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Toddler dietary patterns from the INSIGHT randomized clinical trial comparing responsive parenting versus control: A latent class analysis

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Abstract

Objective: The aim of this study was to examine the effect of a responsive parenting (RP) intervention on toddler diet and explore associations with mothers' infant feeding practices and child weight status.

Methods: INSIGHT tested an RP intervention designed for the prevention of obesity against a safety control among primiparous mothers and their infants. Mothers reported on feeding practices, as well as toddler diet with a Food Frequency Questionnaire (n = 229). Trained research staff obtained child anthropometrics at age 2 years.

Results: Latent class analysis identified three dietary patterns: high fruits and vegetables (HFV, 31%); meat, potatoes, and added sugars (MPAS, 24%); and high juice, low fruits and vegetables (JLFV, 45%). Toddler dietary pattern was not related to study group (RP, control) or child weight status at age 2 years. Mothers who reported more structure-based feeding had toddlers that were more likely to have the healthier, HFV dietary pattern than MPAS and JLFV. Findings for

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AUTHOR CONTRIBUTIONS
Jennifer S. Savage, Stephanie Anzman-Frasca, and Ian M. Paul designed and conducted the research; Erika Hernandez and Emily E. Hohman analyzed data; Erika Hernandez and Mackenzie J. Ferrante wrote the paper; Erika Hernandez had primary responsibility for final content. All authors read and approved the final manuscript.

CONFLICT OF INTEREST STATEMENT
The authors have no conflicts of interest to disclose.

SUPPORTING INFORMATION
Additional supporting information can be found online in the Supporting Information section at the end of this article.

control-based feeding practices were mixed; maternal restriction was associated with the HFV dietary pattern, whereas the use of food as a reward was associated with MPAS and JLFV.

Conclusions: Mothers' structure-based feeding practices in infancy, as well as some control-based feeding practices, were associated with later healthier toddler dietary patterns.

INTRODUCTION

Good nutrition is essential for children's development in various domains, including brain development, cognitive performance, and physical growth [1]. Despite the importance of healthful eating, the diets of toddlers in the United States do not meet the US Dietary Guidelines [2], especially with regard to the consumption of fruits and vegetables [3]. Throughout the first 2 years after birth, intake patterns change dramatically, shifting from exclusive breast/formula feeding to consuming the majority of calories from solid foods and beverages that are commonly consumed as part of a typical family meal. Research on diet in toddlerhood is limited [4–8] and has focused on group-averaged intake of individual foods [9–11], which precludes understanding of individual differences and dietary patterns. Dietary intake during toddlerhood may influence later food choice [12, 13] making it a critical age for parents to engage in feeding practices that support children's healthful eating.

There is a strong literature base that ties parent feeding practices to children's nutrition [1]. Two overarching constructs are prominent in this literature: structure-based and control-based feeding [14–17]. Structure-based feeding (e.g., limit setting, implementing consistent routines) provides children with consistent guidance that is appropriate to the child's development, whereas control-based feeding (e.g., pressure, restriction, use of food as a reward, food to soothe) is considered coercive and can undermine the development of children's self-regulation of eating [14, 15]. Structure-based feeding is associated with diets that are more aligned with dietary recommendations in early and middle childhood [16]. In contrast, pressure, restriction, use of food as a reward, and food to soothe in childhood are associated with children's high intake of energy-dense foods and low fruit and vegetable consumption from infancy through childhood [18–23]. Studies have shown that restriction can promote liking and intake of the restricted food item [24], whereas pressure to eat can reduce liking and intake of the target food [25]. However, there are also studies indicating protective effects of pressure [26–28] and restriction [9, 26, 29] on children's intake [30]. These mixed findings may be due to the nuances of parent feeding practices at different points throughout a child's development, warranting longitudinal work on parents' early infant feeding practices and associations with later child diet.

The primary aim of this analysis was to examine the effect of a responsive parenting (RP) intervention on toddler dietary patterns at child age 2 years, building on an analysis conducted with the same RP intervention sample at infant age 9 months. At 9 months, five dietary patterns were identified, and RP infants had higher odds of being in the "formula, fruits and vegetables" pattern compared with safety control infants. It is not yet known if these findings are sustained beyond infancy into toddlerhood. The secondary aims of the current analysis were to explore whether maternal feeding practices during infancy at ages 28 weeks and 1 year are associated with toddler dietary patterns, as well as explore associations of toddler dietary patterns with child weight status at age 2 years.

