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Family Meals and Child Academic and Behavioral Outcomes

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This study investigates the link between the frequency of family breakfasts and dinners and child academic and behavioral outcomes in a panel sample of 21,400 children aged 5–15. It complements previous work by examining younger and older children separately and by using information on a large number of controls and rigorous analytic methods to discern whether there is causal relation between family meal frequency (FMF) and child outcomes. In child fixed-effects models, which controlled for unchanging aspects of children and their families, there were no significant ($p < .05$) relations between FMF and either academic or behavioral outcomes, a novel finding. These results were robust to various specifications of the FMF variables and did not differ by child age.

In recent years, a substantial body of literature has examined associations between family meal frequency and a number of child and adolescent outcomes including academic performance and learning (Eisenberg, Olson, Neumark-Sztainer, Story, & Bearinger, 2004), substance use and abuse (Eisenberg, Neumark-Sztainer, Fulkerson, & Story, 2008), and behavior (Sen, 2010). With few exceptions, previous work has indicated the positive value of shared family meal times and of family dinner in particular. Indeed, the evidence from this work has been compelling enough so as to capture the attention of the popular press who have extolled the ''magic'' of the family meal (Gibbs, 2006), and the Council of Economic Advisors to President Clinton who concluded that ''teens who continue to connect with their parents by eating dinner with their family . . . fare better'' (U.S. Council of Economic Advisors, 2000, p. 22).

Yet, much of the previous literature on the relation between family meal frequency (FMF) and child outcomes has been limited. A recent review of research on FMF identified a reliance on cross-sectional data as a major weakness of the majority of previous studies (Fiese & Schwartz, 2008). Although the review identified some notable exceptions to this trend, studies have been limited in other ways, for example, by inconsistently operationalizing FMF (Fiese & Schwartz, 2008) and using only limited controls or basic analytic methods to address possible sources of bias.

This study sought to improve upon and complement previous work in three ways. First, it utilized longitudinal data from the Early Childhood Longitudinal Survey–Kindergarten Cohort (ECLS–K), a large panel data set of U.S. children between ages 5 and 15, and conducted separate analyses by child age group, whereas previous analyses have focused almost exclusively on adolescents. Second, the study examined associations between various operationalizations of the frequency of both family breakfasts and family dinners and a variety of child outcomes, providing for a more nuanced examination of the importance of FMF than has been allowed for or explored in previous work. Last, taking advantage of the longitudinal and comprehensive scope of the ECLS–K, this article provided more robust estimates of the relation between FMF and child outcomes by controlling for an extensive set of characteristics of children, their parents,

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homes, and schools and by using panel data analysis methods to control for unobserved factors of children that might otherwise bias results.

This article proceeds in the following way. We begin with a review of previous research on FMF and child outcomes and also summarize previous theoretical work pertinent to this relation. Next, we describe our data and analytic strategies. We then provide and interpret our results before making recommendations for future research.

Previous Theory and Research

Research from scholars in a variety of different fields has examined the importance of family meals to child and family functioning (Larson, Branscomb, & Wiley, 2006). Although family meals are of relatively short duration—the average family dinner lasts just 20 min (Fiese & Schwartz, 2008)—previous work has highlighted the unique and powerful role of shared family mealtimes in modeling behavior for children and conveying cultural traditions (Larson et al., 2006), and in providing an opportunity for parents to engage in activities that promote literacy, learning, and healthy behavior (Larson, 2008).

In general, family meals are thought to present an opportunity space to promote the healthy development of children (Larson et al., 2006). As a result, the frequency with which such opportunities are available should be related to child and family well-being. According to Fiese, Foley, and Spagnola (2006), family meals comprised both ritual (symbolic) and routine (activity) elements, each of which may be instrumental to a child's positive developmental outcomes. Both routine and ritual practices can act as markers for healthy family functioning; respectively, they are indicative of greater organization and a greater sense of belonging and closeness for children (Fiese et al., 2002).

A number of previous studies have examined the relation between family meal frequency and adolescent cognitive and social outcomes, frequently finding a positive relation. A separate body of literature has also examined the relation between family meals and child nutrition (Burgess-Champoux, Larson, Neumark-Sztainer, Hannan, & Story, 2009), eating behaviors (Neumark-Sztainer, Wall, Story, & Fulkerson, 2004), and child overweight and obesity (Anderson & Whitaker, 2010). However, as the mechanisms relating family meals to these outcomes are likely different from those for academic outcomes and child behavior, we do not consider them here. As described in the following section, this study investigated the effects of family dinner and breakfast frequency on child reading, math, and science scores, and internalizing and externalizing behaviors, each of which has been linked to family meal frequency in previous empirical or theoretical work.

For instance, one study found that family meal frequency was inversely associated with low grade point average among middle and high school girls (Eisenberg et al., 2004). Shared family mealtimes may help promote language development in particular; research has demonstrated that exposure to certain types of talk during mealtimes may foster later reading scores and vocabulary size (Snow & Beals, 2006). These findings are confirmed by a series of unpublished studies by the National Center on Addiction and Substance Abuse at Columbia University (CASA), which have reported a consistent relation between family dinner frequency and teen academic performance, such that children who reported typically eating 5–7 family dinners per week were more likely to report receiving mostly As and Bs in school and less likely to report receiving mostly Cs (CASA, 2007, 2009, 2010).

Children and adolescents eating more meals together with their families have also fared better on measures of psychological adjustment and have engaged in fewer risk behaviors. As noted, family meals may provide connection to important family and cultural rituals, which may in turn be beneficial for children's psychological functioning. In addition, shared family meals may provide increased opportunities for communication and monitoring that may be related to a young person's opportunity or inclination to engage in risky or harmful behavior (Sen, 2010). For example, one study found that 6th- to 12th-grade students who ate 5–7 family dinners per week had significantly lower odds of engaging in a number of high-risk behavior patterns such as alcohol, drug, and tobacco use, depression–suicide, violence, antisocial behavior, and school problems when compared to those who typically ate 0–1 dinners (Fulkerson, Story, Mellin, Leffert, Neumark-Sztainer, & French, 2006). Using data from the National Longitudinal Survey of Youth (NLSY), Sen (2010) found that the frequency of family dinners was associated with decreased substance use and running away for adolescent females and decreased alcohol use, physical violence, property destruction, stealing, and running away for adolescent males. One study by Eisenberg et al. (2004) found that young people who ate 5–7 dinners together with their families were less likely to use drugs and alcohol and had lower depressive symptoms and odds of suicide involvement, while another found evidence of a longitudinal inverse association between FMF and substance use, independent of substance use at first report (Eisenberg et al., 2008). Longitudinal findings from another study also indicated that girls who ate dinner at home every day had lower odds of initiating alcohol use at a follow-up survey (Fisher, Miles, Austin, Camargo, & Colditz, 2007).

Limitations of Previous Work

Although previous work has consistently suggested a beneficial link between family meal frequency and child outcomes, there is some reason to approach these findings with caution. For one, previous studies have been inconsistent in their operationalization of family meal frequency. In their review of the literature on family meals, Fiese and Schwartz (2008) identify inconsistent measurement and operationalization of frequency of family mealtimes as one of the chief shortcomings of previous research and also suggest that there is little agreement regarding a '''critical' number of meals that seems to be essential for healthy outcomes'' (p. 5). This lack of consensus is most clear in the body of research from the Project Eat Surveys, the data set from which the majority of previous work on family meal frequency and child outcomes has been published. In the Project Eat survey, adolescent respondents were asked, ''During the past 7 days, how many times did all or most of your family eat a meal together?'' with response choices of 0, 1–2, 3–4, 5–6, 7, or > 7. Based on this question, researchers have variously identified meal frequency using midpoints (e.g., 0, 1.5, and 3.5; Neumark-Sztainer, Story, Ackard, Moe, & Perry, 2000), categories (e.g., 0, 1–2, ≥ 3; Fulkerson, Neumark-Sztainer, Hannan, & Story, 2008), or cutpoints to determine ''regular'' family meals such as 5 or more (Burgess-Champoux et al., 2009; Eisenberg et al., 2008) or 3 or more (Eisenberg, Neumark-Sztainer, & Feldman, 2009; Feldman, Eisenberg, Neumark-Sztainer, & Story, 2007). Mostly as a consequence of the structure of survey instruments, studies have tended not to explicitly acknowledge the possible differences between the effects of the frequency of all meals and the frequency of just dinner or breakfast separately. The single previous study to use the ECLS–K to investigate the effect of family meals frequency (Gable, Chang, & Krull, 2007) used a summary measure (range = 0–14) of the number of breakfasts and dinners typically eaten together.

