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Does More Cooking Mean Better Eating? Estimating the relationship between time spent in food preparation and diet quality

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Introduction:

Consumers today spend an increasing share of total food expenditures on food away from home—as much as 41 percent of food expenditures in 2009 (Clauson 2011). Consumers also rely heavily on convenient, semi-prepared and processed foods. According to 2006-07 data from the American Time Use Survey, on average, women spend less that 50 minutes per day in food preparation and higher income women spend about 30 minutes per day (Anderson and Hamrick 2009). This increased consumption of food away from home and convenient foods has often been cited as a contributor to obesity and low diet quality among Americans. Thus some public health advocates have speculated that less reliance on prepared foods and, subsequently, more time spent preparing food at home could help to improve diet quality and lower bodyweight.

Unfortunately, data limitations have made it difficult to verify whether or not there truly is a relationship between time spent preparing food and diet quality. While it is plausible that greater reliance on food away from home (FAFH) and other processed foods could be correlated with higher intake of certain flavor enhancers and preservatives, such as sugar, sodium, and solid fats, there is no guarantee that simply spending more time cooking will result in better quality diets. Raw fruits and vegetables are both healthy and convenient while a homemade chocolate soufflé is a time consuming source of empty calories.

In this study, we use a unique dataset designed by researchers at the University of Chicago and collected by Mathematica Policy Research. The sample consists of 400 woman surveyed in the

Chicago area in 2007 and includes both a 24-hour dietary recall and a 24-hour time diary for the same day. The foods recorded in the dietary recall use the 8-digit USDA foodcodes and can be used to calculate diet quality as measured by the 2005 Healthy Eating Index. The activities coded in the time-diary use the same lexicon as the American Time Use Survey, so can be used to also calculate the amount of time spent in primary food preparation. Thus we are able to investigate whether there actually is a significant correlation between diet quality and time spent preparing food.

For our analysis, we begin with a standard multivariate estimation approach. As dependent variables, we use daily energy density (calories divided by grams) and various measure of diet quality. As an explanatory variable, we use the total number of minutes where food preparation was listed as the primary activity on the day of the dietary recall. Because much of the debate about the possible merits of spending more time preparing food stems from concern about rising obesity rates, we also divide our respondents into groups based on their body mass indices (BMIs)—those who are not overweight (BMI<25) those who are overweight or obese (BMI >= 25) and those who are obese (BMI >30). We then estimate the relationship between food preparation and diet quality on the full sample and separately for each BMI group.

Overall, our results indicate that, when controlling for unobserved factors that may affect both preparation time and diet quality, food prep time influences diet quality only for obese persons. However, the improvements in diet quality are minimal. Our results also indicate that foods eaten away from home play an important role in understanding the effects of time spent in food preparation on food away from home.

Background:

The rising rates of overweight and obesity over the past 30 years indicates that the majority of Americans simply consume too many calories. Data from dietary intake studies also show that, in aggregate, we consume too much sodium, saturated fat, added sugars and solid fats (Guenther et al. 2008). At the same time, these studies show we under consume foods that provide key nutrients, such as fruits, dark green and orange vegetables, and whole grains. Thus, a key strategy for reducing obesity while improving (or maintaining) diet quality is to choose a dietary pattern that provides relatively more nutrients per calorie compared to the average American's diet. This sort of advice has appeared in each version of the *Dietary Guidelines for Americans* since 1980. The most recent version, released in 2010, again reiterates this message by recommending that consumers maintain energy balance overtime and choose nutrient dense food and beverages (US Department of Agriculture and US Department of Health and Human Services 2010).

Many individuals, however, may find it difficult to act on these public health messages given today's food environment, which offers many opportunities to make unhealthy food choices. Busy schedules may also affect the quality of the food we eat by changing the regularity with which we eat, time available for meal preparation, and consumption of foods prepared away from home. As such, consumption of FAFH has often been cited as a contributor to obesity and low diet quality among Americans and there is mounting evidence that FAFH can be detrimental to our diet and health. There is a fair amount of research that documents a correlation between consumption of FAFH and either poor diet quality or high body mass indices (BMI) (Binkley et al. 2000; Clemens et al. 1999; Guthrie et al. 2002; Paeratakul et al. 2003; Bowman et al. 2004;

Bowman and Vinyard 2004; Binkley 2008; Kant and Graubard 2001). A similar line of research has found that higher FAFH expenditures are also correlated with lower diet quality (Beydoun et al. 2008).

These correlations between diet quality and food away from home consumption leave out important factors such personal choice and tastes, which may account for much of the association between FAFH and diet quality. To better account for unobservable individual-level influences, such a dietary preferences and habits, some more recent studies have used two days of dietary intake (Todd et al. 2010; Mancino et al. 2009; Binkley 2008; Bowman and Vinyard 2004; Bowman et al. 2004; Paeratakul et al. 2003). For example, Todd et al. (2010) found that one additional meal eaten away from home increases daily caloric intake by about 134 calories and lowers diet quality, as measured by the 2005 Healthy Eating Index (HEI-2005), by about 2 points (out of a possible score of 100). Using experimental methods, Ebbeling et al. (2004) also found evidence of a detrimental effect of fast food on diet quality. They found that adolescents who were told to eat as much (or little) fast food as desired consumed more than 60 percent of their estimated energy requirements at a single fast food meal, that overweight participants ate significantly more calories from fast food than healthy-weight participants, and that these same overweight participants consumed 409 more total calories on the days that they were offered FAFH.

