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Feeding, television, and sleep behaviors at one year of age in a diverse sample

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ABSTRACT

Background: Healthy lifestyle behaviors that can prevent adverse health outcomes, including obesity, are formed in early childhood. This study describes feeding, television, and sleep behaviors among one-year-old infants and examines differences by sociodemographic factors.

Methods: Caregivers of one-year-olds presenting for well care at two clinics, control sites for the Greenlight Study, were queried about feeding, television time, and sleep. Adjusted associations between sociodemographic factors and behaviors were performed by modified Poisson (binary), multinomial logistic (multi-category), or linear (continuous) regression models.

Results: Of 235 one-year-olds enrolled, 81% had Medicaid, and 45% were Hispanic, 36% non-Hispanic Black, 19% non-Hispanic White. Common behaviors included 20% exclusive bottle use, 32% put to bed with bottle, mean daily juice intake of 4.1 ± 4.6 ounces, and active television time 45 ± 73 min. In adjusted analyses compared to Hispanic caregivers, non-Hispanic Black caregivers were less likely to report exclusive bottle use (odds ratio: 0.11, 95% confidence interval [CI] 0.03–0.39), reported 2.4 ounces more juice (95% CI 1.0–3.9), 124 min more passive television time (95% CI 60–188), and 37 min more active television time (95% CI 10–64). Increased caregiver education and higher income were associated with 0.4 (95% CI 0.13–0.66) and 0.3 (95% CI 0.06–0.55) more servings of fruits and vegetables per day, respectively.

Conclusion: In a diverse sample of one-year-olds, caregivers reported few protective behaviors that reduce the risk for adverse health outcomes including obesity. Differences in behavior by race/ethnicity, income, and education can inform future interventions and policies. Future interventions should strive to create culturally effective messaging to address common adverse health behaviors.

1. Introduction

The first years of life are a critical period of growth and development when important nutritional and lifestyle habits are established. Early adoption of a healthful lifestyle has numerous health benefits, including the prevention of obesity. Prevalence of early childhood obesity has risen over the last few decades. Among two-to five-year-old children in the United States, 12.7% have obesity [1]. There are significant disparities in pediatric obesity by sociodemographic factors. Children in households with higher incomes and children whose head of household has a college

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degree are less likely to have obesity [2,3]. Children identified as African-American or Hispanic face considerably higher rates of obesity [3,4]. Race and ethnicity are social constructs which impact culture, and culture heavily influences feeding and lifestyle. Racism has created racial/ethnic health disparities, in part through structural racism's systematic inequities which create inequitable access to healthy food and green spaces [5–7]. This creates additional barriers to healthful living for minoritized communities. In addressing disparities, it is critical to look for differences in behaviors that may be the result of structural inequities with the goal of designing culturally sensitive interventions to promote healthful behaviors and inform policy discussions to address systemic barriers to health.

Prior studies have found associations between health behaviors during the first years of life and risk of later development of obesity. These include: later bottle-weaning, earlier introduction of solid foods, being put to bed with a bottle, poor diet quality, shorter sleep duration, and greater television (TV) time [8–12]. Increased TV time and having the TV on during meals/snacks have been associated with higher body mass index (BMI) in children [13,14]. Many health habits have previously been shown to carry into older childhood or even adulthood [15,16]. Developmentally, one-year of age is when many infants are first on a regular meal schedule and have increased self-feeding, making it a prime age for health promotion interventions. Some studies have investigated differences among children in feeding and lifestyle behaviors by race/ethnicity, and found significant differences, suggesting that interventions need to be tailored to individual communities [3,16–18]. Few studies have comprehensively explored health behaviors of a diverse sample of one-year-olds in the U.S., particularly those whose families face economic challenges. Identifying where behavior strengths and weaknesses lie allows future interventions to be maximally impactful.

