

The Effect of Meal Preparation Time on Food Expenditure and Nutritional Quality of Menus in
Family Child-Care Homes in King County, Washington

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Abstract

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Background: A full time child-care program is expected to provide at least one-half to two-thirds of a child's daily nutrient requirements. As such, child-care settings have been acknowledged as an important setting for the assurance of children's nutrition and for the prevention of childhood obesity. It has been suggested that an increase in the use of in-house food preparation in child-care settings could improve the nutrient profile of menus and decrease food costs. However, a limited number of studies have examined the effect of meal preparation

time on nutritional quality and food expenditure in the general population, and no studies have assessed this relationship in child-care settings.

Objective: To investigate the association between meal preparation time and food expenditure and nutritional quality of menus in family child-care homes.

Methods: Fifty-nine family child-care providers participated in this study. Participants recorded time spent in meal preparation and menus served over a period of five consecutive days of operation, and collected receipts for food items purchased. Multiple linear regression models were used to investigate the associations of breakfast and lunch preparation time with each - food expenditure, and nutritional quality of the menu adjusting for covariates. Nutritional quality of the menu was quantified using mean adequacy ratio (MAR), sodium Dietary Reference Intake (DRI) ratio, percent calories from sugar, and percent calories from *trans* fat.

Results: There was no observed relationship between breakfast preparation time and food expenditure ($p = 0.499$), although there was an inverse trend between lunch preparation time and lunch food expenditure ($p = 0.110$). There was no statistically significant relationship between breakfast or lunch preparation time and indicators of nutritional quality of the menus. There was a direct trend between breakfast preparation time and percent of calories from *trans* fat ($p = 0.073$) and a direct trend between lunch preparation time and MAR ($p = 0.073$).

Conclusion: In this sample, there is insufficient evidence to posit that there is a relationship between time spent in food preparation and food expenditure or measures of the nutritional quality of menus. Future research is needed to understand the role of time spent in food preparation in determining food expenditure and nutritional quality of the menus served at family child-care homes.

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Section One: Introduction

Rates of childhood overweight and obesity continue to remain elevated and garner significant public health focus in the United States. According to the Centers for Disease Control and Prevention (CDC), 16.0 and 14.4 percent of children over two years of age are overweight and obese, respectively¹.

In 2007, an estimated 55 percent of children aged three to five years spent time in center-based child-care². A report released by the Task Force on Childhood Obesity in 2010 describes the child-care setting as a “tremendous opportunity to prevent obesity by making an impact at a pivotal phase”³. The Academy of Nutrition and Dietetics (formerly American Dietetic Association) asserts that a full time child-care program should meet one-half to two-thirds of a child’s daily nutrient requirements⁴. Additionally, early childhood is an important time for the development of food behaviors and preferences. Thus, child-care settings present an opportunity not only to assure the nutritional status of young children, but also to expose children to and encourage healthy eating behaviors that could carry into adulthood^{5,6}.

The Child and Adult Care Food Program

In 2010, more than 3.2 million children daily benefited from meals and snacks provided by the Child and Adult Care Food Program (CACFP) in child care-centers, family child-care homes, and after school programs in the United States⁷. CACFP, a program of the U.S. Department of Agriculture (USDA), provides financial reimbursement to providers for meals and snacks that are served to participating children and that meet CACFP nutrition standards.

Seventy-three percent of facilities that participate in CACFP are family child-care homes, each enrolling an average of eight children⁸. Family child-care homes are defined as “private homes that are licensed, registered, or approved to provide family child care.”⁹

Providers in family child-care homes are reimbursed based on the number and type (breakfast, lunch, or snack) of meals served⁹. In 1996, following the passage of the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA), CACFP adopted a tiered reimbursement system for family child-care homes (**Table 1**). Providers may qualify for the tier I reimbursement rate if they live in a low-income area or if the provider’s own household income is at or below 185 percent of the federal poverty level⁹. Providers who do not meet these criteria receive the tier II reimbursement rate. However, providers who are reimbursed at the tier II rate may be reimbursed at the tier I rate for children in their care who qualify for free and reduced price meals or if their sponsoring agency opts to reimburse at the higher rate⁹. This reimbursement system was designed to prioritize funding for low-income providers and children.

Table 1¹ Child and Adult Care Food Program reimbursement rates for tier 1 and tier 2 family child-care homes.

	Breakfast		Lunch		Snacks	
	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2
Contiguous States	\$1.27	\$0.46	\$2.38	\$1.44	\$0.71	\$0.19
Alaska	\$2.03	\$0.72	\$3.86	\$2.33	\$1.15	\$0.31
Hawaii	\$1.48	\$0.53	\$2.79	\$1.68	\$0.83	\$0.23

¹Adapted from USDA Food and Nutrition Services⁹.

Meal Requirements and Institute of Medicine Recommendations

Current CACFP Meal Requirements define serving sizes appropriate for different age groups and stipulate numbers of “food components” to be included in each meal and snack⁹. The

USDA has defined the four food components as milk, fruit/vegetable, grains/bread, and meat/meat alternatives; in order to be reimbursed providers must comply with serving sizes and must also serve meals that consist of the combinations of food components specified by the guidelines⁹. At present, CACFP does not utilize nutrient based standards to ensure the nutritional quality of food served in CACFP-participating facilities.

Studies have shown that facilities that participate in CACFP serve more nutritious food and that participation in the program is associated with better health outcomes. Bruening et al found that, when compared to children from a day care center not participating in CACFP, children from a day care center that did participate in CACFP had higher intakes of several nutrients, were offered more servings of milk and vegetables, were offered fewer servings of fats/sweets, and experienced fewer days of illness¹⁰. Another study compared sack lunches provided by parents of children in full time child care to CACFP Meal Requirements; the authors concluded that most sack lunches brought from home failed to meet CACFP standards, specifically with regard to servings of dairy, fruits and vegetables¹¹.

In 2008, the USDA asked the Institute of Medicine (IOM) to review current Meal Requirements and to provide recommendations for improving CACFP's Meal Requirements based on the Dietary Guidelines for Americans and Dietary Reference Intakes (DRIs)⁸. The IOM published a report detailing its recommendations in 2011⁸. Of note, the IOM recommended Meal Requirements that mandate greater variety in fruits and vegetables served, increase servings of whole grains, and decrease the amounts of solid fats, *trans* fats, added sugar, and sodium in the menus served to children⁸. The IOM acknowledges that food costs associated with adherence to their recommendations are likely to be higher, and furthermore, that the increase in

cost is likely to be more than child-care providers will be able to incur at present⁸. Therefore, an increase in reimbursement would be required to support such changes⁸. However, the IOM also provided a series of implementation recommendations meant, in part, to minimize the increased financial burden of meeting their recommendations. Of note, the IOM recommends that the USDA provide extensive technical assistance and training to child-care providers⁸. In its report, the IOM supposes that shifting dependence from pre-packaged, convenience foods to “in-house food preparation” may be one mechanism to reduce the cost of food and to improve the nutritional quality of foods served in CACFP-participating child-care facilities⁸. Qualitative studies have found that child-care providers prefer convenience foods¹², but no research to date has studied the impact of meal preparation time on food costs or quality in child-care settings.

