Child Care Centers and the Infant/Toddler Feeding Environment. Hamilton, Jean, Wasser, Heather, and Bentley, Margaret E,

Extended abstract

Background

The rising rate of overweight and obesity in the U.S. is a serious public health concern. These conditions are associated with increased mortality and morbidity from various diseases including heart disease, high blood pressure, and diabetes. Obesity is especially high among low income and minority populations. In addition there is the high rate of overweight among children, including very young children. The prevalence of overweight (weight-for-length >= 95th percentile) among infants from birth through 23 months old in the United States is currently estimated at 11.4%. Non-Hispanic blacks have higher rates (18.5%) compared to non-Hispanic whites (10%) (Ogden et al, 2002).

As part of the effort to understand the cause of rising rates of overweight and obesity, researchers are investigating feeding patterns during infancy, the incidence of infant risk of obesity, and the role it plays in subsequent obesity (Stettler et al, 2002; Gunnarsdottir and Thorsdottir, 2003). Infancy is a time when parents and other caregivers have virtually total control of what, where, when, and how infants eat. Therefore, the feeding environment not only includes the types of food presented, but also the location and timing of meals and snacks, and the interactions parents and caregivers have with children during feeding.

Nutrition research on child care settings focuses primarily on preschool children, not infants and toddlers. Much of this research concentrates on the nutrient and energy content of meals and snacks offered to and consumed by children 3 to 5 years of age (Oakley et al, 1995; Bollella et al, 1999; Briley et al, 1989, 1993, 1994, 1999; Bruening et al, 1999; Cowell et al, 1979; Crepinsek et al, 2002, 2004; Domer, 1983; Drake, 1991, 1992; Fox et al, 1997; Glantz et al, 1983; Glantz and O'Neill-Fox, 1982; Padgett and Briley, 2005). As part of the focus on nutrient content of food provided in child care settings, nutrition research also examines the benefits of the Child and Adult Care Food Program (CACFP). The CACFP is a U. S. Department of Agriculture (USDA) program that subsidizes the cost of meals and snacks for children in out of home care including child care centers. The aim of the CACFP is to improve nutrition and make child care more affordable for low income families; however, the results are not conclusive. In one study, Oakley (1995) finds that child care facilities participating in CACFP are more likely to report using the Dietary Guidelines for Americans in their menu planning for preschoolers, but this self-report does not translate into healthier menus. Bruening et al (1999) finds nutritional benefits for African American preschoolers receiving CACFP meals compared to meals brought from home. Glantz and O'Neill-Fox (1982) also find nutritional benefits in CACFP participation of child care centers and child care homes compared to centers who do not participate in CACFP.

We find only one study examining the influence of child care on the nutrient intake of toddlers, aged 15 to 24 months. Ziegler et al 2006 divide where toddlers eat into three locations (home, day care, or away). They find that meals and snacks eaten at day care compare favorably to those eaten at home. In fact, day care lunches are higher in nutrients from milk consumption. We find no studies on the quality of nutrition provided infants, aged 0-11 months or toddlers, aged 12-14 months in child care settings.

We also find no studies on the overall feeding environment of infants and toddlers in child care settings. However, some nutrition research does study teacher education and its relation to good nutrition. Gould-Gillis (1980) examines the nutrition knowledge and opinions of preschool teachers in relation to their education in early childhood and find no association. Similarly, Nahikian-Nelms (1997) finds no association between a preschool teacher's behavior at mealtime and her level of education or training in nutrition.

The rich and large literature by developmental psychologists and other social scientists takes a broad look at aspects of the child care environment in order to determine if the child care setting facilitates healthy cognitive, social, and physical development. This literature provides an approach for looking at the determinants of quality child care and the effects of quality on the development of children by using environmental measures. Much of this research focuses on process quality: the quality of the interaction between child and provider. The findings of this literature are that structural inputs such as larger staff-child ratio, smaller group size, more teacher education and training do lead to improvements in child care quality (Mocan et al, 1995). These results have important policy implications for how child care facilities are regulated. This research does study infants and toddlers as well as preschoolers; however, it examines a number of factors related to child development and does not focus on the feeding environment. Furthermore, not all researchers agree with the role of structural inputs. In particular, (Blau, 1997, 2000) challenges the view that larger staff-child ratios, smaller group size, and some types of education increase quality.