Although previous research with the ECLS–K data set has investigated the associations between FMF and child obesity in children (Gable et al., 2007), the majority of research on academic and behavioral outcomes has focused on adolescents. This is largely a limitation of existing information, as many data sets containing information on FMF (Project Eat, NLSY, AddHealth) are focused on adolescents explicitly. However, family meals may differ in their importance as children develop. Data from previous research (Fulkerson, Neumark-Sztainer, & Story, 2006; Fulkerson, Story, et al., 2006) suggest that family meals become less common as children age, and a recent meta-analysis indicates that age may have a moderating effect on the relation between family meals and child nutritional outcomes (Hammons & Fiese, 2011). Variation in meal frequency may be more meaningful for younger children, as differences might be indicative of departures from more typical behavior. Alternatively, as children age and engage in more potentially risky or otherwise detrimental activities, frequent family meals might be distinguished by their ability to protect children against risk and promote healthy development. To our knowledge, no study has systematically investigated the differential impacts of FMF by child age.

Previous research on FMF and adolescent outcomes has also relied primarily on cross-sectional data or has typically been limited to estimating the effect of family meal frequency by including a limited number of controls, which suggests that the findings of earlier studies may be biased as a consequence of endogeneity. The endogeneity problem (Duncan, Magnuson, & Ludwig, 2004) has been extensively addressed in previous work in human development (Berger, Bruch, Johnson, James, & Rubin, 2009; National Institute of Child Health and Human Development Early Child Care Research Network [NICHD ECCRN] & Duncan, 2003) and so will not be reviewed in full here. In short, endogeneity occurs most frequently when unobserved characteristics are correlated with both an independent and dependent variable of interest, a problem commonly referred to as omitted variables bias. In regression analyses of the type used in most previous research on family meals, endogeneity can bias coefficients leading to inaccurate estimates of the effect of family meals on children. Concerns about the endogeneity of FMF are expressed by Neumark-Sztainer (2008), who noted, ''A question that often emerges is whether the family meal is truly contributing to these better outcomes or if the family meal is only a proxy measure for important confounders such as familial relationships'' (p. 11). Indeed, while previous work has demonstrated a significant relation between family meals and adolescent controls after controlling for measures of familial relationships like family connectedness (Eisenberg et al., 2004), there may be many other factors not controlled for in previous work that could likewise confound estimates.

It is important to clarify that previous research has not typically claimed a direct link between FMF and child outcomes. Typically, studies have concluded by suggesting the need for additional research to identify the mechanisms by which family meals might affect outcomes (Eisenberg et al., 2004; Eisenberg et al., 2008) or by indicating steps like public education campaigns to raise awareness about the value of family meals (Eisenberg et al., 2004; Sen, 2010). Although an investigation of potential pathways by which shared mealtimes might affect family functioning or child well-being is a potentially important task for research, this study attempts to rigorously investigate the more primary question of whether FMF has a main ''effect'' on child outcomes.

In general, the sort of endogeneity of greatest concern to the study of family meal frequency is selection bias, whereby children ''select'' into both family meal frequency and an outcome of interest as a consequence of unobserved characteristics of the children or their families. For example, parents who recognize the value of shared family mealtimes may also engage in other activities that they believe are good for children, such as promoting extracurricular activities, reading to children, or pursuing high-quality schooling, each of which might affect children's school performance. In such a case, the frequency that a family eats meals together may act as a marker for other such activities, but may not actually be causally related to child outcomes.

Similarly, the tendency of a family to eat meals together may reflect congruence between parents' work schedules and children's routines, and thus, it may be emblematic of greater overall possibilities for communication and monitoring, which could account for the relation between family meal frequency and child behavioral and academic outcomes. Finally, greater closeness among family members and with parents in particular might increase the frequency of shared family meals but could also foster an environment that promotes healthy outcomes for children (Boyer, 2006).

Many studies reviewed for this article relied upon cross-sectional survey data. The handful of studies using longitudinal data to examine the links between family meal frequency and the outcomes of interest to this article have tended to employ more sophisticated methods but have also been limited. For instance, although Eisenberg et al. (2008) included controls for a baseline measure of their dependent variable, they additionally controlled for only family connectedness, child race, and socioeconomic status. Using repeated observations on adolescents from the NLSY, Sen (2010) included a large number of controls and a measure of the dependent variable measured at a future time to address concerns of reverse causality and selection bias but did not employ other panel data methods that might have better addressed possible bias.

A reliance on cross-sectional data is additionally potentially troublesome because of concerns about reverse causality (Larson et al., 2006). This is especially true for studies examining internalizing or externalizing behaviors. That is, although it is possible that increased FMF promotes positive child outcomes, it is equally plausible that children are less likely to engage in any sort of shared family activity (including family meals) because they are engaged in risky behavior or have psychological distress.

This study extended previous research of the effects of FMF in a number of ways. First, using a large panel sample of children, we examined the relation between FMF and child outcomes for all sample children (ages 5–15) and then separately for younger and older children, whereas previous analyses have exclusively examined adolescents. Second, to address issues regarding the operationalization of family meals, we utilized the relatively comprehensive information on family meal frequency in the ECLS–K data set to examine the separate effect of the number of shared breakfasts and shared dinners and to explore whether the operationalization of FMF affects its relation to child outcomes. In addition, we took advantage of the longitudinal nature of our data source to reduce concerns regarding endogeneity. We utilized lagged regression models, which examined the effect of family meal frequency on child outcomes at a later time point, thereby creating a temporal set up that precludes the possibility of reverse causality. In addition, to more clearly estimate the causal effect of FMF, in all models we included a large number of controls, which addressed the selection bias associated with observed characteristics of children, families, and schools that might be correlated with both FMF and child outcomes. Last, we utilized panel data methods—lagged dependent variables (LDV) models and child fixed-effects models—each of which improves upon previous analyses by controlling for unobserved factors that might confound the effect of family meal frequency on child outcomes.

Method

Sample and Missing Data

Data for this study came from the ECLS–K, a nationally representative survey begun with approximately 21,400 kindergarteners in the 1998–1999 school year. Data came from five waves of the ECLS–K data collection, the spring terms of 1999, 2000, 2002, 2004, and 2007, when the majority of sampled students were in kindergarten, first, third, fifth, and eighth grades, respectively. At the eighth grade wave of data collection, approximately 9,700 children completed the child assessment (Tourangeau, Nord, Le, Sorongon, & Najarian, 2009).

The reduction in sample size in the ECLS–K from kindergarten to the eighth grade wave of data collection was largely a consequence of planned sample attrition, as the ECLS–K did not follow approximately 8,500 children who moved schools between kindergarten and fifth grade (Tourangeau et al., 2009). On average, the children remaining in the sample were of higher socioeconomic status; were more likely to be White, non-Hispanic; and were less likely to live in a single-parent home. To account for missing data, we used multiple imputation (MI). MI makes the assumption that data are missing at random, that is, that the probability of missingness for a given variable depends only on other available information, which can be controlled for (Gelman & Hill, 2007). Using the multiple imputation of chained equations command (Royston, 2007) in Stata 11 MP, we created five complete data sets. Across the five data sets, missing values were imputed using slightly different multivariate prediction algorithms that incorporated sampling variability for each variable with missing data (Gelman & Hill, 2007). We analyzed these complete data sets using the combining algorithm developed by Rubin (1987). The results of these analyses did not differ meaningfully from results using complete case analysis (not shown but available on request).

Using these MI data from the five waves of ECLS–K data, we pooled observations to create a data file, which we used in both pooled cross-sectional and longitudinal analyses. Our sample sizes differed according to the availability of our outcomes by grade; our analyses used between 42,820 and 85,640 child-grade observations, contributed by the full sample of children. Respondents were an average of 6.09 years old (SD = 0.37) in the spring of kindergarten year. Fifty-one percent of the sample was male. Approximately 55% of respondents were White, not Hispanic; 15% were Black, not Hispanic; 18% were Hispanic of any race; nearly 2% were native American or native Alaskan; and nearly 10% were Asian, Pacific-Islander or of another race or ethnicity. Sample sizes are rounded to the nearest 10 as per data license restrictions.

