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MATERNAL DEPRESSION IN A RACIALLY AND SOCIOECONOMICALLY  
DIVERSE COHORT: INFLUENCES ON INFANT FEEDING PRACTICES.

by

Lauren M. Sims

A Thesis Submitted in Partial Fulfillment of the  
Requirements for the Degree of  
Master of Public Health

Major: Public Health

The University of Memphis

May 2013

## ABSTRACT

Sims, Lauren Michelle. MPH. The University of Memphis. May 2013.  
Maternal Depression in a Racially and Socioeconomically Diverse Cohort:  
Influences on Infant Feeding Practices. Fawaz Mzayek, MD, MPH, PhD:

Feeding practices during infancy and early childhood have lifelong effects on weight and relationships with food. With the growing prevalence of obesity in adults and children, early feeding practices are being examined more carefully as points in which public health interventions may be successful. Experts recommend that feeding practices be responsive in nature. Maternal depression has been shown to have deleterious effects on parenting practices, contributing to their unresponsiveness. As the responsive frameworks for parenting and feeding are similar, we expected to find similar effects of maternal depression on feeding practices. Maternal depression does, in fact, contribute to unresponsive feeding practices in our models. This study gives us a starting point to further explore the relationships of maternal depression and responsive feeding practices, in order to find interventions aimed at increasing the responsiveness of feeding practices in early childhood.

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## Introduction

The prevalence of obesity has grown to epidemic proportions in the United States, as well as around the world. A complex health problem, obesity affects both children and adults of all races and socioeconomic backgrounds. The increasing prevalence of overweight and obesity, especially among children, has brought this health problem much attention in recent years (Flegal, Carroll, Kit, & Ogden, 2012). The most basic cause of obesity is consuming more calories through food and drinks than one expends over a long period of time. This energy balance is fundamental to the study of obesity, but it does not explain the root causes of this health problem (Davis et al., 2007). Indeed, there are still many other facets of obesity that are not well understood. Exploring early feeding practices and the factors that affect them will provide new insights to one of the root causes of obesity, especially among children (Hurley & Black, 2011).

When researching obesity and weight gain in children, different approaches must be explored than when researching this health problem in adults. A population of children will be unique in that they are, to a large extent, not in control of their food intake. Therefore, examining feeding practices of their parents is a better way to discover habits that have deleterious effects on children's weight (Hurley & Black, 2011). Studies have shown that early feeding practices have life-long impacts on weight, relationships with food, and food choices (Hurley, Cross, & Hughes, 2011).

Nutrition experts recommend the same responsiveness in feeding practices that is recommended in the overall parenting style (Black & Aboud, 2011). Responsive parenting is conceptualized as a mutual process between parent and child consisting of four steps: “1) the caregiver creates a routine, structure, expectations, and emotional context that promotes interaction; 2) the child signals through motor actions, facial expressions, or vocalizations; 3) the caregiver recognizes the signals and responds promptly in a manner that is emotionally supportive, contingent on the signal, and developmentally appropriate; and 4) the child experiences a predictable response” (Black & Aboud, 2011, p. 1) Indeed, this framework, used in responsive parenting, is also applicable for responsive feeding. Parents who report responsive feeding practices are more likely to have children of healthy weights, who eat more fruits and vegetables, and who have a healthier relationship with food (Baughcum et al., 2011). On the other hand, parents who report nonresponsive feeding practices are more likely to have children who are under or overweight, eat fewer vegetables, and cannot control their food intake (Baughcum et al., 2011).

Mothers who suffer from postpartum depression are more likely to report nonresponsive parenting styles and a shorter duration of breastfeeding in young infants (Akman et al., 2008). However, less is known about the effects on feeding practices after breastfeeding is discontinued in these mothers (Dennis & McQueen, 2009). This study explores the relationship between markers of maternal depression and infant feeding practices after most mothers have

discontinued breastfeeding by examining their feeding practices one year after birth using data from the Conditions Affecting Neurocognitive Development and Learning in Early Childhood (CANDLE) Study.

### Methods

The CANDLE Study is located in Shelby County, Tennessee, which is the county surrounding the city of Memphis. This site was chosen because of the unique demographic characteristics found in this area. The study cohort is a representative sample of the population of Shelby County with 66% of study mothers being African American, 31% being Caucasian, 63% being single mothers, and 58% living in low income households. This unique population provides an opportunity to examine a plethora of factors, which may affect children who are growing up in these conditions. The study recruited 1503 participants between December 2006 and June 2011 and of those, 1474 are available for follow up.

CANDLE participants were recruited during their second trimester of pregnancy and are being followed until their child's third birthday. Study visits take place during the second and third trimesters of pregnancy, at birth, four weeks after birth, and annually thereafter. Data collected during the study includes information on demographics, physical health, environmental exposures, nutritional factors, psychosocial measures, biological specimens, and cognitive measures on both mothers and their children.