METHODS

Participants

Healthy, term infants and primiparous mothers were recruited from the maternity ward at Penn State Milton S. Hershey Medical Center in Hershey, Pennsylvania. All newborns were screened for the study by reviewing hospital charts, and study personnel went in-person to the maternity ward to discuss the study and consent eligible and interested mothers. More detailed information on participants and study design have been published elsewhere [31]. The Institutional Review Board at Penn State Hershey approved the study protocol. The study was registered at www.clinicaltrials.gov (NCT01167270) prior to enrollment of the first participant.

Interventions

Dyads were randomized into either the RP or child safety control intervention at 10–14 days postpartum. Research nurses delivered intervention content at 4 home visits (at infant age 3–4, 16, 28, and 40 weeks; approximately 60–90 min each) followed by clinical research center visits at ages 1 and 2 years, and phone calls at 1.5 and 2.5 years (approximately 20–30 min each). Mothers received honoraria up to $415 for participation plus visit-specific gifts that had a retail value of approximately $100. Because of an 87% retention rate of 279 dyads that completed the first study visit, the sample size at the 2-year timepoint was 243, with 229 dyads providing toddler dietary data.

For participants in the RP intervention, research nurses provided guidance on responding to their child's needs in the domains of feeding, sleep, emotion regulation, and interactive play using interactive discussion, handouts, and hands-on demonstration. RP guidance on infant feeding included teaching mothers to recognize hunger and fullness cues. Mothers were also taught to offer age-appropriate foods and portion sizes, to use food for hunger only and not as a reward or punishment or to soothe a distressed (but not hungry) child, to use repeated exposure to promote acceptance of new foods, and to establish household routines and limits. Mothers in the control group received a developmentally appropriate child safety intervention. Messages related to feeding for the safety control group focused on food safety and preventing choking. More detailed information on intervention curricula have been published elsewhere [31]. Intervention fidelity and acceptability were very high [32].

Measures

Demographic characteristics: Demographic characteristics were collected at enrollment. Mothers self-reported on race, ethnicity, highest education attained, and annual household income. Maternal age, prepregnancy weight, and child sex were extracted from medical records.

Maternal feeding practices: Mothers completed the 83-item Infant Feeding Styles Questionnaire (IFSQ) at infant age 28 weeks [33]. The indulgent subscales were excluded from analyses because of high rates of "not applicable" responses, which yielded high rates of missing responses for each item. The laissez-faire subscales were excluded from analyses because of low internal consistency (α = 0.53–0.62), which has also been shown in other studies with samples of varying sociodemographics [34–37]. Pressure subscales included pressure finishing (e.g., "I try to my get (child) to finish his/her food"; α = 0.86), pressure soothing (using feeding to get the child to stop crying; e.g., "The best way to make infant stop crying is to feed him/her"; α = 0.79), and pressure cereal (adding cereal to the bottle to help the child sleep or feel full; e.g., "Cereal in the bottle helps an infant sleep through the night"; α = 0.81). Correlations between pressure subscales ranged from r = 0.35–0.36, $p < 0.0001$, which is consistent with prior research [33]. Restriction subscales included restriction amount ("I carefully control how much my child eats"; α = 0.74) and restricting diet quality ("An infant should never eat fast food"; α = 0.73). The two different restriction subscales were not correlated with one another (r = 0.02, p = 0.76). Responsiveness subscales included responsive satiety ("I let my child decide how much to eat"; α = 0.77) and responsive attention ("I talk to my child to encourage him/her to eat"; α = 0.62). Responsiveness subscales were not correlated (r = 0.10, p = 0.13).

Mothers completed the 34-item Structure and Control in Parent Feeding (SCPF) questionnaire at infant age 1 year [15]. Structure-based feeding subscales included limit setting ("I avoid buying sweets or desserts that I don't want my child to eat"; α = 0.75) and consistent mealtime routines ("My child eats at scheduled meal and snack times, not in-between"; α = 0.75). Control-based feeding subscales included pressure ("I try to get my child to eat even if s/he doesn't seem hungry or says 'I'm not hungry'"; α = 0.81) and restriction ("If my child is eating too much I take some of it away"; α = 0.66). An additional nine questions were added to assess feeding to control behavior, including food to soothe (e.g., "I give snacks or drinks as a way to distract and keep my child quiet when my child is acting out"; α = 0.85) and food as reward (e.g., "I offer my child his/her favorite food(s) as a reward for good behavior"; α = 0.73) [38].

