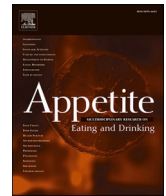




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# Food and beverage offerings by parents of preschoolers: A daily survey study of dinner offerings during COVID-19<sup>☆</sup>

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## ABSTRACT

The COVID-19 pandemic is likely to have altered parents' daily feeding practices, including what and how much they feed their children, which may have negative implications for children's weight. The primary aim of this study was to examine patterns of and variation in parents' daily food and beverage offerings at dinner across 10 days during the COVID-19 pandemic using descriptive analysis and non-parametric tests. Ninety-nine parents ( $M_{age} = 32.90$ ,  $SD_{age} = 5.60$ ) of children ages 2–4 years ( $M = 2.82$ ,  $SD = 0.78$ ) completed an online baseline survey and 10 daily surveys (929 completed surveys) assessing their daily food and beverage offerings at dinner. On average, parents did not offer recommended foods and beverages on a daily basis; parents offered vegetables and protein most often across the 10 days, however, less than 50% of parents offered the recommended serving size for each group. The intraclass correlations and random sampling plots revealed considerable within-parent variation in food and beverage offerings. Eating dinner as a family, planning dinner in advance, and preparing a homemade dinner were associated with more vegetable and protein offerings, while processed, fast, or fried foods were offered less often when dinner was planned or homemade. Dairy, water, and refined grains were offered more often when dinner was homemade, while whole grains, processed, fast, or fried foods, and sugar-sweetened beverages were offered less often when dinner was homemade. The results provide documentation of parents' daily food and beverage offerings at dinner within the context of COVID-19 and point towards the importance of examining predictors and consequences of parents' daily feeding practices.

## 1. Introduction

Parents and children were presented with an entirely new and pervasive source of stress when COVID-19 was officially declared a pandemic by the [World Health Organization \(2020\)](#) on March 11, 2020. Disease mitigation measures were quickly put into place including stay-at-home orders and social distancing ([The White House, Office of the Press Secretary, 2020](#)). These measures resulted in abrupt changes for both parents and their children – children could no longer attend in-person schooling (or child-care), parents transitioned to remote work, and in many cases, parents may have experienced job loss ([Brown et al., 2020](#); [Di Giorgio et al., 2020](#); [Lee et al., 2021](#); [Patrick et al., 2020](#)). Early in the pandemic (April to May 2020), at least 70% of parents reported feeling stress about either themselves or a family member contracting COVID-19, about having their basic needs met, and about adjusting to their new routines and managing online learning for their children ([APA, 2020a](#)). Prior to the pandemic, parents of young children tend to

experience more stress than childless adults ([Evenson & Simon, 2005](#); [Nomaguchi & Milkie, 2003](#)), and this has continued to be true during the pandemic ([APA, 2020a](#)).

The COVID-19 pandemic has also changed the home food environment and eating behaviors. Parents have reported changes in their children's eating behaviors such as both reduced appetite ([Orgiles et al., 2020](#)) and increased appetite ([Philippe et al., 2021](#)), frequent snacking ([Pietrobelli et al., 2020](#)), and emotional overeating ([Philippe et al., 2021](#)). In addition to children's eating behaviors, parents' feeding practices and parents' eating behaviors also changed. Parents who reported changes in their feeding practices tended to become more permissive such as having fewer rules, using food to soothe their child, and granting children more autonomy ([Philippe et al., 2021](#)). Parents' COVID-19-specific stress has also been linked to offering less healthy food and snacks to children ([Jansen et al., 2021](#)) as well as to more emotional eating among mothers ([Wang et al., 2021](#)). Processed food sales (e.g., chips, popcorn, candy) have also skyrocketed since the onset

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of the pandemic (Creswell, 2020; Skerritt et al., 2020), which may be linked with efforts to cope with stress, depression, or anxiety (Cummings et al., 2021). For example, Wang et al. (2021) found that mothers reported using comfort eating (e.g., candy, chips) as a way to cope with their COVID-19 stress and that mothers' COVID-19 stress was marginally associated with emotional eating.

A positive consequence of the COVID-19 pandemic is that families spent more time together and were likely to eat at home more often. Over 80% of U.S. parents reported feeling grateful for the extra time they had with their children during the pandemic (APA, 2020b), and more than half of U.S. adults reported that they were cooking at home more than pre-pandemic, with 51% reporting that they would maintain their cooking habits after the pandemic (Hunter, 2020). Some reasons for increased cooking could be reduced access to restaurants and in-person dining was discouraged to prevent transmission of COVID-19 (Luna, 2020; National Restaurant Association Restaurant Law Center, 2020) as well as the misconception that COVID-19 could be transmitted through food (International Food Information Council, 2020). Cooking at home is associated with more healthful diets (Wolfson et al., 2016), and increased cooking during the pandemic may lead to healthier offerings in the future. The increase in cooking could also suggest an increase in planning meals in advance, which is an effective strategy for engaging in health behaviors (Anderson, 2020). Meal planning has been linked to healthier diets (Beck, 2007; Neumark-Sztainer et al., 2014) and better physical and mental health outcomes (Fiese et al., 2012). Both cooking at home and meal planning may be important mechanisms for understanding parents' feeding practices during the pandemic. However, current evidence is limited; one study to date (Jansen et al., 2021) found that parents' snack planning during the pandemic was associated with low-fat chip consumption, but snack planning was not significantly associated with sweet snack or other savory snack consumption. Taken together, further investigation is needed to document parents feeding practices during the COVID-19 pandemic.

Negative disruptions in parents' feeding practices during the pandemic may have consequences for child weight outcomes. Most parents want to ensure that their children are healthy and are growing well (LeVine, 1988), but despite best intentions, parents may not meet dietary recommendations. Because the most direct determinant of child weight is what and how much children eat (Birch & Ventura, 2009; Davison & Birch, 2001), capturing patterns of parents' food and beverage offerings within the context of a natural stressor, the COVID-19 pandemic, is essential for documenting the potential for child overweight and obesity risk. For overweight and obesity prevention, early childhood is an important period for documenting parents' behaviors as rates of overweight and obesity are lowest during this time (Hales et al., 2017; Simmonds et al., 2016) and children are learning about food and healthy eating (Birch & Ventura, 2009). The 2020–2025 Dietary Guidelines for Americans describe the recommended foods and beverages for promoting healthy dietary patterns to promote health and prevent disease (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020). The primary recommended food groups, for adults and children above age 2, include vegetables, fruit, protein, grains, dairy, and oils, and the primary recommended beverages for children above age 2 include water, unsweetened milk (or unsweetened dairy alternatives), and fruit juice without added sugar. Data from the NHANES 2013–2016 indicates that most of the population (ages 1 and older) does not meet the recommended daily intakes for vegetables, fruit, protein, grains, or dairy (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020). According to the same USDA report, at least 80% of the population does not meet the recommendations for vegetables, fruit, and dairy. However, when considering only 2-to-4-year-olds, the average intake for fruits and protein are within the recommended range, while vegetables and dairy are below the recommended range. Another study using the NHANES data reported that 20% of children do not drink water on a given day, and instead of water, they are more likely to consume beverages with

sugar (Rosinger et al., 2019).

To capture day-to-day variation in parents' food and beverage offerings, a daily survey (i.e., daily diary) approach must be employed. Unlike cross-sectional or traditional longitudinal designs, daily surveys were created to examine everyday life experience in a natural context (Bolger et al., 2003; Reis, 1994). This type of design allows for daily variation in phenomena to be captured, which is particularly useful for assessing changes in food and beverage offerings across multiple days. This type of design has also been widely used in the psychological literature to assess health (e.g., Ferguson et al., 2004; Piazza et al., 2013) and couple and family relationships (e.g., Almeida et al., 1999; Gleason et al., 2008). By capturing daily phenomena, participant retrospection is reduced because there is less reliance on memory over an extended period of time (Almeida, 2005). In other words, daily surveys can capture experiences closer to their occurrence rather than asking participants to recall what happened weeks or months ago. Another strength of the daily survey approach is the ability to test lagged associations while accounting for concurrent associations (Wickham & Knee, 2013). Daily survey data thus allows for the examination of carryover effects from day-to-day; an ecologically valid method to establish temporal precedence. A small number of studies have examined parents' feeding practices or child eating behaviors using a diary approach or an ecological momentary assessment approach (EMA; Berge et al., 2017; Berge et al., 2018; Dunton et al., 2019; Loth et al., 2021; Tate et al., 2020). Most recently, Loth et al. (2021) examined parents' food parenting practices (i.e., coercive control, indulgence, structure, autonomy) before and during the COVID-19 pandemic and reported reductions in structured and autonomy supportive practices during the pandemic. In addition to how parents feed their children, it is important to capture which foods and beverages parents offer to their children.

