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Intrusions in Children's Dietary Recalls: The Roles of Body Mass Index, Sex, Race, Interview Protocol, and Social Desirability

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Abstract

Dietary-reporting validation study data and school foodservice production records were used to examine intrusions (reports of uneaten items) in school meals in 24-hour recalls. Fourth-grade children (20 low-body mass index [BMI; $\geq 5^{\text{th}}$ and $< 50^{\text{th}}$ percentiles]; 20 high-BMI [$\geq 85^{\text{th}}$ percentile]; 50% boys; 75% Black) were each observed eating two school meals (breakfast, lunch) and interviewed about the prior 24 hours that evening (24E) or the previous day the next morning (PDM). Social desirability was assessed. Intrusions were classified as stretches (on meal tray), internal confabulations (in school foodservice environment but not on meal tray), and external confabulations (not in school foodservice environment). For breakfast, reported items were less likely to be intrusions for Black than White children, and for low-BMI boys than the other BMI-x-sex groups, and to be external confabulations for high-BMI girls than high-BMI boys. For lunch, reported items and intrusions were more likely to be stretches for 24E than PDM interviews. As social desirability increased, fewer items were reported for breakfast, and reported items and intrusions were more likely to be internal confabulations for lunch. For breakfast, compared to low-BMI girls, as social desirability increased, intruded amounts were larger for high-BMI boys and smaller for high-BMI girls. For lunch, intruded amounts were smaller for high-BMI girls than the other BMI-x-sex groups. Amounts reported were smaller for stretches than internal confabulations and external confabulations for breakfast, and external confabulations for lunch. To better understand intrusions, dietary-reporting validation studies are needed with larger samples by BMI-group, sex, and race.

Keywords

Childhood Obesity; Dietary Assessment; Youth

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DISCLOSURE The authors have no conflicts of interest to declare.

INTRODUCTION

Parents have difficulty accurately reporting their children's intake at school because this intake occurs when parents are not present. Thus, it is necessary to rely on children's self-reported intake. Dietary self-report methods are generally used with children over age 9 years, or 3rd grade (1).

In dietary-reporting validation studies, reported information (e.g., 24-hour dietary recalls [24hDRs]) is compared to reference information (e.g., meal observations). When evaluating reporting accuracy at the food-item level, items eaten and reported eaten are *matches*, and errors include *omissions* (items eaten but unreported) and *intrusions* (uneaten items reported eaten). This article focuses on intrusions.

In a small dietary-reporting validation study (2), children of high- and low-body mass index (BMI) were observed eating two consecutive school meals (breakfast and lunch) and later provided 24hDRs about the period including those meals. There was a significant BMI-group-x-sex interaction on *intruded kilocalories* (kilocalories from intrusions and reported amounts of matches that exceeded observed amounts). High-BMI girls intruded fewer kilocalories than low-BMI girls, whereas high-BMI boys intruded more kilocalories than low-BMI boys (interaction $P<0.04$). High-BMI girls intruded the fewest kilocalories; low-BMI girls intruded the most kilocalories. Furthermore, interview protocol was manipulated by interviewing half of the children in each BMI-group about the prior 24 hours in the evening (24E) of the day their meals were observed; the other half were interviewed about the previous day in the morning (PDM) on the day after their meals were observed. Intruded kilocalories were less, although not significantly less ($P<0.11$), for 24E than PDM interviews (2).

Insight concerning intrusions may contribute to developing instructions and prompts for 24hDR protocols that elicit fewer intrusions. Toward this end, in children's validated reports of school meal intake, each intrusion may be classified by type as a *stretch* (on the child's tray for that meal), *internal confabulation* (available in the child's school foodservice environment for that meal, but not on the child's tray), or *external confabulation* (not available in the child's school foodservice environment for that meal). According to the source monitoring perspective (3), accurate self-reporting of intake requires an individual to differentiate among several sources of information. Types of intrusion in children's recalls may characterize success of this differentiation. Items on children's school meal trays may constitute two sources—items eaten and items not eaten; stretches occur when children fail to differentiate between these sources. A third source is items available in children's school foodservice environments at that meal but not on their trays; internal confabulations occur when children fail to filter out this source. A fourth source is all other items (e.g., from preceding, intervening, and/or future school meals; from non-school meals); external confabulations occur when children fail to filter out this source. As the retention interval increases between eating and reporting, the likelihood of stretches should decrease, and of external confabulations should increase (4).