Measures

Academic outcomes. One particular advantage of the ECLS–K is its comprehensive direct assessments of children. At each survey wave, children's academic performance was assessed. For academic outcomes in this study, we utilized children's scores on assessments of reading and mathematics tests that were administered at all waves. We also used scores from the ECLS–K science assessment, which children took in the third, fifth, and eighth grades of data collection. Based on students' performance on each of these assessments, the ECLS–K created three score variables: a number right score, an item response theory (IRT) score, and a standardized t score. Standardized t scores (M = 50, SD = 10) were the most appropriate for this study, as they provide information on a child's performance relative to his or her peers in contrast to IRT or number right scores, which are criterion referenced and thus indicative of absolute performance. To appropriately assess changes in relative performance over time, we used reweighted scores for all academic outcomes as recommended by the ECLS–K (Tourangeau et al., 2009). Psychometric analysis of the cognitive scores in each domain indicated high reliability: At the eighth grade data collection, the theta reliability scores for the reading, math, and science assessments were .87, .92, and .84, respectively (Najarian, Pollack, & Sorongon, 2009). Table 1 presents descriptive statistics by grade for each academic outcome as well as all other variables.

Behavior problems. In addition to cognitive performance, this study examined the associations between FMF and child behavior problems. At each survey point, the ECLS–K collected data on behavior problems, but the source of reporting for these data changed over time with parents, children, and teachers reporting on children's behavior. To minimize bias in these measures, we relied on teachers'

Table 1
Descriptive Statistics for Variables

Variable name	Range	Mean or proportion by grade (standard deviation in parentheses for continuous variables)				
		Kindergarten	1st	3rd	5th	8th
Family meal frequency						
Total no. of breakfasts	0–7	4.26 (2.46)	4.43 (2.42)	4.11 (2.42)	3.56 (2.42)	3.22 (2.29)
0 breakfasts	0–1	.06	.05	.07	.10	.12
1 breakfast	0–1	.05	.05	.06	.09	.10
2 breakfasts	0–1	.24	.25	.25	.28	.31
3 breakfasts	0–1	.07	.07	.07	.10	.08
4 breakfasts	0–1	.05	.05	.07	.04	.05
5 breakfasts	0–1	.11	.11	.13	.11	.15
6 breakfasts	0–1	.03	.03	.03	.03	.03
7 breakfasts	0–1	.40	.39	.32	.24	.16
Total no. of dinners	0–7	5.75 (1.76)	5.75 (1.73)	5.68 (1.71)	5.46 (1.77)	5.25 (1.72)
0 dinners	0–1	.01	.01	.01	.01	.01
1 dinner	0–1	.01	.01	.01	.02	.01
2 dinners	0–1	.05	.05	.05	.05	.05
3 dinners	0–1	.06	.06	.06	.08	.10
4 dinners	0–1	.08	.08	.09	.11	.13
5 dinners	0–1	.14	.16	.18	.19	.25
6 dinners	0–1	.07	.06	.06	.09	.08
7 dinners	0–1	.57	.57	.54	.45	.37
Outcome variables						
Reading standardized *T* score	5.31–86.91	50.68 (9.76)	50.77 (9.44)	50.64 (9.76)	50.83 (9.64)	50.68 (9.73)
Math standardized *T* score	1.92–85.22	51.01 (9.75)	50.79 (9.57)	50.77 (9.76)	51.03 (9.69)	50.66 (9.64)
Science standardized *T* score	18.89–82.62			50.62 (9.94)	50.91 (9.73)	50.54 (9.56)
Problem behaviors: internalizing	1–4	1.58 (0.52)	1.60 (0.52)	1.64 (0.54)	1.65 (0.54)	2.05 (0.54)
Problem behaviors: externalizing	1–4	1.68 (0.64)	1.67 (0.64)	1.72 (0.61)	1.66 (0.59)	
Basic controls						
Race: White, not Hispanic[a]	0–1	.55				
Black, not Hispanic	0–1	.15				
Hispanic, any race	0–1	.18				
Native American, not Hispanic	0–1	.02				
Asian, not Hispanic	0–1	.10				
Male	0–1	.51				
SES[b]–1st quintile[a]	0–1	.19	.18	.18	.17	.15
2nd quintile	0–1	.19	.19	.19	.18	.22
3rd quintile	0–1	.20	.20	.20	.18	.23
4th quintile	0–1	.20	.20	.21	.22	.22
5th quintile	0–1	.21	.22	.22	.25	.17
Additional controls: demographic						
Mother worked before kindergarten	0–1	.73				
Non-English language primary in home	0–1	.14				
Number of children in home	1–22	2.70 (1.06)	2.56 (1.17)	2.53 (1.15)	2.49 (1.22)	2.36 (1.14)
Area of residence: small town or rural[a]	0–1	.20	.20	.20	.20	.21
Suburbs or large town	0–1	.39	.39	.40	.40	.41
City	0–1	.41	.41	.40	.39	.38
Region of residence: West[a]	0–1	.23	.23	.23	.23	.23
Northeast	0–1	.18	.18	.18	.18	.18
Midwest	0–1	.25	.25	.25	.25	.24
South	0–1	.33	.34	.33	.34	.35
Household type: two parent[a]	0–1	.76	.76	.75	.74	.74

(Continued)

Table 1
Continued

Variable name	Range	Mean or proportion by grade (standard deviation in parentheses for continuous variables) Kindergarten	1st	3rd	5th	8th
Single mother	0–1	.22	.22	.22	.23	.23
Single father	0–1	.02	.02	.02	.02	.03
Child birth weight: normal	0–1	.84				
Very low (< 1500 gm)	0–1	.03				
Low (≥ 1500 gm to < 2500 gm)	0–1	.08				
High (> 4500 gm)	0–1	.05				
Child was ever in Head Start	0–1	.14				
Usual hours of weekday television watching	0–24	1.86 (1.28)	2.22 (1.35)	2.21 (1.34)	2.28 (1.29)	3.08 (2.97)
Usual hours of weekly employment: mother	0–80	22.79 (19.86)	25.24 (18.74)	26.11 (18.12)	26.99 (17.80)	28.99 (17.53)
Usual hours of weekly employment: father	0–80	43.57 (15.56)	43.00 (16.31)	42.10 (16.37)	41.01 (17.61)	40.40 (17.89)
Additional controls: school						
Parental school involvement index	0–6	3.64 (1.57)	3.96 (1.54)	4.13 (1.48)	4.04 (1.48)	2.56 (1.62)
School climate index	1.11–5	3.76 (.40)	3.78 (.39)	4.09 (.46)	4.08 (.49)	4.06 (.66)
School year length	5–374	177.95 (12.24)	178.65 (10.88)	179.03 (9.53)	178.80 (2.93)	178.69 (3.27)
Teacher years of experience	1–47	9.09 (7.82)	8.88 (8.05)	9.27 (8.19)	8.35 (7.34)	7.90 (5.98)
School facility quality index	1–50	34.00 (7.63)	34.90 (7.68)	35.90 (7.70)	37.36 (7.45)	39.12 (6.57)
Teacher education: HS or sssociates[a]	0–1	.02	.01	.00	.00	.00
Bachelor's	0–1	.28	.30	.28	.20	.08
At least 1 year > bachelor's	0–1	.35	.32	.32	.30	.23
Master's	0–1	.30	.31	.34	.38	.55
Specialist or professional or doctorate	0–1	.05	.06	.07	.11	.15
Percent minority in student body: < 10%[a]	0–1	.31	.31	.30	.28	.24
10% to < 25%	0–1	.18	.16	.16	.16	.18
25% to < 50%	0–1	.16	.16	.16	.17	.19
50% to < 75%	0–1	.11	.11	.12	.11	.14
> 75%	0–1	.24	.25	.26	.28	.25
School enrollment: 0–149[a]	0–1	.08	.05	.05	.04	.03
150–299	0–1	.20	.19	.18	.18	.12
300–499	0–1	.27	.29	.32	.33	.19
500–749	0–1	.29	.25	.28	.29	.26
≥ 750	0–1	.17	.21	.18	.16	.40
School type: Catholic[a]	0–1	.11	.11	.11	.10	.09
Other religious	0–1	.06	.06	.06	.06	.05
Other private	0–1	.04	.03	.02	.02	.02
Public	0–1	.78	.80	.82	.82	.84

[a]Indicates the omitted category in regression analyses.
[b]The socioeconomic status (SES) variable is an index of parental education, household income, and parental job prestige created by the Early Childhood Longitudinal Survey-Kindergarten Cohort.

reports when possible. For kindergarten, first, third, and fifth grades, we used teachers' responses on the internalizing and externalizing behavior subscales of the Social Rating Scale (SRS), an adaptation of Gresham and Elliott's (1990) Social Skills Rating System (Pollack, Atkins-Burnett, Najarian, & Rock, 2005). Each of the subscales of the SRS was validated using both confirmatory and exploratory factor analysis (Pollack, Atkins-Burnett, Najarian, et al., 2005). In each of these survey waves, teachers were asked to evaluate the frequency of children's internalizing and externalizing behaviors according to the following scale: 1 = *never* (a student never exhibits this behavior), 2 = *sometimes* (a student exhibits this behavior occasionally or sometimes), 3 = *often* (a student exhibits this behavior regularly but not all the time), 4 = *very often* (a student exhibits this behavior most of the time, and N/O = *no opportunity* (no opportunity to observe this behavior).