To address this gap, this study aimed to: 1) describe feeding, TV time, and sleep behaviors in racially/ethnically diverse one-year-old infants predominantly from low-income households, and 2) assess for sociodemographic differences among these behaviors. Our hypothesis was that most behavior variation would exist by income with fewer differences associated with race/ethnicity and education, because poverty and the stress of poverty increases barriers to healthy routines [19,20]. Parents experiencing food insecurity have been shown to demonstrate more pressuring feeding behaviors [21] and food insecurity is associated with worse weight trajectories in children [22]. Parenting stress has been shown to be inversely correlated with protective health behaviors among parents of young children [20]. Therefore, we predicted that protective health practices would be associated with higher income.

2. Materials and methods

This study is a retrospective cross-sectional analysis of the infants in the control arm of the Greenlight Study. The Greenlight Study was a cluster randomized obesity prevention intervention for children two months to two years old. Study enrollment and data collection processes were previously described [23]. The Greenlight Study has been registered at www.clinicaltrials.gov (identifier NCT01040897). The study was approved by the institutional review boards at each of the participating university medical centers. In brief, caregiver-infant dyads were enrolled at the two-month well visit at four resident clinic sites. The University of North Carolina at Chapel Hill and the University of Miami/Jackson Memorial Medical Center were the control arm of the study. Eligibility included caregiver's ability to speak English or Spanish. Exclusion criteria included prematurity of more than 34 weeks and any chronic medical problems that may affect weight gain. Participants were included in this study if they had a visit within two months of their first birthday at a control site.

Caregivers completed questionnaires with trained research assistants who were fluent in English or Spanish. The research assistants built rapport with families and asked questions verbally to reduce any literacy challenges. While some demographic data, such as caregiver education and household income, were collected via caregiver self-report at the two-month well visit, many demographic factors were updated at the one-year well visit, including insurance and enrollment in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Caregivers' education was defined as the highest level of school completed. Income was an estimate of total income over the past year for all people in the child's home. Caregivers were asked about their ethnicity and racial identity. This study only included caregivers who identified as Hispanic, non-Hispanic Black/African American, or non-Hispanic White.

2.1. Health behaviors

At the one-year well visit, caregivers completed questionnaires about their infant's diet. Questions about juice and sweetened beverages were phrased as "usually on a typical day". Breastfeeding was counted as affirmative if any exposure was reported. Fast food, fruit and vegetable consumption were collected from a food frequency questionnaire about the previous 24 h. Caregivers also completed questionnaires about their infant's TV exposure and sleep habits. This included questions about passive TV exposure, time when the infant was in a room where the TV on; and active TV exposure, time when the infant was intentionally watching TV; and whether the TV was sometimes or usually on during meals. Those who reported 24 h of passive TV exposure were excluded from the study because these extreme values were not likely plausible, and no method was available to verify them. Caregivers reported average nighttime and nap time sleep on a typical day; those values were summed to calculate 24-h sleep duration. Caregivers reported whether their child usually was put to sleep with a bottle/cup. A "set bedtime" was defined as answering yes to "Does your child usually go to bed at about the same time every night?" Please see supplemental information for additional details.

2.2. Statistical analyses

Infant (sex, age, insurance type, out of home childcare) and caregiver (race/ethnicity, household income, education, age, relationship to child, country of birth, enrollment in WIC, number of children in household) demographics/characteristics were summarized with counts and proportions reported for non-missing categorical variables and means and standard deviations (SD) or medians with 25th and 75th percentiles (Q1-Q3) reported for continuous variables. Similarly, behaviors (feeding, TV, sleep) were summarized with proportions reported for non-missing categorical variables and means ± SD or medians (Q1-Q3) reported for continuous variables.

Modified Poisson regression models were used for binary outcomes to estimate risk ratios (RR), multinomial logistic regression models were used for multi-categorical outcomes to estimate odds ratios (OR), and linear regression models with robust standard error were used for continuous outcomes to estimate average slope change (β), all presented with 95% confidence intervals (CI). Regression models assessing associations between sociodemographic factors and behavior outcomes were controlled for site and infant sex (chosen a priori). Separate models for race/ethnicity, income, and caregiver education were created for each behavior outcome. Due to small cell counts, income was treated as an ordinal variable with the following categories: less than $10,000; $10,000 to $19,999; $20,000 to $39,999; $40,000 or greater. Caregiver education was also treated as an ordinal variable with four categories: less than high school, high school, some college, or college graduate. Of note, 33–40 (14%–17%) participants' data were missing for some behavior outcomes and were excluded from the corresponding outcome-specific analyses. As analyses were considered exploratory, adjustment for type I error was not considered. Data were analyzed using R 4.1.0 (R Core Team, 2021) [24]. For all analyses, a two-tailed p-value <0.05 was considered statistically significant.

