



Infant sugar sweetened beverage and 100% juice consumption: Racial/ethnic differences and links with fathers' consumption in a longitudinal cohort

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ABSTRACT

The consumption of sugar-sweetened beverages (SSB) and 100% juice before age 12 months is discouraged. We examine racial/ethnic differences in SSB and 100% juice consumption when infants were 6- and 12-months old and examine links between fathers' and infants' beverage consumption. Participants were from a longitudinal cohort of infants and their parents (recruited 2016–2018), followed from birth until the child was 24 months. In 2020, we analyzed data collected when infants were 6- (N = 352 infants and 168 fathers) and 12-months (N = 340 infants and 152 fathers) old. Based on maternal report, 13% of infants consumed 100% juice at 6 months and 31% at 12 months. Two percent of infants consumed SSB at 6 months and 7% at 12 months. In models adjusting for income and education, Black/African American (Black/AA) and Hispanic infants were 5–6 times as likely at 6 months and 3 times as likely at 12 months to consume 100% juice compared with non-Hispanic white and Asian infants. At 12 months, Black/AA and Hispanic infants were 6–7 times as likely to consume SSB than non-Hispanic white and Asian infants after adjusting for covariates. In unadjusted models, infants were more likely to consume 100% juice and SSB at 12 months when their fathers were high consumers (>12times/month) of the beverage; effects were no longer significant after adjusting for income, race/ethnicity, education and maternal beverage consumption. Results highlight the need to implement culturally responsive interventions promoting healthy beverage consumption in infants prior to birth and should concurrently target fathers, in addition to mothers.

1. Introduction

The first 1000 days of a child's life are critical for establishing healthy eating patterns and preventing long term health consequences of a suboptimal diet (Pérez-Escamilla et al., 2017). Dietary patterns in early life are associated with intake in later childhood, adolescence, and adulthood (Sonneville et al., 2015; Fiorito et al., 2010; Mennella and Ventura, 2011; Park et al., 2014; Lott et al., 2019), illustrating that eating patterns in infancy can have implications throughout the life course. Given that beverages are an important part of a child's diet in

regard to both nutrition and hydration, healthy beverage consumption in early childhood has emerged as a public health priority (Lott et al., 2019). Current recommendations state that beyond breast milk or infant formula, additional beverages are neither recommended nor necessary from 0 to 6 months of age (Lott et al., 2019; Eidelman and Schanler, 2012). From 6 to 12 months of age, small amounts of plain drinking water are recommended as part of a healthy diet, but additional beverages are not recommended (Lott et al., 2019). Despite these recommendations, data suggest that consumption of 100% juice and sugar-sweetened beverages (SSB) are relatively common during the first year

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of life (Kay et al., 2018; Pan et al., 2014). Given that the 2020–2025 Dietary Guidelines for Americans will include children under 2 years old for the first time (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015), there is a particular need to build the evidence base on consumption patterns among the youngest children.

The negative impacts of SSB consumption on health are well established (Bleich and Vercammen, 2018). Most notably, SSB consumption is linked with increased risk of obesity among children and adults (Malik et al., 2013). Furthermore, consumption of SSB in infancy predicts intake at age 6 (Park et al., 2014), lending support to the importance of early prevention in order to establish healthy dietary patterns across the life course. In addition to SSB, 100% fruit juice is an emerging risk factor for obesity in children (Shefferly et al., 2016) and may be a gateway drink for later SSB intake (Sonnevile et al., 2015). Despite these facts, 100% juice is often perceived as a healthy option (Heyman and Abrams, 2017), demonstrating the necessity of focusing on 100% juice as well as SSB when designing preventive interventions for healthy beverage consumption in children.

This longitudinal study examines infant consumption of SSB and 100% juice at ages 6- and 12-months and addresses two noteworthy gaps in the literature, including a focus on children as young as 6 months and the inclusion of fathers. First, we examine racial/ethnic differences in consumption of each beverage at 6 and 12 months. Nationally representative data from NHANES show that non-Hispanic Black children consumed the most 100% juice and SSB at age 2 compared with other racial/ethnic groups (Demmer et al., 2018; Grimes et al., 2017). An expert panel convened by Healthy Eating Research in 2019 on healthy beverage consumption in early childhood set forth a series of future research recommendations that highlight the need for further results by race/ethnicity and income (Lott et al., 2019). This study extends prior research by examining whether racial/ethnic disparities in SSB and 100% juice consumption are present when children as early as 6 months of age. Second, this study examines the association between fathers' SSB and 100% juice consumption and infant consumption of the same beverages. The types of foods and beverages that young children are exposed to are largely dependent on their caregivers (Pérez-Escamilla et al., 2017). While there is an emerging literature on maternal predictors of infant beverage consumption, highlighting the roles of demographic factors (e.g., maternal age, race, education) and duration of breastfeeding on the introduction of both SSB and 100% juice (Tovar et al., 2019), no studies to our knowledge have examined the influence of fathers.