The aim of the current study was to describe patterns and variation in parents' food and beverage offerings at dinner across 10 days of daily surveys during the COVID-19 pandemic. Specifically, I examined how often parents offered both recommended (e.g., vegetables, fruit, protein, dairy, whole grains, water) and non-recommended (e.g., refined grains, processed, fast, or fried foods, sweets and desserts, sugar-sweetened beverages) foods and beverages at dinner, and whether parents offered the recommended amounts of those items. I also examined whether characteristics about dinner were associated with parents' food and beverage offerings, including day of the week (weekday vs. weekend), having a shared family meal, planning dinner in advance, and preparing a homecooked meal. Dinner was selected as the primary target for three reasons: 1) to reduce participant burden so that parents would not have to recall all offerings across the entire day; 2) parents may be more likely to personally feed their children dinner than they would earlier meals and snacks, given that many young children may have returned to childcare or preschool by the time of data collection (September to November 2020), where non-parent caregivers select, prepare, or offer meals; and 3) because existing food diaries are time intensive, I created a checklist measure of food and beverage offerings based on existing measures of food frequencies (O'Connor et al., 2008; Saloheimo et al., 2015) that would be easier and quicker to complete. More information on this measure is provided in the Method section. Based on previous research, I anticipated that the majority of parents would not offer the recommended foods and beverages (e.g., vegetables, fruit, protein, dairy, whole grains, and water) at dinner on a daily basis, and on days where parents do offer recommended foods and beverages, they would offer less than the recommended serving size. However, due to the exploratory nature of this aim, no further directional hypotheses were made.

## 2. Method

### 2.1. Sample information

Ninety-nine parents (88 mothers, 11 fathers) of 2- to 4-year-old

children were recruited from social media to complete an online survey and daily surveys. Parents' ages ranged from 23 to 51 years ( $M = 32.90$ ,  $SD = 5.60$ ). Most of the sample identified as White (88%); the remaining 12% of the sample was Black ( $n = 3$ ), Asian or Asian American ( $n = 4$ ), and Mixed/Biracial or "Other" ( $n = 4$ ), and 12% of the sample identified as Hispanic, Latino, or of Spanish descent. Eighty-six percent of parents identified as being currently married, 49% of parents held a Bachelor's degree, 41% of parents were considered to have a healthy body mass index and 59% were considered overweight or to have obesity (for reference, roughly 73% of US adults are considered overweight or to have obesity using BMI; Fryar et al., 2020), and the median household income was \$82,500 (ranging from \$3,000 to \$325,000). Nineteen states in the U.S. were represented in the sample; Alabama, Arkansas, Arizona, California, Colorado, Florida, Idaho, Illinois, Indiana, Maryland, Michigan, New York, North Carolina, Ohio, Pennsylvania, Texas, Utah, Virginia, and Washington. The target children were 51% female ( $n = 51$ ) and averaged 2.82 years of age ( $SD = 0.78$ ), with 52% ( $n = 51$ ) of children having returned to school in Fall 2020 and 9% ( $n = 9$ ) having an identified food allergy.

## 2.2. Procedure

A flyer was posted and shared on social media, including Facebook, Instagram, and Twitter, to recruit 100 parents of 2- to 4-year-old children from September 2020 to November 2020 (no data collection occurred on holidays); a target sample size of 100 parents to complete 10 daily surveys was set to result in 1000 observations, which should be sufficient to examine within-person associations in future analyses (Nezlek, 2020). To be eligible for inclusion, parents had to be at least 18 years of age, have at least one child born between 2016 and 2018, be able to complete the survey in English, be currently living in the U.S., be living with their child during the stay-at-home orders in spring 2020, and be living with their child at the time of the study. All parents were individually screened via email prior to enrollment, and following enrollment, parents were sent a link to an online survey via Qualtrics (<http://www.qualtrics.com/>).

Using the baseline survey Qualtrics link, parents were presented an informed consent page and then completed a tick-box indicating their consent to participate. The daily surveys began 2–3 days after the baseline self-report survey was sent to parents and continued for 10 consecutive days; completion of the baseline survey was confirmed prior to beginning the daily surveys. This length of time is comparable to typical daily survey studies ranging from 7 to 14 days (e.g., Maher et al., 2013; Santiago et al., 2016). In the daily surveys, parents completed a brief battery of measures related to their daily experiences and the food and beverages they offered to their children for dinner. If parents had more than one child in the 2-to-4-year range, parents were instructed to select their youngest child in that age range on whom to report. An online text-messaging service, TextMagic (<https://www.textmagic.com/>), was used to send daily text messages and reminder text messages to participants containing an electronic Qualtrics link to complete the daily survey for 10 consecutive days. They were able to access the daily surveys between 5 p.m. and 3 a.m. to ensure that dinner for the respective day was captured and to reduce errors in reporting. The daily surveys were accessible via a web-browser on both mobile devices and laptop or desktop computers. The median completion time for the daily surveys was 9 min. Participants were compensated \$10 for completion of the baseline survey, \$30 for completion of the daily surveys (\$3/per day for 10 days), and \$10 for completion of the entire study. The study was approved by the Institutional Review Board at the University of Texas at Austin (reference #: 2019-12-0029).

## 2.3. Measures

### 2.3.1. Parents' food and beverage offerings and size of offerings at dinner

In each daily survey, parents were presented with a list of 33 foods

and beverages and were asked to indicate which foods and beverages they offered to their child for dinner that night (adapted from O'Connor et al., 2008, and Saloheimo et al., 2015). The list of foods and beverages were categorized into the following food groups: vegetables (4 items), fruits (1 item), protein (5 items; including alternative proteins commonly consumed by vegetarians and vegans), whole grains (1 item), refined grains (2 items), dairy (4 items), processed, fast, or fried foods (5 items), and sweets and desserts (2 items). Two beverage categories were created to assess water (1 item) and sugar-sweetened beverages (2 items) were offered each night. The food and beverage groups were selected to reflect the 2020–2025 Dietary Guidelines for Americans (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020). Example items include red or orange vegetables, dark green vegetables, white or sweet potatoes (excluding French fries), fruit (any kind), refined grains (such as white bread, white rice, corn products), whole grains (such as brown rice, wheat breads, quinoa), white meat or poultry (excluding fried white meat), red meats (excluding hot dogs and bacon), pizza, chicken nuggets or other fried chicken, candy/cake/pie/cookies, frozen treats (such as ice cream), soda or fruit juice with sugar, water (any kind), and dairy milk. Parents were also given blank options if they were not sure how to categorize the food or beverage offered, or if the food or beverage was not reflected on the list provided. There were 61 days where parents used a blank option, and their responses were assigned to the appropriate item. At the item-level, offered foods and beverages were coded as "1" and non-offered foods and beverages were coded as "0". For food and beverage groups with more than one item, if at least one item in that group was offered at dinner, a score of "1" was assigned to that food or beverage group. If no items in that group were offered, a score of "0" was assigned to that food or beverage group. As a result, all food and beverage groups were dichotomized to indicate whether each group was offered at dinner or not.

