# Associations between Multiple Measures of Parental Feeding and Children's Adiposity in United Kingdom Preschoolers

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**Abstract**

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***Objective:*** Research into the association between parental control over feeding and children's adiposity has produced inconclusive results. Some studies have found parental control to be associated with unhealthy food choices and disordered intake regulation, whereas others have found favorable or null associations between control and adiposity. This study hypothesized that variability in measures of parental feeding could contribute to these discrepancies. Scales from a range of existing parental feeding questionnaires were used together, in the same large sample of children, to examine associations with adiposity.

***Research Methods and Procedures:*** Associations between scores on scales from three published parental feeding questionnaires [Child Feeding Questionnaire (CFQ); Preschooler Feeding Questionnaire (PFQ); and Parental Feeding Style Questionnaire (PFSQ)] and children's BMI z-scores, calculated from measured heights and weights, were examined in a socioeconomically diverse sample of 439 parents and their 3- to 5-year-old children.

***Results:*** Higher scores on CFQ Pressure to Eat and PFQ Pushing the Child to Eat More were significantly associated with lower BMI z-score, while PFSQ Prompting to Eat, CFQ Restriction, PFSQ Instrumental Feeding, and PFSQ Emotional Feeding were unassociated with BMI z-score.

***Discussion:*** These results suggest that parents of leaner children are more likely to encourage their children to eat. Other feeding strategies seemed to have negligible relationships with children's BMI z-scores at this stage. Longitudinal and genetically informed designs are needed to clarify the causal pathways between parental feeding and children's adiposity.

**Key words: parental control, parenting, overweight, instrumental feeding, food as a reward**

## Introduction

Parents are an important influence on children's behavior (1,2), and it is more than likely that this impact extends to weight-related behaviors such as physical activity and eating style. Parental behaviors have, therefore, attracted special interest as potentially modifiable environmental levers with which to tackle the current obesity epidemic (3,4). A growing body of work has examined whether the ways parents feed their children might influence the type and amount of food that children eat and, ultimately, their adiposity (5).

Innovative studies conducted by Birch and colleagues (6) have been particularly influential in this field. In an early experimental study, a small sample of children ($n = 22$) were trained to focus either on external cues such as the amount of food remaining on the plate (simulating parental pressure to eat) or on internal cues of hunger and satiety (simulating child control over intake). Only the "internal cue-trained" children adjusted their subsequent intake according to the calorie content of a pre-load (7). In another study, children were presented with two snack foods, one of which was placed within view but could only be eaten for a limited period, and one to which they had free access (simulating parental restriction). They showed greater desire for, selection of, and intake of, the restricted food (8). Other research from the same laboratory has used psychometric measures of parents' feeding style to assess parents'

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actual behavior and behavioral tests to assess children's eating. These studies have shown that parental control is associated with poorer caloric compensation in preschoolers (9). A robust relationship between parental restriction of high-energy foods and children's consumption of snack foods in the absence of hunger has also been reported (10,11).

Other studies have examined the impact of instrumental feeding, i.e., using food as a reward. In one well-controlled study, 4- to 7-year-old children ($n = 87$) were asked to consume Snack A to win a taste of Snack B. Although snacks were initially liked equally, post-test ratings revealed that liking for Snack A (the "means" snack) decreased relative to Snack B (the "reward" snack), suggesting that parents' use of instrumental feeding could decrease healthy preferences (12). The impact of emotional feeding (i.e., using food to influence children's affect) has not been explored experimentally. However, retrospective evidence from clinical populations demonstrates that overweight women are more likely to recall maternal use of controlling food practices during childhood (13,14), and adults in a community sample who recalled instrumental feeding in childhood scored more highly on bingeing and restraint (15).