3. Results

Our cohort included 235 infant-caregiver dyads. Mean infant age was 12.5(SD 0.5) months, and 48.9% were male (Table 1). The infants were primarily insured through Medicaid (81.3%), and 72.7% were enrolled in WIC. Infants in the study were 45.1% Hispanic, 35.7% non-Hispanic Black, and 19.1% non-Hispanic White. Most infants were in low-income households; only 21.7% reported a household income ≥$40,000 annually. Relative to UNC, caregivers at the Miami site were more likely to identify as Hispanic (54% versus 42%), less likely to identify as non-Hispanic White (9% versus 24%), and more likely to have private insurance (24% versus 10%). Other demographic factors, including percent Spanish speaking, were similar between the sites.

3.1. Health behaviors

In terms of feeding behaviors, few caregivers reported continuing to breastfeed (13.9%, Table 2). Most infants (87.9%) were given juice/sweet beverages on a typical day. Mean ounces of 100% juice on a typical day was 4.1(SD 4.6) ounces. Only 35.6% reported exclusively using a sippy cup; 20.3% of infants were exclusively using a bottle, with the remaining 44.1% using both. Mean servings of fruits and vegetables in the previous 24 h were 3.1(SD 2). Few (4.6%) reported giving their infant any fast food prepared outside the home on the previous day.

For TV behaviors, about half (51.3%) of caregivers reported usually or sometimes having the TV on during mealtimes (Table 2). Mean daily passive TV time was 216.7(SD 184.6) minutes per day. Mean daily active TV time was 44.9(SD 72.7) minutes per day. For sleep practices, 31.8% of caregivers reported putting their infant to bed with a bottle/cup sometimes or most of the time. Most caregivers (85.5%) reported their infant usually had a set bedtime.

Table 1
Demographic characteristics of study sample.

Characteristic	Total N = 235	
	n	(%)
Infant sex		
Male	115	(48.9)
Female	120	(51.1)
Caregiver Race/Ethnicity		
Hispanic	106	(45.1)
Non-Hispanic Black	84	(35.7)
Non-Hispanic White	45	(19.1)
Household income[a]		
<$10,000	60	(25.5)
$10,000-$19,999	67	(28.5)
$20,000-$39,999	57	(24.3)
≥$40,000	51	(21.7)
Caregiver education[a]		
Less than high school	52	(22.1)
High school graduate	74	(31.5)
Some college	57	(24.3)
College graduate	52	(22.1)
Insurance type[b]		
Medicaid	191	(81.3)
Private	35	(14.9)
None	9	(3.8)
WIC, any[b,c]		
Enrolled	144	(72.7)
Not enrolled	54	(27.3)
Caregiver type[b,d]		
Mother	192	(94.1)
Father	11	(5.4)
Other	1	(0.5)
Caregiver born in United States[a]		
Yes	133	(56.6)
No	102	(43.4)
Out of home childcare[b,e]		
Yes	20	(10)
No	180	(90)
Site		
UNC	164	(69.8)
Miami	71	(30.2)
Child age, months (mean ± SD)	12.5 ± 0.5	
Caregiver age, years (mean ± SD)[b]	29.6 ± 6.2	
Number of children in household[a] (median [Q1-Q3])	2	(1–3)

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children; UNC, University of North Carolina at Chapel Hill; SD, standard deviation; Q1-Q3, 25th-75th percentiles.
[a] Collected by caregiver report at enrollment when infant was two months of age.
[b] Collected by caregiver report when infant was one year of age.
[c] Missing for 37 participants.
[d] Missing for 31 participants.
[e] Missing for 35 participants

Table 2
Feeding, television, and sleep behaviors at one year of age.