While there is evidence that consuming FAFH can lower diet quality and raise energy density, less is known about the health and dietary impact of convenient foods purchased for at home consumption. As indicated by Kolondinsky and Glodstein (2011), empirical research on the

impact of time spent in food preparation on diet quality and health outcomes is an emerging area of study in economics and consumer behavior. Analysis of American Time Use Survey (ATUS) data finds that time spent if food preparation decreased as incomes rise (Hamermesh 2007; Andrews and Hamrick 2009; Mancino and Newman 2007), particularly among women. While this is in line with standard economic theory, it is at odds with the empirical evidence that lower income women are also more likely to be overweight or obese than higher income women (Change and Lauderdale 2005). Further investigation into the Eating and Health Module of the ATUS, however, shows that healthy weight individuals spend more time in food preparation than overweight individuals and both healthy weight and overweight individuals spend more time in food preparation than obese individuals (Hamrick, 2010). Using multivariate analysis and an instrumental variable approach to control for the simultaneity of time use decisions, Zick et al. (2011) also find an inverse relationship between time spent in food preparation and BMI. Cawley and Liu (2007) also used the ATUS data to investigate a pathway between maternal employment and childhood obesity. They focused on the relationship between full-time employment status and variety of time use variables that could impact child health, such as time spent grocery shopping, cooking, playing with children, and eating with children. Among women, they found that working full time reduced time spent in cooking by about 12 minutes per day.

This line of research indicates that more time spent in food preparation is correlated with healthier weight outcomes. Unfortunately, data limitations have prevented researchers from estimating the relationship between time spent in food preparation and diet quality. Another drawback of existing estimates is they cannot disentangle the effect of FAFH, which would reduce time spent cooking, from the effect of cooking at other meals. This in turn may bias the

estimated correlation between time spent cooking and BMI. By using data on dietary intake and time use, this study adds to the literature on time use and nutrition outcomes by estimating the correlation between time spent in food preparation and various measures of diet quality. By controlling for consumption of food away from home, we believe we increase the precision of the estimated impact of time spent cooking by parsing out the effect of food away from home. We also attempt to control for unobservable effects, such as individual preferences and differences among meals by estimating the relationship between various measures of diet quality at each meal on the amount of time spent in food preparation prior to that meal, allowing for individual and meal-level fixed effects.

Data and empirical framework

Data for this study comes from an original dataset designed by Marianne Bertrand and Diane Whitmore Shanzenbach and collected by Mathematic Policy Research (described in Bertrand and Shanzenback, 2009). Only women over the age of 18 were recruited for this survey. The overall response rate was 17 percent. Thus it should be noted that results from this study have low external validity. For our study, we use two components of this survey. The first is a 24-hour dietary recall that used the USDA's Automated Multiple Pass Method[1] to record everything that a respondent ate and drank over a 24 hour period starting and ending at midnight. The second component is a 24-hour recall time diary for the same time period of time, which used the same lexicon as the ATUS.

Using the 8-digit foodcodes in the dietary recall data, we append the USDA's MyPyramid Equivalent Database to calculate the amount of serving equivalents (in cups or ounces) of each

[1] This is the same method used by other dietary intake data, such as the National Health and Nutrition Exam.

food item in the dietary survey. We then use the method developed by the USDA's Center for Nutrition Policy and Promotion (CNPP) to measure an individual's diet quality using the Healthy Eating Index-2005 (HEI-2005). The HEI-2005 score measures how well an individual's diet adheres to the 2005 *Dietary Guidelines for Americans*. This total score is the sum of an individual's score on twelve components: total fruit; whole fruit; total vegetables; dark green and orange vegetables and legumes; total grains; whole grains; milk; meat and beans; oils; saturated fat; sodium; and calories from solid fat, alcoholic beverages, and added sugars (SoFAAS) (Guenther et al. 2008).

These component scores are created using a dietary density approach. For fruit, vegetables, grains, milk, meat and beans, densities reflect the cup or ounce equivalents per 1,000 calories. For oils and sodium, the densities measure grams per 1,000 calories. For saturated fat and SoFAAS, densities measure the percent of daily calories. For this analysis we focus on the component densities where current dietary intake is lacking: total fruit, whole fruit, total vegetables, dark green and orange vegetables and whole grains. We also look at component densities where current intake is excessive: saturated fat, sodium, and SoFAAS. We also include energy density, measured as calories per gram of food consumed as a dependent variable. Foods with a higher energy density tend to provide more calorieswith less satiety. For example, a tablespoon of butter is more energy dense than a cup of broccoli. We calculate HEI-2005 scores and density measures for each respondent's daily intake. We also calculate the HEI-2005 score and density measures for each eating occasion. We include a table created by CNPP explaining the definition for each of these components in table 1.

