Assessing Causality and Persistence in Associations Between Family Dinners and Adolescent Well-Being*

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Abstract. Adolescents who share meals with their parents score better on a range of indicators tapping health and well-being. These associations are consistent and strong, and they have attracted much attention in media and policy circles. We address two questions yet unresolved in the growing literature on family meals: Are associations causal and do they persist over time? Using data from the National Longitudinal Survey of Adolescent Health, we examine associations between family dinners, mental health, and substance use. We rely on detailed measures of family relationships and activities to assess the extent to which family dinners proxy family organization. As a more stringent test of causality, we estimate first difference models, accounting for time-invariant unobserved factors that might jointly determine family dinners and adolescent well-being. In subsequent analyses, we will incorporate additional waves of data to examine persistence in the association between family meals and adolescent well-being into young adulthood.

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In recent years, the search for ways for families to connect in an increasingly complex and fast-paced world has led back to the dinner table. The allure of the family meal has captured the attention of the news media (Hoffman 2009; Gibbs and Miranda 2006), policy groups (CASA 2009; Child Trends 2003), and researchers (Doherty 2000; Neumark-Sztainer et al. 2003). The extant literature shows that adolescents who share meals with their parents tend to have healthier eating habits and body weight (Taveras et al. 2005; Videon and Manning 2003; Stewart and Menning 2009), higher academic achievement (Counsel of Economic Advisers 2000), higher psychological well-being (Eisenberg et al. 2004; Counsel of Economic Advisers 2000), and lower risk of substance use (CASA 2009; Counsel of Economic Advisers 2000; Eisenberg et al. 2008). Associations between family meals and adolescent well-being are consistent and strong. And because family meals are routine for the majority of U.S. families, they have the potential to significantly influence child behavior and development (Fiese and Schwartz 2008). Key questions, however, about family meals and adolescent well-being remain, in particular, as to whether associations are causal and whether they persist into young adulthood. We address these issues using rich, nationally representative panel data on adolescents and their families.

Background

Family meals provide a regular context for parent-child conversation and communication, which may directly influence adolescent mental health and risk-taking. But the frequency of family meals is also closely related to other aspects of family resources, organization, relationships, and overall climate that contribute to adolescent well-being. For example, families in poverty are less likely to eat together (Neumark-Sztainer et al. 2003), and poverty is in turn associated with multiple dimensions of child well-being (Duncan et al. 2010). The frequency of

family meals is also likely related to the quality of family relationships, which in turn is associated with child well-being into young adulthood (Amato & Sobolewski 2001; Musick and Meier 2010). Family meals may be a marker for family relationships, with little additional value to child development.

Few studies consider such factors in assessing the link between family meals and child well-being. In particular, there is little work controlling for aspects of family functioning that may jointly account for the frequency of family meals and child well-being. Studies by Eisenberg and colleagues are an exception. They find significant associations between family meals and psychological well-being (2004) and substance use (2008) net of family connectedness—a composite of adolescent responses to questions about how much they feel their parents care about them and how much they feel they can talk with their parents about problems. Most studies assessing the frequency of family meals and child well-being lack a rich set of controls to rule out potential confounding factors.

Moreover, the bulk of work on family meals relies on point-in-time data. Cross-sectional data provide no leverage in sorting out temporal order and make it all the more challenging to assess causality. They further constrain our understanding of how the association between family meals and child well-being plays out over time. Thus we know very little about the persistence of this association as adolescents age into young adulthood. Limited longitudinal research is mixed: Eisenberg et al. (2008) examine the association between family meals and substance use among adolescents five years later. Adjusting for baseline use, they find significantly lower odds of subsequent substance use among females but not males. Tavernas et al. (2005) find no association between family dinners and becoming overweight one year later.

Our study investigates the association between family meals and adolescent mental health and substance abuse. Much work in this area relies on convenience and/or community samples collected at a single point in time. We use the National Longitudinal Survey of Adolescent Health (Add Health) which has been little utilized to examine family meals (but see Videon and Manning 2003; Stewart and Menning 2009). Adolescent mental health and substance use both have long-term health consequences, and they tap internalizing and externalizing responses that allow us to capture variation among girls (who tend to score higher on internalizing responses) and boys (who tend to score higher on externalizing responses).