Time Use and Food Expenditure

In 1965, Gary S. Becker published an article called *A Theory of the Allocation of Time*¹³. Becker asserts that households are producers as well as consumers, and that the combination of goods, raw materials, and labor should all be recognized as inputs that can be converted into product¹³. Additionally, in 1977 economist Clair Vickery published *The Time-Poor: A New Look at Poverty* and presented the argument that, like income, time is of equal import in defining poverty¹⁴. These economists’ acknowledgement of time as a resource supports the theory that an increase in time spent in food preparation may be associated with lower food expenditures.

Yet relatively little research has examined the relationship between time spent in food preparation and monetary investments in food¹⁵, and no studies exist on the relationship between meal preparation time and food expenditure in child-care settings. Previous research has

demonstrated that while adults in households above 185 percent of the federal poverty level are equally likely to report engaging in food preparation as those living at or below 185 percent of the federal poverty level, households with higher income report less *time* in food preparation, on average¹⁶. Similarly, Mancino et al found that households spend an average of nine fewer minutes in food preparation per day for a \$100 increase in weekly household income¹⁷. Yet these studies do not allow for a direct comparison between meal preparation time and food expenditure because household income is used as the predictor.

Time Use and Diet Quality

A shift in reliance from convenience foods to “in-house preparation” logically means child-care providers will be required to invest more time in meal preparation. And while the IOM suggests that such a change would be an important strategy to improve the nutritional quality of foods served in CACFP-participating facilities, there is little research on the relationship between time spent in food preparation and meal quality. Furthermore, this relationship has never been studied in a child-care setting.

The average amount of time American women spend in food preparation has dropped from 92 minutes per day in 1975 to 51 minutes per day in 2006; a change which coincides with a steady rise in obesity rates¹⁸. The drop in food preparation time for women cannot be explained by an increase in average food preparation time for men, which has increased by only three minutes in the same time frame¹⁸. Data from the 2006-2007 American Time Use Survey (ATUS) reveals that for women, greater time spent in food preparation and clean-up is associated with a lower body mass index (BMI)¹⁹. The same relationship was not observed in men,

presumably because women are more likely to identify themselves as the primary meal preparer in their households¹⁹. Another study examining time spent in various activities found that only among single women aged 31 to 50 years who were overweight, an additional 10 minutes spent in food preparation and clean-up decreased BMI by 0.13 points; no association between meal preparation time and body weight was observed in healthy weight women²⁰.

In addition to research on the association between meal preparation time and BMI, there is evidence that those who spend more time in food preparation are more likely to consume a more nutritionally adequate diet. Women who reported they are likely to spend less than 15 minutes preparing dinner were less likely to consume two or more servings of fruits and vegetables each per day²¹. Chu and colleagues found that time spent in meal preparation was not significantly related to weight status, but did find that women who reported spending less time in breakfast preparation tended to eat breakfasts of higher nutritional quality whereas women who spent more time preparing dinner had a more nutritious dinner²². Specifically, women who spent less time preparing breakfast consumed less energy, dietary fat, sodium, and refined grains while consuming more whole grains and dairy foods and more iron²². Conversely, women who spent more than 20 minutes preparing dinner ate more vegetables, fiber, and meat²². More time preparing lunch was associated with both favorable indicators of diet quality – such as more servings of vegetables – as well as unfavorable indicators of diet quality – such as higher energy and sodium content²². Thus, the relationship between meal preparation time and nutritional quality may be different at breakfast, lunch, and dinner and may impact aspects of diet quality in different ways.

The observed relationship that more time spent in food preparation is often – but not always – associated with lower body weight and more nutritious food is not surprising. Convenience foods and meals eaten or prepared away from home have become increasingly pervasive, yet also tend to be high in calories, sodium, and dietary fat^{22,23}. Studies on meal preparation time and nutritional quality of menus are absent in child care settings.

Research Aims

The purpose of the present study is to examine the impact of meal preparation and serving time on food expenditure and the nutritional quality of menus in family child-care homes in King County, Washington.

AIM 1: To describe meal preparation time among family child-care home providers and to examine its association with key socio-demographic and professional variables.

AIM 2: To investigate the association between meal preparation time and meal food expenditure in family child-care homes. The hypothesis is that meal preparation time will be inversely associated with meal food expenditure in family child-care homes.

AIM 3: To investigate the association between meal preparation time and four measures of nutritional quality of menus in family child-care homes: mean adequacy ratio, sodium DRI ratio, percent calories from sugar and percent calories from *trans* fat. The hypothesis is that meal preparation time will be directly associated with mean adequacy ratio and inversely associated with sodium DRI ratio, percent calories from sugar, and percent calories from *trans* fat.

Section Two: Methods

Participant Recruitment and Study Procedures

Participant recruitment, selection, and study procedures were developed for the *Cost and Quality* study at the University of Washington Center for Public Health Nutrition. The primary purpose of the *Cost and Quality* study was to determine the impact of CACFP reimbursement policies on nutritional quality of menus, the results of which have been published elsewhere²⁴. The analysis described here is within secondary aims of the original study.

Child care providers were initially notified of the research study with an announcement in a child-care organization newsletter. Subsequently, 321 invitation letters were mailed to providers in King County, Washington. Ninety-five providers responded, and 63 were deemed eligible to participate. To meet eligibility criteria, providers had to operate a family child-care home, participate in CACFP, and live in King County, Washington. Four providers have been excluded from analysis for failure to follow study protocol; 59 child-care providers are included in the present analysis.

Data collection in each family child-care home took place over the course of four weeks. Participants' professional, social, and demographic characteristics were obtained through in-person interviews. For a period of seven consecutive days, participants recorded time spent in all activities related to food using forms provided by research staff; a copy of the time use form can be found in Appendix A. Of note, participants recorded a single time value for the time they spent preparing and serving each meal. For the purposes of this analysis, indications of meal preparation time refer to time that providers reported spending in meal preparation and serving. Participants also recorded all foods and beverages served for breakfast, morning snack, lunch,

and/or afternoon snack for a period of five consecutive days. Participants were provided with forms to record menu items (Appendix B), which included space for participants to include information on nutritionally relevant details of food served (e.g. low-fat milk or whole milk), brand of product, package size of purchased food item, and store where the food was purchased. Of note, time use information was collected during the first week of the data collection period whereas menus were provided during the fourth week. Participants provided receipts for all food purchases made during the four week data collection period. All participants provided written consent, and study procedures were approved by the University of Washington Human Subjects Division.

Food Expenditure Calculations

Monsivais et al completed initial menu characterization^{24,25}. Menu items were standardized to portions appropriate for children aged three to five years. Food expenditures for individual food items were calculated by Monsivais et al^{24,25} by linking foods reported on menus to foods included on receipts that were submitted by each participant. In total, approximately 80 percent of foods and beverages from menus were successfully linked to receipts collected from each provider during the four week data collection period. For those food items which could not be linked to receipts, prices were determined either by using other providers' receipts or by using websites of grocery retailers commonly used by participants (Safeway Inc., Pleasanton, CA; Amazon Fresh, Seattle, WA; or Sam's Wholesale Club, Bentonville, AR).