Toddler dietary patterns: Mothers reported on toddlers' diet at 2 years using a 121-item Food Frequency Questionnaire (FFQ) that was modified from the young child's Harvard Service FFQ [39] but has not been validated with these modifications. Modifications included the addition of 26 food items that young children are known to consume (e.g., Goldfish crackers), the addition of 16 items that expanded on 6 items from the Harvard Service FFQ (e.g., "popcorn and pretzels" was separated into two individual items, "popcorn" and "pretzels"), and reporting toddler consumption over the past week (rather than 4 weeks). This modified FFQ was semi-quantitative; there were 9 response options including 0, 1, 2–3, 4–6 times per week, 1, 2, 3, 4–5, and 6 or more times per day. These options were converted to a numeric daily value, using median values for the options encompassing a range (e.g., 4.5 for 4–5 times per day). Variables for the pattern analysis were created by dichotomizing intake of 10 food groups that were derived from relevant FFQ items: starch, milk, other dairy, fruit, vegetables, meat, juice, sugar-sweetened beverages (SSBs), sweets, and fried potatoes, a method that has been previously used and published [40, 41]. Food and beverage groups were dichotomized based on meeting or not meeting a defined number of servings per day, except fried potatoes, which was dichotomized based on servings per week. Cut points were modified from the paper published with the same sample at a previous timepoint [40] by considering developmental differences from child age 9 months to 2 years, recommendations from the Child and Adult Care Food Program (CACFP) [42] and MyPlate [43], as well as discriminatory power in the model (Table S1).

Anthropometrics: Trained research staff, masked to study group, obtained all child measurements at age 2 years. Weight was measured in duplicate to the nearest 0.05 kg using an electronic scale (Seca 354 or Seca 874; Seca). Standing heights for children were measured to the nearest 0.1 cm with a stadiometer (Seca 216; Seca). Additional measurements were taken until two measurements differed by no more than 0.05 kg or 1 cm and means of the measurements were used for analysis. Child body mass index (BMI; calculated as weight in kilograms divided by height in meters squared) for age was converted to percentiles and z scores using the 2000 Centers for Disease Control and Prevention growth reference for children 2 years and older [44]. BMI at or above the 85th percentile but below the 95th percentile was defined as overweight, and BMI at or above the 95th percentile was defined as obesity [45].

Statistical analysis

All analyses were conducted in SAS 9.4 (SAS Institute, Cary, NC). PROC LCA [46], a latent class analysis procedure, was used to identify patterns based on eight food groups from the FFQ including starch, fruit, vegetables, meat, juice, SSBs, sweets, and fried potatoes (milk and other dairy items did not discriminate between patterns, so they were not included in the current analysis). Models were conducted with 1–7 patterns to identify the best-fitting models at child age 2 years, using fit criteria and interpretability of the item response probabilities [46–48]. Next, measurement invariance was tested across intervention groups (RP, control) to confirm that the same class solution was appropriate for both [46]. Invariance was determined. Analyses to address aims were then conducted to (1) examine intervention group differences, (2) explore associations of maternal feeding practices with toddler dietary patterns, and (3) explore associations of toddler dietary patterns with child weight status. Significance was determined at $p < 0.0038$, using a Bonferroni correction to account for the multiple tests conducted in the current analysis.

To address the primary aim of the current analysis, a categorical variable for intervention group assignment (RP or safety control) was entered into the model as a predictor. To address the secondary aims, each feeding practice at 28 weeks and 1 year were entered one at a time into the model, including the categorical variable for intervention group (13 models total). If predictors were significant at $p < 0.0038$, the odds ratios (ORs) and confidence intervals (CIs) generated by the LCA procedure were examined by using a reference group in comparison with the other patterns to identify which patterns were significantly associated with specific predictors. The reference group was planned to be the pattern that most closely aligns with dietary recommendations prior to conducting the LCA. ORs <1 indicate higher odds of having the reference group dietary pattern, whereas ORs >1 indicate higher odds of having the dietary pattern being compared with the reference group. Demographic covariates including child sex, maternal age, maternal education, annual household income, and maternal prepregnancy BMI were tested using backwards deletion, removing covariates if not significant. Finally, latent class membership was used to test the association with child BMI-for-age *z* scores and categorical weight status (≥85th percentile) at age 2 years using an ANOVA and a χ^2 test, respectively.

RESULTS

Participant characteristics

Table 1 presents maternal and family characteristics by intervention group. Mothers and toddlers were predominantly White and non-Hispanic; mothers were predominantly college-educated. No significant differences in demographic characteristics by intervention group were observed.