Thus, there is a gap in our understanding of infant and toddler feeding in child care centers because the nutrition literature focuses mostly on the nutrient value of menus of preschoolers while the child development literature looks broadly at the quality of the environment of which feeding is only one aspect. This study explores the gap by addressing the following questions: 1.What is the quality of the feeding environment for infant and toddlers? 2. Does the feeding environment differ with the overall quality of child care center? 3. Do for profit child care centers behave differently than not for profit? 4. Do child care centers that participate in the USDA Child and Adult Care Food Program (CACFP) behave differently than non-CACFP centers? 5. Do child care centers that serve predominantly African American children behave differently from those that serve non-African Americans? 6. Does teacher education matter? 7. Do staff-child ratios matter?

Data

The data for this study are based on formative research of regulated child care providers. This study is part of a larger study, the Infant Care, Feeding, and Risk of Obesity Study which examines infant feeding practices among low income African American mothers (Lederman, 2004). We draw data from a sample of 38 child care centers from five counties in the Piedmont region of North Carolina. Most centers (28) came from a random sample of centers stratified by county and three levels of overall quality. The rest of the centers (10) are drawn from centers who serve African American infants and toddlers from the larger study (the cohort). Either an infant or toddler classroom was observed in each center. Data are gathered from four sources. The child care administrator is interviewed about general features of the child care center. The child care teacher of the observed classroom is interviewed about her feeding practices and the foods eaten by the children in her care. The classroom is observed by Hamilton and the quality of the feeding environment is assessed using the meal/snack item from the revised Infant/Toddler Environmental Rating Scale (ITERS-R) created by Thelma Harms, Debby Cryer, and Richard M. Clifford (2003). Hamilton also developed an item to capture aspects of nutrition awareness that were missing from the ITERS-R. Administrative data from the North Carolina Division of Child Development is used for the overall quality rating, the star rating, of a center.

Study variables

The meal/snack item from the ITERS-R is our dependent variable, the measure of the feeding quality. The item is scored on a scale that ranges from 1 to 7, where 1 is inadequate, 3 is minimal, 5 is good, and 7 is excellent. Each scale (1, 3, 5, 7) has a list of indicators that are scored yes or no. The indicators capture four basic dimensions of the feeding environment. One dimension is food quality/quantity which is based on USDA CACFP guidelines for feeding children and the appropriateness of the food, e.g. does a food cause choking. A second dimension is child/teacher interactions. For example, does a teacher feed a child when he is hungry and does a teacher provide adequate supervision of infants and toddlers. A third dimension is sanitary procedures which captures how well teachers prevent viral and bacterial transmissions by keeping surfaces clean, food sanitary, and teacher and child hands clean. The fourth dimension is teacher/parent interaction which measures how well the caregivers and parents work together to provide information about what and how the child is eating. The scoring method is unique in that if any indicator under 1=inadequate is scored yes then the meal/snack item is score as a 1. A center can also score a 1 if the center fails to gain a majority of indicators for a 3 rating.

The independent variables are drawn from the child care quality literature. See table 1 for the list of all variables. The overall quality rating variable is based on the 5 point rating given by the North Carolina Division of Child Development (DCD). Centers receive 1 star for meeting the minimal requirements for licensure. They can voluntarily receive 2 – 5 stars by meeting higher requirements and undergoing quality assessments. We create three categories for overall quality with high quality equal to 4 or 5 stars, medium quality equal to 3 stars and low quality equal to 1 or 2 stars. The variables that measure participation in CACFP and for profit status are coded 1 if yes and 0 if no. Also, teacher

education is measured as a dichotomous variable, coded 1 if a center has any teacher with a B.A. or B.S. or higher in child development and 0 if it has none. There are two measures of staff/child ratio: staff/infant and staff/toddler. Both are dichotomous variables where the variable is coded 1 if the staff/child ratio is above the regulated minimum and 0 if the ratio is at the regulated minimum. (The regulated minimum in North Carolina is 1 teacher to 5 infants (0-12months) and 1 teacher to 6 toddlers (12-24months).The ethnic profile of infant and toddlers served is a dichotomous variable coded 1 if 50% or greater African American infants and toddlers and 0 otherwise. For the regression analysis we use the percent of African American infants and toddlers and the percent of teachers at the center with college degrees in child development instead of the dichotomous version. We also measure the size of the center.