Table 1: Definition of HEI-2005 components

Healthy Eating Index−2005 components and standards for scoring[1]			
Component	**Maximum points**	**Standard for maximum score**	**Standard for minimum score of zero**
Total Fruit (includes 100% juice)	5	≥0.8 cup equiv. per 1,000 kcal	No Fruit
Whole Fruit (not juice)	5	≥0.4 cup equiv. per 1,000 kcal	No Whole Fruit
Total Vegetables	5	≥1.1 cup equiv. per 1,000 kcal	No Vegetables
Dark Green and Orange Vegetables and Legumes[2]	5	≥0.4 cup equiv. per 1,000 kcal	No Dark Green or Orange Vegetables or Legumes
Total Grains	5	≥3.0 oz equiv. per 1,000 kcal	No Grains
Whole Grains	5	≥1.5 oz equiv. per 1,000 kcal	No Whole Grains
Milk[3]	10	≥1.3 cup equiv. per 1,000 kcal	No Milk
Meat and Beans	10	≥2.5 oz equiv. per 1,000 kcal	No Meat or Beans
Oils[4]	10	≥12 grams per 1,000 kcal	No Oil
Saturated Fat	10	≤7% of energy[5]	≥15% of energy
Sodium	10	≤0.7 gram per 1,000 kcal[5]	≥2.0 grams per 1,000 kcal
Calories from Solid Fats, Alcoholic beverages, and Added Sugars (SoFAAS)	20	≤20% of energy	≥50% of energy

[1]Intakes between the minimum and maximum levels are scored proportionately, except for Saturated Fat and Sodium (see note 5).
[2]Legumes counted as vegetables only after Meat and Beans standard is met.
[3]Includes all milk products, such as fluid milk, yogurt, and cheese, and soy beverages.
[4]Includes nonhydrogenated vegetable oils and oils in fish, nuts, and seeds.
[5]Saturated Fat and Sodium get a score of 8 for the intake levels that reflect the 2005 Dietary Guidelines, <10% of calories from saturated fat and 1.1 grams of sodium/1,000 kcal, respectively.

Table created by CNPP and available at:
http://www.cnpp.usda.gov/Publications/HEI/healthyeatingindex2005factsheet.pdf

Using the ATUS activity codes, we create an indicator variable that takes on a value of 1 when the respondent indicated that she was engaged in a household activity that involved food and drink presentation as the primary activity[2] and a value of zero otherwise. We then sum the total number of minutes that person spent in primary food preparation that day. When analyzing HEI-

[2] In both the ATUS data and this dataset, that is activity code 20201 (http://www.bls.gov/tus/lexiconnoex2007.pdf).

2005 scores and component densities for each eating occasion, we also sum the number of minutes engaged in this activity before that specific eating occasion.

The empirical set up for this study is fairly straightforward. When analyzing the relationship between time in food preparation per day and daily diet quality, we use the following specification:

(1) $D_i = \alpha + \beta_1 Tf_i + \beta_2 Tf^2{}_i + \beta_3 FAFH_i + \beta_4 Meal_i + \varphi Z_i + \varepsilon$,

where D_i are the various measures of daily diet quality. The variable Tf_i is the total number of minutes spent in food preparation that day, $FAFH_i$ is a vector of variables counting the number of meals the respondent ate from restaurants such as table service restaurants, cafeterias and fast food places, and the number of meals eaten from other FAFH places, such as meals on wheels, soup kitchens and adult day care facilities. Another vector of variables, $Meal_i$, indicate whether or not a respondent consumed breakfast, lunch, dinner or a snack on the recall day and Z_i is a vector of individual and household level socioeconomic characteristics—the number of adults in the household, the number of children in the household, whether the respondent was single, whether the respondent was employed, household income category, the respondent's age, age squared, education level, race and whether or not the recall occurred on weekend or weekday.

This specification assumes that all explanatory variables are exogenous to an individual's unobserved preferences that also influence diet quality. However, it is more likely the case that both time spent in food preparation and eating away from home are correlated with other unobservable factors such as dietary preferences and cooking skills. For example, someone's fondness for complicated and rich French food would affect both the amount of cooking time

required for certain meals and the nutrient profile of foods consumed. Not controlling for this unobservable, but relevant factor would then exaggerate cooking time's estimated influence on diet quality. While we do not have any good candidate instruments for cooking time or FAFH in this data set, we do have multiple observations from each respondent for each eating occasion. With that, we attempt to control for certain individual level fixed effects, as well as the effect of FAFH and the type of eating occasion.

The survey sample included 400 women living in the Chicago area. After removing individuals who had incomplete data on various explanatory variables (age), we have a sample of 396. When looking at the relationship between food preparation and diet quality at each meal, we have 1,617 observations. Statistical tests comparing those who are in the estimation sample to those who are excluded reveal no significant differences on explanatory variables. Summary statistics for the variables used in both of our specifications are presented in tables 2 and 3.