For each food or beverage offered at dinner, parents were also asked to indicate the serving size offered. Parents were presented with three serving size options for each of the 33 food and beverage items based on the 2020–2025 Dietary Guidelines (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020) and the American Academy of Pediatrics (2019). The serving size options were specific to children in the targeted age range (2-to-4 years of age), and prior to survey administration, the serving sizes were reviewed and validated by a panel of experts. For example, the recommended serving size for red or orange vegetables for 2- to 4-year-old children is roughly  $\frac{1}{2}$  cup, and parents were asked if they served less than  $\frac{1}{2}$  cup, equal to  $\frac{1}{2}$  cup, or more than  $\frac{1}{2}$  cup. Similarly, the recommended serving size for white meat or poultry is 3 oz. filet (size of your palm), and parents were asked if they served less than 3 oz. filet (size of your palm), equal to 3 oz. filet (size of your palm) or more than 3 oz filet (size of your palm). The actual recommended serving size was not revealed to parents in the instructions or response options, but the recommended serving size was always the middle option. The response options were coded into three groups: less than the recommended serving size, equal to the recommended serving size, and more than the recommended serving size.

### 2.3.2. Daily survey characteristics

Within-person daily characteristics included whether it was the weekday vs. weekend (1 = weekday), whether all or most of the family ate dinner together (1 = dinner together), whether the dinner was planned in advance (1 = planned), and whether the dinner was homemade (1 = homemade).

## 2.4. Analysis plan

To address my primary aim, which was to examine patterns of and variation in parents' food and beverage offerings across the 10 days of daily surveys, I conducted a visual inspection of the data in two ways: proportion of food and beverage offerings by daily survey number and

average proportion of food and beverage offerings and serving size of offerings. I then estimated random coefficients models for each food and beverage group to calculate intraclass correlations (ICCs) indicating the amount of variability that is attributable to within- or between-subjects' factors. Lastly, I drew a random sample of  $n = 25$  parents to visualize the variation in parents' offerings to compare against the ICCs. Data management and descriptive statistics were generated in Stata version 15 (StataCorp, 2017), while the random coefficients models were conducted in Mplus version 7.11 (Muthén & Muthén, 2014).

### 3. Results

#### 3.1. Descriptive statistics

Participants collectively completed a total of 929 daily surveys across the 10-day period, averaging 9.38 daily surveys per participant ( $SD = 1.14$ ). The 61 missing daily surveys, out of a potential total of 990 equates to 6.16% total missing. Chi-square tests were conducted to determine whether missing data were more likely to occur on weekdays vs. weekends; no significant differences were found. This percent missing (6%) is considered inconsequential (Bennett, 2001; Schafer, 1999). Eighty-two percent of the time (i.e., 761 days), parents personally fed their child dinner that night and there were 95 days on which parents knew what was offered to their children for dinner even if they did not personally feed them. There were 22 days in which parents did not personally feed their child and did not know what their child was offered for dinner; these 22 days were omitted from analysis, which resulted in 907 daily surveys used for analysis.

#### 3.2. Variation in parents' food and beverage offerings

Fig. 1 depicts the proportion of the sample who offered at least one item from each food or beverage group by daily survey number (i.e., day in study). The two most offered food groups were protein and vegetables; between 53% and 70% of parents reported offering protein and vegetables across the 10 days. Dairy, water, and refined grains offerings ranged from 42% to 59% of the time. The remaining food and beverage groups were offered less than 40% of the time; fruit ranges from 25% to

40% of the time, processed, fast, or fried foods ranges from 26% to 35%, sweets and desserts range from 12% to 25%, sugar-sweetened beverages range from 3% to 16%, and whole grains ranges from 2% to 13%. Although there was some variability over time, the general trend for each food and beverage group was relatively stable.

Fig. 2 depicts the average proportion of food and beverage offerings at dinner across the 10 days and, when offered, whether parents offered less than, more than, or equal to the recommended serving size for each food and beverage group. Because processed, fast, or fried foods, sweets and desserts, and sugar-sweetened beverages are not recommended groups, these groups were only coded as "more than recommended size".

Parents offered protein and vegetables at dinner 60%–62% of the time. On days that parents offered protein or vegetables, 57%–65% offered their children less than the recommended serving size, 30%–39% offered the recommended serving size, and 4% offered more than the recommended serving size. Dairy and water were offered around 50% of the time. When dairy was offered, the majority (53%) of parents offered less than the recommended serving size, while 41% offered the recommended serving size, and 6% offered more than the recommended serving size. Fifty-seven percent of water offerings were equal to the recommended serving size, while 18% offered less than the recommended serving size and 25% offered more than the recommended serving size. Whole grains were sparingly offered, and when parents did offer whole grains, 49% did not offer enough and 51% did not offer the recommended serving size nor more than the recommended serving size. This evidence suggests that, in general, parents were not offering recommended food and beverages (i.e., vegetables, fruits, protein, dairy, whole grains, water) to their children for dinner on a daily basis.

On average, refined grains (50%) were offered 42% more often at dinner than whole grains (8%), and when refined grains were offered, 47% of parents offered the recommended size, 39% offered less than the recommended serving size, and 14% offered more than the recommended serving size. Compared to whole grains, refined grains were offered 6 times more often. Processed, fast, or fried foods were offered 30% of the time, sweets and desserts 17% of the time, and sugar-sweetened beverages 9% of the time; when each group was offered, 100% of parents offered more than the recommended serving size. In other words,

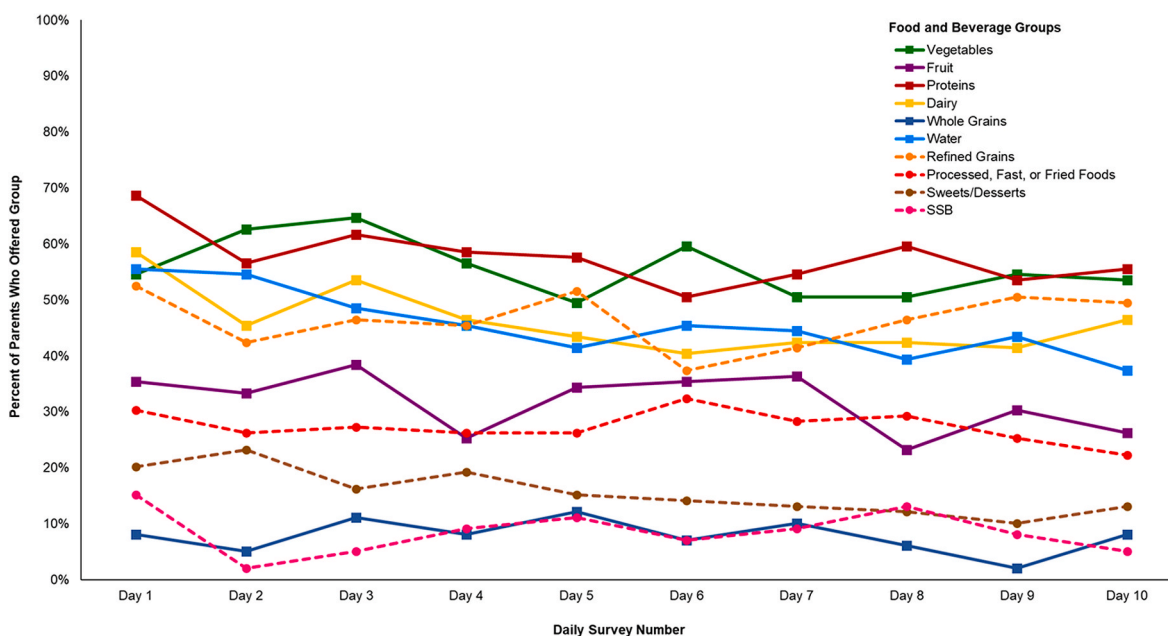


Fig. 1. Percent of Parents who Offered Items from Each Food and Beverage Group at Dinner by Daily Survey Number.

Note. Solid lines represent the recommended food and beverage groups; Dashed lines represent the non-recommended food and beverage groups. Color-coding for each group corresponds to random sampling plots in Fig. 3 through 7.