2. Methods

2.1. Participants

Data were drawn from the Rise & SHINE (Sleep Health in Infancy and Early childhood) study, a longitudinal observational study of mothers and their newborn infants over the first two years of life. In a sub-sample of families, fathers were also recruited. The primary objective of the Rise & SHINE study is to examine associations of infant sleep patterns with growth from birth to 24 months. Eligible infants were singleton, born at least 37 weeks' gestation, and free from genetic disorders, congenital malformations or other conditions that could affect sleep or growth. Eligible mothers were biological mothers of the target infant, at least 18 years of age, fluent in either English or Spanish, and free from any significant psychosocial/mental health conditions, sleep disorder or substance use disorder that could limit her participation in the study. Eligible fathers were biological fathers living in the same household as the infants. Partners Health Care Institutional Review Board approved the study procedures and materials.

2.2. Procedures

Recruitment of mother-infant dyads took place between May 2016 and June 2018 (referred to as the main study). Mothers and their newborns were recruited, following delivery, in the labor and delivery unit of a large hospital in Massachusetts. Trained research staff explained the study, determined mothers' and infants' eligibility, obtained mothers' written informed consent and administered a brief intake survey. In October 2016, the recruitment protocol was expanded to include eligible fathers (referred to as the father sub-study). Fathers were recruited in the delivery ward at the time when mothers were recruited using similar procedures. If the father was not present at the time of recruitment but was deemed eligible, a link to a consent form and survey were emailed to him using contact information provided by mothers.

Data were collected for mother-infant dyads (main sample) when the enrolled infant was 1, 6, 12 and 24 months old by trained research assistants during scheduled home visits. Fathers participated in the study at 6 and 12 months only. To facilitate their participation, fathers completed all surveys online. The current study utilizes demographic data collected at enrollment and beverage data collected at 6 and 12 months for the main sample and the father sub-sample (data freeze 8-31-19).

2.3. Measures

Infant beverage consumption. When the infant was 6 and 12 months, mothers responded to the following questions from the CDC Infant Feeding Practices survey (6 and 12 month surveys) (Fein et al., 2014): *In the past 7 days, how often was your baby fed... (1) 100% fruit or 100% vegetable juice and (2) sugar-sweetened beverages (SSB) including juice drinks, soft drinks, soda, sweet tea, and drinks such as kool-aid.* Mothers were instructed to write in the number of feedings, including feedings by everyone who feeds the baby and snacks and night-time feedings.

Parent beverage consumption. Fathers' beverage consumption was measured when infants were 6- and 12-months using questions from the NHANES Dietary Screener Questionnaire (National Cancer Institute, 2015). Fathers were asked to indicate how often, on average, in the past 4 weeks they drank: (a) 100% pure fruit juices such as orange, mango, apple, grape and pineapple juices; (b) punch, sweetened fruit drinks, sports drinks, Kool-Aid, Tampico, lemonade, Hi-C, cranberry drink, Goya, or Vitamin Water; and (c) any regular sodas or soft drinks, including Manzanita, Penafiel, Coke, Pepsi, Dr. Pepper, or Mountain Dew (excluding diet sodas). Response options were: never, less than once per week, once per week, 2–4 times per week, daily or nearly daily, 2–4 times per day and 5 or more times per day. All scores were converted to a metric of monthly consumption. For response options that were ranges, the mid-point of the range was used for the conversion; for example, 3 times per day was used for 2–4 times per day, which was then converted to 90 times per month. SSB consumption was calculated as the sum of (b) and (c). Mothers' SSB and 100% juice consumption at 6 months, covariates in the current study, were measured and coded using the same instrument and methods as for fathers.

Family Demographics. Family demographic information was collected at enrollment. Mothers reported their child's race/ethnicity (non-Hispanic white, Hispanic, Asian, non-Hispanic Black). Mothers also reported their household annual income, relationship with the target child's biological father, education and employment status. Fathers reported their education and employment status.