A personality characteristic on which individuals vary systematically is the tendency to respond in a socially-desirable way—reporting *never* performing a behavior that most everyone performs at least occasionally (e.g., gossiping), or *always* performing a behavior that most people perform usually but omit occasionally (e.g., admitting mistakes). Individuals who respond in a socially-desirable way may err systematically in responding to a variety of questions, including questions about diet; thus, social desirability is an example of response bias (5). Although social desirability was assessed in the BMI dietary-reporting validation study (2), results were not discussed in that publication because social desirability was not a significant covariate for any accuracy variable concerning kilocalories.

For this article, data from the BMI dietary-reporting validation study (2) were used, along with school foodservice production records (completed by school foodservice managers to comply with federal regulations), to examine intrusions in the school meal parts of children's 24hDRs. Specific questions concerned whether the likelihood of reporting intrusions and types of intrusion, and amounts reported by types of intrusion, were related to BMI, sex, race, interview protocol, and social desirability. These questions were guided by the source monitoring perspective and the design of the BMI dietary-reporting validation study, but were not investigated previously.

METHODS AND PROCEDURES

Approvals were obtained from the appropriate human research committees. In August, 2002, 443 fourth-grade children from six schools in one district were invited to participate; 312 (70%) agreed by providing written child assent and parental consent. Schools provided participating children's race, sex, and date of birth.

Research staff measured children without shoes at school in the morning in November, 2002, using digital scales and portable stadiometers according to established procedures (6,7). Interrater reliability was assessed daily on a random 10% of children; intraclass correlations were ≥ 0.99 for weight and height. Each child's height, weight, and age were used to determine his/her BMI-for-age percentile (8). Children with percentiles $\geq 5^{\text{th}}$ and $< 50^{\text{th}}$ were classified as low-BMI and children with percentiles $\geq 85^{\text{th}}$ as high-BMI.

Twenty low-BMI and 20 high-BMI children were randomly selected with selection constrained to have 10 boys and 15 Black children per BMI-group. Each child was observed eating two school meals in December, 2002, and randomly assigned to the 24E or PDM protocols with assignment constrained to have 10 low-BMI (5 boys) and 10 high-BMI (5 boys) children per protocol. These 40 children were a subset of 120 children interviewed once each during August or September, 2002, for another study (9).

Observations

Dietitians used established procedures to observe children eating breakfast and lunch obtained at school (10–13). Observers stood near tables where children sat in groups, and wrote items and amounts eaten in servings onto paper forms. Most foods were served to children because *offer-versus-serve*, in which children may refuse some foods, was not implemented (14). Milk was required, but children chose the flavor/fat content. When single-serve condiments were available, children selected limited quantities. For breakfast, children selected either the cold (i.e., ready-to-eat [RTE] cereal, crackers [graham, animal], milk, and juice) or hot (i.e., non-RTE-cereal entrée [e.g., waffles], milk, and juice [or sometimes fruit]) option. For lunch, children chose one of three entrées. Children did not know specifically who was being observed, who would be interviewed, or that only low-BMI and high-BMI children would be interviewed. Practice observations were conducted to familiarize children with observers' presence (15). Interobserver reliability, assessed weekly, was satisfactory (2,15,16).

Interviews

Dietitians used written interview protocols, fully described elsewhere (2), which were multiple-pass and modeled on the Nutrition Data System for Research (NDSR; 4.05_33, Nutrition Coordinating Center, University of Minnesota, Minneapolis). Interviewers wrote information children reported onto paper forms instead of using NDSR software. The 24E interviews (about the 24 hours preceding the interview) were conducted by telephone between 6:30 and 9:00 p.m. on the observation day. The PDM interviews (about midnight to midnight of the previous day) were conducted in person at school after breakfast on the day after the observation day.

A previous dietary-reporting validation study (12) found no significant effect of interview modality (telephone versus in person) on fourth-graders' reporting accuracy.