Once food expenditure for each menu item had been determined, the total price per gram was multiplied by the number of grams in a portion to determine portion food expenditure.

$$\textit{Portion Food Expenditure} = \frac{\textit{grams}}{\textit{portion}} \times \frac{\textit{total price}}{\textit{total grams}}$$

Portion food expenditures were totaled for foods and beverages served at each breakfast and lunch meal, and were then standardized to 260 calories for breakfast and 338 calories for lunch, representing 20 percent and 26 percent, respectively, of daily calorie needs for children aged 2 to 4 years⁸.

$$\textit{Breakfast Food Expenditure} = 260 \textit{ calories} \times \frac{\sum \textit{Portion Food Expenditure}}{\sum \textit{Portion Calories}}$$

$$\textit{Lunch Food Expenditure} = 338 \textit{ calories} \times \frac{\sum \textit{Portion Food Expenditure}}{\sum \textit{Portion Calories}}$$

For each participant, food expenditures were averaged across all days in which the child-care home was operational to calculate mean food expenditure per child for breakfast and lunch.

Menu Nutritional Quality Calculations

Nutritional quality of menus was measured using mean adequacy ratio (MAR)²⁶⁻²⁸, sodium DRI ratio^{29,30}, and percent calories from sugar³⁰ and *trans* fat³⁰. Foods were analyzed for nutrient composition with FoodProcessor SQL dietary assessment software (version 10.5.0,

2008, ESHA Research, Salem, OR) for the *Cost and Quality* study. The nutrient content of individual food items were summed for each meal and standardized to 260 calories for breakfast and 338 calories for lunch, representing 20 percent and 26 percent, respectively, of daily calorie needs for children aged 2 to 4 years⁸.

The NAR – that is the percent of the DRI for a specific nutrient that is provided – was determined for nine nutrients of concern for children: calcium³⁰⁻³², fiber^{30,31}, folate³¹, iron^{29,32}, magnesium³¹, potassium^{30,31}, zinc^{29,32}, vitamin D³⁰ and vitamin E³¹. Because breakfast and lunch were standardized to 20 percent and 26 percent, respectively, of daily calorie needs for children aged 2 to 4 years, individual NARs were truncated at 0.2 for breakfast and 0.26 for lunch. The MAR was calculated by averaging NARs for these nine nutrients, and multiplied by 100 percent. Truncating individual NARs for the purpose of MAR calculation prevents nutrients that are provided in excess of the DRI from compensating for nutrients still lacking. Based on this methodology, 20 percent would be the highest MAR possible for breakfast, and would represent a breakfast that provides 20 percent of nutrient requirements within a meal providing 20 percent of daily energy needs for children aged 2 to 4 years. Similarly, 26 is the highest possible MAR for lunch, and would indicate that 26 percent of daily nutrient needs are provided within a meal that includes 26 percent of daily calorie needs.

$$NAR = \frac{\textit{Intake of nutrient}}{\textit{Daily reference intake for nutrient}}$$

$$MAR = \frac{\sum_{i=1}^9 NAR_i}{9} \times 100$$

The sodium DRI ratio was calculated as for the NAR, but was not truncated. For the purpose of calculating percent of calories from sugar and *trans* fat, it was assumed that one gram of sugar provided 4 calories and one gram of *trans* fat provided 9 calories.

$$\text{Percent calories from sugar} = \frac{(\text{grams sugar})\left(\frac{4 \text{ calories}}{\text{gram}}\right)}{\text{total calories}} \times 100$$

$$\text{Percent calories from trans fat} = \frac{(\text{grams trans fat})\left(\frac{9 \text{ calories}}{\text{gram}}\right)}{\text{total calories}} \times 100$$

Statistical Analysis

All statistical analyses were conducted using Stata 12.1 (StataCorp LP, College Station, Texas). Descriptive statistics were used to summarize meal preparation time and its association with key socio-demographic and professional characteristics of the sample. Breakfast and lunch preparation times were positively skewed; however the logarithms of breakfast and lunch preparation times were normally distributed. Therefore, the logarithms of breakfast and lunch preparation times were used for all linear regression analyses. Multiple linear regression models were used to assess the relationship of meal preparation time with food expenditures and nutritional quality of menus, before and after adjusting for covariates. Separate analyses were conducted for breakfast and lunch with time spent in breakfast preparation or time spent in lunch

preparation each used as independent variables. Food expenditure and four measures of the nutritional quality of menus were used as dependent variables of interest. Nutritional quality of menus was indicated by MAR, sodium DRI ratio, and percent calories from sugar and *trans* fat. Covariates were socio-demographic characteristics (age, gender, race/ethnicity, highest education attained, and annual household income), professional characteristics (average number of children in care, years of experience in CACFP, hours of help for food related tasks per week, and reimbursement tier), and energy content of the meal. Age, average number of children in care, years of experience in CACFP, hours of help with food related tasks per week, and energy content of meals were continuous variables. Highest education attained was coded as a categorical variable, with categories representing high school or general education development test (GED), some college or two-year degree, and four-year degree or beyond. Race was also coded as a categorical variable with three categories: white, non-Hispanic; black, non-Hispanic; and all other races or more than one race reported. Household income was coded as a three category variable, with categories for household income of less than \$60,000; \$60,000 to \$99,999; and greater than or equal to \$100,000. For all regression analyses, any p value < 0.05 was adjusted for multiple comparisons using the Bonferroni method such that a p value of 0.005 was considered statistically significant.

Qualitative Analysis

To more completely understand of the impact of meal preparation time on foods served, menus of providers who reported the most and the least meal preparation times were qualitatively examined for trends. Breakfast menus from providers who reported the five lowest

breakfast preparation times were compared to breakfast menus from the providers who reported the five highest breakfast preparation times. Similarly, lunch menus from providers who reported the five lowest lunch preparation times were compared to lunch menus from providers who reported the five highest lunch preparation times.

Section Three: Results

Participant Characteristics

All 59 child-care providers included in this analysis were women. The average age of participants was 48 years, ranging from 31 years to 64 years of age. Most participants were white, non-Hispanic and had attended at least some college. Socio-demographic characteristics are summarized in **Table 2**.

Table 2. Socio-demographic characteristics of 59 family child-care home providers in King County, Washington.		
Age, mean, in years (n=58)	48 years Std. Dev. 8.5 years	
	n	%
Race (N=59)		
White, non-Hispanic	45	76.3
Black, non-Hispanic	3	5.1
All other races and mixed race	11	18.6
Household Income (N=58)		
< \$60,000	21	36.2
\$60,000 - \$99,999	20	34.5
≥ \$100,000	17	29.3
Highest Educational Attainment (N=59)		
High School / GED	4	6.8
Some college or Associate's degree	41	69.5
Bachelor's degree or higher	14	23.7

Participants cared for an average of 8 children each day and had an average of 12 years of experience in CACFP. Twenty-nine of the 59 participants did have help with food preparation and/or clean-up in a typical week. Across all providers, the average number of hours of help with food related tasks per week was 14.3 hours. Professional characteristics of participants are summarized in **Table 3**.