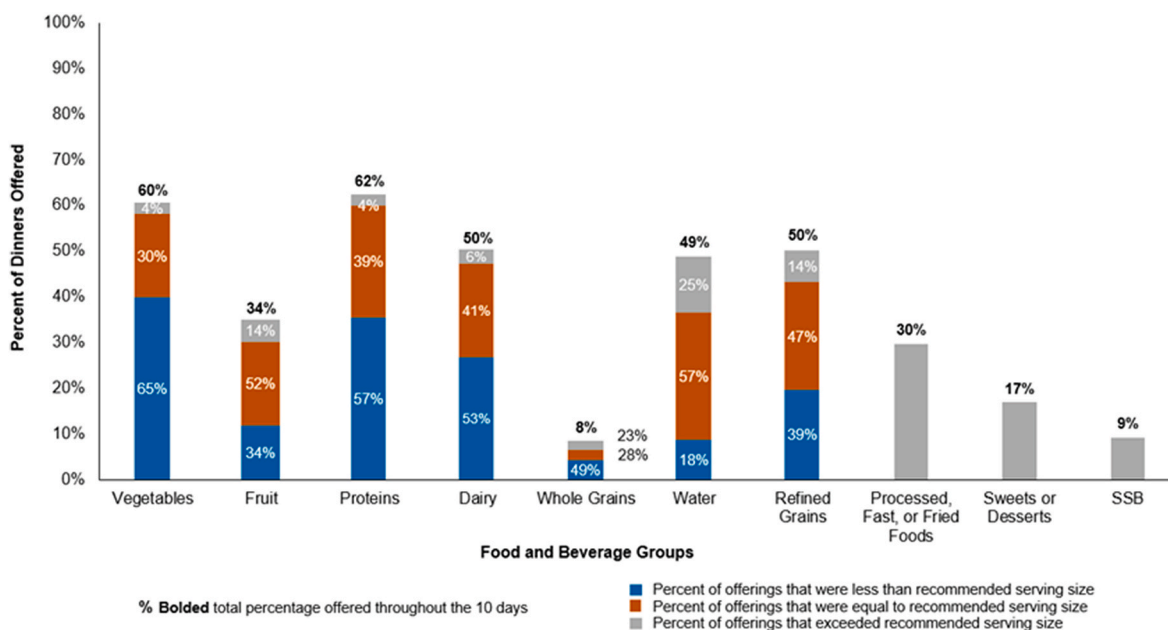


Fig. 2. Percent of 10 Dinners at Which Parents Offered Key Food and Beverage Groups and Whether They Met Recommended Serving Size.

parents did not offer processed, fast, or fried foods, sweets and desserts, or sugar-sweetened beverages greater than 30% of the time for dinner, or roughly equal to 3 days.

3.3. Intraclass correlations and random sampling of parents' food and beverage offerings

Intraclass correlations (ICCs) for parents' food and beverage offerings at dinner were calculated to determine the percent of variance explained by between-person variability compared to within-person variability. ICC values range from 0 to 1, with a value of 1 indicating greater between-person variability, and a value of 0 indicating observation independence, or more within-person variability. The ICCs for all food and beverage offerings were equal to or less than 0.60; 0.28 (vegetables), 0.43 (fruit), 0.13 (protein), 0.42 (dairy), 0.28 (whole grains), 0.60 (water), 0.13 (refined grains), 0.07 (processed, fast, or fried foods), 0.35 (sweets and desserts), and 0.46 (sugar-sweetened beverages). These food and beverage groups are correlated 0.07-0.60 across days, indicating greater evidence of within-person variability, rather than between-person variability, which suggests the ability to test future within-person associations.

A random sample of  $n = 25$  was drawn to illustrate variation in parents' food and beverage offerings at dinner over time across the sample. Fig. 3 through 7 depict variation in parents' vegetable, fruit, protein, dairy, whole grains vs. refined grains, water, processed, fast, or fried foods, sweets and desserts, and sugar-sweetened beverages over time by participant identification number. Upon inspection of each plot, there is noticeable variation in parents' offerings within- and between-parents, which aligns with the ICCs presented above.

3.4. Differences in parents' food and beverage offerings by dinner characteristics

Chi-square tests were conducted to determine whether reports of parents' food and beverage offerings at dinner differed by weekday vs. weekend, by whether all or most of the family ate dinner together, by whether dinner was planned in advance, and by whether the dinner was homemade (see Table 1). Vegetables and protein were offered more when the family ate dinner together ( $\chi^2(1) = 34.65, p < .001, \chi^2(1) = 24.60, p < .001$ , respectively), when dinner was planned ( $\chi^2(1) = 36.25,$

$p < .001, \chi^2(1) = 19.96, p < .001$ ), and when dinner was homemade ( $\chi^2(1) = 83.72, p < .001, \chi^2(1) = 59.40, p < .001$ ). Processed, fast, or fried foods were offered less often when the meal was planned ( $\chi^2(1) = 15.26, p < .001$ ) or when dinner was homemade ( $\chi^2(1) = 102.50, p < .001$ ). Dairy, water, and refined grains were offered more often when dinner was homemade ( $\chi^2(1) = 15.27, p < .001, \chi^2(1) = 5.19, p < .05, \chi^2(1) = 15.17, p < .001$ , respectively), while whole grains and sugar-sweetened beverages were offered less often when dinner was homemade ( $\chi^2(1) = 11.58, p < .01, \chi^2(1) = 7.94, p < .01$ ). No significant differences emerged for weekdays vs. weekends.

4. Discussion

Currently, there is limited research examining parents' feeding practices during the COVID-19 pandemic. A key finding from this descriptive analysis of parents' food and beverage offerings is that parents are not offering their children recommended foods and beverages, such as vegetables, fruit, protein, whole grains, dairy, and/or water, on a daily basis for dinner during the pandemic. Across the entire sample, parents' food and beverage offerings remained relatively stable throughout the 10 days; protein, vegetables, dairy, water, and refined grains were the five most offered food and beverage groups. However, most parents did not offer these recommended food groups on a daily basis for dinner, and only offer vegetables and protein just over half of the time and offer fruit, dairy, and water half of the time or less. This study was novel in exploring patterns of and daily variation in parents' food and beverage offerings at dinner during the pandemic and was conducted in a more ecologically valid framework than past research.

The trends identified in recommended food and beverage offerings were fairly consistent with national averages recorded before the COVID-19 pandemic. Most U.S. children ages 2-to-4 years old do not consume the recommended intake for vegetables, dairy, and whole grains (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020), or for water (Rosinger et al., 2019). Contrariwise, most children consume the recommended intake amounts for proteins and fruit (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020). I found that, on average, parents did not meet recommendations at dinner every day, and recommended food and beverage offerings occurred at or below 60% of the time. Parents may be less likely to offer recommended foods and beverages due to