After providing the 24hDR, each child completed 20 items from the Children's Social Desirability 46-item scale (17). Previously (18), one-month test-retest reliability of the 46-item scale with 100 fourth-grade children was adequate (Cronbach's $\alpha=0.79$). Factor analysis yielded one large factor with eigenvalues of 8 and 12 for the two administrations, and 14 to 15 smaller factors with eigenvalues of 1 to 2. Selecting the 15 highest-loading items on the first factor per administration yielded 20 items (items 1, 7, 11, 14, 16, 18, 20, 22, 23, 26, 28, 29, 32, 34, 37, 38, and 43 to 46). For the 20 items, the correlation between administrations was 0.80. Correlations between the 46-item scale and the 20-item scale were 0.95 (1st administration) and 0.96 (2nd administration). The distribution of socially-desirable-keyed *yes* and *no* responses in the 20-item scale mirrored that of the 46-item scale.

Interviews were audio recorded and transcribed. Quality control for interviews, assessed throughout data collection, indicated that interviewers followed protocols (2).

Classification of Reported Foods and Amounts

Analyses concerned foods because intake is reported as foods, and were restricted to school meals because only these meals were observed. The Table legend provides criteria for reported items to be considered school meal items. Items reported eaten at school meals were classified as *matches* if children were observed eating those items at the same meals; reported items were classified as matches unless reports clearly did not describe items observed eaten. Reported items not classified as matches were classified as *intrusions*. The Table legend provides examples. Intrusions were further classified as *stretches*, *internal confabulations*, or *external confabulations* based on observations and production records. Observed and/or reported amounts, recorded qualitatively, were assigned numeric values in servings as explained in the Table legend. These procedures and criteria were used previously (10–13).

Social Desirability

Answers that matched the socially-desirable choice were scored 1 point. Scores could range from 0 to 20. Higher scores indicated a greater tendency toward socially-desirable responding.

Availability of Foods in School Foodservice Environments

A catalog of items available in school foodservice environments for specific meals was created. Production records listed 459 items (breakfast-165; lunch-294); 224 additional items (breakfast-129; lunch-95) were observed during specific meals. Finally, 35 more items (breakfast-6; lunch-29) were assumed available for specific unobserved meals. For example, if hamburgers were on a school's production record for a specific lunch, but ketchup was not, ketchup was assumed available and added to the catalog for that lunch. In the set of 459 items, all kinds/flavors of RTE cereal, milk, and juice were considered available daily for breakfast, and all kinds/flavors of milk were considered available daily for lunch because production records usually listed these items in general terms, rather than specifying kinds/flavors. Although production records never listed ice cream, various kinds were assumed available daily for lunch because observers noted that various kinds were sold à la carte during lunch at most schools on most days.

For each intrusion, the observation form and/or availability catalog were checked to ascertain availability for that item on the child's tray and/or in the child's school foodservice environment for that meal (breakfast, lunch).

Analyses

Separate analyses were conducted for the two school meals because many breakfast and lunch items differ and, in cafeterias, children typically sit as they arrive at school for breakfast, but with their classes for lunch.

For each school meal, analysis of covariance (ANCOVA) was used to investigate numbers of items observed eaten, numbers of items reported eaten, and amounts reported eaten of intrusions.

For each of seven outcomes for each school meal, a per-child logistic-binomial model was fit to investigate the likelihood that reported items were 1) intrusions, 2) stretches, 3) internal confabulations, and 4) external confabulations; and that intrusions were 5) stretches, 6) internal confabulations, and 7) external confabulations. Intrusions could only be classified as stretches if uneaten items were observed on the child's tray for that meal. Thus, the two logistic-binomial models concerning stretches were repeated using data only from the subset of children who could have had stretches to determine likelihoods conditioned on the possibility of reporting stretches. Because results essentially agreed with those from the full sample, only the latter are described.

For each school meal, for children who had ≥ 1 item observed uneaten (and so could be a stretch), a logistic-binomial model was fit to investigate the likelihood that items observed uneaten on each child's tray for that meal were stretches. For each of these children, a discriminability measure (to quantify discrimination in reports between what was eaten and what could have been eaten but was not) was calculated for each school meal as $[(\text{number of matches}) \div (\text{number of items observed eaten})] - [(\text{number of stretches}) \div (\text{number of items observed uneaten on the tray})]$. The discriminability measure ranges from -1 to 1 ; values closer to 1 indicate better discrimination between what was eaten (and should be reported) and what could have been eaten but was not (and should not be reported). It was analyzed using ANCOVA.

Predictors included BMI-group, sex, race, interview protocol, and social desirability; because the sample was small, the only interactions included were BMI-group x sex, social desirability x BMI-group, and social desirability x BMI-group x sex. For each analysis, a full model was fit, then a backwards stepwise model estimated with non-significant ($P > 0.40$) predictors removed, and a final model constructed from these results. Because each child could have multiple items and intrusions, inferences utilized empirical standard errors from the modified sandwich variance estimator, so P values are conservative (19).