Behavior	Total N = 235	
	n	(%)
Feeding behaviors		
Any breastfeeding[a]		
Yes	28	(13.9)
No	173	(86.1)
Bottle/Sippy cup use[b]		
Bottle only	41	(20.3)
Sippy cup only	72	(35.6)
Both	89	(44.1)
Sweet drinks[c]		
Usually in a 24 h period	175	(87.9)
Not usually	24	(12.1)
100% Juice, typical ounces in 24 h (mean ± SD)[c]	4.1 ± 4.6	
Servings of fruit/vegetables, 24-h food frequency (mean ± SD)[d]	3.1 ± 2	
Servings of vegetables, 24-h food frequency (mean ± SD)[d]	1.5 ± 1.1	
Fast food, 24-h food frequency[d]		
Any	9	(4.6)
None	186	(95.4)
TV behaviors		
TV on during meal[e]		
Yes, sometimes or usually	101	(51.3)
No	96	(48.7)
Passive TV time on a typical day, minutes (mean ± SD)[f]	216.7 ± 184.6	
Active TV time on a typical day, minutes (mean ± SD)[c]	44.9 ± 72.7	
Sleep habits		
Put to sleep with bottle/cup[a]		
Yes, sometimes or most of the time	64	(31.8)
No, never	137	(68.2)
Set bedtime[g]		
Yes usually	171	(85.5)
No, goes to bed at a different time each night	29	(14.5)
Usual 24-h sleep (naps and nighttime), hours (mean ± SD)[h]	11.8 ± 2.6	

SD, Standard Deviation; TV, television
[a] Missing for 34 participants.
[b] Missing for 33 participants.
[c] Missing for 36 participants.
[d] Missing for 40 participants.
[e] Missing for 38 participants.
[f] Missing for 36 participants and excluding 14 participants reporting 24 h of passive TV time.
[g] Missing for 35 participants.
[h] Missing for 37 participants

3.2. Adjusted analyses

After adjusting for infant sex and site, several caregiver sociodemographic characteristics were associated with protective health behaviors. Non-Hispanic Black caregivers were less likely to report exclusive bottle use compared to Hispanic caregivers (OR 0.11, 95% CI 0.03–0.39, Table 3). Non-Hispanic White caregivers were more likely to report exclusive sippy cup use compared with Hispanic caregivers (OR 2.54, 95% CI 1.07–6.05). Higher caregiver income was associated with 0.3 more servings of fruits and vegetables per day (95% CI 0.06–0.55).

Table 3
Regression models examining the association of feeding and lifestyle behaviors with demographic characteristics.