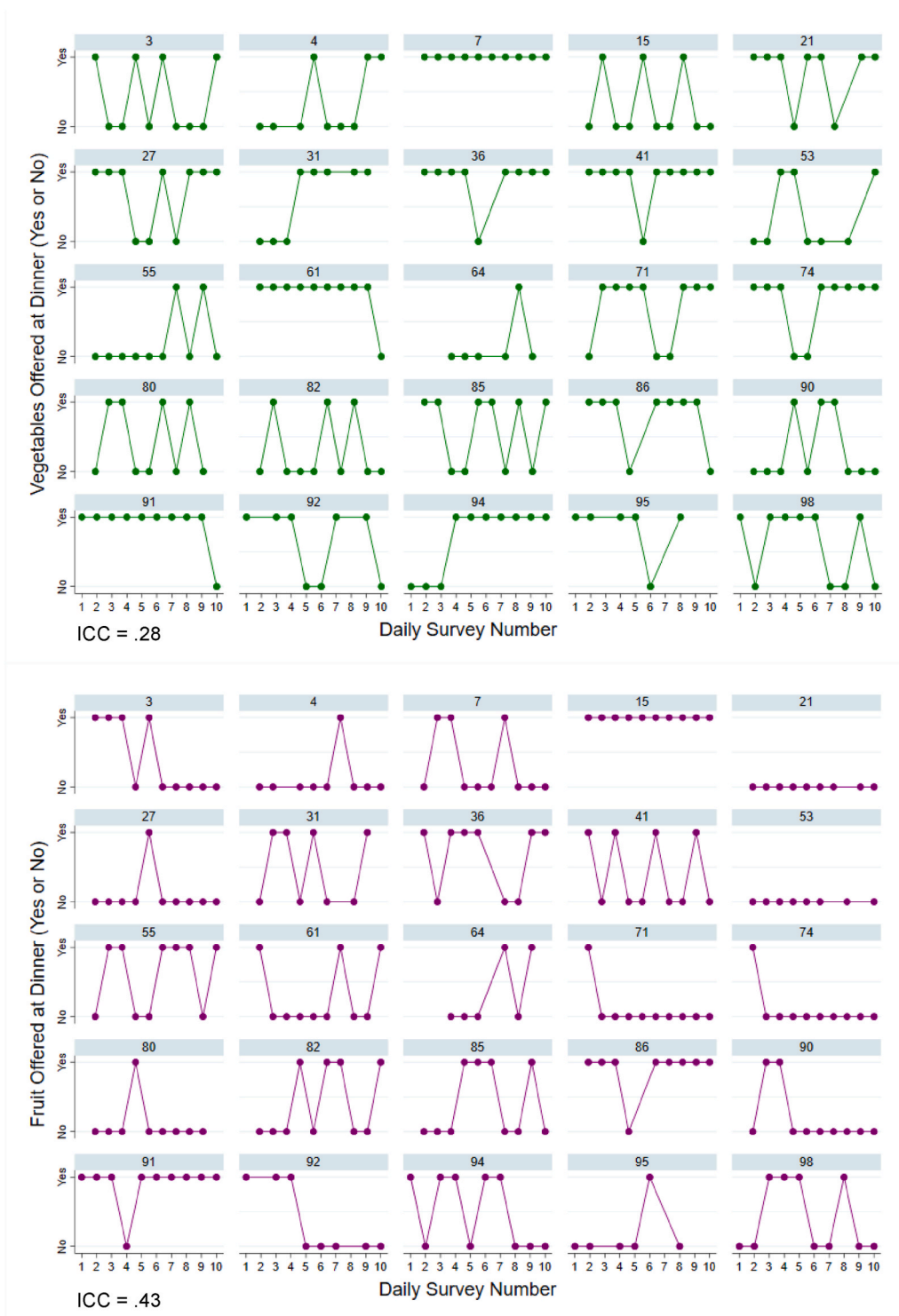


Fig. 3. Random sampling of 25 parents' offerings of vegetables and fruit at dinner across 10 days. Note. Vegetable included red or orange vegetables, dark green vegetables, other vegetables, and sweet or white potatoes. Fruit included any fruits either fresh, frozen, dried, or canned.

their own dietary preferences (Harris & Ramsey, 2015; Hoerr et al., 2009) as well as their child's behavior or responses to offerings (Hingle et al., 2012). Some recommended foods, such as vegetables and protein, may be more commonly offered at dinner (Mathias et al., 2017; Yannakoulia et al., 2010). Other foods, such as fruit and whole grains, may be served as a snack or during an earlier meal (Draxten et al., 2014; Yannakoulia et al., 2010), which may partially explain why fruit and whole grains offerings were low. For beverages, the current recommendation is for children to consume sugar-free or low sugar beverages

such as water or milk (or lactose-free milk; U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020). Yet, 20% of U.S. children ages 2-to-5 years old do not drink any water on a given day (Rosinger et al., 2019), and unsweetened milk consumption has decreased (Lasater et al., 2011). Inadequate offerings of recommended foods and beverages may place children at risk for micronutrient deficiencies that may affect growth and development (e.g., Berryman et al., 2018; Dror & Allen, 2013).

There are several strategies that parents can use to improve intake of

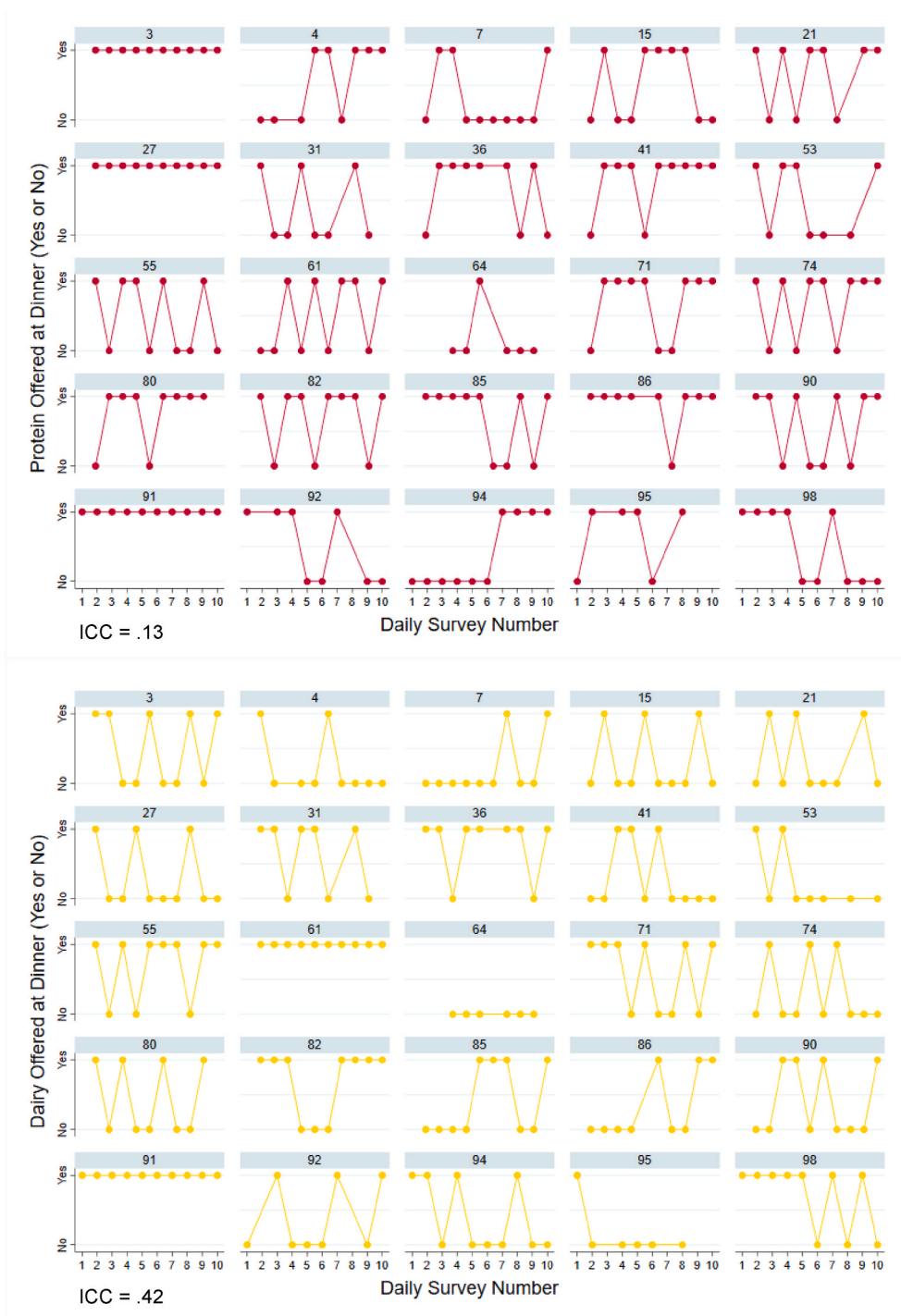


Fig. 4. Random sampling of 25 parents' offerings of protein and dairy at dinner across 10 days. Note. Protein included poultry or white meat (excluding fried poultry or white meat), red meats (excluding hot dogs, bacon), meat alternatives (e.g., tempeh, tofu), eggs, and legumes (e.g., lentils, chickpeas). Dairy included dairy milk (unflavored), cheese, other dairy products (e.g., yogurt), and milk alternatives (e.g., almond or soy milk).

recommended foods and beverages. Parents can leverage children's preferences for fruit to promote overall diet quality (Ramsay et al., 2014; Ramsay et al., 2017) by offering appropriate amounts of fruit throughout the day, including at dinner and for dessert. Parents can also repeatedly offer vegetables (Birch & Fisher, 1998) or incorporate vegetables into dishes the child already likes (Capaldi-Phillips & Wadhera, 2014), expose children to new foods through taste and visual guides (Heath et al., 2011), and model healthy eating to their child (Patrick & Nicklas, 2005). Increasing exposure to recommended foods and beverages during early childhood is important for combatting unhealthy

habits as children enter formal schooling (Nepper & Chai, 2016). However, when non-recommended foods and beverages are requested by their children, parents may use this opportunity to teach their children about which foods and beverages that can be consumed "anytime" versus foods and beverages that should be consumed "sometimes" (Sigman-Grant et al., 2014; Nicholson et al., 2018).