2.4. Analytic approach

Prior to testing the research questions, we examined item distributions and cross-distributions and calculated descriptive statistics. To address the skewed nature of the infant beverage data and facilitate interpretation of the results, infant consumption scores at both 6 and

Table 1
Sample characteristics for the main sample and father sub-sample.

	Main sample ¹ N (%)	Father sub-sample ² N (%)
Child race/ethnicity		
Non-Hispanic white	145 (41.9%)	82 (48.8%)
Black/African American	29 (8.4%)	10 (5.7%)
Hispanic	118 (34.1%)	42 (25.0%)
Asian	54 (15.6%)	34 (20.2%)
Family income		
<\$80,000	132 (38.8%)	45 (27.0%)
>\$80,000	208 (61.2%)	122 (73.0%)
Parent marital status		
Married	280 (80.7%)	155 (91.1%)
Maternal education		
<Bachelor's degree	101 (28.7%)	36 (21.8%)
>Bachelor's degree	251 (71.3%)	134 (78.8%)
Maternal employment		
Full time	189 (53.7%)	106 (61.9%)
Paternal education		
<Bachelor's degree		34 (19.9%)
>Bachelor's degree		137 (80.1%)
Paternal employment		
Employed full time		152 (88.9%)

¹Main sample = mother-infant dyads. Demographic data reported when infants were 6 months old (N = 352 dyads).

²Father sub-sample = father-mother-infant triads. Data reported when infants were 6 months (N = 171 triads).

Data were collected 2016–2018 in Massachusetts, USA.

12 months were dichotomized to reflect whether the infant consumed any SSB or 100% juice at each age. Mothers' and fathers' education were coded as less than a bachelor's degree versus bachelor's degree or higher. Family income was coded as <\$80,000 per year versus \$80,000 or more per year, which is consistent with the U.S. Department of Housing and Urban Development's definition of low-income limit for a household size of 3–4 individuals in the Boston area in 2018. Data analysis was performed in 2020 using SAS 9.4.

We tested each research question using the largest possible sample. We examined the number of infants consuming each beverage at ages 6 and 12 months and racial/ethnic differences in infant beverage consumption using data from the main sample, which included 352 mother-infant dyads at 6 months and 340 dyads at 12 months. We assessed links between fathers' and infants' beverage consumption using data from the father sub-sample, specifically fathers with complete data when infants were 6 and 12 months old (N = 145).

To address the first research question, we calculated the number and percentage of infants consuming each beverage at 6 months and at

12 months and used logistic regression to assess racial/ethnic differences in the likelihood of infants consuming 100% juice, and SSB, at each age. We ran unadjusted and adjusted models, with adjusted models including household income and mothers' education as covariates. Mothers' education was used as a covariate in these models because father's education was not measured for all infants in the main sample. Given instability observed in the model at 6 months, with large confidence intervals and non-convergence of the SSB model at 6 months, we reran the models combining non-Hispanic white and Asian infants as the referent category. The rationale for this strategy was that Hispanic and Black infants were the predominant focus of the analysis and similar rates of SSB consumption were observed for Asian and non-Hispanic white infants. To support transparent reporting, we also provide results for the four racial/ethnic groups separately, with non-Hispanic white as the referent category, in a supplemental table.

The second research question focused on associations between fathers' and infants' beverage consumption. We utilized logistic regression to assess links between fathers' SSB (and 100% juice) consumption across ages 6 and 12 months and infants' consumption of the same beverage at 12 months. That is, we examined the longitudinal effect of fathers' consumption over the first year of life on infants' consumption at age 12 months. In order to capture information on fathers' consumption across both time points and address the highly skewed nature of fathers' beverage consumption, we operationalized fathers' consumption as the number of times they were categorized as high consumers of a beverage across the 6 and 12 month assessments (range = 0–4 times classified as a high consumer). High consumption was defined as consuming a beverage 12 or more times a month, which was approximately the top quartile for SSB and for 100% juice consumption. Covariates in the analysis included race/ethnicity, mothers' education and mothers' SSB consumption at 6 months. Mothers' education was used as a proxy for fathers' education given high rates of missingness for fathers' education.