Table 3. Professional Characteristics of 59 family child-care providers in King County, Washington.

Reimbursement Tier	n	%
Tier 1	30	50.9
Tier 2	29	49.1
	Mean	Standard Deviation
Years in CACFP	11.7	8.4
Additional Help, in hours	14.3	22.6
Number of children in care	8	2.9

Previous studies have analyzed menus for adherence to CACFP guidelines; menus reported by participants were 96.6 percent consistent with CACFP guidelines^{24,25}.

Meal Preparation Time

Of the 59 participants, 52 served breakfast and 56 served lunch, though not all participants who served breakfast and/or lunch served it every day. The sample size for all analyses will be n=52 for breakfast and n=56 for lunch. There was great variability in the mean breakfast and mean lunch preparation times in this sample. Breakfast preparation time, which ranged from 6.5 to 90 minutes, averaged 29.2 minutes (standard deviation 19.6 minutes). Most participants reported greater lunch preparation time, with times ranging from 13 to 147 minutes and an average lunch preparation time of 44.7 minutes (standard deviation 25.0 minutes). Both breakfast and lunch preparation times were positively skewed; the logarithm of each variable was normally distributed. Thus, the logarithm of breakfast preparation and the logarithm of lunch preparation time are used as the independent variables for linear regression analyses.

Summary statistics (mean, standard deviation, median, and interquartile range [IQR]) for meal preparation times by reimbursement tier and by socio-demographic characteristics are shown in **Table 4**. There was no discernible effect of reimbursement tier or most socio-demographic variables on time spent in breakfast and lunch preparation. Interestingly, participants who identified their race as black, non-Hispanic spent, on average, significantly more time in both breakfast and lunch preparation than did participants of other races. However, the number of participants who reported their race as black, non-Hispanic was of insufficient size (n=3) to have meaningful discussion or to draw any conclusions about the relationship between race and time spent in meal preparation.

There was a direct, linear relationship between the logarithm of time spent in both breakfast ($\beta=0.0271$; p value 0.026) and lunch ($\beta=0.0245$; p value 0.010) preparation and the average number of children in care (**Figures 1A and 1B**). Years of experience in CACFP was associated with neither breakfast ($\beta = -0.003$; p value 0.516) nor lunch ($\beta = -0.003$; p value 0.434) preparation times. Participants' weekly hours of help with food related tasks was also independent of time spent in both breakfast ($\beta = 0.002$; p value 0.165) and lunch ($\beta = 0.002$; p value 0.178) preparation. Therefore, the only professional characteristic to be significantly associated with meal preparation time is the number of children in attendance; meal preparation time was higher, in general, for providers with more children in attendance.

Table 4. Mean meal preparation time by socio-demographic variables of 59 family child-care home providers in King County, Washington.

		Breakfast Preparation Time, minutes			Lunch Preparation Time, minutes		
		Mean ± SD	Median	[IQR]	Mean ± SD	Median	[IQR]
Total (n=59)		29.2 ± 19.6	21.5	(16.4, 37.8)	44.7 ± 25.0	37.3	(30.0, 54.8)
Reimbursement Tier	Tier 1 (n=30)	32.7 ± 19.6	30	(18.5, 41.1)	50.5 ± 26.7	45.0	(30.2, 62.0)
	Tier 2 (n=29)	26.0 ± 19.5	19.3	(15.0, 25.0)	38.5 ± 21.9	32.0	(28.0, 41.0)
Age, in years	< 40 (n=12)	33.5 ± 25.6	22.2	(18.2, 37.5)	41.4 ± 20.2	39.1	(25.8, 52.5)
	40 - 49 (n=18)	29.7 ± 18.5	22.1	(15.5, 42.5)	46.5 ± 25.6	39.0	(29.0, 56.1)
	≥ 50 (n = 29)	26.8 ± 17.4	21.2	(12.6, 32.4)	45 ± 27.2	34.4	(30.0, 55.0)
Race	White, non-Hispanic (n=45)	26.2 ± 17.9	20.7	(14.8, 30.5)	41.6 ± 22.0	35.0	(29.4, 48.5)
	Black, non-Hispanic (n=3)	53.7 ± 20.6	63.0	(30, 68)	95.4 ± 45.1	76.0	(63.2, 147.0)
	All other races or mixed race (n=11)	33.0 ± 21.6	27.0	(17.8, 34.1)	42.8 ± 14.5	43.2	(29.8, 55.8)
Household Income	< \$60,000 (n=21)	28.1 ± 20.2	17.8	(15.0, 37.9)	44.0 ± 30.8	31.2	(29.1, 51.8)
	\$60,000 - \$99,999 (n=20)	31.5 ± 22.3	24.5	(18.6, 35.6)	46.3 ± 24.4	41.0	(32.0, 55.0)
	≥ \$100,000 (n=17)	27.3 ± 17.1	20.7	(16.4, 36.4)	42.7 ± 18.9	41.6	(26.9, 53.4)
Highest Educational Attainment	High School / GED (n=4)	29.7 ± 22.7	21.6	(14.1, 53.3)	37.3 ± 19.3	32.0	(22.3, 57.7)
	Some college or Associate's degree (n=41)	31.4 ± 21.3	24.5	(16.1, 38.6)	48.1 ± 28.5	38.0	(30.0, 56.5)
	Bachelor's degree or higher (n=14)	21.0 ± 7.8	20.1	(16.1, 24.6)	37.6 ± 11.7	35.0	(29.9, 46.1)