Our analysis advances the existing scholarship in several other ways. First, we investigate whether the association between family meals and adolescent well-being can be explained by socio-demographic controls like family structure and socio-economic status. Second, we assess three aspects of family relationships that may be responsible for both frequent shared family meals and child well-being: parent-child relationship quality, family relationship quality, and shared activities between parents and children. Third, to gain additional leverage on the causal question, we investigate the association between change in family dinners and change in child well-being over the course of one year. Finally, we offer a plan for analyzing persistence in the influence of family meals from adolescence into adulthood, and differences in this influence by gender.

Data, Measures, and Methods

National Longitudinal Survey of Adolescent Health (Add Health)

Add Health is a nationally representative survey of U.S. adolescents who were in grades 7-12 in 1994-95. In 1995, more than 90,000 adolescents in 80 schools completed a self-administered, in-school questionnaire and more than 20,000 students and one of their parents

completed an intensive, in-home interview about health behaviors, mental health, adolescent's daily activities, and parental involvement. The Add Health cohort has been followed into young adulthood with three additional in-home interviews, the last in 2008, when sample members were aged 24-32. Resident parents were interviewed only in the first wave of data collection, and the second in-home interview conducted in 1996 was limited to the approximately 14,700 students who had not yet graduated high school (Udry, Bearman, and Harris).

The preliminary analyses presented below use data from the first two waves of Add Health; we plan to extend these analyses to include information from waves 3 and 4 prior to the PAA meetings. We describe the planned extensions after presenting results of our analysis thus far. As noted, nearly 15,000 adolescents completed both the wave 1 and 2 interviews. We lose a relatively small proportion of cases in each multivariate model due to item non-response on dependent variables. Data were primarily drawn from adolescent responses to questions from the in-home questionnaires, although some information about parents (parental education, family income) was drawn from the wave 1 resident parent questionnaire.

Measures

Family Dinners. Add Health asks adolescents, "On how many of the past 7 days was at least one of your parents in the room with you while you ate your evening meal?" Responses range from 0 to 7 days. To show how our key measures of interest vary by frequency of family dinners, we recode responses into three categories representing low (0-2 days), medium (3-4 days), and high (5-7 days) frequency of family dinners. Existing literature offers no standard way of measuring family meals, although when researchers use a categorical measure, a typical cut-off indexing "frequent" family dinners is 5 or more per week (e.g., CASA 2009; Counsel of

Economic Advisers 2000; Videon and Manning 2003). In our main analyses predicting mental health and substance use, we retain the full count of number of family dinners per week (0-7).

A few notes are warranted about the Add Health question on family dinners. First, this question focuses on the presence of a parent at mealtime without addressing which parent or accounting for other family members. Second, it asks whether at least one of your parents was "in the room" during the evening meal, not necessarily requiring that family members be seated around a table or even interacting with one another. Finally, this measure indexes shared dinners, but not other meals. The social benefit of family meals may not be limited to dinners; some families may derive similar benefits from a regular shared breakfast, and family schedules may be more amenable to sharing breakfast than dinner. Nonetheless, the Add Health measure is arguably an improvement over other studies asking youth to report on how often they share meals with family members, allowing responses in the following categories: never, some days, most days, and every day (e.g., Tavernas et al. 2005). The Add Health approach is more specific with regard to the presence of a parent and with regard to the number of days per week.

Mental Health. We include two indicators of mental health: depressive symptoms and self-esteem. To measure *depressive symptoms*, we use nine items from the Center for Epidemiological Studies Depression Scale (CES-D). While developed with adults, this scale has been validated with adolescent respondents (Radloff 1991). Respondents are asked, "How often was each of the following things true during the past week?" and followed by the items: 1) you were bothered by things that usually don't bother you; 2) you felt that you could not shake the blues, even with help from family and friends; 3) you felt that you were just as good as other people; 4) you had trouble keeping your mind on what you were doing; 5) you felt depressed; 6) you felt that you were too tired to do things; 7) you enjoyed life; 8) you felt sad; and 9) you felt

that people disliked you. Response options for each item were rarely or never (0), sometimes (1), a lot of the time (2), or most of the time or all of the time (3). Items 3 and 7 were reverse coded, and the items were summed for a scale of depressive symptoms ranging from 0 to 27 with a higher score indicating more symptoms.