3. Results

3.1. Sample characteristics

Approximately, 42% of infants in the main sample were non-Hispanic white, 34% were Hispanic, 8% were Black/African American (Black/AA) and 16% were Asian (Table 1). Thirty nine percent of families reported an income of less than \$80,000, 29% of mothers reported less than a bachelor's degree and 19% of mothers were not married. In comparison to the main sample, the father sub-sample included a larger

Table 2
Infants consuming any juice/SSB at 6 months and 12 months and demographic makeup of those infants (Main sample).

	100% Fruit or Vegetable Juice		Sugar-sweetened beverages (SSB)	
	6 months	12 months	6 months	12 months
N, (%) infants consuming the beverage	47 (13.3%)	101 (29.7%)	8 (2.3%)	24 (7.1%)
Of those who consumed a beverage...				
Race/ethnicity (child)				
Non-Hispanic white	3 (6.7%)	18 (18.2%)	0 (0%)	4 (17.4%)
Asian	4 (8.9%)	7 (7.1%)	1 (12.5%)	0 (0%)
Black/African American	7 (15.6%)	14 (14.1%)	2 (25.0%)	3 (13.0%)
Hispanic	31 (68.9%)	60 (60.6%)	5 (62.5%)	16 (69.5%)
Family income				
<\$80,000	31 (68.9%)	70 (72.2%)	6 (85.7%)	15 (65.2%)
>\$80,000	14 (31.1%)	27 (27.8%)	1 (14.3%)	8 (34.8%)
Maternal education				
<4-year degree	27 (57.5%)	53 (52.5%)	4 (50%)	12 (50.0%)
>4-year degree	20 (42.6%)	48 (46.2%)	4 (50%)	12 (50.0%)

¹If Ns in each category do not add to the total N for infants consuming the beverage, the difference is due to missing data.

SSB = sugar-sweetened (soda, punch, fruit drinks).

Main sample, N = 352 at 6 months and 340 at 12 months.

Data were collected 2016–2018 in Massachusetts, USA.

proportion of non-Hispanic white and Asian infants, families with an income greater than \$80,000, mothers and fathers with a bachelor's degree or higher and mothers (and fathers) who were married. In addition, fathers with complete beverage data across ages 6 and 12 months were more educated, had higher household income and were more likely to be non-Hispanic white than fathers who were missing data at 6- or 12-months.

Thirteen percent of infants consumed 100% juice at 6 months and 30% at 12 months (Table 2). Two percent of infants consumed SSB at 6 months and 7% at 12 months. Disproportionate numbers of Hispanic and Black/AA infants consumed 100% juice or SSB at each age. For example, while Hispanic infants made up 34% of infants in the main sample, they represented 69% of infants consuming 100% juice and 63% of infants consuming SSB at 6 months. Similarly, while Black/AA infants made up 8% of infants in the main sample they represented almost 16% of infants consuming 100% juice and 25% of infants consuming SSB at 6 months.

3.2. Racial/ethnic differences in infant beverage consumption

In unadjusted logistic regression models, Black/AA and Hispanic infants were significantly more likely to consume SSB and 100% juice than the referent group of non-Hispanic white and Asian infants, with odds ratios ranging between 6 and 14 (Table 3). When adjusting for income and maternal education, racial/ethnic differences were generally attenuated but remained significant. At 6 months, Black/AA (OR = 5.91, 95% CI = 1.68 – 20.80) and Hispanic (OR = 6.16, 95% CI = 2.20 – 17.21) infants were approximately 6 times as likely to consume 100% juice as non-Hispanic white/Asian infants. At 12 months, Black/AA (OR = 3.26, 95% CI = 1.19 – 8.92) and Hispanic (OR = 3.83, 95% CI = 1.88 – 7.78) infants were approximately 3 times as likely to consume 100% juice as non-Hispanic white/Asian infants. For SSB consumption, racial/ethnic differences were significant in adjusted models at 12 months but not 6 months. At 12 months, Black/AA (OR = 6.27, 95% CI = 1.14 – 34.37) and Hispanic (OR = 7.87, 95% CI = 2.13 – 29.02) infants were approximately 6–7 times as likely to consume SSB as non-Hispanic white/Asian infants.