Non-recommended foods and beverages, namely processed, fast, or fried foods, sweets and desserts, and sugar-sweetened beverages, were offered less than 3 days per 10 days at dinner, with the exception of refined grains, which were the primary grain source offered to children



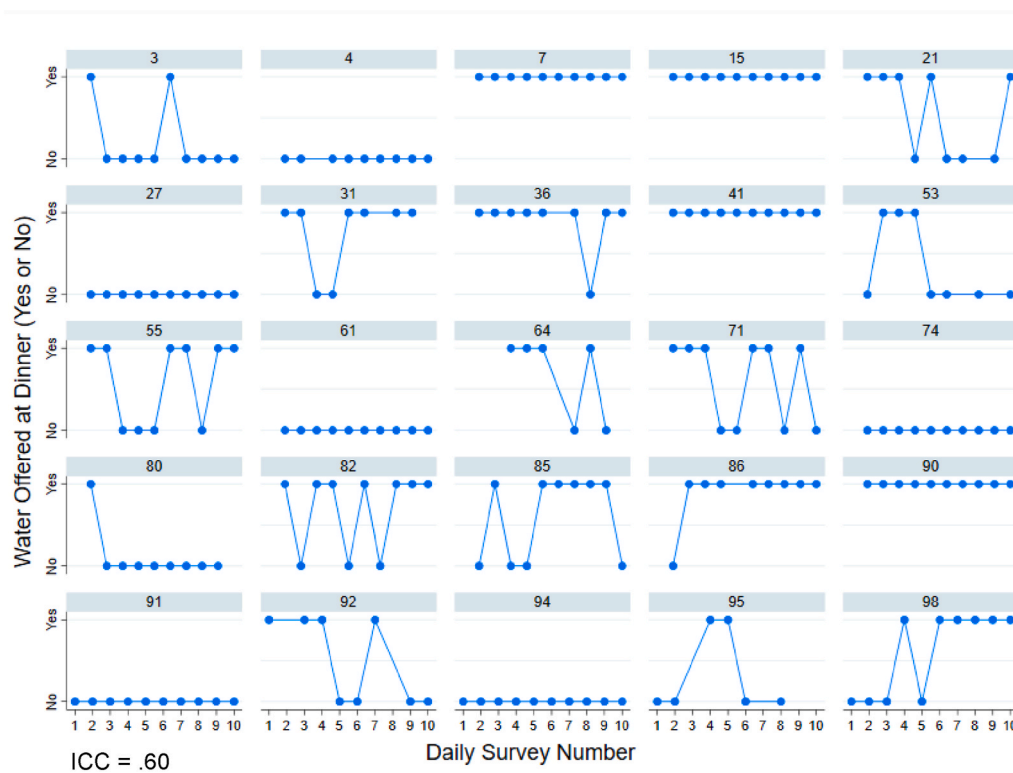
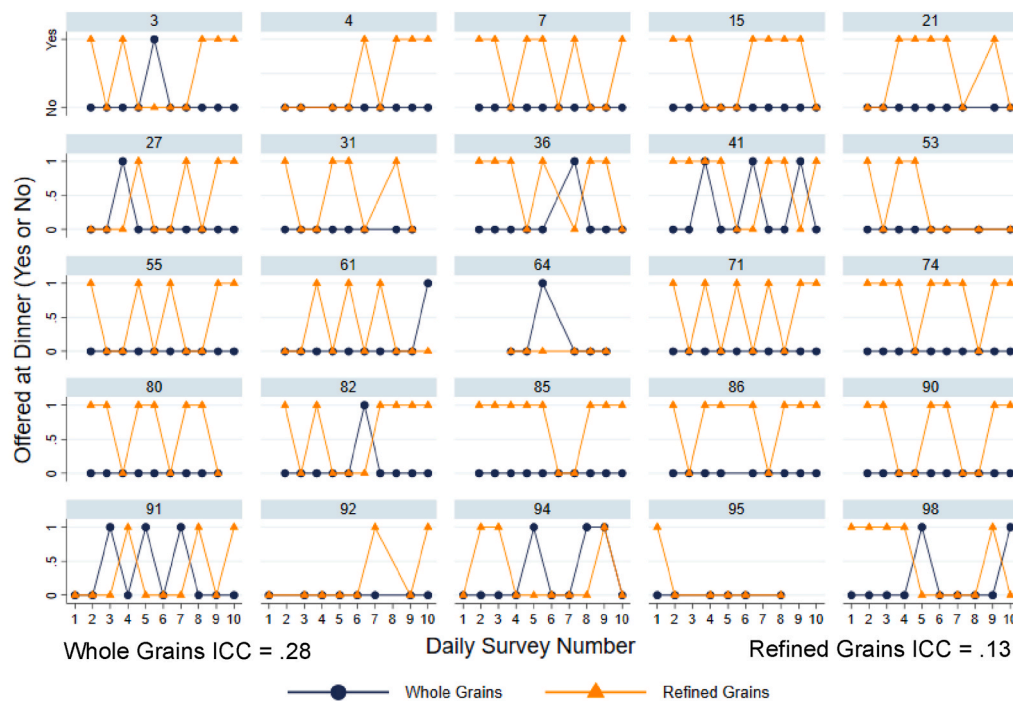


Fig. 5. Random sampling of 25 parents' offerings of whole and refined grains and water at dinner across 10 days. Note. Grains were divided into two groups: whole grains and refined grains. Whole grains included brown rice, wheat breads, ancient grains, and refined grains included white rice, white bread, and corn products. Pasta, such as spaghetti and macaroni, were included in the refined grains group. Water included still and/or sparkling water (e.g., tap, bottled, or canned).

across the 10 days. At the population-level prior to the COVID-19 pandemic, U.S. children were exceeding the recommended limit of added sugars, saturated fat, and sodium intake, which should be limited to 10% of total calories per day for added sugars and saturated fat and limited to 1200 mg for sodium (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020). Alternatively, almost 100% of the U.S. population's grain intake is from refined grains (U.S.

Department of Agriculture & U.S. Department of Health and Human Services, 2020), which is consistent with 2-to-4 year-old's at the population-level and this current study. Some possible explanations for these findings may be that parents are limiting restaurant visits, that only dinner data was reported, or that parents' own grain preferences influenced their offerings. Due to COVID-19 restrictions, parents may be less likely to visit a restaurant to pick-up or dine-in for dinner, and