One possible interpretation of these assorted findings is that higher parental control has the counterproductive effect of making children less able to achieve a balanced diet and appropriate energy intake, with undesirable consequences for children's weight. However, results from cross-sectional surveys of community samples indicate that at least some forms of parental control do not promote obesity. In mothers ($n = 792$) of 8- to 9-year-olds recruited from 13 public elementary schools, scores on a brief parental control index (9) were uncorrelated with BMI and skinfolds in boys and negatively correlated with both indices in girls (16). Similarly, among parents of 3- to 6-year-olds surveyed as part of the National Longitudinal Survey of Youth ($n = 1083$), those who allowed their child no choice in deciding what foods to eat at breakfast and lunch (i.e., exhibited higher control) had children with a slightly lower BMI $z$-score compared with those who gave a little, some, or a great deal of choice (17).

Other large studies have failed to find any associations with parental control. For example, Wardle et al. (18) developed and administered a Parental Feeding Style Questionnaire (PFSQ)[1] to a sample of 214 mothers of 4- to 5-year-old twins at high or low obesity risk and found no consistent associations between a range of feeding behaviors (including instrumental and emotional feeding) and child BMI. Another study assessed a wide range of parental feeding strategies using the Preschooler Feeding Questionnaire (PFQ) in a socioeconomically and ethnically diverse sample of mothers of 2- to 5-year-olds ($n = 634$) and found no differences in feeding behavior between parents of overweight and lean children (19).

The diversity in methods and samples across studies makes it difficult to interpret discrepancies in results. For example, one source of variation could be that different studies have used different measures, ranging from an unvalidated single item (17), a uni-dimensional scale derived through post hoc analysis (16), or an unvalidated set of parental feeding items (19) to a multidimensional questionnaire derived through factor analytic methods (18). Relationships with adiposity may differ depending on the particular type of parental feeding that is assessed. Spruijt-Metz et al. (20) administered the multidimensional Child Feeding Questionnaire (CFQ) (21) to a community sample ($n = 74$) of mothers of 7- to 14-year-old children and found that one aspect of control (restriction) was associated with higher fat mass, whereas another (pressure to eat) was associated with lower fat mass. One explanation for this pattern of results may be that parental feeding behaviors are responses to, rather than determinants of, children's eating behavior, so pressure to eat could be a response to a child who is perceived to be too thin, whereas restriction could be a response to a child who is perceived as overweight. The negative results of Wardle et al. (18) and Baughcum et al. (19) may also be related to the parental feeding scales used.

The current study examines associations between multiple measures of parental feeding and child adiposity in a socioeconomically diverse community sample in the United Kingdom. To clarify between-study differences in results, several scales from a range of published parental feeding questionnaires were administered together in the same sample. The preschool age group (3 to 5 years old) was chosen to facilitate comparison with existing studies. On the basis of previous research, we hypothesized that there would be positive associations between child adiposity and measures of restriction, instrumental feeding, and emotional feeding and negative associations between adiposity and measures of encouragement to eat. We also predicted that significantly higher levels of encouragement to eat would be found for the thinnest group of children.

## Research Methods and Procedures

### *Participants and Procedures*

Participants were recruited from nursery and reception (preschool) classes in 12 primary schools in London, England. Schools were selected to represent a range of socioeconomic deprivation as indexed by the percentage of pupils eligible for free school meals (a government benefit available to lower-income families). Parents or primary caregivers (subsequently referred to collectively as parents)

[1] Nonstandard abbreviations: PFSQ, Parental Feeding Style Questionnaire; PFQ, Preschooler Feeding Questionnaire; CFQ, Child Feeding Questionnaire; IOTF, International Obesity Task Force; SD, standard deviation.

were informed about the study in writing and given the option to exclude their child. Questionnaires and postage-paid return envelopes were distributed when the parents delivered their children to school, and reminders were sent to those who had not returned the questionnaire within 2 weeks. Children were weighed and measured by the research team at school on the day of questionnaire distribution.