To measure *self-esteem*, we include 4 items from the Rosenberg Self-Esteem scale (Rosenberg 1965). Respondents were asked the degree to which they agree or disagree with the following statements: 1) you have a lot of good qualities; 2) you have a lot to be proud of; 3) you like yourself just the way you are; and 4) you feel like you are doing everything just about right. The response options for each statement were strongly agree (0), agree (1), neither agree nor disagree (2), disagree (3), and strongly disagree (4). Responses were summed for a scale of self-esteem ranging from 0 to 16 with a higher score indicating lower self esteem.

Substance Use. We include three indicators of substance use: smoking, marijuana use, and binge drinking. To assess *smoking behavior*, we create a dichotomous indicator for whether the adolescent reports smoking cigarettes one or more days in the past 30 days. Similarly, to assess *marijuana use*, we create a dichotomous indicator for whether the adolescent reports using marijuana at all in the past 30 days. Finally, to assess *binge drinking*, we use a dichotomous indicator for whether the adolescent reports ever drinking five or more drinks in one sitting in the past year.

Family Environment. We include three measures of family relationships to assess the degree to which the associations between shared family meals and adolescent well-being can be explained by other indicators of the family environment. First, we include a measure of *parent-child relationship quality*. We create a scale based on the average of responses to five questions regarding how well the adolescent gets along with a parent. These questions are asked of

adolescents with reference to both resident parents (if there are two parents in the household). Our measure indexes the average of the highest score (resident mother or resident father) for each of the composite variables. The five composite variables are: 1) how close do you feel to your (mother/father); 2) how much do you feel your (mother/father) cares about you; 3) how warm and loving is your (mother/father) towards you; 4) how satisfied are you with your communication with your (mother/father); and 5) how satisfied are you with your relationship with your (mother/father). Response options for these variables range from 0 to 4 with a higher value representing a better relationship. Our summary measure is an average of the five measures and ranges from 0 to 4.

Our second indicator of the family environment is a more global measure of *family relationship quality*. We average responses to three items: 1) how much you feel your family understands you; 2) how much fun your family has together; and 3) how much attention your family pays to you. Again, response options on each item range from 0 to 4 with a higher score indicating a better family relationship. Our summary measure is an average of the three items and ranges from 0 to 4.

Our final indicator of the family environment is a count measure for *shared activities* with the responding adolescent and a parent. Much like the parent-child relationship quality measure described above, the items that comprise the shared activity measure are asked with reference to both the resident mother and the resident father. We rely on the highest score (resident mother or resident father) for each of the composite items. The questions ask whether the adolescent has engaged in each of the following activities with a parent in the past 4 weeks: 1) shopping; 2) playing sports; 3) attending religious services; 4) going to a movie or the theater; 5) talking about personal problems; 6) talking about school or grades; 7) working on a school

project; or 8) talking about other school issues. Responses are yes/no (1/0). Our summary count ranges from 0 to 8 activities shared with parents.

Controls. Multivariate models include controls for various socio-demographic characteristics, including the adolescent's sex, age, race/ethnicity, family structure, family income, and parental education. (Unweighted) descriptive statistics on these variables are shown in Appendix Table 1.

Analytic Strategy

The first phase of our analysis asks whether family meals are associated with our outcomes at baseline, and whether any association can be explained by other factors. We begin by assessing the bivariate association between family meals and our five outcomes at baseline (wave 1). We then include basic socio-demographic controls (age, gender, race/ethnicity, family structure, parental education, and family income) to assess the degree to which family meals are associated with well-being net of these factors. Finally, we include our three measures of the family environment and investigate whether family meals are associated with well-being net of these measures for which family meals may serve as a proxy. We estimate ordinary least squares (OLS) models for our mental health outcomes and logistic models for our substance use outcomes.