Behavior	N	Non-Hispanic Black vs Hispanic		Non-Hispanic White vs Hispanic		Income (ordinal)[d]		Education (ordinal)[e]	
		Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value
Any breastfeeding[a]	201	0.47 (0.18, 1.22)	0.120	1.06 (0.47, 2.38)	0.883	1.40 (0.98, 1.99)	0.064	1.26 (0.85, 1.86)	0.254
Bottle/sippy cup use	202								
Bottle vs. Both[b]		**0.11 (0.03, 0.39)**	**<0.001**	0.76 (0.27, 2.18)	0.612	1.12 (0.79, 1.61)	0.524	0.81 (0.57, 1.17)	0.265
Sippy cup vs. Both[b]		1.20 (0.59, 2.46)	0.616	**2.54 (1.07, 6.05)**	**0.035**	1.24 (0.92, 1.67)	0.162	1.22 (0.90, 1.64)	0.200
Any sweet drinks usually within a 24-h period[a]	199	0.90 (0.79, 1.02)	0.104	0.99 (0.88, 1.10)	0.818	1.03 (0.98, 1.08)	0.197	0.98 (0.95, 1.02)	0.347
100% juice usually within a 24-h period (ounces)[c]	199	**2.42 (0.95, 3.90)**	**0.001**	0.49 (−1.11, 2.08)	0.550	−0.29 (−1.07, 0.48)	0.457	−0.04 (−0.54, 0.46)	0.861
Servings of fruits/vegetables 24-h food frequency[c]	195	0.64 (−0.01, 1.30)	0.055	**0.80 (0.15, 1.44)**	**0.015**	**0.30 (0.06, 0.55)**	**0.016**	**0.40 (0.13, 0.66)**	**0.004**
TV usually or sometimes on during meal[a]	197	**2.38 (1.75, 3.23)**	**<0.001**	1.25 (0.79, 1.97)	0.348	0.90 (0.79, 1.03)	0.115	1.03 (0.91, 1.17)	0.640
Passive TV time on a typical day[c]	185	**124.20 (60.36, 188.03)**	**<0.001**	−1.20 (−67.52, 65.12)	0.972	−6.89 (−31.97, 18.19)	0.588	5.55 (−17.36, 28.46)	0.633
Active TV time on a typical day[c]	199	**36.68 (9.67, 63.68)**	**0.008**	−9.73 (−25.95, 6.48)	0.238	−4.82 (−14.59, 4.94)	0.331	−4.70 (−14.13, 4.72)	0.326
Put to bed with a bottle/cup sometimes or most of the time[a]	201	1.32 (0.86, 2.03)	0.201	0.63 (0.31, 1.27)	0.196	0.84 (0.69, 1.01)	0.067	**0.75 (0.62, 0.91)**	**0.004**
Set bedtime usually[a]	200	0.98 (0.85, 1.13)	0.780	**1.16 (1.04, 1.29)**	**0.007**	**1.06 (1.01, 1.11)**	**0.020**	**1.06 (1.01, 1.11)**	**0.031**
24-h total sleep[c]	198	−0.43 (−0.98, 0.12)	0.123	**0.85 (0.30, 1.41)**	**0.003**	0.23 (−0.01, 0.46)	0.059	0.18 (−0.03, 0.39)	0.086

[a] Risk ratio.
[b] Odds ratio.
[c] β
[d] Income: 1 = <$10k, 2 = $10-$19.9k, 3 = $20-$39.9k, 4 = $40k+
[e] Education: 1 = Less than high school, 2 = High school graduate, 3 = Some college, 4 = College graduate or higherRace/ethnicity, income, and education were fit as separate models for each outcome. All models included infant sex and site as covariates.

Increased caregiver education was associated with 0.4 more servings of fruits and vegetables per day (95% CI 0.13–0.66). Non-Hispanic White caregivers reported 0.8 more servings of fruits and vegetables per day (95% CI 0.15–1.44) relative to Hispanic caregivers. Regression models could not be created for fast food due to low event rate. Caregivers with higher education were less likely to put their child to bed with a bottle/cup (RR 0.75, 95% CI 0.62–0.91). Non-Hispanic White caregivers reported being slightly more likely to have a set bedtime, relative to Hispanic caregivers (RR 1.16, 95% CI 1.04–1.29). Higher caregiver income and education were also associated with being slightly more likely to report having a set bedtime (RR of 1.06, 95% CI 1.01–1.11). For 24-h sleep duration, non-Hispanic White caregivers reported 51 min (0.85 h) more of infant sleep (95% CI 18 to 85 min or 0.30 to 1.41 h), compared to Hispanic caregivers.

Variation in caregiver characteristics was also observed for health behaviors that increase risk for obesity. Non-Hispanic Black caregivers reported 2.42 more ounces of 100% fruit juice on a typical day (95% CI 0.95–3.90), compared to Hispanic caregivers. No statistically significant associations with race/ethnicity, income, or education were found for breastfeeding or any sweet beverages. Non-Hispanic Black caregivers reported more infant TV exposure, when compared with Hispanic caregivers. Non-Hispanic Black infants were reported to have 124 more minutes (95% CI 60–188) of passive TV exposure, and 37 more minutes (95% CI 9.7–64) of active TV time on a typical day compared to Hispanic infants. Non-Hispanic Black caregivers were more likely to report the TV is sometimes or usually on during mealtimes relative to Hispanic caregivers (RR 2.38, 95% CI 1.75–3.23). No significant associations with income or education level were found for any TV exposure measures.