On a daily basis, respondents spend about 36 minutes per day in primary food preparation. There are approximately 2 adults in each household, the average respondent was 52 years old, 25 percent of all time and dietary recalls occurred on a weekend, 86 percent ate breakfast, 80 percent at lunch and 96 percent at supper or dinner. About four eating occasions were from home and about one was from food away from home. The average HEI-2005 score was just over 56 points out of 100. While low, this is similar to the national average of 58 (Guenther et al. 2008). When looking at the data on a per-eating occasion basis, we exclude away from home meals and drinks/extended eating occasions because both require zero food preparation time and will thus be correlated with our variable of interest. For these eating occasions, respondents spent a little

more than 9 minutes in primary food preparation, although among those who did spend time in food preparation spent about 30 minutes per eating occasion. Forty-five percent of all eating occasions were snacks. The high share of snacks may partially explain why HEI scores were lower and energy density is higher compared to daily averages.

Table 2: Summary statistics—Dependent variables

Dependent Variables											
	Daily level summary statistics (N=396)						Meal/eating occasion level summary statisitics (N=1617)				
HEI-2005	Daily HEI-2005 score	**56.14**	*14.34*	20.44	92.11	**HEI-2005**	HEI-2005 score at eating occasion/meal	**42.83**	15.97	9.05	85.25
Energy density	Daily energy density--calories per	**0.94**	*0.35*	0.15	2.29	**Energy density**	Energy density at eating occasion	**1.77**	1.57	0.01	6.91
Total fruit	Daily cup equivalent of total fruit per 1000 calories	**0.65**	*0.75*	0.00	5.20	**Total fruit**	Cup equivalent of total fruit per 1000 calories at eating occasion	**1.42**	3.56	0.00	21.93
Whole fruit	Daily cup equivalent of whole fruit per 1000 calories	**0.46**	*0.64*	0.00	4.66	**Whole fruit**	Cup equivalent of whole fruit per 1000 calories at eating occassion	**1.21**	3.47	0.00	21.93
Whole grains	Daily ounce equivalents of whole grains per 1000 calories	**0.57**	*0.78*	0.00	4.37	**Whole grains**	Ounce equivalents of whole grains per 1000 calories at eating occasion	**0.71**	1.81	0.00	14.83
Vegetables	Daily cup equivalent of total vegetables per 1000 calories	**1.06**	*1.07*	0.00	14.92	**Vegetables**	Cup equivalent of total vegetables per 1000 calories at eating occasion	**0.87**	2.55	0.00	27.68
Dark green/orange vegetab	Daily cup equivalent of darkgreen/orange vegetables per 1000 calories	**0.21**	*0.38*	0.00	3.54	**Dark green/orange**	Cup equivalent of darkgreen/orange vegetables per 1000 calories at eating occasion	**0.22**	1.35	0.00	19.05
Saturated fat	Daily percent of calories from satuated fat	**11.12**	*3.92*	1.65	26.93	**Saturated fat**	Percent of calories from satuated fat at eating occasion	**10.67**	9.27	0.00	56.21
Sodium	Daily grams of sodium per 1000 calories	**1664.28**	*626.36*	209.25	4439.49	**Sodium**	Grams of sodium per 1000 calories at eating occasion	**1410.52**	1460.72	0.00	19875.00
SoFAAS	Daily share of calories from solid fats, alcoholic beverages and added sugars (SoFAAS)	**34.38**	*12.31*	3.07	77.23	**SoFAAS**	Share of calories from SoFAAS at eating occasion	**31.67**	25.11	0.00	112.80

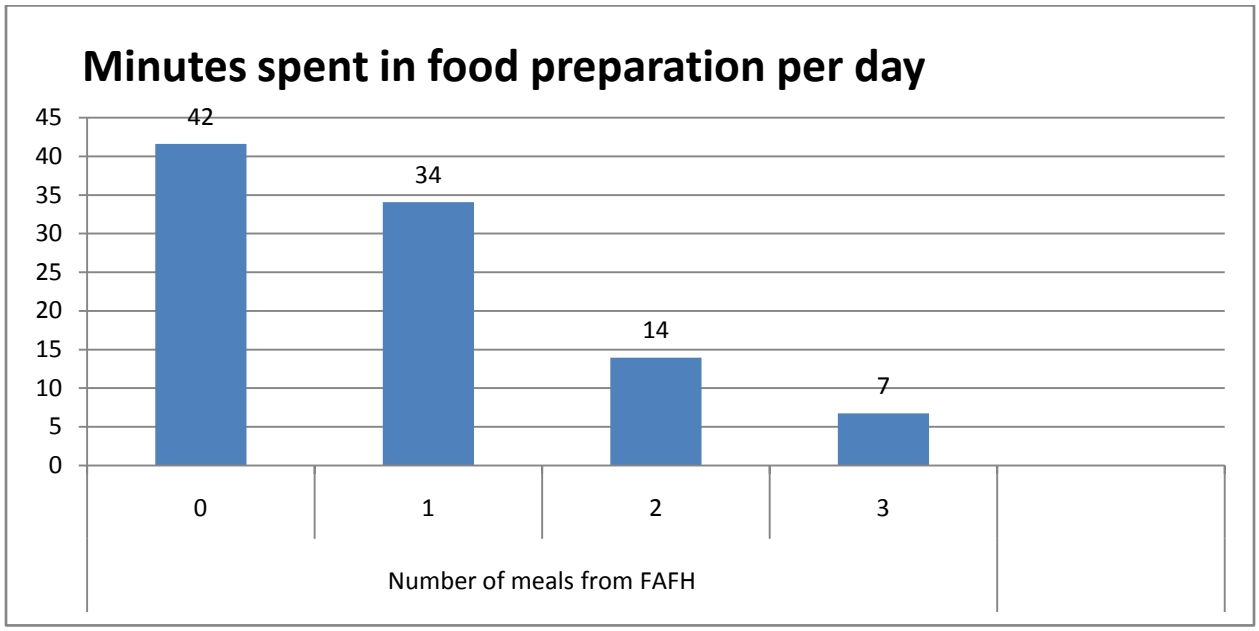
Table 3: Summary statistics—Explanatory variables