### *Measures*

*Parental Feeding Style.* Scales from three published parental feeding questionnaires were selected to represent a range of parental feeding behaviors. Pressure to Eat (four items, e.g., "I have to be especially careful to make sure my child eats enough"), Restriction (eight items, e.g., "I intentionally keep some foods out of my child's reach"), and Monitoring (three items, e.g., "How much do you keep track of the sweet things your child eats?") scales were taken from the CFQ (21). From the PFQ (19), we included four items from the five-item Pushing the Child to Eat More scale (subsequently abbreviated to Pushing to Eat) (e.g., "Do you make your child finish all of his/her dinner before he/she can have a dessert?"). The item "Did you punish or remove privileges to get your child to eat more?" was omitted, due to low endorsement during piloting. Prompting to Eat (eight items, e.g., "Do you praise your child if he/she eats what you give him/her?"), Emotional Feeding (five items, e.g., "Do you give your child something to eat to make him/her feel better when he/she is feeling upset?"), and Instrumental Feeding (four items, e.g., "Do you use puddings as a reward?") scales were drawn from the PFSQ (18). Response options for the CFQ items were five categories expressing agreement (disagree, slightly disagree, neutral, slightly agree, agree) or frequency (never, rarely, sometimes, often, always), depending on the item. Response options for PFQ and PFSQ items were also standardized to this five-point frequency scale (further details available from the authors).

*Demographic Characteristics.* Questions on parents' age, sex, ethnicity, and educational level were included. Children's exact ages were calculated by subtracting their date of birth from the date of questionnaire completion.

*Child Height and Weight.* Trained researchers weighed and measured children according to standard protocols, using calibrated Tanita digital scales (Tanita Corp., Tokyo, Japan) and a Leicester height measure (Seca, Birmingham, UK). Height was recorded to the nearest millimeter and weight to the nearest 10th of a kilogram. These data were used in combination with calculated child ages to generate exact BMI z-scores with reference to 1990 United Kingdom growth reference curves together with IOTF weight categories (22), using imsGrowth v2.12 (available from: http://homepage.mac.com/tjcole). BMI centiles were derived from these z-scores for the categorical analyses.

### *Statistical Analysis*

Data were analyzed using *t* tests (SPSS software, version 12; SPSS, Inc., Chicago, IL) to compare BMI values of children whose parents did or did not complete the questionnaire, and $\chi^2$ tests to compare parental characteristics and questionnaire scores for children for whom height and weight data were or were not available. Pearson's correlations were used to test associations between parental feeding scales and child BMI z-score. Univariate ANOVAs were used to examine differences in parental feeding scores by child adiposity groups. In order to create these adiposity groups, overweight and obese children were identified according to International Obesity Task Force (IOTF) categories (23), then, to test for weight-related differences within the normal-weight group, children were subdivided into a "normal/low-weight" group, defined as those children at or below the 50th BMI centile based on 1990 United Kingdom reference data, and a "normal/midweight" group, defined as those children above the 50th BMI centile but not meeting IOTF criteria for overweight or obesity. Given the suggestion of sex and ethnic differences in previous research, *t* tests were used to compare parental feeding scores for boys and girls, and univariate ANOVAs with educational level as a covariate were used to test for ethnic differences, controlling for education. Correlations between parental feeding style and adiposity were repeated for boys and girls separately and compared to identify significant sex effects. Partial correlations were used to examine relationships between feeding style and adiposity, controlling for parental education.

## Results

### *Response Rates*

According to school records, the 12 participating schools had 1140 children in the selected class groups. The vast majority of children ($n = 1088$, 95%) were present on the day of anthropometric data collection, and only one parent withdrew her child from the study. A total of 827 children (73%) were weighed and measured. Data could not be collected from the remainder due to time constraints. Questionnaires were returned by 541 parents, amounting to a 50% response rate. Measured child heights and weights were available for 439 (81%) of questionnaire respondents. To explore the possibility that parents' decisions to complete the feeding questionnaire depended on their children's adiposity, child BMI values for questionnaire respondents and non-respondents were compared, but there were no significant differences. There were no differences in demographic characteristics between respondents whose children were weighed or not weighed. CFQ Pressure to Eat scores were slightly higher in those with missing height and weight data (mean score, 2.3) than in those with data present (mean score, 2.0) ($t = 2.18$, $df$ 535, $p = 0.030$), but there were no differences on other parental feeding scales.