For the externalizing behaviors subscale, teachers in kindergarten and first grade were asked to assess the frequency that a child argued, fought, got angry, acted impulsively, and disturbed ongoing activities (Tourangeau et al., 2001). In the third- and fifth-grade data collections, one additional item was added to assess how often a child talked during quiet study time (Pollack, Atkins-Burnett, Najarian, et al., 2005). Information on externalizing behaviors was not collected at the eighth-grade data collection, and so all analyses using externalizing behaviors as an outcome relied on the kindergarten through fifth grades only. The split-half reliabilities for the eternalizing behaviors subscale were very good, .89 in both third and fifth grades, for example (Pollack, Atkins-Burnett, Rock, & Weiss, 2005; Pollack, Atkins-Burnett, Najarian, et al., 2005). At each survey wave, teacher responses on each item were averaged to create a single score ranging from 1 to 4 representing overall externalizing behavior, which was provided by the ECLS–K.

Teachers completed the internalizing behaviors subscale of the SRS from kindergarten through fifth grade. At each time point, teachers were asked to assess how frequently children appeared to be anxious, lonely, sad, and to have low self-esteem (Tourangeau et al., 2001). Using these four items, the ECLS–K once again created an average measure ranging from 1 to 4 to represent a child's level of internalizing behaviors. The measures comprising the internalizing behaviors subscale had lower, but still acceptable, levels of split-half reliability, .77 in fifth grade, for example (Pollack, Atkins-Burnett, Najarian, et al., 2005). Because neither parents nor teachers reported on children's internalizing behaviors in the eighth grade, we relied on children's self-report at this single data point. Children responded to eight statements about sadness, loneliness, and anxiety to measure their level of internalizing behaviors, assessing how true each statement about them was: 1 = *not at all true*, 2 = *a little bit true*, 3 = *mostly true*, or 4 = *very true* (Najarian et al., 2009). The alpha reliability coefficient for this scale was .75, indicating good reliability. Supplementary models, which excluded children's self-report data from eighth grade, arrived at the same conclusions as the fixed-effects models displayed in Tables 2 and 3 in the Results section.

Family meal frequency. At each survey point, parents answered the following questions regarding the frequency of family meals: ''In a typical week, please tell me the number of days at least some of the family eats breakfast together'' and ''In a typical week, please tell me the number of days your family eats the evening meal together.'' For each question, respondents were able to choose a number from 0 to 7. We note that because data were collected when children were in school, these measures jointly capture almost the entire range of possible meals a family might eat together in a given week (21 total meals − 5 meals eaten at school = 16 meals), an improvement over much previous research.

Lacking consistent direction from previous research or a consensus about appropriate critical cut-points, we created two separate continuous measures, ranging 0–7, which indexed the number of breakfasts and the number of dinners that families ate together in a typical week. Rather than creating a summary measure as in Gable et al. (2007), in our main analyses we elected to maintain separate measures to investigate the possible independent effects of breakfast and dinner frequency, which we believe to be separate constructs, a fact confirmed by the relatively low correlation between the two measures ($r = .14$, $p < .001$). These two variables are our preferred operationalization of family meal frequency, which we believe represent the most parsimonious approach to modeling the potential impact of FMF.

To explore the sensitivity of the relation between FMF and child outcomes to various specifications of FMF, we conducted additional analyses utilizing alternative measures of FMF. We based our choice of operationalization in part on previous research. As noted earlier, previous studies have found a relation between ''regular'' family meals and child outcomes, although regularity has been defined in different ways across studies. In addition, previous work has examined the relation between the total number of family meals and child outcomes. Thus, we defined FMF in a number of additional ways: as a continuous variable measuring the total number (0–14) of family meals eaten in a typical week as in Gable et al. (2007), as a dichotomous variable indicating that a family typically ate 3 or more meals a week as in Eisenberg et al. (2009) and Feldman et al. (2007), and as a dichotomous variable indicating that a family typically ate 5 or more meals a week as in Eisenberg et al. (2008). Also, because the relative frequency of meals differs in the ECLS–K as compared to other data sources (see the Results section), we created a variable indicating that a family typically ate 9 or more meals together, which represents the median value for total meal frequency. Last, to test for the possibility of nonlinear relations between FMF and child outcomes, we included squared terms for both breakfast and dinner frequency.

Additional controls. In an attempt to minimize bias from confounding, the analyses described in the following also included controls for a wide variety of factors. Table 1 describes time-specific means and standard deviations for all variables and identifies those categories that are omitted in analyses (and therefore treated as reference groups). The first group of controls adjusted for ''basic'' factors including child race and ethnicity, child gender, and family socioeconomic status, and a time-varying variable created by the ECLS–K that divided families into quintiles based on parental education, family income, and parental job prestige. A second group of controls accounted for sociodemographic factors including whether a child's mother worked before kindergarten, whether English was spoken in the child's household, the number of children in the household, the urbanicity of a child's residence, a child's region of residence, whether the child was living with a single mother or single father, mothers' and fathers' typical hours of weekly employment (coded as 0 if no such parent exists in the household), indicator variables for a child's birth weight, a variable indicating whether a child participated in a Head Start program, and a variable indicating the average hours of television a child watched on weekdays.

Because the ECLS–K collected data on children within schools, it presents a valuable source of controls for characteristics of children's schools and teachers. Such information could be particularly important if families who are committed to their children's well-being eat meals together frequently but also purposefully choose good schools or are able to select good teachers, both of which are responsible for high academic performance and good behavior. Thus, the last set of controls indexed measures of teacher quality, including years of experience and level of education, two factors related to overall teacher effectiveness (Rice, 2003). This set of controls also included a number of school-level variables linked to student outcomes in previous research including the percent of a student body identified as a minority (O'Connor, Hill, & Robinson, 2009), a measure of school climate (an index averaging administrators' reports about schools, including reports on parental involvement, overcrowding, and teacher turnover; Bear, Gaskins, Blank, & Chen, 2011), school enrollment (Leithwood & Jantzi, 2009), the type of school (private, public, Catholic, or other religious; Morgan, 2001), and the number of days students are required to attend school (Patall, Cooper, & Allen, 2010). This set also included a measure of school facility quality (a summative index at each time point of administrator reports on the presence and adequacy of cafeterias, computer labs, libraries, art facilities, gymnasiums, music facilities, playgrounds, classrooms, auditoriums, and multipurpose rooms), which might otherwise index school quality. Last, this set of controls included a measure of school involvement by children's families (an index averaging parent reports at each time point of family involvement since the beginning of the school year in the parent–teacher association, attendance at a parent–teacher conference, volunteerism at school, attendance at school events, and participation in a school fundraiser), which might be an important marker of family investment in a child also related to FMF.

Analysis

For each dependent variable, we specified a series of multiple regression models, which in sequence provided successively stronger tests of the causal relation between family meal frequency and child outcomes. Using pooled data, we first estimated models of the type described in Equation 1:

$$Y_{it} = \beta_0 + \beta_1 \mathrm{FMF}_{it-1} + \beta_2 X_{it-1} + \beta_3 \mathrm{AGE}_{it} + \varepsilon_{it}, \quad (1)$$

where Y_{it} is an academic or behavioral outcome for a child at time t, FMF represents variables for breakfast and dinner frequency (each scaled 0–7) measured at the previous time, and X_{it-1} is a vector of variables also measured at the previous time and representing the set of control variables described earlier, AGE is a set of indicator variables representing a child's age in years, and ε_{it} is a child- and time-specific error term.