Explanatory Variables											
	Daily level summary statistics (N=396)					Meal/eating occasion level summary statisitics (N=1617)					
Variable name	**Variable description**	**Mean**	*Std. Dev.*	Min	Max	**Variable name**	**Variable description**	**Mean**	*Std. Dev.*	Min	Max
Food prep	Minutes spent in primary food preparation per day	**36.08**	*43.06*	0.00	320.00	**Food prep**	Minutes spent in primary food preparation prior to eating	**9.15**	21.22	0.00	300.00
HH adults	Number of adults in household (HH)	**1.82**	*0.78*	0.00	4.00				-NA-		
HH kids	Number of children in HH	**0.74**	*1.12*	0.00	5.00				-NA-		
Working	Respondent is emloyed	**0.54**	0.50	0.00	1.00				-NA-		
Single	Respondent is not married or living with partner	**0.35**	0.48	0.00	1.00				-NA-		
HH income grouping									-NA-		
1	< $30,000	**0.18**	*0.39*	0.00	1.00				-NA-		
2	$30,000-$58,000	**0.20**	*0.40*	0.00	1.00				-NA-		
3	$58,000-$100,000	**0.19**	*0.39*	0.00	1.00				-NA-		
4	>$100,000	**0.20**	*0.40*	0.00	1.00				-NA-		
5	Missing income	**0.22**	0.42	0.00	1.00				-NA-		
Race/ethnicity									-NA-		
1	White	**0.86**	0.35	0.00	1.00				-NA-		
2	Black or African American	**0.07**	0.26	0.00	1.00				-NA-		
3	Asian	**0.02**	0.12	0.00	1.00				-NA-		
4	American Indian or Alaska Native	**0.01**	0.10	0.00	1.00				-NA-		
6	Something else	**0.04**	0.20	0.00	1.00				-NA-		
Education level									-NA-		
1	Less than high school	**0.07**	0.25	0.00	1.00				-NA-		
2	High school or GED	**0.26**	0.44	0.00	1.00				-NA-		
3	Some college	**0.26**	0.44	0.00	1.00				-NA-		
4	College	**0.26**	0.44	0.00	1.00				-NA-		
5	Some graduate school	**0.04**	0.20	0.00	1.00				-NA-		
6	Graduate school	**0.12**	0.33	0.00	1.00				-NA-		
Weekend	Recall occurred on weekend	**0.25**	*0.43*	0.00	1.00				-NA-		
Breakfast	Respondent ate breakast	**0.86**	*0.35*	0.00	1.00	**Breakfast**	Eating occassion was breakast	**0.20**	0.40	0.00	1.00
Lunch	Respondent ate lunch	**0.79**	*0.41*	0.00	1.00	**Lunch**	Eating occassion was lunch	**0.14**	0.34	0.00	1.00
Dinner	Respondent ate dinner	**0.74**	*0.44*	0.00	1.00	**Dinner**	Eating occassion was dinner	**0.15**	0.36	0.00	1.00
Supper	Respondent ate supper	**0.22**	*0.42*	0.00	1.00	**Supper**	Eating occassion was supper	**0.05**	0.21	0.00	1.00
Brunch	Respondent ate brunch	**0.05**	*0.21*	0.00	1.00	**Brunch**	Eating occassion was brunch	**0.01**	0.09	0.00	1.00
Snack	Number of snacks consumed that day	**2.18**	*1.65*	0.00	10.00	**Snack**	Eating occassion was a snack	**0.45**	0.50	0.00	1.00
Drink	Number of drinks/extended consumption	**0.34**	*0.75*	0.00	5.00				-NA-		
Home	Number of meals at home	**4.38**	*2.14*	0.00	13.00				-NA-		
FAFH-restaurant	Number of meals from FAFH-restaurants and fast food	**0.53**	*0.92*	0.00	7.00				-NA-		
FAFH-other	Number of meals from FAFH-other	**0.51**	*0.94*	0.00	6.00				-NA-		

Results:

We expect there to be an inverse relationship between food away from home and time spent cooking—the more you eat out, the less you need to cook. To verify if this is true in our data, we grouped respondents into 1 of four categories based on the numbers of meals they ate away from home (zero, 1, 2 or 3) and calculated the average number of minutes spent in food preparation. We found that amount of time spent preparing food drops for each meal eaten away from home—from 7 minutes to as much as 20 minutes per meal (chart 1).