**Table 1.** Sample characteristics

| Characteristic | *n* | % |
|---|---|---|
| Parents | | |
| Sex | | |
| Female | 408 | 92.9 |
| Male | 29 | 6.6 |
| Missing | 2 | 0.5 |
| Relationship with child* | | |
| Mother | 413 | 94.1 |
| Father | 21 | 4.8 |
| Other (e.g., grandparent, guardian) | 3 | 0.7 |
| Missing | 2 | 0.5 |
| Ethnicity* | | |
| White British | 310 | 70.6 |
| Indian, Pakistani, or Bangladeshi | 26 | 5.9 |
| Black African or Black Caribbean | 52 | 11.8 |
| Other (including mixed race) | 43 | 9.8 |
| Missing | 8 | 1.8 |
| Education | | |
| None | 40 | 9.1 |
| GCSE or equivalent | 173 | 39.4 |
| A-level or equivalent | 93 | 21.2 |
| Degree or higher | 112 | 25.5 |
| Other/missing | 21 | 4.8 |
| Children | | |
| Sex | | |
| Female | 195 | 44.4 |
| Male | 243 | 55.4 |
| Missing | 1 | 0.2 |
| Weight status† | | |
| Normal weight | 315 | 71.8 |
| Overweight | 86 | 19.6 |
| Obese | 38 | 8.7 |

GCSE, General Certificate of Secondary Education; IOTF, International Obesity Task Force.

GCSE or equivalent are qualifications taken at 16 years of age; A-level or equivalent are qualifications taken at 18 years of age; and Degree or higher are qualifications taken over age 18 years.

* Due to rounding, percentages for these variables do not add up to 100.

† Weight status categories determined using IOTF criteria (23).

### *Sample Characteristics*

Parent and child characteristics for families with complete child height and weight data are presented in Table 1. The mean age of the children was 4.4 years [standard deviation (SD), 0.6] and ranged from 3 to 6 years. The mean BMI of the children was 16.8 kg/m$^2$ (SD 1.9) and ranged from 13 to 31 kg/m$^2$, and mean z-score relative to 1990 United Kingdom reference data was 0.67 (SD 1.12). Twenty percent of the children were overweight, and ~9% were obese, according to the IOTF criteria.

### *Parental Feeding Scales*

Descriptive statistics for the final scales are given in Table 2. Cronbach's $\alpha$ scores for each scale demonstrated good internal consistency, ranging from 0.73 for CFQ Pressure to Eat to 0.88 for PFSQ Emotional Feeding. Item means were highest for CFQ Monitoring and PFSQ Prompting to Eat and lowest for PFSQ Emotional Feeding and PFSQ Instrumental Feeding. Reflecting this pattern, distributions for PFSQ Prompting to Eat, CFQ Monitoring, and CFQ Restriction showed some negative skewness, and PFSQ Emotional Feeding and PFSQ Instrumental Feeding showed a positive skew.

*t* Tests demonstrated no significant differences between boys and girls on any parental feeding scales. CFQ Monitoring scores were significantly higher among white parents, whereas CFQ Pressure to Eat, PFQ Pushing to Eat, PFSQ Emotional Feeding, and PFSQ Instrumental Feeding were lower among this group. These findings were unchanged when controlling for parental education.