Preliminary Findings

First of all, we find the overall level of the feeding quality to be 2.6 which is less than minimal. We first use bivariate analyses (ANOVA and t-tests) to answer our research questions on the determinants of the quality of the feeding environment. We find that high quality centers have a significantly higher mean level of the feeding environment (3.59) than medium centers (1.54). Low centers received a feeding quality level of 2.25. We find that centers who participate in CACFP have a lower level of quality (1.94) than non-CACFP centers (3.20). We do not find a statistically significant difference between for profit and not for profit centers. Centers that served 50% or more African American infants and toddlers had lower ratings (1.33) than those who served less than 50% (4.18). Nutrition training is not found to be significant. However, centers with teachers having a B.A. or B.S. in child development have higher quality (4.20) than those centers whose teachers did not have college degree in child development (1.57). Finally, centers whose staff/infant ratios are above the regulated minimum have a significantly higher score on the feeding quality (4.17) than centers who are at the regulated ratios (1.20). We find the same result for high staff/toddler ratio (3.84) compared to low (1.37).

We then use multiple regression analysis to examine a production function of the quality of the feeding environment to pinpoint the variables that have an impact after controlling for other factors. The independent variables are CACFP participation, nutrition training, center size, for profit status, percent of black infants and toddlers, the staff/infant ratio, and the percent of staff with B.A. or B.S. in child development. (The staff/toddler ratio was not entered with the staff/infant ratio because of high correlation between the two variables.) See table 3.

Three explanatory variables are significant. Centers with staff/infant ratios above the legal minimum have higher quality ($p < .001$). When the percent of African American infants and toddlers is higher, the quality is lower ($p < .01$). In addition, the higher is the percent of staff with a bachelor's degree in child development, the higher is the quality ($p<.05$) CACFP participation, for profit status, and center size are not found to be statistically significant.

Discussion

Our study points to an overall feeding environment that fails to meet minimal standards. Our results are consistent with findings from the North Carolina Rated License Assessment Project which evaluates reports an average meal/snacks score of 2.53 which is close to our score of 2.6 **(**Cassidy et al 2003).

The results of the bivariate and multivariate analysis point to a few factors that may affect the feeding environment for infants and toddlers. The fact that a better staff/infant ratio is associated with a higher quality feeding environment is consistent with the child development literature findings that higher staff/child ratio leads to better overall quality. Furthermore, we examine the reasons for low scores on the meals/snacks item. We find that centers whose staff/infant ratios are at the regulated minimum of 1 to 5 are usually scored inadequate (1) because they use inappropriate feeding practices. Infants are not held for bottle feeding but instead are fed in an infant bouncer seat or older infants and toddlers are allowed to walk around with bottles or sippy cups. We believe these practices occur because one caregiver has difficulty feeding and caring for five infants at the same time. Other reasons for inadequacy such as not sanitizing tables and trays and microwaving bottles may also arise because of time management issues.

A higher percentage of African Americans infants and toddlers in a center results in a lower quality feeding environment. In examining the reasons for the low scores (1 or 2) among providers with more than 50% African American infant and toddlers, we find that inappropriate feeding practices like not holding a child for bottle feeding is the main cause. However, if we look at those predominantly African American centers that also have a high staff/infant ratio, we find that the reason for a low score is more often a failure to provide well-balanced age-appropriate meals and snacks. We need to investigate if this latter result is due to a lack of training or different cultural norms.

The finding that centers with a higher percentage of teachers with bachelor's degree in child development have a higher feeding quality is consistent with the findings of the child development literature. Our crude measure of nutrition training was not included in this analysis because all but three centers had some sort of nutrition training. A better measure of the kind and timing of nutrition training is needed to understand if it would make a difference in the feeding quality.