3.3. Links between fathers' and infants' beverage consumption

Fathers reported consuming SSB an average of 9.48 (sd = 17.74) times per month at 6 months and 7.71 (sd = 19.32) times per month at 12 months. They consumed 100% juice an average of 6.45 (sd = 8.22) times per month at 6 months and 8.46 (14.55) times per month at 12 months. Table 4 reports results from logistic regression models testing associations between fathers' 100% juice and SSB consumption across ages 6 to 12 months and infant consumption of the same beverage at 12 months. Significant father-infant associations were identified in

the unadjusted models. Each unit increase in the number of times that fathers reported high consumption (i.e., > 12 times per month) of 100% juice was associated with approximately a 65% increase in the odds of an infant consuming 100% juice by age 12 months (OR = 1.65, 95% CI = 1.02–2.66). For SSB consumption, each unit increase in the number of times that fathers reported high consumption was associated with approximately a 3-fold increase in the odds of an infant consuming SSB by 12 months. Associations between fathers' and infants' SSB and 100% juice consumption were attenuated and no longer significant after adjusting for race/ethnicity, income, education and mothers' beverage consumption.

4. Discussion

In this study, 13% of infants consumed 100% juice and 2% consumed SSB at 6 months. At 12 months, 30% consumed 100% juice and 7% consumed SSB. Consumption rates at 12 months are similar to those reported in two large national studies (Kay et al., 2018; Grimes et al., 2017). Consistent with prior studies (Pan et al., 2014; Beck et al., 2013; Cullen et al., 2002; Garnett et al., 2013; Taveras et al., 2010), noteworthy disparities in infants' 100% juice and SSB consumption were identified: Black/AA and Hispanic infants were approximately six times as likely as non-Hispanic white and Asian infants to consume 100% juice at 6 months and three times as likely at 12 months. In addition, Black/AA and Hispanic infants were 6–7 times as likely as non-Hispanic white and Asian infants to consume SSB at 12 months, while no differences were observed at 6 months. Findings from our study indicate that racial/ethnic differences in 100% juice consumption are present as early as 6 months, persist to 12 months and exist after accounting for differences in income and education. In contrast, differences for SSB consumption were not detectable however until age 12 months.

Fathers who reported high consumption (i.e., >12 times per week) of 100% juice or SSB across ages 6 and 12 months were more likely to have infants who consumed 100% juice or SSB respectively at 12 months than infants whose fathers consumed the beverages less frequently. These effects were attenuated and no longer significant after adjusting for covariates. It is worth noting, that attenuation of the effect for fathers' beverage consumption was primarily driven by race/ethnicity; that is, it was not due to the inclusion of mothers' beverage consumption, which was a non significant covariate. In short, the role of race/ethnicity overrode any specific contributions of fathers' or mothers' beverage consumption.

While it is widely accepted that mothers' diet influences the diets of young children (Robinson et al., 2007; Fisk et al., 2011; Nicklas et al., 2001), the role of fathers has received little attention. These results illustrate that fathers' diet also plays a role in infant beverage consumption, even as early as 6 months. The fact that such links were no longer apparent after accounting for race/ethnicity and education,

Table 3

Racial/ethnic differences in infant juice and sugar-sweetened beverage consumption at ages 6 and 12 months (Main sample).

	Infant 100% Fruit or Vegetable Juice consumption			Infant sugar-sweetened beverage consumption		
	% consume	Unadjusted OR (95% CI)	Adjusted OR (95% CI) ²	% consume	Unadjusted OR (95% CI)	Adjusted OR (95% CI) ²
Child age: 6 mons						
Non-Hispanic white	2.1%	Ref	ref	0.0%	ref	ref
Asian ¹	7.4%			1.8%		
Black/African American	24.2%	8.72 (2.80–27.19)	5.91 (1.68–20.80)	6.9%	14.67 (1.29–167.20)	7.86 (0.54–114.75)
Hispanic	26.3%	9.77 (4.14–23.06)	6.16 (2.20–17.21)	4.2%	8.76 (1.011–75.89)	4.47 (0.37–54.04)
Child age: 12 mons						
Non-Hispanic white	12.8%	ref	ref	2.8%	ref	ref
Asian ¹	13.2%			1.8%		
Black/African American	53.4%	7.89 (3.28–18.97)	3.26 (1.19–8.92)	11.5%	6.20 (1.30–29.43)	6.27 (1.14–34.37)
Hispanic	53.6%	7.80 (4.45–13.66)	3.83 (1.88–7.78)	14.3%	7.92 (2.57–24.33)	7.87 (2.13–29.02)

Main sample, N = 352 at 6 months and 340 at 12 months.