Chart 1: Time spent in food preparation drops as meals from FAFH increase



To examine the extent to which omitting FAFH and meal patterns may overestimate the effect of time in food preparation, we first compare a model without controls for food away from home and meal patterns to one which controls for these factors (table 4). In both models, we include all of the explanatory variables included in table 2. We report the results for the estimated impact of time spent in food preparation, but the entire set of results are available upon request. We find

that, in absolute value, the estimated effects of time spent in food preparation are larger when omitting FAFH and meal patterns and that these differences are significant for the estimated effect of HEI score, vegetables and SoFAAS. After controlling for FAFH and meal patterns, we find that time spent preparing food only has a significant impact on daily whole grain dietary density. However, the estimated effect is quite small—an additional 10 minutes spent cooking would increase whole grain density by .06, or about 10% of the mean value. This works out to be about 1 tenth of a slice of whole grain bread or a tablespoon of wholegrain pasta.

Table 4: Estimated impact of time spent in food preparation

Estimated effect of time spent in food preparation on (N=396):	Model 1[ŁŁ]: Not controlling for FAFH and meal patterns		Model 2[*]: Controlling for FAFH and meal patterns	
	Coefficient	Standard error	Coefficient	Standard error
HEI-2005	0.062*	(0.036)	0.014	(0.037)
Energy density	0.001	(0.001)	0.001	(0.001)
Total fruit	0.001	(0.002)	0.001	(0.002)
Whole fruit	0.001	(0.002)	-0.000	(0.002)
Whole grains	0.006***	(0.002)	0.006***	(0.002)
Vegetables	0.001	(0.003)	-0.000	(0.003)
Dark green & orange vegetables	0.001	(0.001)	0.000	(0.001)
Saturated fat	-0.003	(0.010)	0.000	(0.011)
Sodium	0.692	(1.641)	-0.242	(1.701)
SoFAAS	-0.056*	(0.031)	-0.013	(0.033)

[ŁŁ]Both models control for time in food prep squared, age, number of adults in the household, number of children in the household, employment status, living alone or single, education , race/ethnicity income, age, age-squared and whether or not the recall occurred on a weekend.
[*]Model 2 also controls for food away from home, whether or not the respondent ate specific meals and the number of snacks.

To examine differences in the impact of time spent in food preparation by BMI grouping, we continue to use the specification that controls for FAFH and meal patterns. In this case, we only find a positive relationship between time spent in food preparation and diet quality among non-

overweight individuals (table 5). Among this group, an additional 10 minutes spent in food preparation would increase HEI score by 2.5 points—about 5% of the mean score. Increased time in cooking is estimated to increase whole fruit density by .07 per 1000 calories , whole grain density by .13 per 1000 calories and lower the share of calories from SoFAAS by 2%. Unfortunately, we find that the correlation between cooking and diet quality among overweight or obese respondents is significant, but in the opposite direction—more time spent in food preparation is estimated to lower diet quality among overweight respondents and increase energy density among obese respondents. We also find that the estimated relationship between time in food preparation and HEI-2005 scores, energy density, whole fruit, whole grains and SoFAAS differs significantly between non-overweight and overweight respondents.

Table 5: Estimated impact of time spent in food preparation, by BMI group

	BMI <25 (N=154)		BMI>=25 (N=242)		BMI>30 (N=126)	
	Controlling for FAFH and meal patterns		Controlling for FAFH and meal patterns		Controlling for FAFH and meal patterns	
	Coefficient	Stnd error	Coefficient	Stnd error	Coefficient	Stnd error
HEI-2005	0.259***	(0.097)	-0.076*	(0.043)	-0.092	(0.071)
Energy density	-0.003	(0.002)	0.002	(0.001)	0.006**	(0.002)
Total fruit	0.002	(0.004)	-0.001	(0.003)	-0.004	(0.004)
Whole fruit	0.007*	(0.004)	-0.003	(0.002)	-0.006	(0.004)
Whole grains	0.013**	(0.005)	0.001	(0.003)	0.000	(0.004)
Vegetables	0.008	(0.010)	-0.002	(0.003)	-0.005	(0.004)
Dark green & orange vegetables	0.004	(0.004)	-0.001	(0.001)	-0.000	(0.002)
Saturated fat	-0.020	(0.028)	0.017	(0.013)	0.014	(0.022)
Sodium	2.927	(4.406)	-0.459	(2.074)	0.083	(3.627)
SoFAAS	-0.200**	(0.082)	0.049	(0.038)	0.060	(0.060)

Estimations also control for time in food prep squared, age, number of adults in the household, number of children in the household, employment status, living alone or single, education , race/ethnicity, income, age, age-squared and whether or not the recall occurred on a weekend number of meals eaten from food away from home, whether or not the respondent ate specific meals and the number of snacks.