Despite the large number of controls contained in X, we used two additional longitudinal analytic approaches to deal with the potential endogeneity of the FMF variables. The first of these approaches was a LDV model of the type described in Equation 2:

$$Y_{it} = \beta_0 + \beta_1 \mathrm{FMF}_{it-1} + \beta_2 X_{it-1} + \beta_3 \mathrm{AGE}_{it} + Y_{it-1} + \varepsilon_{it}. \quad (2)$$

In LDV models, the value of the dependent variable from the previous time period (Y_{it-1}) is included in the analyses. This approach helps to control for any unobserved factors that might have contributed to children's earlier outcomes and that could bias the coefficient for FMF. For example, if as noted, FMF is a marker for other behaviors of parents that are related to both FMF and child outcomes, as might be the case if well-intentioned parents have made early investments in their children's learning, then we would expect these efforts to be ''captured'' by the lagged dependent term in Equation 2. Thus, the estimate of the effect of FMF on child outcomes (β_1) in the LDV model represented in Equation 2 is less likely to be biased than the comparable term in Equation 1 (NICHD ECCRN & Duncan, 2003). Although the LDV approach is an improvement over the basic pooled model, it is not a panacea for possible endogeneity and can pose additional problems if there is correlation between the lagged term and an outcome (Foster, 2010), as might well be the case for academic and behavioral outcomes.

Thus, the second approach was to specify child fixed-effects models of the type found in Equation 3:

$$Y_{it} = \beta_0 + \beta_1 \mathrm{FMF}_{it-1} + \beta_2 X_{it-1} + \beta_3 \mathrm{AGE}_{it} + u_i + \varepsilon_{it}, \tag{3}$$

where u_i is a child-specific term (the so-called fixed effect), which represents both observed and unobserved unchanging characteristics of children and their families. Such an analysis relies exclusively on within-child variation to estimate the effect of FMF on child outcomes, providing less biased estimates by discarding between-individual variation that is likely to be the source of confounding influences (Allison, 2009).

While fixed-effects models control for unchanging characteristics of children and their families, it is important to note that they do not address bias related to time-varying factors, and so analyses of Equation 3 included all time-varying controls from the previous models. However, if time-varying variables related to both FMF and child outcomes are not controlled for, estimates from analyses of fixed effects can still be biased. Nonetheless, because the fixed-effects model provided the strongest test of the causal relation between FMF and child outcomes, Equation 3 represents our preferred modeling strategy.

We utilized each of the three modeling approaches outlined in Equations 1–3 for our main analyses, which use continuous measures of the frequency of family breakfasts and family dinners. For our additional analyses, which explored various alternative specifications for FMF, we focused our analyses on fixed-effects models (Equation 3) exclusively.

Finally, previous research has indicated that the frequency of family meals declines as children age, and thus, it may be that FMF has a different impact on the functioning of younger and older children. To test for this possibility, when possible, we separated children into younger and older age groups and replicated our fixed-effects analyses for each outcome. Because our fixed-effects models require a minimum of two waves of data plus an additional wave to include lagged measures of breakfast and dinner frequency and control variables, we separated analyses for reading scores, math scores, and internalizing behaviors into two age groups. The first examined younger children for whom outcomes were measured in first and third grades, and the second examined older children for whom outcomes were measured in fifth and eighth grades. Data were not available on externalizing behaviors in eighth grade, and so our age groups for this outcome were first and third grades for younger children and third and fifth grades for older children. Because science scores were not collected until third grade, separate analyses by age group were not possible for this outcome.

Results

Family Meal Frequency in the ECLS–K

Table 1 presents the proportion of parents by grade who reported eating breakfast or dinner together at particular frequencies. In addition, the table shows the average number of family breakfasts and dinners reported by parents at each wave. On average, respondents reported eating more dinners together in a typical week than breakfasts although the number of both breakfasts and dinners declined as children aged. Most notable were the decreases in the proportion of parents who reported eating 7 dinners together (.57 in kindergarten to .37 in eighth grade), 7 breakfasts together (.40 in kindergarten to .16 in eighth grade), and the increases in the proportion reporting eating no breakfasts together (.06 in kindergarten to .12 in eighth grade). Despite declines over time, frequent family meals (and frequent family dinners in particular) were common among respondents, with 70% reporting eating 5–7 dinners together in eighth grade and 34% reporting eating 5–7 breakfasts together at the same time.

These findings are a notable contrast to previous research. For example, research with the Project EAT data set found that approximately one third of adolescents reported eating two or fewer meals together in the previous week (Eisenberg et al., 2004; Fulkerson, Neumark-Sztainer, et al., 2006). When we pooled our data and examined children in eighth grade (those closest in age to Project Eat respondents), we found that fewer than 2% of parents in the ECLS–K reported eating meals together so infrequently. Looking only at dinner frequency, data from the NLSY, Sen (2010) found that approximately 20% of youth respondents reported eating two or fewer dinners together in a typical week, compared to only approximately 7% of parents in our eighth-grade sample. We consider potential causes of these discrepancies in our discussion section.

Main Results

Table 2 presents the results of the regression models examining the association between the frequency of family breakfasts and family dinners and child academic and behavioral outcomes. For each of the outcomes, the results of the three modeling approaches are presented: a pooled model with the set of controls described in Table 1 (Equation 1), a LDV model that includes all controls from Table 1 as well as earlier version of the dependent variable at an earlier time point (Equation 2), and a fixed-effects model that includes the full set of controls and also controls for the unchanging characteristics of children (Equation 3). All models included standard errors clustered by school and indicator variables that controlled for child age in years. Alternative analyses that clustered standard errors at the child level arrived at almost identical findings. Because we specify lagged regression models, analyses for reading standardized scores, math standardized scores, and internalizing behaviors included observations on the dependent variable from first, third, fifth, and eighth grades, while models for science standardized scores included observations from third, fifth, and eighth grades only, and those for externalizing behaviors included first, third, and fifth grades.

For each outcome, column 1 presents the results for the pooled regression models with controls. Consistent with previous research on FMF, each additional breakfast was associated with increased reading, math, and science scores and decreased internalizing and externalizing behaviors. In all cases, the predicted change associated with an increase in breakfast frequency was relatively small, approximately 2/100th of a standard deviation in academic scores and < 1/100th of a point for problem behaviors. Unexpectedly, dinner frequency

Table 2
The Effects of Family Meal Frequency on Child Academic and Behavioral Outcomes

	Reading			Math			Science			Internalizing behaviors			Externalizing behaviors		
	Pooled with controls	LDV models	Child FE models	Pooled with controls	LDV models	Child FE models	Pooled with controls	LDV models	Child FE models	Pooled with controls	LDV models	Child FE models	Pooled with controls	LDV models	Child FE models
Variables	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
No. of breakfasts	0.186***	0.110***	0.018	0.181***	0.080***	0.017	0.228***	0.100***	0.009	−0.005***	−0.005***	−0.001	−0.008***	−0.004***	−0.002
	(0.025)	(0.021)	(0.015)	(0.018)	(0.016)	(0.022)	(0.023)	(0.016)	(0.036)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
No. of dinners	−0.077**	−0.038	0.008	−0.082***	−0.022	0.013	−0.081	−0.057	−0.077	0.003*	0.002*	−0.000	0.004**	0.002	−0.000
	(0.024)	(0.021)	(0.022)	(0.022)	(0.015)	(0.018)	(0.044)	(0.034)	(0.050)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Lagged term		0.511***			0.626***			0.618***			0.186***			0.429***	
		(0.006)			(0.005)			(0.005)			(0.005)			(0.008)	
Observations		85,640			85,640			42,820			85,650			64,230	
r^2	.22	.43	.69	.22	.52	.75	.28	.56	.81	.12	.15	.42	.10	.27	.63

Note. All models include standard errors clustered by school and control for all variables listed in Table 1. LDV = lagged dependent variable; FE = fixed effects.
$^*p < .05$. $^{**}p < .01$. $^{***}p < .001$.

was significantly associated with poorer reading and math scores and increases in internalizing and externalizing behaviors, although the magnitudes of these associations were smaller than the comparable ones for breakfast frequency.