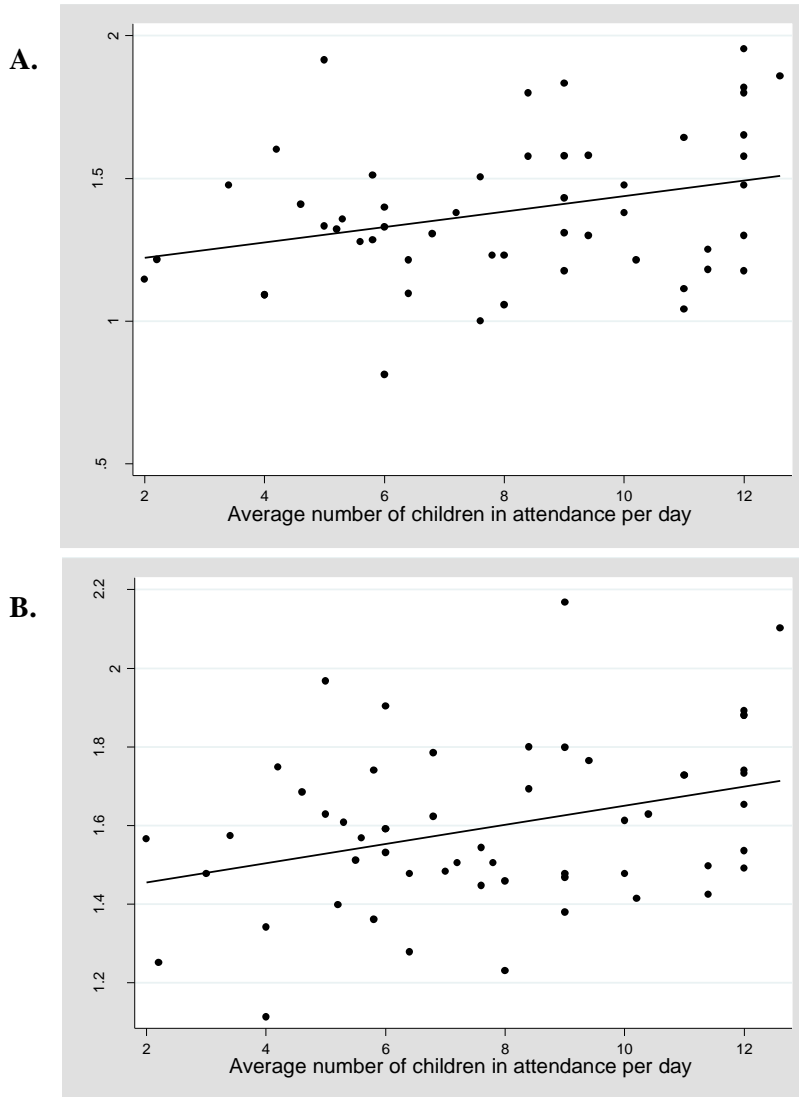


Figure 1A. Linear relationship between daily number of children in day care and log (breakfast preparation time) among 59 family child-care providers in King County, Washington. **Figure 1B.** Linear relationship between daily number of children in day care and log (lunch preparation time) among 59 family child-care providers in King County, Washington

The mean \pm standard deviation, median (IQR) for all dependent variables are summarized in **Table 5**. Food expenditure per child varied widely, and in general, participants' expenditure was more at lunch than at breakfast. Mean food expenditure per child at breakfast was \$0.74 (standard deviation \$0.23) with a range of \$0.36 to \$1.28. Mean food expenditure at lunch was \$1.28 (standard deviation \$0.45), ranging from \$0.51 to \$2.82. In general, mean MAR and sodium DRI ratio were higher for lunch than for breakfast, but percent calories from sugar and *trans* fat was higher at breakfast. Of note, percent calories from *trans* fat was quite low for all providers at both meals.

Table 5. Food expenditure and nutritional quality of menus served in 59 family child-care homes in King County, Washington.

	Breakfast (n=52)			Lunch (n=56)		
	Mean \pm SD	Median	IQR	Mean \pm SD	Median	IQR
Food Expenditure, \$	0.74 \pm 0.23	0.70	0.57, 0.88	1.28 \pm 0.45	1.14	1.00, 1.48
MAR	13.14 \pm 1.86	12.85	12.13, 14.39	14.67 \pm 2.37	14.74	12.66, 16.30
Sodium DRI Ratio	18.93 \pm 3.70	18.36	16.50, 20.85	48.7 \pm 12.10	49.29	41.66, 57.29
% Calories from Sugar	37.29 \pm 7.20	36.65	32.48, 41.84	25.04 \pm 4.69	24.68	21.17, 27.56
% Calories from <i>trans</i> Fat	0.59 \pm 0.56	0.47	0.13, 0.93	0.27 \pm 0.25	0.21	0.08, 0.40

Meal Preparation Time and Food Expenditure

In a linear regression model, time spent in breakfast preparation was not associated with food expenditure per child for the breakfast meal (**Table 6A**). There was an inverse trend between lunch preparation time and food expenditure per child at the lunch meal, but this relationship was not statistically significant (**Table 6B**). In terms of other covariates, reimbursement tier was found to be associated with lunch food expenditure both in Model 1 as well as in Model 2, such that providers who are reimbursed at a higher rate had higher food expenditure.

Table 6A. Multiple linear regression to examine the association of breakfast food expenditure with breakfast preparation time, among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Log (Breakfast Preparation Time)	0.01	-0.26, 0.27	0.95	-0.09	-0.36, 0.18	0.50
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	0.12	-0.01, 0.26	0.07	0.10	-0.06, 0.27	0.21
Average Number of Children	0.02	-0.01, 0.04	0.15	0.01	-0.02, 0.05	0.52
Weekly Hours of Help	0.00	0.00, 0.01	0.03	0.00	-0.00, 0.01	0.52
Years of Experience in CACFP	-0.01	-0.02, 0.00	0.14	-0.01	-0.02, 0.01	0.29

^aModel 1: adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2: Model 1 + professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

Table 6B. Multiple linear regression to examine the association of lunch food expenditure with lunch preparation time, among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Log (Lunch Preparation Time)	0.32	-1.08, 0.45	0.41	-0.58	-1.30, 0.14	0.11
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	0.38	0.13, 0.62	0.00	0.34	0.06, 0.61	0.02
Average Number of Children	0.00	-0.05, 0.05	0.98	-0.03	-0.09, 0.04	0.41
Weekly Hours of Help	0.01	-0.00, 0.01	0.06	0.01	-0.00, 0.02	0.09
Years of Experience in CACFP	0.00	-0.02, 0.02	0.98	0.00	-0.02, 0.02	0.77

^aModel 1: adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2: Model 1 + professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

Meal Preparation Time and Nutritional Quality of Menus

Meal Preparation Time and MAR

Linear regression models showed that there was no association between breakfast preparation time and breakfast MAR before or after adjusting for covariates (**Table 7A**). On the other hand, there was an inverse, statistically significant relationship between lunch preparation time and MAR prior to controlling for professional characteristics and an inverse trend between lunch preparation time and lunch MAR when controlling for all covariates (**Table 7B**). In Model 1, participants' years of experience in CACFP was associated with breakfast food expenditure, and hours of help with food related tasks was associated with lunch MAR; however neither relationship was significant after adjusted for all covariates.

Table 7A. Multiple linear regression to examine the association of breakfast Mean Adequacy Ratio (MAR)[†] with breakfast preparation time, among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Log (Breakfast Preparation Time)	0.00	-0.03, 0.03	0.87	0.12	-2.33, 2.57	0.92
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	0.90	-0.27, 2.07	0.13	0.63	-0.86, 2.11	0.40
Average Number of Children	0.04	-0.16, 0.24	0.68	-0.04	-0.36, 0.28	0.80
Weekly Hours of Help	0.01	-0.01, 0.04	0.24	0.01	-0.03, 0.06	0.55
Years of Experience in CACFP	0.10	0.00, 0.19	0.04	0.09	-0.01, 0.19	0.09

^aModel 1 adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2: Model 1 + professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

[†]MAR based on nine nutrients of concern for children's health: calcium, fiber, folate, iron, magnesium, potassium, zinc, vitamin D, and vitamin E

Table 7B. Multiple linear regression examine the association of lunch Mean Adequacy Ratio (MAR)[†] with lunch preparation time, among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Lunch Preparation Time	4.44	0.68, 8.20	0.02	3.57	-0.35, 7.49	0.07
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	1.13	-0.23, 2.49	0.10	0.55	-0.95, 2.05	0.46
Average Number of Children	0.13	-0.11, 0.37	0.28	0.10	-0.43, 0.24	0.56
Weekly Hours of Help	0.04	0.01, 0.07	0.02	0.03	-0.01, 0.08	0.16
Years of Experience in CACFP	0.03	-0.08, 0.14	0.57	0.02	-0.08, 0.13	0.65

^aModel 1 adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2: Model 1 + professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

[†]MAR based on nine nutrients of concern for children's health: calcium, fiber, folate, iron, magnesium, potassium, zinc, vitamin D, and vitamin E

Meal Preparation Time and Sodium DRI Ratio

In terms of the sodium DRI ratio as a measure of nutritional quality of menus, no association was observed with time spent in breakfast or lunch preparation (**Table 8A and 8B**). None of the professional characteristics were significantly associated with sodium DRI ratio in either the unadjusted or the adjusted models for breakfast or lunch.