Data were analyzed using Stata (9.2, Stata, Inc., College Station, TX) and SAS (9.0, SAS Institute, Inc., Cary, NC); two-tailed P values were used.

RESULTS

The Table shows numbers of items observed eaten (in any nonzero amount) and items reported eaten (in any nonzero amount). The number of items *observed* eaten differed by sex ($P = 0.010$) for breakfast and by sex ($P = 0.054$), race ($P = 0.032$), and interview protocol ($P < 0.001$) for lunch.

Social desirability scores ranged from 1 to 20 (mean = 10.88; SD = 5.30). The number of items *reported* eaten for breakfast was negatively associated with social desirability ($P < 0.001$); the partial correlation between items reported eaten for breakfast and social desirability was -0.26 .

No significant effects of BMI-group or interactions with BMI-group were found for numbers of items observed eaten or reported eaten for either meal.

The Table also shows numbers of intrusions overall and by type, and amounts reported eaten for intrusions overall and by type. For the amount reported eaten of an intrusion, for breakfast, the BMI-group-x-sex ($P=0.002$) and BMI-group-x-sex-x-social-desirability interactions ($P<0.001$) were significant; compared to low-BMI girls, for every one-unit increase in social desirability, the amount reported eaten of an intrusion was 0.06 servings larger for high-BMI boys ($P=0.002$) and 0.02 servings smaller for high-BMI girls ($P=0.009$). For lunch, BMI-group ($P<0.001$) and BMI-group x sex ($P=0.018$) were significant; the amount reported eaten of an intrusion differed for high-BMI girls and low-BMI girls ($P<0.001$) and post-hoc contrasts indicated it differed for high-BMI girls and low-BMI boys ($\chi^2_{(1)}=5.07$, $P=0.024$), and high-BMI boys ($\chi^2_{(1)}=8.57$, $P=0.003$). By types of intrusion, for breakfast, amounts reported eaten differed for stretches and internal confabulations ($P=0.001$), and for stretches and external confabulations ($P=0.001$); for lunch, amounts reported eaten differed for stretches and external confabulations ($P<0.001$).

Likelihood of Intrusions and Types of Intrusion

Breakfast—The likelihood that reported items were intrusions was lower for Black than White children (odds ratio [OR]=0.21, $P=0.001$) and for low-BMI boys than low-BMI girls (OR=0.19, $P=0.025$); post-hoc contrasts indicated a lower likelihood for low-BMI boys than both high-BMI boys and high-BMI girls ($\chi^2_{(2)}=6.22$, $P=0.045$). The likelihood that reported items were external confabulations was lower for high-BMI girls than high-BMI boys (OR=0.10, $P=0.038$). For the remaining five outcome variables, no significant effects were found ($P_s>0.080$).

Lunch—For two outcome variables, only interview protocol was significant: Compared to PDM interviews, for 24E interviews, the likelihood was higher that reported items were stretches (OR=0.09, $P=0.025$) and that intrusions were stretches (OR=0.12, $P=0.042$). Also, the likelihood that reported items were internal confabulations and that intrusions were internal confabulations were both positively associated with social desirability (both ORs=1.3, $P=0.014$ and 0.035, respectively). For the remaining three outcome variables, no significant effects were found ($P_s>0.068$).

Stretches and Discriminability Measure

For neither school meal did the binomial model detect significant effects in the proportion of items observed uneaten that were reported as stretches ($P_s>0.126$).

For breakfast, the discriminability measure differed by BMI-group ($P=0.044$), sex ($P=0.001$), and BMI-group x sex ($P=0.003$): Compared to low-BMI girls (mean $\pm$ SD; -0.07 ± 0.54), the discriminability measure differed for low-BMI boys (0.46 ± 0.31 , $P=0.001$) and high-BMI girls (0.33 ± 0.37 , $P=0.044$); post hoc contrasts indicated it differed for low-BMI boys and high-BMI boys (0.06 ± 0.56 , $P=0.025$). In addition, for breakfast, the discriminability measure differed by race (Black= 0.28 ± 0.39 , White= 0.05 ± 0.63 , $P=0.026$) and interview protocol (24E= 0.35 ± 0.36 , PDM= 0.03 ± 0.56 , $P=0.050$). For lunch, no significant effects were detected in the discriminability measure ($P_s>0.220$).