Column 2 for each outcome presents the results from LDV models. In general, the pattern of results was similar between the pooled and LDV results. However, the magnitude of the associations was smaller in most cases than in the pooled models, and reading scores, math scores, and externalizing behaviors were no longer significantly associated with dinner frequency.

There were notable differences in the results for the child fixed-effects models (column 3 for each outcome). Unlike in the previous two sets of models, there were no significant relations between FMF and any of the child outcomes. Although it was not possible to combine estimates across multiple imputed data sets, we computed a Sargen–Hansen statistic for each fixed-effects regression from each of the five multiply imputed data sets used to arrive at the estimates in Table 2. The Sargen–Hansen statistic can be calculated in place of the Hausman test when using clustered data (using the xtoverid command in Stata; Schaffer & Stillman, 2010). Each version of this test indicated the superiority of these models over comparable random effects models.

Table 3 presents results from child fixed-effects models that varied the manner by which FMF was operationalized. All models in Table 3 included the full set of controls used in the fixed-effects analyses from Table 2. The results from these analyses

Table 3
Alternative Specifications for Family Meal Frequency: Fixed-Effects Models

FMF variable	Reading				Math				Science			
Total meals	0.014				0.015				−0.023			
	(0.012)				(0.013)				(0.021)			
No. of breakfasts		0.040				0.074				0.042		
		(0.072)				(0.057)				(0.131)		
No. of breakfasts^2		−0.003				−0.007				−0.004		
		(0.008)				(0.006)				(0.016)		
No. of dinners		0.021				0.002				−0.044		
		(0.099)				(0.083)				(0.201)		
No. of dinners^2		−0.001				0.001				−0.004		
		(0.011)				(0.009)				(0.023)		
3 or more			−0.047				0.182				−0.031	
			(0.363)				(0.238)				(0.581)	
5 or more				0.007				0.083				−0.155
				(0.157)				(0.116)				(0.324)
9 or more				0.101				0.087				−0.086
				(0.089)				(0.068)				(0.113)
Observations			85,640				85,640				42,820	
r^2			.69				.75				.81	

FMF variable	Internalizing behaviors				Externalizing behaviors			
Total meals	−0.001				−0.001			
	(0.001)				(0.001)			
No. of breakfasts		−0.001				0.004		
		(0.005)				(0.006)		
No. of breakfasts^2		−0.000				−0.001		
		(0.001)				(0.001)		
No. of dinners		0.003				0.005		
		(0.007)				(0.010)		
No. of dinners^2		−0.000				−0.001		
		(0.001)				(0.001)		
3 or more			0.009				0.001	
			(0.019)				(0.027)	
5 or more				−0.013				0.001
				(0.011)				(0.020)
9 or more				−0.004				−0.004
				(0.006)				(0.008)
Observations			85,640				64,230	
r^2			.42				.63	

Note. All models include standard errors clustered by school and control for all variables listed in Table 1. FMF = family meal frequency.

Table 4
Family Meal Frequency and Child Outcomes by Age Group: Fixed-Effects Models

Variables	Reading	Math	Internalizing behaviors	Externalizing behaviors
	Kindergarten, 1st grade, 3rd grade			Kindergarten, 1st grade, 3rd grade
No. of breakfasts	−0.019 (0.045)	0.024 (0.026)	−0.002 (0.003)	−0.002 (0.002)
No. of dinners	0.006 (0.052)	−0.024 (0.040)	0.002 (0.003)	0.001 (0.004)
	3rd grade, 5th grade, 8th grade			1st grade, 3rd grade, 5th grade
No. of breakfasts	0.004 (0.037)	−0.010 (0.051)	−0.001 (0.003)	−0.001 (0.003)
No. of dinners	−0.006 (0.036)	0.032 (0.029)	−0.003 (0.003)	−0.003 (0.003)

Note. All models include standard errors clustered by school and control for all variables listed in Table 1. Because science scores were available only in third, fifth, and eighth grades, subanalyses by age group were not possible.

supported those from Table 2. In short, the relation between FMF and child academic and behavioral outcomes was not sensitive to the manner by which FMF was operationalized. Neither the continuous variables representing total meal frequency, the separate continuous and squared terms assessing nonlinear relations, nor the various indicator variables for regular family meals were significantly related to any of the other child outcomes in the main analyses.

Last, Table 4 presents the findings from models that replicated the fixed-effects models from Table 2 by age group. As noted earlier, because science scores were only collected beginning in the third-grade wave of data collection, separate age group analyses were not available for this outcome. As indicated in the table, child age group did not appear to affect the general findings from Table 2. That is, FMF was not significantly related to reading or math scores or problem behaviors among either younger or older children in the sample.

Discussion

As discussed at the outset, previous research on FMF and child outcomes has been limited in a number of different ways. Using extremely rich data on a nationally representative sample of children who entered kindergarten in fall 1998 and were followed through eighth grade and applying more rigorous methods than have typically been used in previous studies on this topic, we found little evidence for beneficial effects of frequent family meals. In our preferred models, effects of family meals on child academic and behavioral outcomes were either small or effectively zero. Our results did not vary when we employed different operationalizations of our main independent nor did they vary by child age.

Of course, our study is not without limitations. As with all nonexperimental research, we are not able to be certain that we have eliminated all possible confounders and estimated true causal effects. We have included an extensive set of confounding variables to ensure that we have controlled, to the extent possible, for factors associated with the selection into family meals. However, doing so raises the potential concern that we are also controlling for factors that are causal antecedents to family meals—factors such as family status, parental employment, and so on. As such, our analyses cannot address the question of whether family meals might influence child outcomes as part of a more complex set of processes, whereby they act as mediators between such causal antecedents and child outcomes. Although this seems unlikely, given that we fail to find significant effects of family meals on child outcomes, a firmer answer would require a fuller set of analyses that begin with family predictors and then explore the role of family meals as a mediating variable. Such analyses were beyond the scope of this article but would be worth exploring in future research.

Although this study contributed to the existing literature by investigating whether the impacts of FMF differed by child age, an important caveat to our results is that we examined children through eighth grade only (when children were on average 13.6 years old). Many of the prior studies finding strong positive associations between frequent family meals and child outcomes focused on older adolescents, for whom family meals may be more protective. Relatedly, because our sample is relatively young, we were not able to examine all the outcomes that have been studied in prior research.

Most notable is the lack of information on substance use, which other studies have found to be related to family meal frequency. By analyzing the effects of FMF on a younger sample of children, this study can be understood as an extension rather than a repudiation of previous work.

Nevertheless, our results are generally at odds with prior studies of adolescents. We note that in our pooled models with controls and to a lesser extent in our LDV models (both in Table 2), there were numerous significant associations between FMF and child outcomes. Thus, when we implemented modeling strategies most similar to those of previous work, we found that FMF was indeed associated with child academic and behavioral outcomes, if not always in the way predicted by previous work. This indicates that an important reason for the discrepancy between our results and other studies' findings was not the age of the children studied but rather the methods we applied.

Our study found differences between the measures of FMF in the ECLS–K and those found in other studies. There are a couple of likely causes that underscored these differences. For one, both our own data and data from previous studies (Fulkerson, Neumark-Sztainer, et al., 2006; Fulkerson, Story, et al., 2006) confirmed that the frequency of family meals is lower among older children. As a result, it is not surprising that the parents of children in the ECLS–K data set (the majority of whom are 14 or younger) reported eating meals together as a family more frequently. In addition, differences between the ECLS–K and other data sets were not so pronounced when comparing response categories indicating more frequent meals. For instance, when the data from eighth-grade respondents in ECLS–K were compared with adolescent respondents from the NLSY (Sen, 2010) and CASA (2010), results were similar, where approximately 60% of respondents reported eating dinner five or more times per week, compared to 70% in the ECLS–K (Table 1).

Second, there appear to be differences between youth and parental report about family frequency and about the family meal environment in general (van Assema, Glanz, Martens, & Brug, 2007). As the ECLS–K used only data from parental reports, we would expect to find higher reported rates of family meals than in prior studies that relied on child reports. One study published on a subset of Project EAT data (Fulkerson, Neumark-Szatiner, et al., 2006) found that parents were only half as likely (6.8% vs. 13.7%) as adolescents to report never eating together but more than twice as likely (22% vs. 9.9%) to report eating seven meals together as a family in the previous week; parents were only slightly less likely to select any of the other responses, including the choice of more than seven meals. The authors of this study suggested that parents may report more frequent family meals because they may count meals that do not include children; this is a valid concern for the questions in the ECLS–K, which did not specifically ask parents to report on meals involving the study child.