¹Non-Hispanic whites and Asians were combined into one category to reduce the degrees of freedom and maintain analytic power.

²Models are adjusted for family income and maternal education.

Table 4
Fathers' beverage consumption (across ages 6 and 12 months) as a predictor of infant beverage consumption at 12 months, unadjusted and adjusted results (Father sub-sample, full data).

Independent variables	Outcome: Infant consumption of any JUICE at 12 months		Outcome: Infant consumption of any SSB at 12 months	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Fathers' beverage consumption ^{1,2}	1.65 (1.02-2.66)	1.10 (0.58-2.08)	3.07 (1.07-8.83)	2.24 (0.72-7.01)
Race/ethnicity ³		7.44 (2.53-21.88)		8.94 (0.76-104.82)
Low maternal education ⁴		1.95 (0.62-6.13)		0.79 (0.10-6.38)
Mothers' beverage consumption ^{2,5}		1.03 (0.98-1.08)		0.96 (0.82-1.19)

SSB = sugar-sweetened beverages.

Father sub-sample, N = 145 with beverage data at 6 and 12 months (i.e., full data).

1 Fathers' beverage consumption = number of times fathers where a high consumer (i.e., consumed a beverage 12 or more times per month) across ages 6 and 12 months. Range = 0 (never a high consumer) to 2 (high consumer at 6 and 12 months).

2 Fathers' and mothers' beverage consumption refers to the same beverage modeled as the infant outcome (i.e., parent juice consumption predicts infant juice consumption and parent SSB consumption predicts infant SSB consumption).

3 Racial/ethnic minority = Black/African American or Hispanic. Referent group = non-Hispanic white + Asian.

4 Referent group = education >= bachelor's degree.

Mothers' beverage consumption = reported consumption (number of times per month) when the infant was 6 months old.

indicates that the role of fathers' beverage consumption on infant consumption is intertwined with the roles of race/ethnicity and education. It is possible that links between fathers' and infants' beverage consumption may differ for Hispanic and Black/AA children compared with non-Hispanic white and Asian infants, with stronger effects observed for Hispanic and Black/AA children. While we did not test racial/ethnic differences in links between fathers' and infants' beverage consumption, due to limits in sample size, the pattern of findings herein suggests that this may be a worthy question to pursue in future research. Recent research showing links between Hispanic and African American fathers' SSB consumption and their children's SSB consumption, independent of covariates, also lends support to this suggestion (Harris and Ramsey, 2015).

The present study has two major strengths. First, the inclusion of fathers in our study is novel and contributes to the dearth of knowledge on the relationship between infants' and fathers' beverages consumption in the first year after birth. Second, our longitudinal study addresses calls for more longitudinal studies on fathers' influences on children's diet over time (Rahill et al., 2020). Third, we examined racial/ethnic differences in 100% juice and SSB consumption in infants as young as 6 months. These strengths should be balanced against a number of limitations. Our study focused on biological fathers living with the child and birth mother. Future research should explore the relationship between fathers' and infants' beverage consumption in diverse family structures (e.g., single parent households, "blended" families) more reflective of contemporary families. Second, while we utilized questions from a large national study, our diet assessment focused on intake frequency rather than volume. Third, our results may not be generalizable to other populations. Participants in our study were recruited from a large hospital and medical system in Massachusetts.

In summary, while rates of 100% juice and SSB consumption were low in this sample, consumption rates were higher than desired given that neither beverage is recommended for infants (Lott et al., 2019). Overall, results highlight the necessity of developing culturally responsive interventions implemented prior to birth promoting healthy beverage consumption in infants, the importance of avoiding the introduction of 100% juice and SSB, and that it is important to consider the role of fathers' beverage consumption alongside that of mothers.

CRedit authorship contribution statement

K.K. Davison: Conceptualization, Formal analysis, Funding acquisition, Writing - original draft, Writing - review & editing. **R.L. Franckle:** Writing - original draft, Writing - review & editing. **B.K. Lo:** Writing - original draft, Writing - review & editing. **T. Ash:** Investigation, Project administration, Writing - review & editing. **X. Yu:** Data curation, Project administration, Writing - review & editing. **S.J. Haneuse:** Conceptualization, Methodology, Writing - review & editing. **S. Redline:** Conceptualization, Funding acquisition, Writing - review & editing. **E.M. Taveras:** Conceptualization, Funding acquisition, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2021.101324>.

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