The second phase of our analysis capitalizes on the longitudinal nature of the data and provides a more stringent test of causality. Using the same measures of mental health, substance use, and family dinners at waves 1 and 2, we estimate first difference models, which are exactly equivalent to a fixed-effects model in the two-period case. We regress change in our outcomes assessed at waves 1 and 2 on change in family dinners assessed at waves 1 and 2:

$$\Delta y_i = y_{i2} - y_{i1}$$

$\Delta x_i = x_{i2} - x_{i1}$

$\Delta y_i = \alpha + \beta \Delta x_i + \Delta \mu_i$, where $\mu_i = \theta_i + \varepsilon_{it}$, and $\Delta \mu_i = \Delta \varepsilon_i$

The subscript *i* indexes individuals, *t* indexes time, α is the mean adjusted well-being across all sample members, *x* is a count of family dinners, and μ represents unobserved factors that are both time-invariant (θ) and time-varying (ε). Regressing Δy on Δx eliminates bias due to any time-invariant unobserved factor that might jointly determine family dinners and adolescent well-being. (As is clear from the notation, the estimated effect of family dinners potentially suffers from bias due to time-varying unobservables.)

Results

Table 1 shows descriptive statistics on our key measures of interest, for the full sample and by frequency of family dinners. Here, we categorize family dinners into low, medium, and high frequency; in subsequent analyses we retain the full count of family dinners (i.e., 0-7 per week). The first row shows that the majority (60%) of adolescents report eating with a parent 5 or more times a week. The quality of family relationships tends to go up as family dinners become more frequent. For example, the count of activities with a parent is fully a point higher for adolescents who eat with their parents 5 or more times a week compared to those who eat with their parents twice or less (3.88 versus 2.88). Two-parent families have more frequent family dinners, as do higher-income families, suggesting that resources facilitate the family meal. Finally, adolescent well-being scores are higher among those having frequent family dinners. For example, adolescents in the "high" family dinners category have 2 fewer depressive symptoms, on average, than those in the "low" category (5.32 versus 7.27). They are about a third less likely to smoke and binge drink and a half less likely to use marijuana.

Table 2 reports OLS regression models of mental health, and Table 3 shows logistic models of substance use. The tables are structured similarly, with columns displaying results of models that successively add variables: model 1 including only family dinners, model 2 controlling for sociodemographic characteristics of the adolescent and family, and model 3 accounting for the quality of family relationships. The final 3 rows of each table indicate the percent change in the coefficient on family dinners as we progress from one model to the next. These rows indicate the extent to which the family dinners coefficient can be accounted for by socio-demographic controls and family relationships.

There are similarities in results across outcomes. First, bivariate associations between family dinners and each of our outcomes are statistically significant and reasonably large (model 1). Second, despite variation in family structure and income by family dinners (Table 1), the addition of sociodemographic controls does little to alter the coefficient on family dinners (model 2). And finally, the family dinners coefficient is reduced substantially when family relationship variables are controlled (model 3). That is, the association between family dinners and adolescent mental health and substance use appears robust to sociodemographic controls, but family dinners appear to serve in part as proxies for more general aspects of the family environment. Family relationship variables account for about half the family dinners association with depressive symptoms, 80% with self esteem, and about a third with substance use.

Having access to a rich set of potentially confounding covariates, in particular, detailed aspects of the family environment, provides some leverage on questions of causality. We go a step further by estimating first difference models of change in our outcomes on change in family dinners. Results are shown in Table 4. For all outcomes but marijuana, the change in family dinners is statistically significantly related to the change in our outcomes. Further analyses are

required to flesh out the magnitude of these effects, but preliminary results point to a causal relationship between family dinners and adolescent well-being, or at least a relationship that is not completely driven by *time invariant* variables, observed or unobserved.

Next Steps

Analyses so far have shed light on the nature of the association between family dinners and adolescent well-being. This association appears robust to sociodemographic characteristics of the adolescent and family. It remains, although is substantially reduced, with the addition of variables tapping the quality of family relationships. Relying on two waves of data, fixed-effects models provide evidence for a causal link between family dinners and adolescent outcomes. Prior to the PAA meetings, we will elaborate on these preliminary findings. First, we will use our models to better assess the substantive implications of our results, i.e., generating model-based estimates of adolescent well-being varying the frequency of family dinners. Second, we will investigate differences in the relationship between family dinners and well-being for males and females. Finally, incorporating the third and fourth waves of the Add Health, we plan to examine whether the protective effects of family meals in adolescence extend into young adulthood.