4. Discussion

In a relatively low-income, racially/ethnically diverse sample of one-year-old infants, both adverse and protective health behaviors pertinent to childhood obesity risk were identified. While other studies have examined associations with each type of sociodemographic factor, this study is the first to assess multiple demographic factors simultaneously for one-year-old children. Our hypothesis was that more differences in protective health behaviors would be found by income, since the extremes of poverty would also capture some impacts of racism as a driver of poverty [25]; yet our results showed more variation by race/ethnicity. Investigating behavioral differences alone does not address societal barriers to healthful living, such as systemic racism and economic inequality. Rather it can reflect those systemic inequities, shine light on where policies are needed, provide topic areas to focus on during individual counseling, and inform future interventions' culturally effective messaging. Importantly, a number of caregivers reported protective practices that reduce obesity risk such as minimal fast food use, a large portion (85%) had a set bedtime, and mean sleep duration was within the recommended range for one-year-old infants [26]. These are existing areas of strength for child health providers to build upon while engaging families and encouraging further positive behavior change.

Our study found lower rates of fast-food consumption among one-year-old infants compared with previous reports in preschool children [27]. This finding highlights a potential window of opportunity to limit the introduction of fast food around age one-year. Our study also highlights opportunities to improve counseling and support of families in the adoption of healthful behaviors by focusing on: increasing fruit and vegetable consumption, decreasing juice consumption, decreasing TV time, eliminating bedtime bottle use, and complete transition to a sippy cup. While the daily absolute differences in servings of fruits and vegetables were only about half of a serving, this adds up to clinically significant differences over the course of a week. Few caregivers were able to meet the recommended guidelines in these areas. This suggests the need for additional, more effective strategies/policies for addressing these issues with populations at high risk for obesity, who are facing other social and structural barriers to care.

This study found higher rates of sweet beverage consumption on a typical day compared to previous studies that reported only half [28] to 70% [29] of toddlers consumed 100% juice daily. Although our study was not designed to determine reasons for this, part of this discrepancy could be explained by the higher rates of WIC recipients in our sample (73% versus 35% in Kay et al. and 47% in Miles and Siega-Riz) [28,29]. Previously WIC enrollment was associated with increased juice consumption in toddlers [30]. Encouraging limited juice intake will be an important aspect of ongoing obesity prevention interventions; as well as advocating for decreased juice allowances from WIC and increased funds for produce.

Our sample reported significant TV exposure, with mean active TV time of 44.9(SD 72.7) minutes. This is particularly notable given the American Academy of Pediatrics recommends avoiding all media use in children younger than 18 months (with the exception of video chatting) [31]. Other studies have found similar high rates of TV exposure among one-year-old infants [32]. Improved counseling and interventions to limit screen time are needed.

This work adds to the literature demonstrating racial/ethnic disparities in juice consumption [18] and TV behaviors [16,17]. As mentioned above, our hypothesis was there would be more differences in positive health behaviors by income, because the extremes of poverty would encapsulate some impacts of racism as a driver of poverty [25]; yet we found more variation by race/ethnicity. While behavioral differences seen by race/ethnicity are in part due to cultural differences, some of these differences are driven by structural racism and interpersonal experiences of racism. Under-resourced communities are often the result of structural racism, and lead to many racial/ethnic minority groups living in areas with limited access to grocery stores and fresh produce [5,6]. Food and beverage marketing targeted at Hispanic and Black consumers is different, featuring foods that are calorie-dense and nutrient-poor [33,34]. Our findings may also suggest that families are not receiving similar, or similarly effective, counseling in these clinics. Healthcare providers have implicit biases, and racial and ethnic minorities often experience inequities in the healthcare system [35]. It is important to strive for culturally sensitive care and communication with all families [36]. One area for potentially improved culturally effective messaging is around the transition to the sippy cup, as delayed transition is one risk factor for early childhood obesity [8]. Our study found many Hispanic caregivers had not yet transitioned to sippy cups, suggesting a potential focus of future health promotion interventions.