### *Associations between Parental Feeding Style and Child Adiposity*

Table 3 shows simple correlations between parental feeding scores and children's BMI z-scores, and Table 4 gives results from univariate analyses of differences in parental feeding style by child adiposity group. To take account of skewness in the parental feeding variables, both parametric and non-parametric correlations were calculated, but as they produced very similar results only parametric correlations are presented for comparability with previous results. CFQ Pressure to Eat and PFQ Pushing to Eat were inversely correlated with BMI z-score. Post hoc testing with univariate ANOVAs revealed that the "normal/low-weight" group had significantly higher CFQ Pressure to Eat scores (mean score, 2.3) than the other three groups (normal/mid-weight, overweight, and obese; mean scores, 1.9, 1.9, and 1.8, respectively). Other parental feeding scales were not significantly correlated with BMI z-score and did not differ by adiposity group.

To test whether associations differed by sex, correlations were repeated for boys and girls separately. Correlations between several parental feeding scales and BMI z-scores were higher for boys than for girls (CFQ Pressure to Eat: boys −0.17, girls −0.13; PFQ Pushing to Eat: boys −0.14, girls −0.08; PFSQ Prompting to Eat: boys −0.11, girls 0.03), and the correlation between CFQ Restriction and BMI z-score was higher for girls (boys −0.05, girls 0.16). However, overlap between confidence intervals indicated that none of the differences were significant, so results for

**Table 2.** Descriptive statistics for parental feeding scales

| Factor | No. of items | $\alpha$ | Mean (standard deviation) | *n* |
|---|---|---|---|---|
| CFQ | | | | |
| Monitoring | 3 | 0.87 | 3.0 (0.8) | 432 |
| Restriction | 8 | 0.78 | 2.4 (0.9) | 434 |
| Pressure to Eat | 4 | 0.73 | 2.0 (1.1) | 436 |
| PFQ | | | | |
| Pushing to Eat | 4 | 0.75 | 1.8 (0.9) | 432 |
| PFSQ | | | | |
| Prompting to Eat | 8 | 0.80 | 3.1 (0.6) | 433 |
| Emotional Feeding | 5 | 0.88 | 0.9 (0.8) | 434 |
| Instrumental Feeding | 4 | 0.74 | 1.2 (0.8) | 432 |

CFQ, Child Feeding Questionnaire; PFQ, Preschooler Feeding Questionnaire; PFSQ, Parental Feeding Style Questionnaire.

the full sample are presented here. Numbers in each ethnic category were too small to explore ethnic differences in correlations. Finally, to test whether socioeconomic factors might confound the relationship between parental feeding style and child adiposity, partial correlations were conducted, controlling for parental education; correlation strengths and directions were unchanged.

## Discussion

This study set out to examine cross-sectional associations between multiple measures of parental feeding style and child adiposity in a large, socioeconomically diverse sample of United Kingdom parents of preschoolers.

**Table 3.** Correlations (Pearson's *r*) between parental feeding scales and child BMI z-score

| Factor | *r* | *p* |
|---|---|---|
| CFQ | | |
| Monitoring | 0.00 | 0.965 |
| Restriction | 0.03 | 0.517 |
| Pressure to Eat | −0.15 | 0.001 |
| PFQ | | |
| Pushing to Eat | −0.12 | 0.013 |
| PFSQ | | |
| Prompting to Eat | −0.06 | 0.277 |
| Emotional Feeding | −0.04 | 0.435 |
| Instrumental Feeding | −0.02 | 0.636 |

CFQ, Child Feeding Questionnaire; PFQ, Preschooler Feeding Questionnaire; PFSQ, Parental Feeding Style Questionnaire.

Scales measuring encouragement to eat showed the strongest associations with child adiposity, with higher parental encouragement associated with thinner children. This finding is likely to reflect parents' responding to lower weight in their children by pressuring them to eat more than they would like, or using well-liked foods to reward consumption of less-liked foods. Notably, the PFSQ Prompting to Eat scale showed no association with BMI z-score, perhaps because it describes a more *authoritative* type of feeding, which is aimed at enhancing the healthfulness of children's diets, rather than promoting greater energy intake, and may be less responsive to children's weights.