Similarly, the frequency with which parental respondents to the ECLS–K chose ''seven'' breakfasts or dinners might reflect the social desirability of these choices, which may be a stronger source of bias for parents than for adolescent respondents in other surveys and thus may represent error in these variables. If the higher reporting by parents is indeed indicative of overreporting either as a consequence of the social desirability of reporting more meals together, or because parents in the ECLS–K reported having meals together but when a child was not present, then the coefficients for FMF reported in Tables 2 and 3 would be biased toward zero and would thus underestimate the true effect of FMF on child academic and behavioral outcomes. This type of bias may be unique to the ECLS–K data set among other large, nationally representative studies as it is the only such study to use parents' reports. However, we note that this sort of bias would be present across all our models and was not strong enough to eliminate the significant associations between FMF and child outcomes in our pooled models and LDV models. Once again, this bolsters our confidence that discrepancies between our findings and those of previous analyses were not a consequence of differences in the manner by which data on family meal frequency were collected. Moreover, because children in the ECLS–K were younger on average than those in previous analyses, it is less likely that parents would report having family meals that did not include them. Future research using data sets with adolescent or child report of FMF could provide useful evidence in this regard.

A strength of the current study was our examination of several possible operationalizations of family meal frequency. Overall, our results were robust to different specifications of family meals, increasing our confidence that the lack of beneficial effects of family meals is not due to our choice of specification of the family meals variables.

In sum, despite differences between our study and previous analyses, our results suggest that the findings of previous work regarding FMF and adolescent outcomes should be viewed with some caution. When compared to those from the pooled and LDV models, the coefficients for breakfast and dinner frequency in our FE models were substantially attenuated and close to zero in many cases. These differences suggest that invariant and unmeasured characteristics of children or their families related both to FMF and child outcomes may bias estimates from pooled or LDV models. For instance, frequent family meals may be an investment by families who consistently engage in other activities and provide other supports that promote positive outcomes for children. Fixed-effects analyses are not without their weaknesses, however. It may be the case that unobserved, time-varying characteristics may account for both changes in FMF and child outcomes, in which case fixed-effects model results would be biased, although these factors would have to account for both increased family meal frequency and poorer outcomes for children. With longitudinal data at their disposal, researchers should continue to take advantage of more robust tests of the causal relation between FMF and both child and adolescent outcomes, and future analyses might attempt to replicate the results of previous studies using the sort of methods included in this article.

Because this study was the first to find no association between FMF and child outcomes and differs from previous investigations, it may be premature to make conclusions about the value of family meal frequency. Previous research and theory have both suggested that shared family meals are a valuable and important developmental context for children, and their worth may go beyond the ability of surveys to detect or measure or may affect different outcomes than those assessed here. Indeed, even if family meals act as a proxy for other behaviors that are related to positive outcomes for children and adolescents, future research that investigates the processes underlying such behaviors could prove informative for policy makers, practitioners, and the public.

Furthermore, quantity of shared meals may not be the most relevant measure of the worth of family meals. Indeed, some contemporary research focuses on the quality of interactions that occur at the family dinner or breakfast table (Fiese & Schwartz, 2008). Our data do not afford us the ability to distinguish the quality of the mealtime environment, and so we cannot draw conclusions about the value of family meals in this regard.

Last, research on the quality of the home environment (Bradley, Corwyn, Burchinal, McAdoo, & Garcia Coll, 2001) indicates that there is significant variation in mealtime frequency between racial and ethnic groups and within groups by family socioeconomic status. While our analyses controlled for race and ethnicity and socioeconomic status, our findings do not rule out the possibility that the importance of the mealtime environment varies across different groups, which might be the case if different processes were at work during mealtimes. Thus, there are several ways in which future research might more comprehensively investigate the effects of both quality and quantity of family meals on child and adolescent outcomes, by, for example, examining the moderating role of factors such as race or ethnicity, single-parent household-status, and family socioeconomic status and utilizing data sources that contain richer detail on the routine and ritual aspects of shared mealtimes.

Ultimately, we cannot conclude that shared family times over breakfast or dinner should be ignored or that families should not attempt to cultivate these types of collective experiences. Rather, we suggest that the magnitude of the effect of FMF may be less than suggested by previous work. Future analyses should be undertaken in such a way as to acknowledge and address possible sources of endogeneity that can bias the results of regression analyses.

References

Allison, P. D. (2009). *Fixed effects regression models*. Thousand Oaks, CA: Sage.

Anderson, S. E., & Whitaker, R. C. (2010). Household routines and obesity in US preschool-aged children. *Pediatrics*, *125*, 420–428. doi:10.1542/peds.2009-0417

Bear, G. G., Gaskins, C., Blank, J., & Chen, F. F. (2011). School climate survey-student: Its factor structure, concurrent validity, and reliability. *Journal of School Psychology*, *49*, 157–174. doi:10.1016/j.jsp.2011.01.001

Berger, L. M., Bruch, S. K., Johnson, E. I., James, S., & Rubin, D. (2009). Estimating the ''impact'' of out-of-home placement on child well-being: Approaching the problem of selection bias. *Child Development*, *80*, 1856–1876. doi:10.1111/j.1467-8624.2009.01372.x

Boyer, T. W. (2006). The development of risk-taking: A multi-perspective review. *Developmental Review*, *26*, 291–345. doi:10.1016/j.dr.2006.05.002

Bradley, R. H., Corwyn, R. F., Burchinal, M., McAdoo, H. P., & Garcia Coll, C. (2001). The home environments of children in the United States Part II: Relations with behavioral development through age thirteen. *Child Development*, *72*, 1868–1886. doi:10.1111/1467-8624.t01-1-00383

Burgess-Champoux, T. L., Larson, N., Neumark-Sztainer, D., Hannan, P. J., & Story, M. (2009). Are family meal patterns associated with overall diet quality during the transition from early to middle adolescence? *Journal of Nutrition Education and Behavior*, *41*, 79–86. doi:10.1016/j.jneb.2008.03.113

Council of Economic Advisors. (2000). *Teens and their parents in the 21st century: An examination of trends in teen behavior and the role of parent involvement*. Washington, DC: Council of Economic Advisors. Retrieved August 6, 2007, from http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED443529

Duncan, G. J., Magnuson, K. A., & Ludwig, J. (2004). The endogeneity problem in developmental studies. *Research in Human Development*, *1*, 59–80. doi:10.1207/s15427617rhd0101&2_5

Eisenberg, M. E., Neumark-Sztainer, D., & Feldman, S. (2009). Does TV viewing during family meals make a difference in adolescent substance use? *Preventive Medicine*, *48*, 585–587. doi:10.1016/j.ypmed.2009.04.002

Eisenberg, M. E., Neumark-Sztainer, D., Fulkerson, J. A., & Story, M. (2008). Family meals and substance use: Is there a long-term protective association. *Journal of Adolescent Health*, *43*, 151–156. doi:10.1016/j.jadohealth.2008.01.019

Eisenberg, M. E., Olson, R. E., Neumark-Sztainer, D., Story, M., & Bearinger, L. H. (2004). Correlations between family meals and psychosocial well-being among adolescents. *Archives of Pediatric and Adolescent Medicine*, *158*, 792–796. doi:10.1001/archpedi.158.8.792

Feldman, S., Eisenberg, M. E., Neumark-Sztainer, D., & Story, M. (2007). Associations between watching tv during family meals and dietary intake among adolescents. *Journal of Nutrition Education and Behavior*, *39*, 257–263. doi:10.1016/j.jneb.2007.04.181

Fiese, B. H., Foley, K. P., & Spagnola, M. (2006). Routine and ritual elements in family mealtimes: Contexts for child well-being and family identity. *New Directions for Child and Adolescent Development*, *111*, 67–89. doi:10.1002/cd.156

Fiese, B. H., & Schwartz, M. (2008). Reclaiming the family table: Mealtimes and child health and wellbeing. *Social Policy Report*, *22*, 3–19.