Table 8A. Multiple linear regression to examine the association of breakfast Sodium DRI ratio[†] with breakfast preparation time, among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Log (Breakfast Preparation Time)	-0.00	-0.05, 0.05	0.95	0.05	-4.42, 4.53	0.98
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	0.02	-0.11, 0.14	0.80	-0.61	-3.32, 2.11	0.65
Average Number of Children	-0.08	-0.42, 0.26	0.63	-0.17	-0.76, 0.42	0.56
Weekly Hours of Help	-0.01	-0.05, 0.04	0.77	0.02	-0.06, 0.09	0.70
Years of Experience in CACFP	0.01	-0.15, 0.17	0.89	0.00	-0.18, 0.19	0.98

^aModel 1 adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2: Model 1 + professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

[†]Sodium DRI ratio is the percentage of the DRI for sodium that is provided by a meal

Table 8B. Multiple linear regression to examine the association of lunch sodium DRI ratio[†] with lunch preparation time, among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Log (Lunch Preparation Time)	-7.73	-27.65, 12.19	0.44	-4.16	-24.76, 16.44	0.69
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	-3.50	-10.59, 3.59	0.33	-0.74	-8.62, 7.14	0.85
Average Number of Children	-0.01	-0.80, 6.64	0.12	-0.27	-2.02, 1.47	0.75
Weekly Hours of Help	-0.11	-0.28, 0.05	0.19	-0.09	-0.33, 0.15	0.46
Years of Experience in CACFP	0.48	-0.06, 1.02	0.08	0.56	-0.01, 1.12	0.05

^aModel 1 adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2: Model 1 + professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

[†]Sodium DRI ratio is the percentage of the DRI for sodium that is provided by a meal

Meal Preparation Time and Percent Calories from Sugar

Linear regression models showed that there was no association between breakfast or lunch preparation time and percent calories from sugar from breakfast or lunch, respectively

(Table 9A and 9B). In terms of professional characteristics, tier 1 reimbursement was associated with significantly fewer breakfast calories from sugar (Table 9A), but it became insignificant after adjusting for additional professional covariates (Model 2). None of the other professional covariates were associated with percent calories from sugar for breakfast or lunch menus.

Table 9A. Multiple linear regression to examine the association of percent breakfast calories from sugar with breakfast preparation time, among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Log (Breakfast Preparation Time)	3.35	-4.36, 11.07	0.39	5.02	-2.89, 12.93	0.21
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	-3.78	-7.44, -0.13	0.04	-3.78	-8.58, 1.02	0.12
Average Number of Children	0.14	-0.51, 0.79	0.67	0.28	-0.77, 1.32	0.60
Weekly Hours of Help	-0.04	-0.12, 0.04	0.34	-0.046	-0.18, 0.09	0.50
Years of Experience in CACFP	0.02	-0.29, 0.33	0.90	-0.01	-0.34, 0.31	0.93

^aModel 1 adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2: Model 1 + professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

Table 9B. Multiple linear regression to examine the association of percent of lunch calories from sugar with lunch preparation time, among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Log (Lunch Preparation Time)	1.93	-6.21, 10.07	0.64	3.97	-4.63, 12.57	0.36
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	-0.68	-3.55, 2.18	0.63	-0.08	-3.52, 3.05	0.89
Average Number of Children	-0.28	-0.77, 0.22	0.27	-0.12	-0.85, 0.61	0.74
Weekly Hours of Help	-0.05	-0.12, 0.02	0.14	-0.05	-0.15, 0.05	0.31
Years of Experience in CACFP	0.06	-0.16, 0.29	0.57	0.09	-0.14, 0.33	0.42

^aModel 1 adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2: Model 1 + professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

Meal Preparation Time and Percent Calories from *trans* Fat

Breakfast preparation time was found to be positively associated with percent calories from *trans* fat; however the association was not statistically significant (**Table 10A**). There was no association between time spent in lunch preparation and percent of lunch calories from *trans* fat (**Table 10B**). In terms of professional characteristics, reimbursement at the tier 1 rate was significantly associated with fewer breakfast calories from *trans* fat, both in the unadjusted and adjusted models (**Table 10A**).

Table 10A. Multiple linear regression to examine the association of percent of breakfast calories from *trans* fat with breakfast preparation time, among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Log (Breakfast Preparation Time)	0.36	-0.41, 1.12	0.35	0.64	-0.06, 1.35	0.07
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	-0.47	-0.83, -0.12	0.01	-0.69	-1.12, -0.26	0.00
Average Number of Children	-0.01	-0.07, 0.06	0.85	-0.10	-0.19, -0.00	0.05
Weekly Hours of Help	-0.00	-0.01, 0.01	0.98	0.01	-0.00, 0.02	0.09
Years of Experience in CACFP	0.02	-0.01, 0.05	0.17	0.03	-0.00, 0.05	0.09

^aModel 1 adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2: Model 1 + professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

Table 10B. Multiple linear regression to identify predictors of percent of lunch calories from *trans* fat among 59 family child-care providers in King County, Washington

	Model 1 ^a			Model 2 ^b		
	β	95% CI	P value	β	95% CI	P value
Log (Lunch Preparation Time)	0.14	-0.30, 0.57	0.52	0.16	-0.31, 0.63	0.49
Reimbursement Tier:						
Tier 2	Ref	-	-	Ref	-	-
Tier 1	-0.14	-0.31, 0.03	0.10	-0.11	-0.29, 0.07	0.23
Average Number of Children	0.00	-0.02, 0.03	0.77	-0.01	-0.05, 0.03	0.71
Weekly Hours of Help	0.00	-0.00, 0.00	0.78	0.00	-0.00, 0.01	0.53
Years of Experience in CACFP	0.00	-0.02, 0.01	0.50	0.00	-0.01, 0.01	0.94

^aModel 1 adjusted for participants' socio-demographic characteristics (age, race, household income, highest education attained) and energy content

^bModel 2 controls for participants' socio-demographic characteristics (age, race, household income, highest education attained), professional characteristics (reimbursement tier, average number of children in attendance, weekly hours of help, and years of experience in CACFP), and energy content

Qualitative Analysis

In order to more completely understand the influence of meal preparation time, menus from participants who reported the five most and the five least meal preparation times were qualitatively assessed. For breakfast, the five lowest preparation times ranged from 6.5 to 12 minutes, whereas the five highest preparation times ranged from 66 to 90 minutes. The menus of participants who reported the least preparation time served primarily cereal or a toasted grain product (e.g. bagel or toast), and fruit and/or milk. Interestingly, participants who reported the most breakfast preparation time also tended to serve cereal and toasted grain products with fruit and/or milk, but there was a greater frequency of hot breakfast items such as pancakes and waffles (made from mix) and eggs. Participants from both groups served a combination of fresh fruits (e.g. bananas, apples, oranges and nectarines) as well as canned fruit.