It was also interesting that children in the lowest weight category (i.e., children who were underweight or low normal weight) had significantly higher CFQ Pressure to Eat scores than those in the other three categories. Examination of the items suggests that some of them explicitly describe a parental reaction to poor appetite and low weight (e.g., "If I did not guide or regulate my child, he/she would eat much less than he/she should") rather than a parental behavior alone (e.g., "I praise my child if he/she eats a new food"). This scale may, therefore, be more sensitive than others to parents responding to low weight in their children. The stepwise pattern of the association lends further support to the theory that pressure is applied as a specific response to perceived low weight, rather than influencing adiposity in a linear fashion.

In contrast to previously published associations (8,10,11,20), CFQ Restriction was unassociated with child BMI z-score in our full sample. Similarly, despite widely held beliefs about the dangers of using food to manipulate affect, or as a reward (3), neither PFSQ Emotional Feeding or PFSQ Instrumental Feeding showed clear associations with adiposity. However, the PFSQ Pushing to Eat scale did contain three items assessing the use of desserts and favorite

**Table 4.** Mean parental feeding scores by child adiposity group

| Factor | Normal/low-weight ($n$ = 125) | Normal/mid-weight ($n$ = 190) | Overweight ($n$ = 86) | Obese ($n$ = 38) | $p$ |
|---|---|---|---|---|---|
| CFQ | | | | | |
| Monitoring | 2.97 | 3.07 | 2.91 | 3.11 | 0.395 |
| Restriction | 2.48 | 2.37 | 2.50 | 2.66 | 0.249 |
| Pressure to Eat | 2.30*†‡ | 1.88* | 1.88† | 1.84‡ | 0.003 |
| PFQ | | | | | |
| Pushing to Eat | 1.96 | 1.77 | 1.66 | 1.83 | 0.082 |
| PFSQ | | | | | |
| Prompting to Eat | 3.14 | 3.04 | 2.94 | 3.11 | 0.114 |
| Emotional Feeding | 0.91 | 0.85 | 0.86 | 0.80 | 0.868 |
| Instrumental Feeding | 1.22 | 1.15 | 1.24 | 1.23 | 0.747 |

CFQ, Child Feeding Questionnaire; PFQ, Preschooler Feeding Questionnaire; PFSQ, Parental Feeding Style Questionnaire; IOTF, International Obesity Task Force.
Normal/low-weight category includes children with a BMI centile score of 50 or under, according to 1990 United Kingdom reference data (22). Normal/mid-weight category includes children over 50th centile but not meeting IOTF criteria for overweight or obesity. Overweight and obese categories were determined using IOTF criteria (23). Matching symbols (*†‡) denote significant differences between groups (least significant difference).

foods to reward the consumption of meals and healthy foods and was associated with lower child weight. Our findings could indicate that restriction, emotional feeding, and use of food specifically to reward behavior (as measured by the PFSQ Instrumental Feeding scale) had not yet impacted on children's weight. Alternatively, this sample of parents may have been disinclined to respond to their children's weight by adopting these feeding strategies.

As was the case for the CFQ Pressure to Eat scale, some of the items on the CFQ Restriction scale seemed to be assessing parental responses to their children, describing children's eating habits to which the parent reacts (e.g., "If I did not guide or regulate my child, he/she would eat too many of his/her favorite foods"). We have previously demonstrated a strikingly low level of awareness of child overweight among mothers of preschool-age children in the United Kingdom (24), which is consistent with an absence of restriction in response to higher weight. Our results may, therefore, reflect important cultural differences between our diverse United Kingdom sample and some of the more affluent United States samples, which demonstrate concern for child weight at a younger child age and could be more likely to implement restrictive feeding practices (10). The high mean for CFQ Monitoring in this sample, together with the absence of an association between Monitoring and adiposity, suggests that these United Kingdom mothers may be more inclined to exert moderate forms of control aimed at achieving a healthful diet.