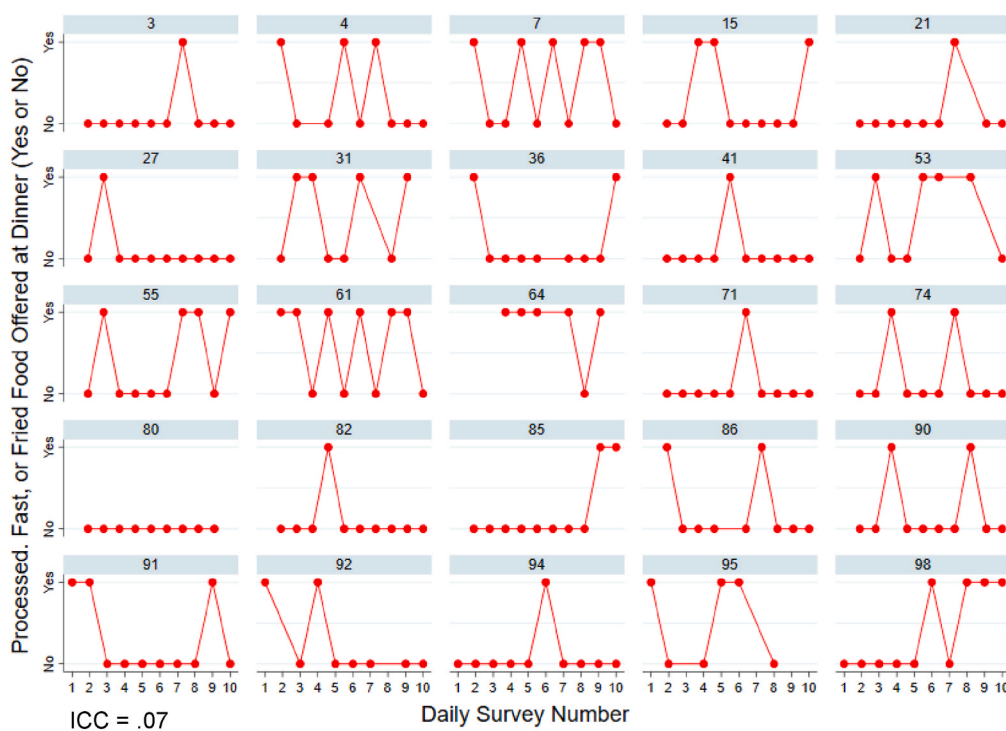
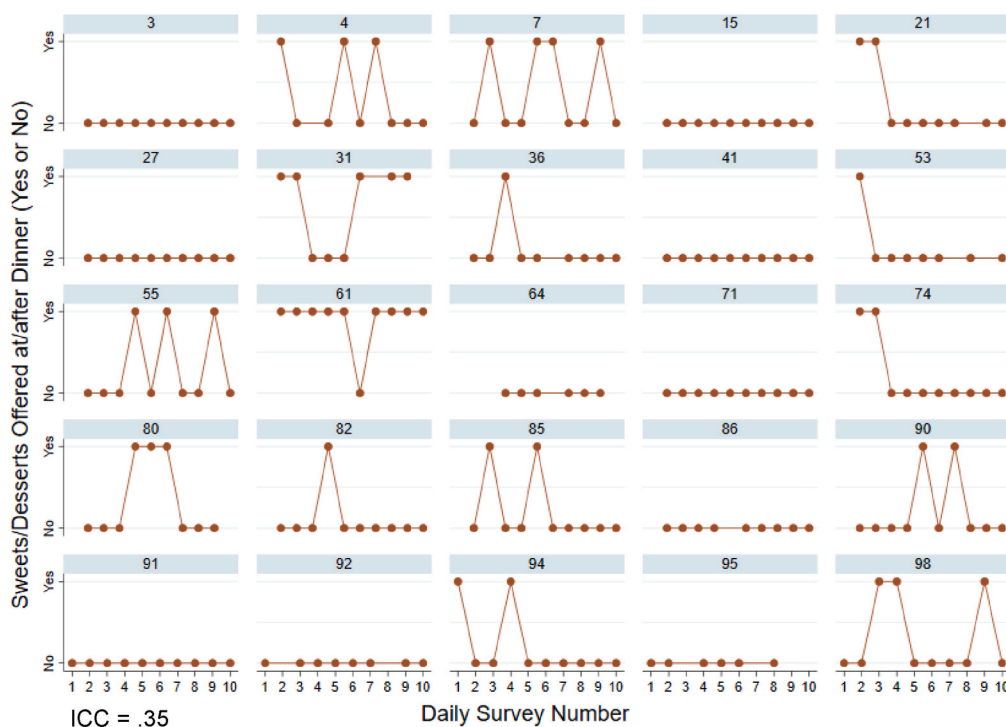


Fig. 6. Random sampling of 25 parents' offerings of processed, fast, or fried food and sweets and desserts at dinner across 10 days. Note. Processed, fast, or fried foods included processed meats (e.g., hot dog, bacon), burgers (cheese or plain), breaded and fried chicken products (including nuggets), pizza (any kind), and other fried foods (e.g., French fries, chips). Sweets/desserts included frozen treats (e.g., ice cream, popsicles, milkshakes) and sweets and baked goods (e.g., candy, cookies, slice of cake).



instead, parents may opt to cook dinner at home, which may be linked to healthier meals compared to restaurant meals (Lachat et al., 2012; Wolfson et al., 2016). Children are also more likely to consume sugar as a snack (Shriver et al., 2018), and recent findings demonstrate that parents are offering more sweet and savory snacks during the COVID-19 pandemic (Jansen et al., 2021). On the other hand, refined grains may be offered to children more often because the adults in their home may not consume whole grains themselves (Cleveland et al., 2000; U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020) or because children prefer refined grain products

(Burgess-Champoux, Rosen, Marquart, & Reicks, 2008). However, parents may be able to further reduce offerings of non-recommended foods and beverages through cooking at home (Mills et al., 2017) and repeated exposure to healthier alternatives (Heath et al., 2011). Although the rates of non-recommended offerings reported here are relatively low, considering the age of the children ( $M = 2.82$  years) in this sample, parents' offerings of these foods and beverages should continue to be monitored in both primary and national studies.

Characteristics about the mealtime, such as eating together, planning dinner in advance, preparing homemade meals, may be associated with

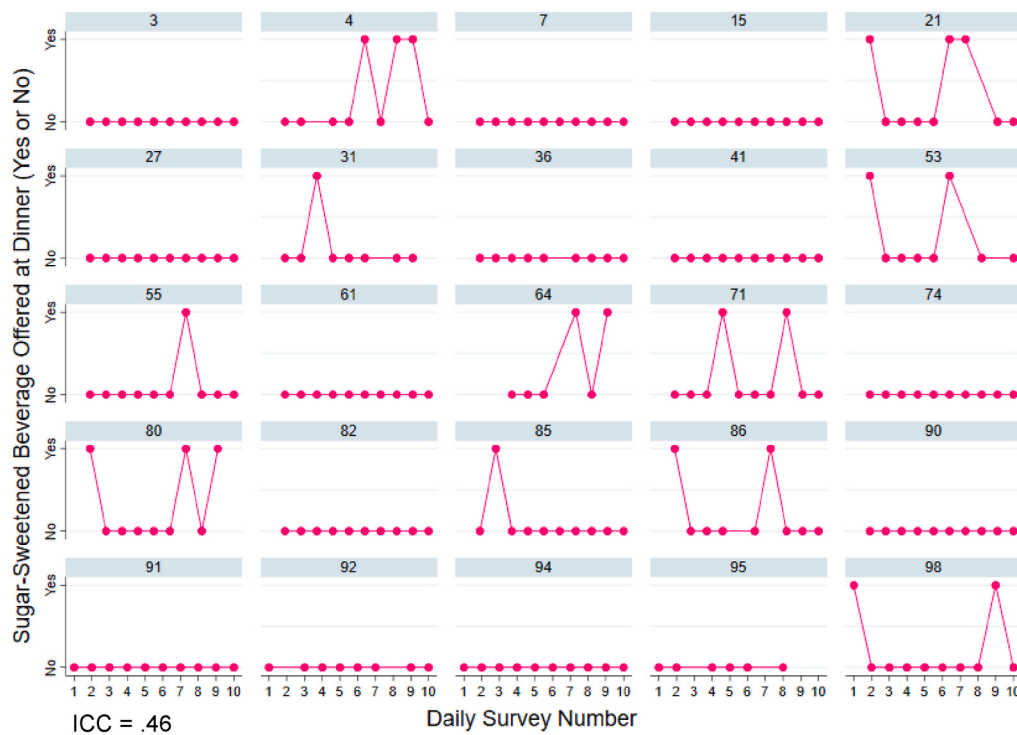


Fig. 7. Random sampling of 25 parents' offerings of sugar-sweetened beverages at dinner across 10 days. Note. Sugar-sweetened beverages (SSBs) included soda, fruit juice with added sugar, and flavored milk (e.g., chocolate milk).