Pattern analysis of toddler diet

Table 2 presents fit indices for 1–7 class solutions of toddler diet. The fit criteria indicated that the 2-class or 3-class solutions were the best fit. Three fit criteria supported the 3-class solution. Furthermore, the interpretability of the item response probabilities was clearer. Thus, the 3-class solution was selected.

Pattern names were generated based on the item response probabilities of the 8 food groups that were included in the analysis (Table 3). The first dietary pattern, "high fruits and vegetables (HFV)" (31% of participants), was characterized by high consumption of fruits, vegetables, and starch. The second dietary pattern, "meat, potatoes, and added sugar (MPAS)" (24% of participants), was characterized by high consumption of meat, juice, SSBs, sweets, and fried potatoes. Last, the third dietary pattern, "high juice, low fruits and vegetables (JLFV)" (45% of participants), was characterized by high consumption of juice and low consumption of fruits and vegetables (Figure 1).

RP intervention effect on dietary patterns

No significant difference was observed between intervention group (RP, control) and toddler dietary patterns (Table 4).

Associations of feeding practices with dietary patterns

The next set of analyses conducted was to examine associations of mothers' feeding practices in infancy with toddler dietary patterns at age 2 years. At age 28 weeks, 1 of the 7 IFSQ feeding practices was a significant predictor of dietary patterns: restriction of diet quality ($p = 0.0034$). Mothers' higher restriction of diet quality was associated with toddlers' higher odds of having the healthier HFV dietary pattern than the MPAS (OR = 0.46 [0.27–0.79]) or JLFV patterns (OR = 0.42 [0.25–0.72]). When controlling for significant covariates (maternal education and maternal prepregnancy BMI), this finding fell outside the threshold of $p < 0.0038$ ($p = 0.02$). There was no association between dietary patterns and pressure finishing, pressure soothing, pressure with cereal, restrict amount, responsive attention, and responsive satiety feeding styles.

At age 1 year, 3 of the 6 structure and control feeding practices were significant predictors of dietary patterns: limit setting ($p = 0.0001$), consistent routines ($p = 0.0006$), and the use of food as a reward ($p = 0.002$). More limit setting by mothers was associated with toddlers' higher odds of having the healthier HFV dietary pattern than the MPAS (OR = 0.10 [0.04–0.25]) or JLFV patterns (OR = 0.22 [0.09–0.53]). Similarly, mothers who reported implementing more consistent routines had toddlers who had higher odds of having the healthier HFV dietary pattern than the MPAS (OR = 0.19 [0.08–0.046]) or JLFV patterns (OR = 0.30 [0.13–0.68]). Finally, mothers' higher use of food as a reward was associated with toddlers' higher odds of having the JLFV (OR = 6.18 [1.92–19.90]) than the healthier HFV dietary pattern. There was no association between restriction, pressure, the use of food to soothe, the use of food as reward, and dietary patterns. HFV was used as the reference group in all analyses (Table 5).

Associations of dietary patterns with child weight status

Finally, toddler dietary class was not associated with child BMI-for-age *z* scores ($F = 1.05$, $p = 0.35$) or categorical weight status (≥85th percentile; $\chi^2 = 1.73$, $p = 0.42$) at child age 2 years.

DISCUSSION

Three dietary patterns were observed among toddlers. One dietary pattern (HFV) was characterized by high consumption of fruits, vegetables, and starches. The dietary second pattern (MPAS) was characterized by high consumption of meat, fried potatoes, and added sugars. The third dietary pattern (JLFV) was characterized by high consumption of juice and low consumption of fruits and vegetables. Two of these dietary patterns (HFV, JLFV) illustrate how intake of fruits and vegetables, or lack thereof, are major defining factors in the toddler diet, and one dietary pattern (MPAS) illustrates high consumption of high energy-dense foods as a characteristic feature. These findings are consistent with previous literature indicating diets of most US children do not meet the dietary guidelines [3].

Surprisingly, no association between intervention group (RP, control) and toddler dietary patterns was observed at child age 2 years. Findings from this analysis extend the previous work in this sample at infant age 9 months, which identified five dietary patterns and found that RP infants were more likely to have the "Formula, Fruits and Vegetables" dietary pattern than safety control infants [40]. The timeline of the RP intervention messaging may help explain the current lack of findings in the RP versus control groups; there were 4 home visits from birth to child age 9 months in which intervention content was delivered, with less frequent intervention between 1 and 2.5 years. The group differences in dietary patterns at 9 months but not 2 years suggests the importance of additional messaging on the "what" children eat, in addition to the "how," which is focused on feeding practices, particularly as children transition to an exclusively table-food diet and undergo other developmental changes such as neophobia.