Similarly, menus from participants with the five highest and five lowest reported lunch preparation times were compared. The five lowest reported lunch preparation times ranged from

13 to 22 minutes, where the five highest reported preparation times ranged from 78 to 147 minutes. Frozen foods (e.g. frozen tater tots and fish sticks) were served in both groups, as were items that require minimal preparation (e.g. sandwiches and boxed macaroni and cheese). However, the group that reported the most meal preparation time also served dishes made from scratch (e.g. meatloaf and soup), whereas the participants who reported the least preparation time reported none. The group that reported more lunch preparation time also served cooked meat products like chicken breasts. Both groups served a combination of fresh and canned fruits and vegetables. Direct comparisons between specific meal preparation time and specific foods served could not be made because time use data and menu data were collected during different weeks.

Section Four: Discussion

The results presented here do not allow for rejection of the null hypothesis that food expenditure and nutritional quality of menus, as measured by MAR, sodium DRI ratio, percent calories from sugar, and percent calories from *trans* fat, are independent of meal preparation time. The lack of association between time spent in meal preparation and food expenditure as well as between time spent in meal preparation and measures of the nutritional quality of menus is contrary to the stated hypotheses.

It has been demonstrated both in the general population as well as in family child-care homes that increased food expenditure is associated with food of higher nutritional quality^{24,25,33,34}. However, family child-care providers receive limited reimbursement for meals, and therefore creative solutions may be required to maximize the health benefits of food purchased with limited funds. Where previously posited economic theories suppose that meal preparation time may be substituted for raw goods' expenditures^{13,14}, the results presented here suggest that child-care providers' food expenditure is independent of time spent in meal preparation. Others have hypothesized that a potential relationship between meal preparation time and food expenditure may be attenuated in low-income individuals, who are likely to have limited freedom in substituting money for time¹⁷. Therefore, one possible explanation for these null findings is that participants have little freedom to substitute food spending for meal preparation time due to limited funds. In other words, participants' food choice decisions may already be limited by their reimbursement such that opting to spend more money to save meal preparation time may not be an option. An interesting question for future research would be whether the relationship between meal preparation time and food expenditure differs in child-care providers who are reimbursed at different levels.

The lack of an observed association between meal preparation time and measures of nutritional quality of menus is similarly unexpected and contrary to the common belief that more healthful diets require more food preparation time. The relationship between meal preparation time and MAR at the lunch meal approaches statistical significance, however the results of this analysis cannot refute the independence of the two variables. Instead, what these results suggest is that encouraging providers to increase their time investment in meal preparation alone is insufficient to improve the nutritional quality of foods offered. Cooking skills education infused with nutrition education has been shown to improve nutritional quality of diets in other adult populations³⁵⁻³⁷, and may be an important factor in improving nutritional quality of menus served in child-care facilities. It is also important to consider the evolving market of convenience foods, which may include traditional items now available in modified varieties such as “low sodium” or “no high fructose corn syrup” that may make differences more difficult to detect using the nutrient based indicators utilized in this analysis. Similarly, stark differences in nutrient content may be diminished by traditionally nutrient poor foods that are now fortified with nutrients that were considered in computing MAR. Given these expanded options, individuals may be able to purchase convenience foods with a nutrient profile that, given the methods described here, are not markedly different from the nutrient profile of a more traditional “healthy” diet.

There was a direct, positive relationship between time spent in meal preparation and percent of calories from *trans* fat, which is contrary to the hypothesis that this relationship would be inverse. However, this relationship was not statistically significant and percent calories from *trans* fat was minimal for all providers, limiting the usefulness of this result.

In looking qualitatively at those menus of participants who reported the least and the most meal preparation times, we see a greater number of foods that require cooking and a greater

number of meals prepared from single ingredients in those providers who spend more time preparing meals. Conversely, while pre-prepared foods were served in both high and low reporters of meal preparation time, they were more common in participants who reported the least amount of meal preparation time. This supports the assumption that use of convenience foods is associated with less meal preparation time and that increased in-house food preparation is associated with increased meal preparation time. However, this relationship was not quantitatively assessed, and the data collection design makes it impossible to compare specific meal preparation time with specific menus.

In its report detailing updated recommendations for CACFP, the IOM suggests that, “reduced use of pre-prepared foods and increased in-house food production would be helpful in reducing sodium, solid fats, added sugars, and cost; technical assistance would help develop the skills needed.”⁸ It is important to consider the caveat that the education and cooking skills development may be essential if the benefits of increased meal preparation time are to be realized. The results of this analysis demonstrate that increased time spent in food preparation does not necessarily correlate with lower cost and improved nutritional quality of menus, and highlights the need to assess technical assistance and its ability to achieve cost and nutrition goals. What these results suggest is that encouraging providers to increase their time investment in meal preparation alone is insufficient to improve the nutritional quality of foods offered.

Strengths and Limitations

There are several limitations to this study. Participant recruitment and data collection methods were designed for the primary aim of describing the effect of CACFP reimbursement

policies on the nutritional quality of menus in the *Cost and Quality* study²⁴. As such, the sample size may be insufficient to detect relationships between time use and the dependent variables included here. Similarly, the sodium content of menus was not an outcome of the primary research question, and the degree of accuracy of participants' reporting added salt is unknown. Convenience sampling of family child-care providers also introduces the potential for selection bias. Furthermore, participants did not record food-related time use and menus simultaneously. Therefore, this analysis cannot compare specific meal preparation time to food served, and instead relies on the assumption that weekly averages for time use and foods served are indicative of typical behavior. Additionally, time use and menus were all self-reported. In terms of capturing time spent in various activities, time use diaries are likely more accurate than other methods such as recall²³. The null findings also raise questions about participants' interpretation of directions and whether the time use diaries were accurately able to capture meal preparation data. All dependent variables (food expenditure, MAR, sodium DRI ratio, and percentage of calories from sugar and *trans* fat) were based on foods that were offered in the family child-care homes, not necessarily those foods that were consumed by children. Lastly, because MAR is an aggregate measure of nutrient adequacy, deficiencies in key nutrients may be masked by adequacy in other nutrients.

Strengths of this study include the collection of food receipts to calculate food expenditure specific to each providers' shopping environment and habits. Where other studies have relied on income as a proxy for food expenditure, this study directly measures both food expenditure as well as meal preparation time. Furthermore, this study is the first to assess the impact of meal preparation time on food expenditure and nutritional quality of menus in a child-

care setting, and given childhood obesity concerns and recommendations from the IOM these discussions are particularly relevant.