DISCUSSION

The BMI-group-x-sex interaction was significant for several outcome variables: For each meal, the amount reported eaten for an intrusion was smallest for high-BMI girls; this provides insight into the previously-reported (2) BMI-group-x-sex interaction for intruded kilocalories, with

high-BMI girls intruding the least. Reported items for breakfast were less likely to be intrusions for low-BMI boys than the other three BMI-x-sex groups, and to be external confabulations for high-BMI girls than high-BMI boys. For breakfast, there was better ability to discriminate between eaten and uneaten items on the tray for low-BMI boys and high-BMI girls than low-BMI girls, and for low-BMI boys than high-BMI boys.

Interview protocol (which corresponds to retention interval in this article) was associated with several outcome variables: Compared to PDM interviews, for 24E interviews, as expected, both reported items and intrusions were more likely to be stretches (for lunch) and there was better ability to discriminate between eaten and uneaten items on the tray (for breakfast). For prior-24-hours interviews, the end of the 24 hours coincides with the beginning of the interview (10), so minimal time and no meals intervene between the to-be-reported meals and the interview; both of these decrease intrusions. For lunch, children who later had 24E interviews were observed to have eaten fewer items than children who later had PDM interviews; this was a chance result. Examination of lunch data indicated that children with 24E and PDM interviews were served similar numbers of vegetable items (34 and 37, respectively), but the percentages of vegetable items eaten (in any nonzero amount) were 26% and 62%, respectively.

Sex was associated with two outcome variables: Compared to girls, for boys, there were *more* items observed eaten for breakfast, but *fewer* for lunch, although previous results for this sample failed to detect a significant difference by sex in *kilocalories* observed eaten for breakfast and lunch combined (2).

Race was associated with several outcome variables: Compared to White children, for Black children, for breakfast, reported items were less likely to be intrusions and there was better ability to discriminate between eaten and uneaten items on the tray. Compared to White children, for Black children, for lunch, fewer items were observed eaten, although previous results for this sample failed to detect a significant difference by race in *kilocalories* observed eaten for breakfast and lunch combined (2). Race effects were unexpected.

Social desirability was associated with several outcome variables: For breakfast, as social desirability increased, the number of items reported eaten decreased; we have no explanation for this finding. For lunch, as social desirability increased, reported items and intrusions were likelier to be internal confabulations. These findings may indicate that as children score higher on social desirability, they have a greater tendency to report having eaten items not on their trays but available in the school foodservice environment for that meal. Research has shown a relationship of social desirability to adults' dietary reports (e.g., 20). We found a significant interaction of social desirability with BMI-group and sex for breakfast for amounts reported eaten of intrusions; this was surprising considering the small sample. We know of no other dietary-reporting validation studies with children that assessed children's social desirability.

Results concerning smaller amounts reported eaten for stretches than internal confabulations and external confabulations at breakfast, and than external confabulations at lunch, were unexpected.

There are several limitations. The BMI dietary-reporting validation study (2) had a small number of fourth-grade children. Larger samples with different ages are needed to better understand developmental trends in children's dietary-reporting accuracy and intrusions by BMI. Observations included only two school meals per child.

A strength of the current investigation is that it concerned the critical, but understudied, topic of intrusions, as well as *children's* dietary-reporting accuracy by BMI-group. As explained in the original publication of the BMI dietary-reporting validation study (2), many previous studies have not strictly investigated children's dietary-reporting accuracy, primarily due to

help from parents. To our knowledge, these analyses are the first to investigate the effect of BMI-group and BMI-group x sex on intrusions in *children's* 24hDRs. These analyses will hopefully inspire more research on this topic, especially considering the increased prevalence of overweight among children (21). The BMI dietary-reporting validation study (2) had several methodological strengths. Observations, which were conducted in a manner and setting to minimize reactivity, avoided the use of other self-report methods (e.g., food records) by children to compare to their own 24hDRs. Children's social desirability was assessed. Quality control was assessed throughout data collection for observations, interviews, and weight and height measurements.