Fiese, B. H., Tomcho, T. J., Douglas, M., Josephs, K., Poltrock, S., & Baker, T. (2002). A review of 50 years of research on naturally occurring family routines and rituals: Cause for celebration? *Journal of Family Psychology*, *16*, 381–390. doi:10.1037/0893-3200.16.4.381

Fisher, L. B., Miles, I. W., Austin, B., Camargo, C. A., & Colditz, G. A. (2007). Predictors of initiation of alcohol use among US adolescents. *Archives of Pediatric and Adolescent Medicine*, *161*, 959–966. doi:10.1001/archpedi.161.10.959

Foster, E. M. (2010). Causal inference and developmental psychology. *Developmental Psychology*, *46*, 1454–1480. doi:10.1037/a0020204

Fulkerson, J. A., Neumark-Sztainer, D., Hannan, P. J., & Story, M. (2008). Family meal frequency and weight status among adolescents: Cross-sectional and 5-year longitudinal associations. *Obesity*, *16*, 2529–2534. doi:10.1038/oby.2008.388

Fulkerson, J. A., Neumark-Sztainer, D., & Story, M. (2006). Adolescent and parent views of family meals. *Journal of the American Dietetic Association*, *106*, 526–532. doi:10.1016/j.jada.2006.01.006

Fulkerson, J. A., Story, M., Mellin, A., Leffert, N., Neumark-Sztainer, D., & French, S. A. (2006). Family dinner meal frequency and adolescent development: Relationships with developmental assets and high-risk behaviors. *Journal of Adolescent Health*, *39*, 337–345. doi:10.1016/j.jadohealth.2005.12.026

Gable, S., Chang, Y., & Krull, J.l. (2007). Television watching and frequency of family meals are predictive of overweight onset and persistence in a national sample of school-aged children. *Journal of the American Dietetic Association*, *107*, 53–61. doi:10.1016/j.jada.2006.10.010

Gelman, A., & Hill, J. (2007). *Data analysis using regression and multilevel/hierarchical models*. New York: Cambridge University Press.

Gibbs, N. (2006). The magic of the family meal. *Time*, *167*, 50–55.

Gresham, F. M., & Elliott, S. N. (1990). *Social Skills Rating System manual*. Circle Pines, MN: American Guidance Service.

Hammons, A. J., & Fiese, B. H. (2011). Is frequency of shared family meals related to the nutritional health of children and adolescents? *Pediatrics*, *127*, e1565–e1574. doi:10.1542/peds.2010-1440

Larson, R. W. (2008). Family mealtimes as a developmental context. *Social Policy Report*, *22*, 12.

Larson, R. W., Branscomb, K. R., & Wiley, A. R. (2006). Forms and functions of family mealtimes: Multidisciplinary perspectives. *New Directions for Child and Adolescent Development*, *2006*, 1–15. doi:10.1002/cd.152

Leithwood, K., & Jantzi, D. (2009). A review of empirical evidence about school size effects: A policy perspective. *Review of Educational Research*, *79*, 464–490. doi:10.3102/0034654308326158

Morgan, S. L. (2001). Counterfactuals, causal effect heterogeneity, and the Catholic school effect on learning. *Sociology of Education*, *74*, 341–374. doi:10.2307/2673139

Najarian, M., Pollack, J. M., & Sorongon, A. G. (2009). *Early Childhood Longitudinal Study, class of 1998–1999 (ECLS-K) psychometric report for the eighth grade* (NCES 2009-02). Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Retrieved October 15, 2010, from http://nces.ed.gov/pubs2009/2009002.pdf

National Center on Addiction and Substance Use at Columbia University. (2007). *The importance of family dinners IV*. Retrieved May 18, 2011, from http://www.casacolumbia.org/download.aspx?path=/UploadedFiles/30dqhuyg.pdf

National Center on Addiction and Substance Use at Columbia University. (2009). *The importance of family dinners V*. Retrieved July 14, 2010, from http://www.casacolumbia.org/download.aspx?path=/UploadedFiles/ufymohw3.pdf

National Center on Addiction and Substance Use at Columbia University. (2010). *The importance of family dinners VI*. Retrieved December 1, 2010, from http://www.casacolumbia.org/download.aspx?path=/UploadedFiles/1intfzad.pdf

National Institute of Child Health and Human Development Early Child Care Research Network, & Duncan, G. J. (2003). Modeling the impacts of child care quality on children's preschool cognitive development. *Child Development*, *74*, 1454–1475. doi:10.1111/1467-8624.00617

Neumark-Sztainer, D. (2008). Family meals in adolescents: Findings from Project EAT. *Social Policy Report*, *22*, 11.

Neumark-Sztainer, D., Story, M., Ackard, D., Moe, J., & Perry, C. (2000). Family meals among adolescents: Findings from a pilot study. *Journal of Nutrition Education and Behavior*, *32*, 335–340. doi:10.1016/S0022-3182(00)70593-0

Neumark-Sztainer, D., Wall, M., Story, M., & Fulkerson, J. A. (2004). Are family meal patterns associated with disordered eating behaviors among adolescents? *Journal of Adolescent Health*, *35*, 350–359. doi:10.1016/j.jadohealth.2004.01.004

O'Connor, C., Hill, L. D., & Robinson, S. R. (2009). Who's at risk in school and what's race got to do with it? *Review of Research in Education*, *33*, 1–34. doi:10.3102/0091732X08327991

Patall, E. A., Cooper, H., & Allen, A. B. (2010). Extending the school day or school year: A systematic review of the research (1985–2009). *Review of Educational Research*, *80*, 401–436. doi:10.3102/0034654310377086

Pollack, J. M., Atkins-Burnett, S., Najarian, M., & Rock, D. A. (2005). *Early Childhood Longitudinal Study, kindergarten class of 1998–1999 (ECLS-K), psychometric report for the fifth grade* (NCES 2006-036). Washington, DC: National Center for Education Statistics, U.S. Department of Education. Retrieved October 15, 2010, from http://nces.ed.gov/pubs2006/2006036rev.pdf

Pollack, J., Atkins-Burnett, S., Rock, D., & Weiss, M. (2005). *Early Childhood Longitudinal Study, kindergarten class of 1998–99 (ECLS-K), psychometric report for the third grade* (NCES 2005-062)). Washington, DC: National Center for Education Statistics, U.S. Department of Education. Retrieved October 15, 2010, from http://nces.ed.gov/pubs2005/2005062.pdf

Rice, J. K. (2003). *Teacher quality: Understanding the effectiveness of teacher attributes* (Executive Summary, Economic Policy Institute). Retrieved May 17, 2011, from http://www.epi.org/publications/entry/books_teacher_quality_execsum_intro/#ExecSum

Royston, P. (2007). Multiple imputation of missing values: Further update of ice, with an emphasis on interval censoring. *Stata Journal*, *7*, 445–464.

Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. New York: Wiley.

Schaffer, M. E., & Stillman, S. (2010). *XTOVERID: Stata module to calculate test of overidentifying restrictions after xtreg, xtivreg, xtivreg2, xthtaylor*. Retrieved May 18, 2011, from http://ideas.repec.org/c/boc/bocode/s456779.html

Sen, B. (2010). The relationship between frequency of family dinner and adolescent problem behaviors after adjusting for other family characteristics. *Journal of Adolescence*, *33*, 187–196. doi:10.1016/j.adolescence.2009.03.011

Snow, C. E., & Beals, D. E. (2006). Mealtime talk that supports literacy development. *New Directions for Child and Adolescent Development*, *2006*, 51–66. doi:10.1002/cd.155

Tourangeau, K., Burke, J., Le, T., Wan, S., Weant, M., Brown, E., et al. (2001). *ECLS-K base year public-use data file, kindergarten class of 1998–1999: Data files and electronic code book, and user's manual* (NCES 2001-029REV). Washington, DC: National Center for Education Statistics, U.S. Department of Education. Retrieved October 15, 2010, from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2001029rev

Tourangeau, K., Nord, C., Le, T., Sorongon, A. G., & Najarian, M. (2009). *Early childhood longitudinal study, kindergarten class of 1998–1999 (ECLS-K), combined user's manual for the ECLS-K eigth-grade and k-8 full sample data files and electronic codebooks (NCES 2009-004)*. Washington, DC: National Center for Education Statistics, U.S. Department of Education. Retrieved October 15, 2010, from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2009004

van Assema, P., Glanz, K., Martens, M., & Brug, J. (2007). Differences between parents' and adolescents' perceptions of family food rules and availability. *Journal of Nutrition Education and Behavior*, *39*, 84–89. doi:10.1016/j.jneb.2006.08.031