**Table 1**  
Descriptive Statistics for the Daily Offerings and Results from the Chi-Square Tests.

| Daily Offerings                 | M (Days) | SD   | Weekdays (620 days) vs. Weekends (287 days) | Family Dinner 81% (736 days) | Meal Planned 62% (554 days) | Meal Homemade 68% (603 days) |
|---------------------------------|----------|------|---|------------------------------|-----------------------------|------------------------------|
| $\chi^2$ p-value's              |          |      |   |                              |                             |                              |
| Offerings at Dinner             |          |      |   |                              |                             |                              |
| Vegetables                      | 5.51     | 2.68 | .686  | <.001                        | <.001                       | <.001                        |
| Fruit                           | 3.17     | 2.84 | .209  | .258                         | .107                        | .142                         |
| Protein                         | 5.70     | 2.23 | .709  | <.001                        | <.001                       | <.001                        |
| Dairy                           | 4.56     | 2.95 | .854  | .089                         | .729                        | <.001                        |
| Whole grains                    | 0.77     | 1.10 | .193  | .676                         | .062                        | <.010                        |
| Water                           | 4.49     | 3.33 | .405  | .301                         | .271                        | .023                         |
| Refined grains                  | 4.61     | 2.21 | .807  | .090                         | .149                        | <.001                        |
| Processed, fast, or fried foods | 2.72     | 1.61 | .769  | .326                         | <.001                       | <.001                        |
| Sweets and desserts             | 1.56     | 1.87 | .959  | .657                         | .598                        | .856                         |
| Sugar-sweetened beverages       | 0.84     | 1.39 | .498  | .691                         | .504                        | <.010                        |

Note. Family dinner = all or most of the family ate dinner together vs. family did not eat dinner together. Meal planned = meal planned ahead of time vs. prepared at the last minute. Meal homemade = meal was made from scratch or mostly from scratch vs. pre-made, take-out, dining at restaurant. **Bolded** p-values are significant at 0.05 or less.

healthier meals. Parents reported that all or most of the family ate dinner together 81% of the time, and eating dinner together was also associated with offering vegetables and protein more often. Shared family meals have been linked with child health outcomes, such as reduced risk for eating disorders (Neumark-Sztainer et al., 2008), overeating (Videon & Manning, 2003), and childhood obesity (Gable et al., 2007), and increased consumption of fruits and vegetables and healthier foods in general (Hammons & Fiese, 2011). Caldwell et al. (2018) found that having at least one parent present at dinner was associated with increased odds for consuming fruits and vegetables. In addition, parents reported planning dinner in advance and preparing homecooked meals 62% and 68% of the time, respectively, and doing so was associated with more vegetables and protein offerings, and associated with less processed, fast, or fried foods offerings. These meal preparation strategies

have both been associated with consuming healthier diets (Beck, 2007; Mills et al., 2017; Wolfson et al., 2016), and meal planning, specifically, is a useful tool for helping parents overcome barriers such as time constraints and miscommunication with their partner about dinner (Nepper & Chai, 2016). Meal planning is also linked to more positive physical and mental health outcomes in children, such as disease severity, substance use, health quality of life (see Fiese et al., 2012). However, parents may also be overwhelmed by cooking at home or the thought of meal planning, and often report they would like advice on meal planning and recipes from preparing quick, healthy meals (Fulkerson et al., 2011; Nepper & Chai, 2016; Robson et al., 2016). Together, this is evidence suggests that shared family mealtimes, meal planning, and cooking at home are associated with more healthful offerings to children – both in the current study (during the pandemic) and the

existing literature (prior to the pandemic) – but continued focus is needed to educate and encourage parents to eat together as a family, to plan meals in advance, and to cook at home regularly.

The current study has several strengths and important implications for parents' feeding practices during a naturally occurring stressful event, namely the COVID-19 pandemic. First, to my knowledge, this is the first study to examine parents' food and beverage offerings at dinner using a daily survey approach during the pandemic. Prior to the pandemic, several EMA studies focused on parents' feeding practices (Berge et al., 2017, 2018; Tate et al., 2020) and parents' promotion of general healthful eating behaviors (Dunton et al., 2019). More recently during the pandemic, Jansen et al. (2021) examined children's snacking cross-sectionally, while Loth et al. (2021) used an EMA approach to examine changes in food parenting practices before and during COVID-19. The current study complements this previous work by providing an initial glimpse into parents' daily offerings at dinner during the pandemic; one caveat of these findings is that they are specific to the period of COVID-19 rather than documenting changes in parents' feeding practices due to COVID-19. Second, I used daily measures of parents' food and beverage offerings at dinner using a comprehensive checklist, including estimated serving sizes for each offered item. There is a noticeable amount of variation in parents' offerings across the 10 days, and few parents reported offering their child recommended foods and beverages every day, which suggests that parents may not be responding in a socially desirable manner (e.g., reporting offering vegetables every day). The temporal window for reporting was small, which may also help reduce biased responding. Parents received their daily surveys at 5 p.m., a reminder at 9 p.m., and was only available until 3 a.m.; thus, parents only had to recall the food and beverages they offered that evening.

Several limitations of this study need to be considered. First, the current study is relatively homogenous with respect to parent sex, race, ethnicity, education, and income. This sample may be less at risk for experiencing financial strain or food insecurity, in general, but also may be less likely to have been negatively affected by the COVID-19 pandemic (e.g., loss of job, loss of home). On a related note, there may be a potential selection effect; parents who are having more difficulty during the pandemic may have declined to participate or the sampling technique failed to reach these parents. Thus, the results of this study may not generalize well to other populations and additional effort must be made to recruit a more diverse sample in the future, which include partnering with programs such as Woman, Infants, and Children and the Supplemental Nutrition Assistance Program. Second, the measure of parents' food and beverage offerings is an approximation of child dietary intake. The standard method of measuring dietary intake is repeated 24-h dietary recalls (Gibson et al., 2017), which is an in-depth interview to assess energy intake. Using this method, the researcher can ascertain more precise estimates of food and beverage offerings and can be used to retrieve micronutrient estimates. However, this would be too cumbersome for participants to complete for 10 consecutive days, and because parents' behavior was the primary focus, a brief measure of daily food and beverage offerings was created to determine if parents were, at the least, offering recommended foods and beverages to their children at dinner. The current study could be extended by employing an EMA approach, in which parents could be prompted throughout the day to provide information about their food and beverage offerings from morning until evening to account for additional feeding opportunities. A related concern is that parents may be unable to accurately estimate the serving sizes offered to their children (Blake et al., 2015; More, 2013). For example, parents may not know how much their child should eat or drink or may not be able to estimate the exact size offered (e.g., ½ cup vs. 1 cup). Third, the inclusion criteria for participation in the study was limited to one parent from each household, those who lived with their children full-time during the stay-at-home orders, and those who currently live with their child full-time. Divorced (or separated) families with were likely excluded from this study if their child did not live with

them full-time, and thus, parents would not be able to report what their child had for dinner for 10 consecutive days.

## 5. Conclusions

This study documented parents' food and beverage offerings at dinner on a daily basis during the COVID-19 pandemic. On average, parents did not offer recommended foods and beverages on a daily basis. Parents offered vegetables and protein most often across the 10 days, however, less than 50% of parents are offered the recommended serving size for each group. The intraclass correlations and random sampling plots revealed considerable within-person variation. This study also demonstrates that the characteristics of dinner, such as eating together as a family, planning meals in advance, and preparing homemade meals, are associated with greater offerings of recommended foods and beverages. These characteristics may be important targets for combatting daily barriers, such as parents' stress, and future analysis should test daily associations between parents' stress, meal characteristics, and food and beverage offerings.

## Declaration of competing interest

There are no conflicts to disclose.

## Ethical statement

The study was approved by the Institutional Review Board at the University of Texas at Austin (reference #: 2019-12-0029).

## Data availability statement

The dataset generated for this study is available from the corresponding author upon reasonable request.

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