Some maternal feeding practices were associated with dietary patterns at age 2 years. Mothers who reported more restriction of diet quality (e.g., restricting what types of food the child eats) at 28 weeks had toddlers who had higher odds of having the healthier

HFV dietary pattern than the MPAS or JLFV patterns at 2 years, although there was no association between mothers' restriction of the amount of food their child consumes at 28 weeks and toddler dietary pattern. In other words, maternal restriction of food types offered to the child at age 28 weeks was associated with the healthier, HFV toddler dietary pattern. We note here that when controlling for maternal education and prepregnancy BMI, this finding fell below the significance threshold identified in the current analysis and should therefore be interpreted in this context. Previous research on restriction has yielded mixed findings, with some literature indicating that restriction was associated with children's low fruit and vegetable consumption [18, 21] and higher intake of snacks [22], with other findings indicating protective effects of restriction such as lower intake of snacks [49, 50], greater intake of fruit [21], and overall improved diet quality [51]. More recent literature on restriction has distinguished between overt and covert control, with covert control (e.g., control without the child's knowledge) being more analogous to structure-based than control-based feeding. In infancy, restriction is likely more covert than with an older child who can perceive their diet as being restricted, possibly explaining the association with the HFV dietary pattern.

Mothers' use of food as a reward at 1 year was associated with toddlers' higher odds of being in the JLFV dietary pattern than the HFV pattern. This finding is consistent with prior literature indicating that the use of food as a reward is associated with children's lower fruit and vegetable intake [20]. Sweet foods and drinks, and not fruits and vegetables, are more commonly used as rewards. This may explain why infants who are exposed to greater use of food as a reward were more likely to have the JLFV dietary pattern as toddlers.

Also at 1 year, mothers' structure-based feeding was associated with a healthier toddler dietary pattern. Mothers who reported implementing more consistent routines and engaging in limit setting had toddlers who had higher odds of having the HFV dietary pattern than the MPAS or JLFV patterns. Prior literature has indicated that routines and limit setting foster children's developing self-regulation and reduce intake of energy-dense foods by introducing predictability while also allowing a small, developmentally appropriate level of autonomy [15]. Results align with this work, highlighting the potential positive impact of routines and limit setting on children's later diet.

Finally, toddler dietary class was not associated with child weight status at age 2 years in the current analysis, which is in contrast to previous findings on infant dietary patterns and later child weight status at 2 and 6 years [40, 41]. As such, the lack of association between toddler diet and children's weight in the current analysis is surprising, though it is notable that previous associations with weight examined dietary patterns in infancy. Perhaps toddler's dietary exposure, which more closely reflects an adult-like diet than in infancy, may directly affect weight later in a child's development. Future longitudinal research is needed to assess toddler dietary patterns and associations with children's later weight status.

Strengths of the current analysis were the person-centered analytic approach, which allowed for a consideration of individual differences in dietary patterns, as well as a focus on toddler diet, an understudied period of food intake. Previous studies of toddler dietary intake have largely focused on intake of specific foods or food groups, without consideration of overall dietary patterns [10, 11, 52, 53]. This person-centered approach also more closely mirrors a person's whole diet, highlighting its utility in research on toddler diet [54–56]. The FFQ used in the present analysis had notable limitations, including not being a validated version, as well as not capturing the serving size of foods consumed, which required the use of cutoffs based on frequency of intake. Future research could address this limitation by investigating parents' early feeding practices and associations with later toddler diet, using a validated version of an FFQ or 24-h dietary recall. Another limitation of the present analysis is that dietary data were only incorporated from one time point. Longitudinal data were collected from this sample, but the relatively small sample size and thus lack of power precluded the use of latent transition analysis to investigate change in diet from child age 9 months to 2 years. The sample was relatively homogenous, consisting of predominantly White and well-educated mothers, which limits the generalizability of these results. Additional research is needed on a larger sample with more racial/ethnic diversity to identify generalizability of the current findings. Furthermore, mothers were not given instructions on reporting food their child consumed when being cared for by another caregiver. As such, future work on toddler dietary patterns with a more precise measure of diet in all relevant settings is needed. Finally, this analysis relied on mothers' self-report for data on feeding practices and infant intake, which is subject to social desirability bias, and thus may produce skewed estimates of actual behavior. Future research should explore observational assessment of feeding practices as associated with children's later diet.