In summary, despite the small sample, results revealed significant effects of the BMI-group-x-sex interaction, interview protocol, sex, race, social desirability, and the BMI-group-x-sex-x-social-desirability interaction on intrusions in the school meal parts of children's 24hDRs. Additional dietary-reporting validation studies with larger samples of children by BMI-group, sex, and race are needed to replicate these findings and help develop interview methods to better limit intrusions. Improving the accuracy of self-reported data will enhance investigators' ability to interpret findings from epidemiologic studies and to assess the effectiveness of interventions. The significant effects of interview protocol illustrate the importance of retention interval on types of intrusion in children's 24hDRs, and demonstrate the importance of an awareness of principles of memory when designing and conducting epidemiologic studies and interventions. Investigators are encouraged to utilize shorter rather than longer retention intervals when obtaining 24hDRs from subjects, and to specify target period and interview time of 24hDRs in publications.

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Table
Items Observed Eaten, Items Reported Eaten, Intrusions, Types of Intrusion, and Amounts Reported Eaten*

	Observed Eaten		Reported Eaten		Intrusions [†]		Types of Intrusion [‡]				
	n (Mean±SD)	Items [§]	Item n	Amount Mean±SD	Stretch		Internal Confabulation		External Confabulation		
					Item n	Amount Mean±SD	Item n	Amount Mean±SD	Item n	Amount Mean±SD	
Breakfast											
Body Mass Index (BMI) Group											
Low-BMI (20/19) ^{II}	54 (2.70±1.22)	50 (2.63±1.07)	23	0.84±0.28	6	0.59±0.40	12	0.96±0.14	5	0.85±0.22	
High-BMI (20/19)	58 (2.90±0.91)	55 (2.89±0.94)	28	0.74±0.49	6	0.38±0.36	15	0.80±0.47	7	0.93±0.53	
Sex											
Girls (20/18)	48 (2.40±1.10) ^{**}	50 (2.78±0.94)	25	0.73±0.35	8	0.51±0.39	13	0.85±0.30	4	0.81±0.24	
Boys (20/20)	64 (3.20±0.89) ^{**}	55 (2.75±1.07)	26	0.84±0.47	4	0.44±0.41	14	0.89±0.44	8	0.94±0.50	
Race											
Black (30/28)	82 (2.73±1.17)	77 (2.75±0.93)	33	0.75±0.41	8	0.51±0.39	15	0.73±0.35	10	0.97±0.42	
White (10/10)	30 (3.00±0.67)	28 (2.80±1.23)	18	0.85±0.43	4	0.44±0.41	12	1.04±0.33	2	0.50±0.00	
Interview Protocol											
24E (20/19)	52 (2.60±1.05)	54 (2.84±0.96)	23	0.76±0.44	6	0.44±0.38	11	0.91±0.48	6	0.79±0.25	
PDM (20/19)	60 (3.00±1.08)	51 (2.68±1.06)	28	0.81±0.40	6	0.53±0.40	16	0.84±0.29	6	1.00±0.55	
BMI-Group x Sex											
Low-BMI Girls (10/9)	23 (2.30±1.25)	24 (2.67±0.87)	14	0.89±0.19	4	0.81±0.24	6	1.00±0.00	4	0.81±0.24	
Low-BMI Boys (10/10)	31 (3.10±1.10)	26 (2.60±1.26)	9	0.75±0.39	2	0.14±0.05	6	0.92±0.20	1	1.00	
High-BMI Girls (10/9)	25 (2.50±0.97)	26 (2.89±1.05)	11	0.53±0.40	4	0.20±0.20	7	0.71±0.37	0	---	
High-BMI Boys (10/10)	33 (3.30±0.67)	29 (2.90±0.88)	17	0.88±0.51	2	0.75±0.35	8	0.88±0.57	7	0.93±0.53	
Total	112 (2.80±1.07)	105 (2.76±1.00)	51	0.79±0.41	12	0.49±0.38 ^{††}	27	0.87±0.37 ^{††}	12	0.90±0.42 ^{††}	
Lunch											
BMI-Group											
Low-BMI (20/19)	90 (4.50±1.67)	68 (3.58±1.02)	19	0.96±0.31	5	0.75±0.25	4	0.88±0.25	10	1.10±0.32	
High-BMI (20/20)	103 (5.15±1.50)	70 (3.50±1.76)	16	0.89±0.62	4	0.59±0.48	3	0.44±0.49	9	1.18±0.59	
Sex											
Girls (20/20)	102 (5.10±1.33) ^{‡‡}	71 (3.55±1.50)	17	0.81±0.42	5	0.62±0.42	4	0.77±0.46	8	0.95±0.39	
Boys (20/19)	91 (4.55±1.82) ^{‡‡}	67 (3.53±1.39)	18	1.04±0.50	4	0.75±0.29	3	0.58±0.38	11	1.27±0.47	
Race											
Black (30/29)	141 (4.70±1.60) ^{§§}	99 (3.41±1.27)	29	0.93±0.51	6	0.60±0.38	7	0.69±0.41	16	1.16±0.50	
White (10/10)	52 (5.20±1.62) ^{§§}	39 (3.90±1.85)	6	0.92±0.20	3	0.83±0.29	0	---	3	1.00±0.00	
Interview Protocol											
24E (20/19)	82 (4.10±1.52) ^{III}	61 (3.21±1.44)	14	0.71±0.38	8	0.70±0.37	3	0.44±0.49	3	1.00±0.00	
PDM (20/20)	111 (5.55±1.36) ^{III}	77 (3.85±1.39)	21	1.08±0.47	1	0.50	4	0.88±0.25	16	1.16±0.50	
BMI-Group x Sex											
Low-BMI Girls (10/10)	49 (4.90±1.66)	35 (3.50±1.08)	10	0.97±0.08 ^{***}	3	0.92±0.14	2	1.00±0.00	5	1.00±0.00	
Low-BMI Boys (10/9)	41 (4.10±1.66)	33 (3.67±1.00)	9	0.94±0.46 ^{***}	2	0.50±0.00	2	0.75±0.35	5	1.20±0.45	
High-BMI Girls (10/10)	53 (5.30±0.95)	36 (3.60±1.90)	7	0.57±0.58 ^{***}	2	0.18±0.11	2	0.54±0.65	3	0.86±0.72	
High-BMI Boys (10/10)	50 (5.00±1.94)	34 (3.40±1.71)	9	1.14±0.55 ^{***}	2	1.00±0.00	1	0.25	6	1.33±0.52	
Total	193 (4.95±1.41)	138 (3.54±1.43)	35	0.93±0.47	9	0.68±0.35 ^{†††}	7	0.69±0.41	19	1.14±0.46 ^{†††}	