This finding could be due to unobservable, but relevant factors that would impact both the choice to how much time to spend preparing food and diet quality, such as a fondness for FAFH. As an attempt to mitigate this bias, we look at the relationship between time spent cooking at each eating occasion and diet quality by controlling for individual level fixed effects and meal type fixed effects (e.g. breakfast, lunch, and dinner). In this specification, we exclude meals away from home. By definition, these will involve very little food prep time and would then be collinear with our main variable of interest. We also drop drinks and extended consumption from this analysis. Results from this specification are reported in table 6.

Table 6: Estimated impact of time spent in food preparation per eating occasion

	All respondents (N=1617)		BMI <25 (N=654)	
	Coefficient	Standard error	Coefficient	Standard error
HEI-2005	0.046	(0.034)	-0.010	(0.074)
Energy density	-0.005*	(0.003)	-0.008	(0.007)
Total fruit	-0.009	(0.008)	-0.011	(0.018)
Whole fruit	-0.007	(0.008)	-0.010	(0.018)
Whole grains	-0.002	(0.004)	-0.009	(0.009)
Vegetables	0.005	(0.006)	0.012	(0.012)
Dark green & orange vegetables	0.006**	(0.003)	0.008	(0.007)
Saturated fat	-0.008	(0.022)	0.022	(0.047)
Sodium	2.426	(3.059)	0.639	(7.765)
SoFAAS	-0.058	(0.058)	-0.014	(0.123)

	BMI>=25 (N=963)		BMI>30 (N=519)	
	Coefficient	Standard error	Coefficient	Standard error
HEI-2005	0.068	(0.044)	0.218***	(0.074)
Energy density	-0.009**	(0.004)	-0.013*	(0.008)
Total fruit	-0.007	(0.011)	-0.002	(0.018)
Whole fruit	-0.005	(0.010)	-0.003	(0.017)
Whole grains	-0.000	(0.005)	-0.000	(0.009)
Vegetables	-0.000	(0.008)	0.007	(0.016)
Dark green & orange vegetables	0.007	(0.004)	0.022**	(0.009)
Saturated fat	-0.027	(0.027)	-0.088*	(0.047)
Sodium	3.937	(3.376)	1.140	(6.393)
SoFAAS	-0.086	(0.074)	-0.254*	(0.130)

This specification assumes fixed effects for individuals and meals. Meals from FAFH and drinks are dropped from this analysis

Findings from this level of analysis suggest that, for non-overweight respondents, the effect of time spent preparing food has no significant impact on diet quality. For obese respondents, however, there may be a benefit to spending more time preparing food. An additional 10 minutes is estimated to increase HEI scores by more than 2 points, lower energy density, increase dark green and orange vegetable consumption and reduce the share of calories from SoFAAS by more than 2%.

Discussion:

While conventional wisdom holds that more time spent cooking leads to better quality diets and could thus play an important role in reducing obesity and improving other health outcomes, our findings suggests that this correlation is driven primarily by the FAFH's negative impact on diet quality. Once controlling for the amount of FAFH consumed, the impact of spending more time cooking food at home is minimal at best. While not terribly exciting from a research perspective, the possible public health implications are rosier: One does not need to spend a lot of time in the kitchen to improve diet quality. One just needs to spend some time in the kitchen. Based on our simple descriptive statistics (table 3), each meal at home requires a little more than 9 minutes. However, this includes all observations, even those where there was zero food preparation time. Among those who spend any time in food preparation, we find that average respondent spends about 30 minutes in food preparation per meal. Empirical analysis of other dietary data indicates that each meal away from home adds over 130 calories per day and lowers diet quality by about 2 points (Todd et al. 2010). According to 2005-06 NHANES data, individuals age 20 and older consumed, on average, 4 meals away from home per week. Thus if two of these away-from-home meals were replaced by at-home meals, an individual could shed about 4 pounds in a year

by spending about one more hour cooking each week. Our results also suggest that replacing FAFH with relatively easy to prepare foods—such as frozen and packaged dinners and vegetables—might have a positive effect on diet. Whether this is true in an empirically verifiable way is the source of future research.

References:

Andrews, Margaret and Karen Hamrick. "Shopping For, Preparing and Eating Food: Where Does the Time Go?" *Amber Waves*, 7(4): p. 4-5, 2009

Bertrand, Marianne and Diane Whitmore Schanzenback. "Time Use and Food Consumption," American Ecnomic Review: Papers & Proceedings 99(2): p. 170-179, 2009.

Beydoun, May A., Lisa M. Powell, and Youfa Wang. "Reduced away-from-home food expenditure and better nutrition knowledge and belief can improve quality of dietary intake among U.S. adults," *Public Health Nutrition*,p.1-13,April 22, 2008.