CONCLUSION

The present analysis identified three patterns of toddler diet but did not identify differences in these patterns between RP and control groups or associations with child weight status. Additional intervention strategies may need to be developed to promote healthful dietary patterns. Adopting a person-centered analytic approach (describing subgroups of individuals, e.g., latent class analysis) rather than a variable-centered approach (describing differences among mean levels of variables, e.g., ANOVA) allowed for a nuanced examination of how mothers' structure-based and control-based feeding is associated with later toddler diet. This approach could help clinicians and nutrition professionals provide informed recommendations to mothers as they begin to feed their infants about how their early feeding practices may influence later dietary patterns. Specifically, in addition to guidance on what and how much to feed children, promoting mothers' structure-based feeding may also promote healthful child dietary patterns. More research is needed on the implications of mothers' use of restriction over multiple time points throughout a child's development, including how and when this feeding practice is (c)overt, and associations with children's diet.O

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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DATA AVAILABILITY STATEMENT

Deidentified participant data described in the manuscript, including data dictionaries, as well as the analytic code will be made available upon request to the corresponding author.

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Study Importance

What is already known?

- The diets of toddlers in the United States largely do not meet the US Dietary Guidelines.
- INSIGHT, a randomized clinical trial testing a responsive parenting (RP) intervention against a child safety control, was effective at promoting more healthful child diets in infancy for children in the RP group.
- Parents’ feeding practices impact their child’s diet; certain feeding practices are associated with child diets that more closely align with US Dietary Guidelines.

What does this study add?

- Our results identified three toddler dietary patterns.
- No effect of the RP intervention on child diet in toddlerhood was observed.
- Mothers who reported more structure-based feeding had toddlers who were more likely to have more healthful dietary patterns. Findings regarding parents’ control-based feeding and toddler dietary patterns were mixed.
- There were no associations found between toddler dietary patterns and weight status.

How might these results change the direction of research or the focus of clinical practice?

- Additional intervention strategies may need to be developed to promote healthful dietary patterns in toddlerhood, such as messaging focused on parents’ own dietary intake.
- Our findings illustrate the importance of longitudinal study designs in examining the associations between parent feeding practices and child diet, particularly with control-based feeding practices such as restriction.

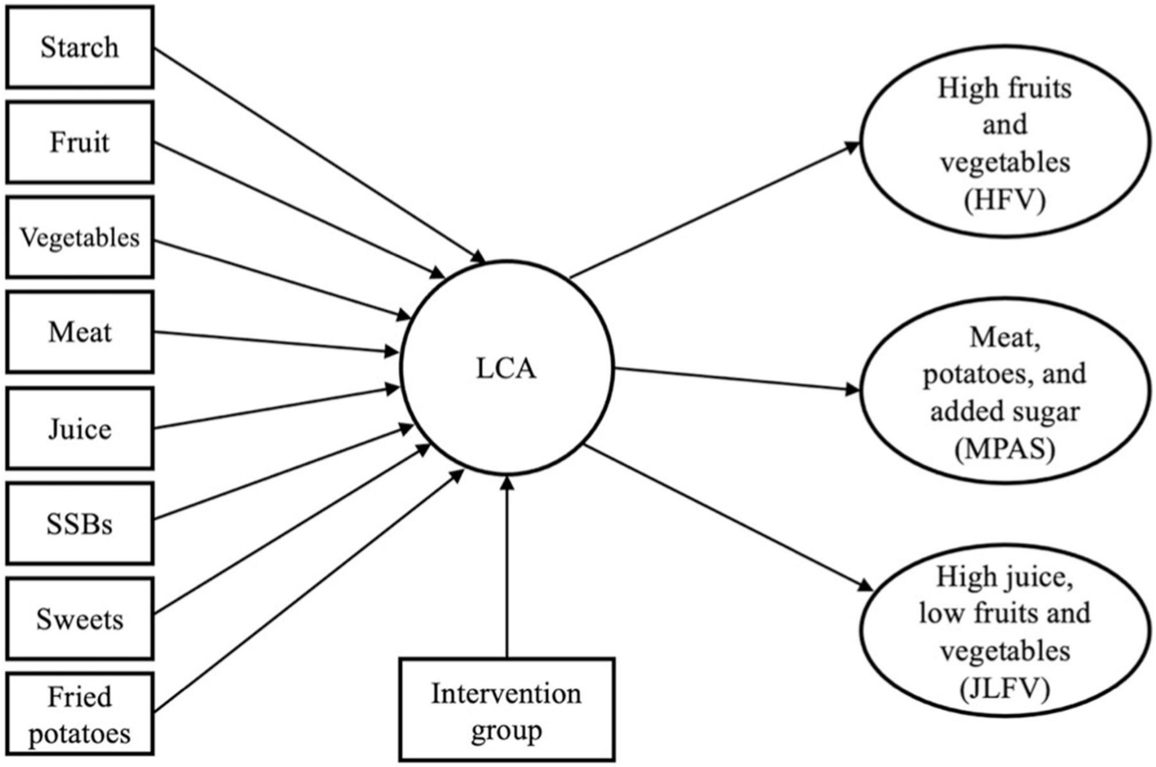

FIGURE 1.
Representation of the 3 classes identified in the current study from latent class analysis (LCA) of 8 food groups.