Future Research

In the context of the nation's childhood obesity epidemic and the IOM's recent recommendations to the CACFP, research on influences of spending and nutritional quality of menus in child-care presents a rich opportunity. An important direction for future research would be to assess effectiveness of nutrition and culinary education for child-care providers, and to explore how such education might impact use of convenience foods, food expenditure, and nutritional quality of menus. Furthermore, most time use studies, including the present analysis, are based on the a priori assumption that use of convenience foods is inversely related to meal preparation time and vice versa – that making meals from scratch is directly related to meal preparation time. It would be useful to more completely understand the relationship between types of foods served – in terms of convenience foods versus foods prepared from scratch – and meal preparation time.

Additionally, because current CACFP Meal Requirements as well as many of the IOM's recommendations to CACFP are based on food components rather than on nutrient standards, future research should include a food based exploration of the impact of meal preparation time on food choices.

Section Five: Conclusion

In conclusion, the results of this analysis refute the hypothesis that child care providers who invest more time in meal preparation will have lower food expenditure and will serve meals of higher nutritional quality. Given the IOM's recent recommendations to redefine CACFP Meal Requirements, strategies for limiting the expected increased cost of meeting those standards should continue to be explored. In this sample of family child-care providers increased meal preparation time did not reduce food expenditures; however it is plausible that an increase in reimbursement rates could influence this effect. Similarly, no statistically significant effect of meal preparation time was seen on MAR, sodium DRI ratio, or percent calories from sugar or *trans* fat. However, given the limitations of nutrient based measures of menu quality, future research should explore the relationship between meal preparation time and other indicators of diet quality. Lastly, education may be a key component of capitalizing on meal preparation time, and future studies on the relationship between time use and menus in child-care settings should include an education component for child-care providers.

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Appendix A

Time Use Diary Date: _____ Participant ID: _____

We would like to know how much time you spend related to serving meals and snacks to the children in your care, including time spent on weekend days. Please complete this form as accurately as possible. Please fill in *either* the hours and minutes spent in the activity *or* the start and stop times of the activity. The information you provide on this form is for use by University of Washington researchers only and will not be seen by CACFP officials.

DAY _____

Question	Hours	Minutes	OR	Start time	Stop time	Refused	Don't Know	
Planning menus								
Preparing for food shopping								
Shopping for food								
Traveling for (to/from) food shopping								
Storing food								
Preparing & serving breakfast?								
Preparing & serving the (AM) morning snack?								
Preparing & serving lunch?								
Preparing & serving the (PM) snack?								
Cleaning up & completing the CACFP forms								

DAY _____

Question	Hours	Minutes	OR	Start time	Stop time	Refused	Don't Know	
Planning menus								
Preparing for food shopping								
Shopping for food								
Traveling for (to/from) food shopping								
Storing food								
Preparing & serving breakfast?								
Preparing & serving the (AM) morning snack?								
Preparing & serving lunch?								
Preparing & serving the (PM) snack?								
Cleaning up & completing the CACFP forms								

DAY _____

Question	Hours	Minutes	OR	Start time	Stop time	Refused	Don't Know	
Planning menus								
Preparing for food shopping								
Shopping for food								
Traveling for (to/from) food shopping								
Storing food								
Preparing & serving breakfast?								
Preparing & serving the (AM) morning snack?								
Preparing & serving lunch?								
Preparing & serving the (PM) snack?								
Cleaning up & completing the CACFP forms								

DAY _____

Question	Hours	Minutes	OR	Start time	Stop time	Refused	Don't Know	
Planning menus								
Preparing for food shopping								
Shopping for food								
Traveling for (to/from) food shopping								
Storing food								
Preparing & serving breakfast?								
Preparing & serving the (AM) morning snack?								
Preparing & serving lunch?								
Preparing & serving the (PM) snack?								
Cleaning up & completing the CACFP forms								

DAY _____

Question	Hours	Minutes	OR	Start time	Stop time	Refused	Don't Know	
Planning menus								
Preparing for food shopping								
Shopping for food								
Traveling for (to/from) food shopping								
Storing food								
Preparing & serving breakfast?								
Preparing & serving the (AM) morning snack?								
Preparing & serving lunch?								
Preparing & serving the (PM) snack?								
Cleaning up & completing the CACFP forms								

DAY _____

Question	Hours	Minutes	OR	Start time	Stop time	Refused	Don't Know	
Planning menus								
Preparing for food shopping								
Shopping for food								
Traveling for (to/from) food shopping								
Storing food								
Preparing & serving breakfast?								
Preparing & serving the (AM) morning snack?								
Preparing & serving lunch?								
Preparing & serving the (PM) snack?								
Cleaning up & completing the CACFP forms								

DAY _____

Question	Hours	Minutes	OR	Start time	Stop time	Refused	Don't Know	
Planning menus								
Preparing for food shopping								
Shopping for food								
Traveling for (to/from) food shopping								
Storing food								
Preparing & serving breakfast?								
Preparing & serving the (AM) morning snack?								
Preparing & serving lunch?								
Preparing & serving the (PM) snack?								
Cleaning up & completing the CACFP forms								

Appendix B.

MENU RECORD

☆ If you offer the children a choice of 2 or more items (for example: a choice of 3 different breakfast cereals or 2 different milks) please circle the items that were offered as alternatives. (See *milk and cereal on example sheet*)

DAY _____	FOOD	PACKAGE SIZE as purchased	TYPE	BRAND	FLAVOR/ Other Details	WHERE PURCHASED
Breakfast						
<i>Example: Cereal/Bread</i>	Bread	24 oz.	Whole Wheat	Orowheat		Safeway
<i>Example: Sweeteners/Condiments/Spreads</i>	PB	2 x 40 oz (multi-buy)	Creamy	Jif		Costco
Cereal/Bread						
Cereal/Bread						
Cereal/Bread						
Juice/Fruit						
Juice/Fruit						
Milk						
Milk						
Meat/or Protein						
Sweeteners/Condiments/Spreads						
Sweeteners/Condiments/Spreads						
Sweeteners/Condiments/Spreads						
AM Snack						
<i>Example: Bread/Alternate</i>	Banana Bread	See recipe record				
Bread/Alternate						
Bread/Alternate						
Fruit/Vegetable/Juice						
Fruit/Vegetable/Juice						
Milk						
Milk						
Meat/or Protein						
Meat/or Protein						
Sweeteners/Condiments/Spreads						
Sweeteners/Condiments/Spreads						

MENU RECORD

DAY _____	FOOD	PACKAGE SIZE as purchased	TYPE	BRAND	FLAVOR/ Other Details	WHERE PURCHASED
Lunch						
	Bread/Alternate					
	Bread/Alternate					
	Fruit/Vegetable/Juice					
	Fruit/Vegetable/Juice					
	Milk					
	Milk					
	Meat/or Protein					
	Meat/or Protein					
	Sweeteners/Condiments/Spreads					
	Sweeteners/Condiments/Spreads					
	Sweeteners/Condiments/Spreads					
PM Snack						
	Bread/Alternate					
	Bread/Alternate					
	Fruit/Vegetable/Juice					
	Fruit/Vegetable/Juice					
	Milk					
	Milk					
	Meat/or Protein					
	Meat/or Protein					
	Sweeteners/Condiments/Spreads					
	Sweeteners/Condiments/Spreads					

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