* Children of low-body mass index (BMI; $\geq 5^{\text{th}}$ and $< 50^{\text{th}}$ percentiles) or high-BMI ($\geq 85^{\text{th}}$ percentile) were observed eating school breakfast and school lunch, and interviewed about the prior 24 hours' intake that evening (24E) or the previous day's intake the next morning (PDM).

[†] Examples of *intrusions* (items reported eaten but not observed eaten at the meal) include fruit juices (e.g., apple observed, orange reported), milk flavors (e.g., chocolate observed, white reported), ready-to-eat cereal (e.g., flake-shaped observed, doughnut-shaped reported), and vegetables (e.g., spinach observed, corn reported). Examples of *matches* (items observed eaten and reported eaten at the

meal) include all kinds of white milk (e.g., skim, whole) and all types of pizza (e.g., cheese, pepperoni). Observed and/or reported amounts were recorded qualitatively and assigned numeric values in servings as *none*=0.00, *taste*=0.10, *little bit*=0.25, *half*=0.50, *most*=0.75, *all*=1.00, or the actual number if >1 serving.

§ Numbers are for items observed eaten in any non-zero amount, and for items reported eaten in any non-zero amount.

Each intrusion was further classified as a *stretch* (on the child's tray for that meal), *internal confabulation* (available in the child's school foodservice environment for that meal but not on the child's tray), or *external confabulation* (not available in the child's school foodservice environment for that meal).

II The first number in parentheses indicates the number of children observed eating the school meal; the second number indicates the number of interviews for which reported meals met criteria to be considered the school meal. To be considered a school meal item, children had to identify *school* as the meal's location, identify breakfast as *school breakfast* or *breakfast*, identify lunch as *school lunch* or *lunch*, report mealtimes to within one hour of observed mealtimes, and report consuming a nonzero quantity.

** $P=0.010$

†† Stretches and internal confabulations ($P=0.001$); stretches and external confabulations ($P=0.001$)

$P=0.054$

§§ $P=0.032$

III $P<0.001$

*** High-BMI girls and low-BMI girls ($P<0.001$), low-BMI boys ($P=0.024$), and high-BMI boys ($P=0.003$)

††† $P<0.001$