TABLE 1

Family characteristics at child age 2 years

Demographic	RP (*n* = 118)	Control (*n* = 111)
Child sex, male, *n* (%)	63 (53.4)	55 (49.6)
Enrolled in childcare, *n* (%)	37 (67.3)	29 (73.9)
Hours per week in childcare, mean (SD)	25.0 (20.4)	25.1 (19.7)
Child race, *n* (%)		
White	104 (88.1)	103 (92.8)
Black/African American	6 (5.1)	3 (2.7)
Native Hawaiian or Pacific Islander	1 (0.9)	0 (0.0)
Asian	3 (2.5)	4 (3.6)
Other	1 (0.9)	0 (0.0)
Biracial	3 (2.5)	1 (0.9)
Child Hispanic/Latino, *n* (%)	9 (7.7)	3 (2.7)
Maternal race, *n* (%)		
White	107 (90.7)	105 (94.6)
Black/African American	4 (3.4)	3 (2.7)
Native Hawaiian or Pacific Islander	1 (0.9)	0 (0.0)
Asian	4 (3.4)	3 (2.7)
Other	2 (1.7)	0 (0.0)
Mother Hispanic/Latino, *n* (%)	7 (6.0)	4 (3.6)
Maternal age (y) at recruitment, mean (SD)	29.2 (4.5)	29.1 (4.7)
Maternal prepregnancy BMI, mean (SD)	25.6 (5.1)	25.7 (5.8)
Maternal highest education, *n* (%)		
High school graduate or less	7 (5.9)	8 (7.2)
Some college	30 (25.4)	26 (23.4)
College graduate	45 (38.1)	49 (44.1)
Graduate degree	36 (30.5)	28 (25.2)
Annual household income, *n* (%)		
<$10,000	4 (3.4)	3 (2.7)
$10,000–24,999	8 (6.8)	6 (5.4)
$25,000–49,999	3 (2.5)	19 (17.1)
$50,000–74,999	44 (37.3)	20 (18.0)
75,000–99,999	29 (24.6)	18 (16.2)
>$100,000	28 (23.7)	39 (35.1)

Abbreviation: RP, responsive parenting.

TABLE 2

Fit indices for 1–7 class solutions of toddler dietary patterns at age 2 years

Number of classes	AIC	BIC	CAIC	Adjusted BIC	Entropy	Bootstrap *p* value[a]
1	330.34	357.81	365.81	332.46	1.00	N/A
2	268.61	326.98	343.98	273.10	0.60	0.01
3	244.50	333.77	359.77	251.37	0.63	0.01
4	248.09	368.27	403.27	257.34	0.68	0.76
5	252.77	403.86	447.86	264.40	0.71	0.62
6	258.66	440.65	493.65	272.67	0.79	0.79
7	264.06	476.95	538.95	280.45	0.75	0.70

Abbreviations: AIC, Akaike information criterion; BIC, Bayes information criterion; CAIC, consistent Akaike information criterion; N/A, not applicable.

[a]Bootstrap *p* value is fit compared with the class solution with one fewer class. The best-fitting model is indicated by the highest number of classes with $p < 0.05$.

TABLE 3

Item response probabilities for three dietary patterns at age 2 years

Age 2 years	Total sample endorse %	Mean (times per day)	HFV	MPAS	JLFV
Frequency (overall)			70 (31%)	56 (24%)	103 (45%)
Frequency (RP)			43 (36.44%)	30 (25.42%)	45 (38.14%)
Frequency (control)			24 (21.62%)	27 (24.32%)	60 (54.05%)
Starch (≥2× per day)[a]	56.77	2.36	0.62	0.77	0.41
Fruit (≥3× per day)	50.66	3.48	0.77	0.56	0.29
Veg (≥2.5× per day)	50.66	2.78	0.75	0.68	0.24
Meat (≥1.5× per day)	31.44	1.26	0.25	0.85	0.03
Juice (>0× per day)	74.12	0.77	0.49	0.98	0.77
SSBs (>0× per day)	48.47	0.44	0.23	0.80	0.47
Sweets (≥1× per day)	27.07	0.70	0.14	0.47	0.24
Fried potatoes (>0.36× per day; 2.5 times per week)	29.39	0.18	0.00	0.59	0.31

Abbreviation: HFV, high fruits and vegetables; JLFV, high juice, low fruits and vegetables; MPAS, meat, potatoes, and added sugar; RP, responsive parenting; SSBs, sugar-sweetened beverages.