We found little evidence for gender differences, suggesting that some of the existing findings on girls alone (10,11,25,26) may also extend to boys. However, the present study could not rule out very small sex differences in association strength. Our results suggest a slightly stronger negative relationship between encouragement to eat and adiposity in boys, and a stronger positive relationship between restriction and adiposity in girls. If this association proves to be robust across other studies, the explanation could be that higher weight is considered desirable in boys (27), and parents are, therefore, more inclined to react to low weight. Conversely, social pressures for girls to be thin (28) may lead parents to restrict the intake of heavier girls.

Ethnic group numbers were too small to explore the possibility of differential feeding-adiposity associations. However, the differences seen here suggest that in the United Kingdom, as in the U.S. (17,29), parental feeding styles may differ by ethnicity, with some minority groups being more comfortable with authoritarian practices such as overt restriction and emotional and instrumental feeding.

The results of this study may explain some discrepancies in previous research. For example, our replication of the previously reported association between Pressure to Eat and child weight, in contrast with our failure to find an association with other feeding styles, suggests that, compared with other feeding strategies, Pressure to Eat shows a more consistent association with weight. Inverse associations when using more general parental control measures (16,17) could, therefore, be driven primarily by parents applying greater encouragement to eat to thinner children. The study by Baughcum et al. (19) may have failed to find an effect because it compared overweight with lean children, whereas

our results suggest that the interesting difference is between normal/overweight and low weight children. An alternative explanation for discrepancies is that they result not from differences in measures but from variation in sample characteristics, e.g., child age and family ethnicity. Future research could adopt a similar multi-measure design to distinguish between these two possibilities.

Strengths of this study are the size and diversity of the sample, the use of multiple measures of parental feeding style, and the extension of existing U.S. findings to a United Kingdom sample. However, some limitations should also be considered. First, as with many studies in this area, we assessed adiposity using BMI z-scores rather than more direct estimates of fatness. BMI z-scores are highly correlated with body fatness and have been recognized as a satisfactory way of ranking children on adiposity levels (30,31). However, current results strictly reflect associations with total mass rather than fat mass alone and are therefore not directly comparable to studies using DXA (20) or skinfold measurements (16). Future studies of cross-sectional relationships between parental feeding and child adiposity would benefit from including waist circumferences or DXA.

A second limitation, common to much of the literature, was the under-representation of detailed measures of *authoritative* forms of feeding, i.e., behaviors that are flexible, guiding the children while permitting them some input into decision-making and, thus, enabling them to learn to control their intake independently. Authoritative and authoritarian behaviors may have different associations with children's eating behavior and adiposity, and future studies should, therefore, explore the correlates of more authoritative forms of feeding, such as those recently outlined by Hughes et al. (29).

Our questionnaire respondents were generally more educated than the United Kingdom population as a whole, and the proportion of ethnic minorities was higher, reflecting the diverse urban areas we sampled (32). Nonetheless, we achieved a socioeconomically diverse sample with sizeable proportions of parents in each educational category. Another possible source of bias in our sample was the failure to weigh and measure all children. However, only one parent excluded her child from participating, and otherwise lack of measurement was determined by time constraints and school events, so there was unlikely to be systematic bias in the missing data. Consistent with this, there were no substantial differences in feeding style or demographic factors between children who were measured and those who were not measured. These factors, therefore, limit the generalization of the results but still permit conclusions to be drawn about the relationships between parental feeding and adiposity, because we achieved adequate variance on all of these variables.

Although the results of the current study have helped to clarify associations between parental feeding and child adiposity, cross-sectional studies are fundamentally unable to tell us about the causal pathways between feeding and weight. If parental feeding impacts on children's adiposity, we are unlikely to see the effects until much later. Longitudinal research is needed to explore these possibilities. Increased use of genetic methodologies may also help to untangle causal relationships by enabling us to see how much of children's eating behavior is genetically determined and to test how parental feeding behavior interacts with behavioral dispositions to cause weight gain (33).

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