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Table 1. Means on Key Variables, by Frequency of Family Dinners

	All	Frequency of Family Dinners (0-7 days/week)		
		Low (0-2)	Medium (3-4)	High (5-7)
Percent	1.00	0.23	0.17	0.60
N	14471	3375	2431	8665
Family relationships				
Parent-child relationship quality (0-4)	3.49 (0.59)	3.29 (0.72)	3.42 (0.58)	3.58 (0.50)
Family relationship quality (0-4)	2.75 (0.83)	2.46 (0.91)	2.63 (0.77)	2.90 (0.77)
Activities with a parent (0-8)	3.57 (1.81)	2.88 (1.72)	3.45 (1.68)	3.88 (1.80)
Family structure & income				
Both parents	0.53	0.18	0.16	0.66
Stepparent	0.14	0.26	0.18	0.56
Single parent	0.27	0.31	0.18	0.51
Other family structure	0.06	0.32	0.16	0.53
Log family income	3.56 (0.79)	3.47 (0.82)	3.59 (0.77)	3.60 (0.78)
Outcomes				
Depressive symptoms (0-26)	5.95 (4.27)	7.27 (4.68)	6.20 (4.12)	5.32 (3.98)
Low self esteem (4-20)	7.71 (2.57)	8.14 (2.71)	7.89 (2.52)	7.47 (2.48)
Smoking (0-1)	0.25	0.32	0.28	0.21
Marijuana use (0-1)	0.14	0.20	0.17	0.10
Binge drinking (0-1)	0.24	0.31	0.30	0.20

Note: Unweighted data. Standard deviations are in parentheses. *N*'s refer to the baseline sample and vary by outcome due to item nonresponse (see model results).

Table 2. OLS Regression Models of Mental Health

	Depressive Symptoms			Low Self Esteem		
	M1	M2	M3	M1	M2	M3
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Family dinners	-0.34 ***	-0.27 ***	-0.14 ***	-0.13 ***	-0.13 ***	-0.03 ***
Female		1.29 ***	1.05 ***		0.84 ***	0.67 ***
Age at wave 1		0.22 ***	0.14 ***		0.08 ***	0.02
Black		0.18 **	0.50 ***		-0.89 ***	-0.65 ***
Hispanic		0.50 ***	0.62 ***		0.04	0.10 *
Asian		1.38 ***	1.33 ***		0.47 ***	0.39 ***
Other race/ethnicity		0.61 **	0.57 **		-0.04	-0.03
Stepparent		0.43 ***	0.17 *		0.17 ***	-0.05
Single parent		0.37 ***	0.08		0.16 ***	-0.18 ***
Other family structure		0.86 ***	0.66 ***		0.37 ***	0.12
Log family income		-0.06	-0.08 *		0.04	0.02
Mother <HS		0.44 ***	0.40 ***		0.16 **	0.11 *
Mother some college		-0.20 **	-0.30 ***		-0.05	-0.09 *
Mother college degree		-0.58 ***	-0.62 ***		-0.09	-0.07
Father <HS		0.05	0.06		0.03	0.03
Father some college		-0.16	-0.19 *		-0.04	-0.06
Father college		-0.40 ***	-0.43 ***		-0.07	-0.09
Parent-child relationship			-0.80 ***			-1.06 ***
Family relationship			-1.44 ***			-0.71 ***
Activities with a parent			0.12 ***			-0.02
Constant	7.51 ***	3.15 ***	10.38 ***	8.29	6.58	13.04 ***
N	14353			14441		
% Δ family dinners coef. M2-M1	-20.17			1.57		
% Δ family dinners coef. M3-M2	-46.79			-79.85		
% Δ family dinners coef. M3-M1	-57.53			-79.54		

Note: Indicators for missing data on family income and parents' education are included but now shown.