[a]The higher frequency category used in the latent class model was derived from items using a modified version of the young child's Harvard Service Food Frequency Questionnaire [34].

TABLE 4

Results indicating no intervention group difference (RP vs. control) in toddler dietary patterns at child age 2 years

	p value	MPAS	JLFV
Intervention group (RP, control)	0.36	1.9 [0.8–4.4]	1.4 [0.6–3.3]

Note: Dietary patterns (HFV, MPAS, and JLFV) were created using latent class analysis. If predictors were significant at $p < 0.05$, odds ratios (OR) and CIs were examined by using HFV as the reference group. ORs <1 indicate higher odds of having the HFV dietary pattern than the pattern indicated above the corresponding column and ORs >1 indicate higher odds of having either the MPAS or JLFV patterns than HFV. CIs that do not include 1 are statistically significant.

Abbreviations: HFV, high fruits and vegetables; JLFV, high juice, low fruits and vegetables; MPAS, meat, potatoes, and added sugar; RP, responsive parenting.

TABLE 5

Results indicating which maternal feeding practices predicted toddler dietary patterns probabilities at child age 2 years

Feeding styles (28 weeks)[a]	***p* value**	**MPAS**[d]	**JLFV**
Pressure finishing	0.06	1.5 [0.9–2.5]	0.78 [0.4–1.4]
Pressure cereal	0.02	2.3 [1.3–4.1]	1.84 [0.98–3.4]
Pressure soothing	0.29	1.2 [0.7–2.0]	0.78 [0.4–1.4]
Restrict amount	0.21	1.4 [1.0–2.1]	1.13 [0.8–1.6]
Restrict diet quality[b]	0.0034[e]	0.5 [0.3–0.8][f]	0.42 [0.3–0.7][f]
Responsive satiety	0.67	1.2 [0.5–2.8]	0.82 [0.4–1.8]
Responsive attention	0.05	1.7 [1.01–2.9]	0.97 [0.6–1.6]
Structure and control (1 year) [c]	***p* value**	**MPAS**	**JLFV**
Limit exposure	0.0001[e]	0.1 [0.0–0.3][f]	0.22 [0.1–0.5][f]
Consistent routines	0.0006[e]	0.2 [0.1–0.5][f]	0.30 [0.1–0.7][f]
Restriction	0.01	0.7 [0.5–1.1]	0.52 [0.3–0.8][f]
Pressure	0.04	1.3 [0.8–2.1]	0.51 [0.3–0.97][f]
Food to soothe	0.12	2.3 [1.1–4.9]	1.80 [0.8–4.0]
Food as reward	0.002[e]	1.9 [0.6–6.7]	6.18 [1.9–19.9][f]

Note: Dietary patterns (HFV, MPAS, JLFV) were created using latent class analysis. If predictors were significant at $p < 0.05$, odds ratios (OR) and CIs were examined by using HFV as the reference group. ORs <1 indicate higher odds of having the HFV dietary pattern than the pattern indicated above the corresponding column and ORs >1 indicate higher odds of having either the MPAS or JLFV patterns than HFV. CIs that do not include 1 are statistically significant.

Abbreviations: HFV, high fruits and vegetables; JLFV, high juice, low fruits and vegetables; MPAS, meat, potatoes, and added sugar; RP, responsive parenting.

[a] Feeding styles were assessed using the Infant Feeding Styles Questionnaire (IFSQ) at infant age 28 weeks [32].

[b] For restrict diet quality, indicates that when controlling for significant maternal and family characteristics (maternal education and prepregnancy BMI), $p = 0.023$.

[c] Structure and control were assessed using the Structure and Control in Parent Feeding (SCPF) at infant age 1 year [15].

[d] The HFV dietary pattern was used as the reference group in all analyses.

[e] In the *p* value column, this indicates statistical significance at $p < 0.05$.

[f] In the MPAS or JLFV column, this indicates statistical significance of the CIs (do not include 1).