Our study also identified an association between higher caregiver income and education levels with more servings of fruits and vegetables per day and healthier sleep routines. Research studies using sociodemographic factors can be used to aid policy discussions which modify these factors, such as the expansion of the child tax credit or debt-free higher education. It is possible policies that increase household income or educational opportunities could therefore improve children's fruit and vegetable intake. Caregivers with lower educational levels might benefit from tailored strategies to help address their children's fruit and vegetable intake. While our study could not determine whether such interventions would be beneficial to increase children's fruit and vegetable intake, future studies could examine the potential impact of such interventions. As to sleep routines, caregivers with higher education levels were less likely to put their infant to sleep with a bottle/cup. There was no association found between 24-h sleep duration and income or education. This differs from prior work showing that low socioeconomic status was associated with shorter nighttime and 24-h sleep in young infants [37]. Our findings may be attributable to the fact that many caregivers in this sample reported positive sleep behaviors.

This study has a few important limitations. The data were collected by self-report. There may be social pressures to report more positive behaviors since enrollment was at health care offices. Also, the accuracy of self-report may be limited. The data were collected from only two locations. Despite smaller numbers in the Non-Hispanic White group, there was still sufficient power to detect many statistically significant differences. However, a strength of this study is that the sample reflects the most common racial/ethnic groups in the U.S at the highest risk for obesity. While we were not able to examine this in the current study, measurement of perceived racism and discrimination would be important in future studies to see how these behaviors intersect with structural barriers and interpersonal experiences of racism. This study did not collect data on total screen time; instead, questions specifically asked about TV habits and may not reflect screen time totals. We found low rates of fast food outside the home, however foods such as French fries or chicken nuggets prepared in the home would not count as "fast-food" in this study, and the question was about the previous 24-h. In future studies, weekly or monthly measures of fast-food consumption should be considered to capture fast food more completely. However, our study was meant to increase accuracy of self-report and questions about the previous day are more likely to be accurate rather than ones that ask families to tally up past behaviors.

5. Conclusions

Across sociodemographic groups, there are areas for improvement in supporting positive early parenting behaviors of one-year-old infants. Future policies and primary-care interventions should strive to address gaps in healthful behaviors including increasing fruits/vegetables, limiting juice, TV time, eliminating bedtime bottle use, and encourage the transition to a sippy cup. Our study described some differences in behaviors by race/ethnicity, income, and caregiver education that may be useful in informing intervention design and policy change. Expanding on prior interventions to target common behaviors and ensuring culturally effective messaging will be critical moving forward. Under-resourced communities often have disparate access to healthy food and face targeted marketing of unhealthy food. This work may inform policy efforts to promote equity in health promoting resources for all neighborhoods.

Author contribution

Michelle Gorecki: Conceptualization, Methodology, Writing- Original draft preparation, Investigation, Formal analysis; **Eliana Perrin**: Conceptualization, Methodology, Writing- Review and Editing, Supervision, Project administration, Funding acquisition; **Colin Orr**: Investigation, Writing- Review and Editing; **Michelle White**: Investigation, Writing- Review and Editing; **H. Shonna Yin**: Conceptualization, Writing- Review and Editing, Project administration, Funding acquisition; **Lee Sanders**: Conceptualization, Writing- Review and Editing, Project administration, Funding acquisition; **Russell Rothman**: Conceptualization, Writing- Review and Editing, Project administration, Funding acquisition; **Alan Delamater**: Conceptualization, Writing- Review and Editing, Project administration, Funding acquisition; **Tracy Truong**: Methodology, Formal analysis, Writing- Review and Editing; Cynthia Green: Formal analysis, Writing- Review and Editing, Supervision; **Kori Flower**: Conceptualization, Methodology, Investigation, Writing- Review and Editing, Supervision.

Ethical review

This work was approved by the institutional review board of the participating medical institutions. Portions of the data were previously presented at a 2021 national conference; they have not been published elsewhere.

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Role of funder/sponsor (if any)

The NIH had no role in the design and conduct of the study.

Clinical trial registration

This trial has been registered at www.clinicaltrials.gov (identifier NCT01040897).

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.obpill.2022.100051.

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