*p < 0.10; **p < 0.05; ***p < 0.01

Table 3. Logit Regression Models of Substance Use

	Smoking			Marijuana Use			Binge Drinking		
	M1 Exp(B)	M2 Exp(B)	M3 Exp(B)	M1 Exp(B)	M2 Exp(B)	M3 Exp(B)	M1 Exp(B)	M2 Exp(B)	M3 Exp(B)
Family dinners	0.90 ***	0.89 ***	0.93 ***	0.85 ***	0.87 ***	0.91 ***	0.88 ***	0.90 ***	0.93 ***
Female		0.96	0.96		0.74 ***	0.70 ***		0.78 ***	0.75 ***
Age at wave 1		1.21 ***	1.19 ***		1.24 ***	1.23 ***		1.40 ***	1.39 ***
Black		0.22 ***	0.24 ***		0.59 ***	0.66 ***		0.27 ***	0.29 ***
Hispanic		0.48 ***	0.49 ***		0.94	0.98		0.72 ***	0.74 ***
Asian		0.41 ***	0.40 ***		0.53 ***	0.51 ***		0.40 ***	0.38 ***
Other race/ethnicity		0.70 **	0.69 **		1.30	1.29		0.65 ***	0.63 ***
Stepparent		1.39 ***	1.30 ***		1.33 ***	1.24 ***		1.35 ***	1.27 ***
Single parent		1.44 ***	1.37 ***		1.98 ***	1.85 ***		1.52 ***	1.44 ***
Other family structure		1.59 ***	1.54 ***		1.72 ***	1.64 ***		1.47 ***	1.42 ***
Log family income		1.01	1.01		1.08 **	1.08 *		1.13 ***	1.13 ***
Mother <HS		0.94	0.93		0.98	0.97		1.06	1.06
Mother some college		0.99	0.99		1.07	1.06		1.03	1.01
Mother college degree		0.86 **	0.89 *		0.92	0.95		0.90	0.91
Father <HS		0.98	0.97		0.85 **	0.83 **		0.97	0.97
Father some college		0.90 *	0.90 *		1.09	1.09		1.03	1.03
Father college		0.78 ***	0.78 ***		0.93	0.94		0.82 ***	0.82 ***
Parent-child relationship			1.06			0.92 *			0.95
Family relationship			0.65 ***			0.63 ***			0.68 ***
Activities with a parent			0.93 ***			0.96 ***			0.97 **
Constant	0.54 ***	0.04 ***	0.15 ***	0.31 ***	0.01 ***	0.04 ***	0.55 ***	0.00 ***	0.01 ***
N	14283			14256			14448		
% Δ family dinners coef. M2-M1	5.52			-15.25			-11.46		
% Δ family dinners coef. M3-M2	-35.16			-33.87			-33.41		
% Δ family dinners coef. M3-M1	-31.59			-43.95			-41.05		

Note: Indicators for missing data on family income and parents' education are included but now shown.

*p < 0.10; **p < 0.05; ***p < 0.01

Table 4. First Difference Models of Mental Health and Substance Use

	Depressive Symptoms	Low Self Esteem	Smoking	Marijuana Use	Binge Drinking
	Coef.	Coef.	Coef.	Coef.	Coef.
Change in family dinners	-0.0857 ***	-0.0424 ***	-0.0051 ***	-0.0040 ***	-0.0005
Constant	-0.0468	-0.2999 ***	0.0693 ***	0.0270 ***	0.0372 ***

Note: OLS regression of change in outcome t2-t1 on change in family dinners t2-t2.

*p < 0.10; **p < 0.05; ***p < 0.01

Appendix Table 1. Means on Control Variables

Female (0-1)	0.51	
Age at wave 1 (11-21)	15.31	(1.62)
White	0.53	
Black	0.22	
Hispanic	0.17	
Asian	0.06	
Other race/ethnicity	0.02	
Both parents	0.53	
Stepparent	0.14	
Single parent	0.27	
Other family structure	0.06	
Log family income	3.56	(0.79)
Mother <HS	0.20	
Mother HS	0.30	
Mother some college	0.27	
Mother college degree	0.24	
Father <HS	0.30	
Father HS	0.27	
Father some college	0.20	
Father college	0.23	
N	14477	

Note: Unweighted data. Standard deviations are in parentheses. N's refer to the baseline sample and vary by outcome due to item nonresponse (see model results).