes	-2.024	0.068	-0.411	1.717	0.212	0.231
	(1.329)	(0.833)	(2.568)	(1.096)	(1.146)	(0.924)
Mother parenting practices index:						
Permissive	1.954***	0.653***	-0.642	0.144	0.507*	1.350***
	(0.353)	(0.223)	(0.687)	(0.293)	(0.306)	(0.247)
Authoritarian	0.201	-0.072	-0.171	0.118	0.412*	0.076
	(0.258)	(0.162)	(0.499)	(0.213)	(0.223)	(0.180)
Authoritative	0.879***	-0.400*	-2.251***	-0.299	-0.734***	-0.479**
	(0.327)	(0.206)	(0.635)	(0.271)	(0.283)	(0.228)
Constant	-9.261***	1.522	15.146**	2.128	4.707*	-0.070
	(3.001)	(1.907)	(5.884)	(2.510)	(2.625)	(2.116)
Observations	771	771	771	771	771	771
R-squared	0.124	0.057	0.052	0.047	0.058	0.101

Notes: Standard errors in parentheses. Omitted education category is greater than high school. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Other variables included in the regressions: Child variables: child age, child gender, birthweight. Mom variables: mom age, labor force participation, hours worked outside home, mom married, mom raised in urban environment, grandmother education, age drinking soda for first time. HH variables: household income, cell phone, oven, internet.

Appendix Table 9: *Weighted OLS multiple regression of the probability of child consuming sugar-sweetened beverages.*

	Weekly portions					
VARIABLES	Soda	Bottled juice	Aguas frescas	Sweetened milk	Fresh juice	Other flavored drinks
Mother education level:						
Primary or less	0.188*	0.158	-0.097	-0.073	-0.060	0.023
	(0.070)	(0.086)	(0.063)	(0.082)	(0.085)	(0.085)
Secondary	0.153*	0.049	-0.003	-0.037	-0.022	0.016
	(0.060)	(0.073)	(0.053)	(0.070)	(0.073)	(0.072)
High school	0.078	0.099	0.023	-0.005	0.058	-0.048
	(0.058)	(0.071)	(0.052)	(0.068)	(0.070)	(0.070)
Mother nutritional knowledge (index):						
Sugar in SSBs	0.012	0.001	0.181	0.783***	-0.410	0.430*
	(0.157)	(0.193)	(0.141)	(0.185)	(0.192)	(0.190)
Causes of diabetes	-0.037	0.061	-0.008	0.125	0.011	0.041
	(0.087)	(0.107)	(0.078)	(0.102)	(0.106)	(0.106)
Mother parenting practices index:						
Permissive	0.078**	0.068	-0.000	0.034	0.033	0.130***
	(0.023)	(0.029)	(0.021)	(0.027)	(0.029)	(0.028)
Authoritarian	0.026	-0.010	-0.008	0.031	0.019	-0.008
	(0.017)	(0.021)	(0.015)	(0.020)	(0.021)	(0.020)
Authoritative	-0.002	-0.022	-0.044	-0.020	-0.039	-0.039
	(0.022)	(0.027)	(0.019)	(0.026)	(0.026)	(0.026)
Constant	-9.635***	2.257	19.431***	1.824	3.914	0.402
	(2.988)	(1.961)	(5.704)	(2.512)	(2.595)	(2.111)
Observations	758	758	758	758	758	758
R-squared	0.086	0.057	0.059	0.075	0.057	0.082

Notes: Standard errors in parentheses. Statistical significance is assessed using BH-adjusted q-values (false discovery rate control): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Omitted education category is greater than high school. Other variables included in the regressions: Child variables: child age, child gender, birthweight. Mom variables: mom age, labor force participation, hours worked outside home, mom married, mom raised in urban environment, grandmother education, age drinking soda for first time. HH variables: household income, cell phone, oven