Although centers who do not participate in CACFP are found to have higher feeding quality in the bivariate analysis, CACFP participation is not found to be significant in the multiple regression analysis. Therefore CACFP appears not to make a difference. One possible reason for that result is that we take a broad view of the feeding environment for infants and toddlers and even though CACFP centers may provide more nutritious meals, they may not do well on the other three dimensions of the feeding environment. Another possible explanation is that since all centers follow CACFP guidelines in North Carolina, there is no difference in the nutrition quality of meals and snacks or other dimensions of the feeding environment.

This study is exploratory and the results are preliminary. There may be selection bias in the sample in that centers volunteered to participate. Therefore, the quality may be higher in our sample than the general population of centers in North Carolina. In addition, selection bias enters in a center's choice of participating in CACFP or of having better ratios. The sample size also limits the number of explanatory variables in the regression leading to the possibility of bias due to omitted variables. The small sample size also makes finding significant differences more difficult when there is multicollinearity among the explanatory variables. Also, we use one classroom to proxy for the quality of all infant and toddler rooms in a center.

Despite the limitations, this study breaks new ground and points the way to future investigations. It highlights the importance of looking at the components of the environment and examining infants and toddlers. It shows that we need to explore further why centers with African American infants and toddlers have lower feeding quality. With this dataset we can examine other variables suggested by the literature, like teacher wage and expenditure on food. In addition we will review the scoring on the meal/snack item as it pertains to the diet composition of the menus as well as decompose the meal/snack item to understand better differences in diet composition and feeding behavior. Also, we will analyze the qualitative data gathered in this study to explore and illustrate how centers with high staff/infant ratio differ from those with the legal minimum and how centers who mostly serve African Americans differ from others. Furthermore, we will seek to analyze datasets with larger samples to see if we can confirm our preliminary findings on the determinants of the feeding environment for infants and toddlers in child care centers.

Table 1. Sample characteristics total and by cohort

Child Care Centers	Total sample N=38	Cohort Sample n=10	Non-cohort sample n=28
Characteristics Percentage/Mean (SD)			
Meals/snacks	2.6 (2.1)	1.3 (0.5)	3.1 (2.3)
Star quality High Medium Low	 44.7% 34.2 21.1	 30.0% 70.0 00.0	 50.0% 21.4 28.6
CACFP subsidy	47.4%	60.0%	42.9%
For profit	81.6%	90.0%	78.6%
High staff/infant ratio	47.4%	10.0%	60.7%
High staff/toddler ratio	50.0%	30.0%	57.1%
Percent African American infants and toddlers	50%	69%	41%
Percent of staff with BS/BA in early childhood	10%	2%	13%
Total enrollment of center	71.0 (42.5)	70.8 (47.7)	105.0 (65.8)

Table 2. Bivariate Analysis (ANOVA and t-tests)

Child Care Centers	Meals
Star quality[1]	
High	**3.59****
Medium	**1.54**
Low	**2.25**
CACFP subsidy	
0 = no	**3.20***
1 = yes	**1.94**
For profit	
0 = no	2.57
1 = yes	2.61
High staff/infant ratio	
0 = no	**1.20******
1 = yes	**4.17**
High staff/toddler ratio	
0 = no	**1.37******
1 = yes	**3.84**
Percent African American infants and toddlers	
0 if < 50%	**4.18******
1 if >= 50%	**1.33**
Percent of staff with BS/BA in early childhood	
0 if < 50%	**1.57******
1 if >= 50%	**4.20**
Nutrition training	
0 = no	1.67
1 = yes	2.69

* p< 0.10 ** p< 0.05 *** p< 0.01 ****p< 0.001

[1] ANOVA is used to compare means. The Bonferroni procedure for multiple comparisons finds for measure 1, the high star quality mean is significantly different from the medium and low; however, for the other measures, only the high star quality mean is significantly different from the medium star quality mean.

Table 3. Regression Results n=38

	Meals/snacks
CACFP subsidy	0.09
For profit	0.12
High staff/infant ratio	**1.78**** **
Percent African American infants and toddlers	**-2.29*****
Percent of staff with BS/BA in early childhood	**2.88***
Center size	0.00
Adj. R squared	0.71

* p< 0.10 ** p< 0.05 *** p< 0.01 ****p< 0.001

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