Binkley, James. "Calorie and Gram Differences between Meals at Fast Food and Table Service Restaurants," *Review of Agricultural Economics* 30(4): p. 750-63, 2008.

Binkley, J.K., J. Eales, and M. Jekanowski. "The Relationship between Dietary Change and Rising Obesity," *International Journal of Obesity* 24(8): p. 1032-39, 2000.

Bowman, Shanthy A., Steven L. Gortmaker, Cara B. Ebbeling, Mark A. Pereira, and David S. Ludwig. "Effects of Fast-Food Consumption on Energy Intake and Diet Quality Among Children in a National Household Survey," *Pediatrics* 113(1): p. 112-18, 2004.

Bowman, Shanthy A., and Bryan T. Vinyard. "Fast Food Consumption of U.S. Adults: Impact on Energy and Nutrient Intakes and Overweight Status," *Journal of the American College of Nutrition* 23(2): p. 163-68, 2004.

Cawley, John and Feng Liu. *Maternal Employment and Childhood Obesity: A Search for Mechanisms in Time Use Data.* NBER Working Paper No. 13600. November, 2007.

Chang, VirginiaW. and Diane S. Lauderdale. "Income disparities in body mass index and obesity in the United States, 1971-2002".*Archives of Internal Medicine, 165*(18): p. 2122-8, 2005.

Clauson, Annette. Food CPI and Expenditures: Table 10. U.S. Department of Agriculture, Economic Research Service, 2011. Available at: http://www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/Data/Expenditures_tables/table10.htm

Ebbeling, Cara B., Kelly B. Sinclair, Mark A. Pereira, Erica Garcia-Lago, Henry A. Feldman, and David S. Ludwig. "Compensation for Energy Intake From Fast Food Among Overweight and Lean Adolescents,"*Journal of the American Medical Association* 291(23): p. 2828-33, 2004.

Guenther, Patricia M., WenYen Juan, Jill Reedy, Patricia Britten, Mark Lino, Andrea Carlson, Hazel H. Hiza, and Susan M. Krebs-Smith. *Diet Quality of Americans in 1994-96 and 2001-02 as Measured by the Healthy Eating Index-2005*, Nutrition Insight 37, U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, 2008.

Guenther, Patricia M., Susan M. Krebs-Smith, Jill Reedy, Patricia Britten, WenYen Juan, Mark Lino, Andrea Carlson, Hazel A. Hiza, and P. Peter Basiotis. Healthy Eating Index-2005. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, 2008. http://www.cnpp.usda.gov/Publications/HEI/healthyeatingindex2005factsheet.pdf

Guthrie, Joanne F., Biing-Hwan Lin, and Elizabeth Frazao. "Role of Food Prepared Away from Home in the American Diet, 1977-78 versus 1994-96: Changes and Consequences," *Journal of Nutrition Education and Behavior*34(3): p. 140-50, 2002.

Hamrick, Karen. *Eating and Health Module (ATUS): 2008.* U.S. Department of Agriculture, Economic Research Service, 2010, http://www.ers.usda.gov/Data/ATUS/Data/2008/2008_table6.htm

Hamermesh, Daniel S. "Time to Eat: Household Production Under Increasing Income Inequality." *American Journal of Agricultural Economics* 89(4): p. 852-863, 2007.

Kant, Ashima K., and Barry I. Graubard. "Eating out in America, 1987-2000: Trends and nutritional correlates," *Preventive Medicine* 38: p. 243-49, 2004.

Kolodinsky, Jane M. and Amanda B. Goldstein. "Time Use and Food Pattern Influences on Obesity." Obestity 19(12): p. 2327-2335, 2011.

Mancino, Lisa, Jessica Todd, and Biing-Hwan Lin. "Separating what we eat from where: Measuring the effect of food away from home on diet quality," *Food Policy* 34 (6): p. 557-562, 2009.

Paeratakul, S., D. Ferdinand, C. Champagne, D. Ryan, and G. Bray. "Fastfood consumption among U.S. adults and children: Dietary and nutrient intake profile," *Journal of the American Dietetic Association* 103(10): p. 1332-38, 2003.

Todd, Jessica E., Lisa Mancino, Biing-Hwan Lin, 2010, *The Impact of Food Away From Home on Adult Diet Quality*, Economic Research Report, ERR-90, Economic Research Service, U.S. Department of Agriculture, February, 24 pp.http://www.ers.usda.gov/Publications/ERR90/

U.S. Department of Agriculture and U.S. Department of Health and Human Services. *Dietary Guidelines*for Americans, 2010. 7ty Edition, Washington, DC: U.S. Government Printing Office, December 2010. available at: http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/PolicyDoc/InsideFrontCover.pdf

Zick, Cathleen D., Robert B. Stevens and W. Keith Bryant. "Time Use Choices and Healthy Body Weight: A Multivariate Analysis of Data from the American Time Use Survey." International Journal of Behavioral Nutrition and Physical Activity 8(84), 2011 http://www.ijbnpa.org/content/8/1/84