Data for this project will come from participant demographics collected at the enrollment visit during the mother's second trimester, participant demographics collected at the child's 12-month clinic visit, the Edinburgh Post-Natal Depression Scale collected at the child's 12 month clinic visit, and the Infant Feeding Practices Questionnaire collected at the child's 12 month clinic visit. All of these forms are administered at study visits completed in one of two clinics in Memphis.

The Edinburgh Post-Natal Depression Scale (EPDS) is a 10-item scale, which uses a simple scoring system and is designed to be a quick screening tool for post-partum depression in the community. The scale asks participants to choose answers based on their feelings in the previous seven days. An example of one of the items is "I have been able to laugh and see the funny side of things" with choices given from "As much as I always could, not quite so much now, definitely not so much now, and not at all." The sensitivity and specificity of the scale were 86% and 78%, respectively, and its validity is strengthened by its ability to measure changes in depression over time (Cox, Holden, & Sagovsky, 1987). Within the CANDLE Study, participants were asked to fill out the questionnaire on their own in the clinic setting at the first clinic visit, when children were between 12 and 18 months of age. Those considered at risk for depression, identified by scoring 13 or higher on the scale, were referred for further evaluation and followed up with by study coordinators.

The Infant Feeding Practices Questionnaire addresses seven types of feeding behaviors among parents including: 1) concern about infant under eating or becoming underweight, 2) concern about infant's hunger, 3) awareness of infant's hunger and satiety cues, 4) concern about infant overeating or becoming overweight, 5) feeding infant on a schedule, 6) using food to calm infant's fussiness, and 7) social interaction with the infant during feeding. The participants filled out this questionnaire on their own in the clinic during the first year clinic visit. The questionnaire consists of 28 questions, 17 of which refer to maternal feeding practices and the remaining 11 refer to maternal beliefs relating to food and weight in their children. The feeding practices section of the questionnaire offers the answers: never, rarely, sometimes, often, and always. The maternal beliefs section of the questionnaire offers the answers: disagree a lot, disagree a little, no strong feelings either way, agree a little, and agree a lot (Baughcum et al., 2001). This questionnaire, like the EPDS, was given to the mother to complete on her own during the 12 month clinic visit with the instructions to fill it out based on her experiences and feelings over the last six months.

### Analysis

The Infant Feeding Practices Questionnaire was not designed specifically to explore responsive feeding patterns. Therefore, we needed to find questions on the questionnaire, which represented the framework of responsive feeding. In discussing the framework of responsive feeding, a few distinct factors come up: being aware of and responding to a child's hunger and satiety cues and filling the

feeding context with positive interaction. In reflecting on these two factors, we were able to choose questions from the feeding practices questionnaire, which we believed accurately measured responsive feeding.

The following questions were chosen because of their relevance in the context of the responsive feeding framework: “Did you let your baby decide when he/she was finished eating?”, “Did you feed your baby extra just to be sure he/she got enough to eat?”, “Did you talk or sing to your baby while you fed him/her?”, “I believed it was important for my baby to finish all of the formula in his bottle.” We also assessed two questions which pointed out feeding related concerns: “If you saw a baby who was the same age as your son/ daughter, but weighed more, did you feel like you were not doing a good job feeding your son/ daughter?”, and “I was worried my baby would become overweight.”. The frequencies of responses for these questions are reported in Table 8.

We combined the first three options on the scale into the value of zero, which means “rarely”, and the last two options into a value of one, meaning “often”. We dichotomized these variables to simplify the interpretation of the results and ease their translation into feeding practices patterns.

The mother’s education level variable was categorized into less than a college degree (n = 597) and greater than or equal to college degree (n = 404). Depression was coded as either not depressed (n = 952), or at risk for depression (n = 49), using the same cut off point of 13 or higher, which is used clinically for this screener.

After recoding these variables, we used logistic regression to examine whether depression would be a predictor for each of these items on the questionnaire. In each model, race, ethnicity, education, and age of mother were included as confounders. Backward selection method was used to retain significant variables, with the “depression” variable forced into each model. Child’s gender, weight at birth, and gestational age of child at birth were first entered into the logistic regression equation then removed one step at a time using a significance cut point of  $p=.05$ .

## Results

Of the 1,474 CANDLE Study participants available for follow-up, 1,001 (68%) have completed the first year clinic visit and have complete data for both the Edinburgh postpartum depression screener and infant feeding practices questionnaire. Of these, 639 (63.8%) are African American, 338 (33.8%) are Caucasian, with 24 (2.4%) women identifying as other. A small number of participants identified themselves as Hispanic or Latino ( $n = 20$ ). Table 1 (Appendix A) reports the descriptive statistics of the population.

Tables 2-7 report the findings for each individual question studied. We found that depression was a significant predictor for the “often” response for the following questions: “Did you feed your baby extra just to be sure he/ she got enough to eat?”, “If you saw a baby who was the same age as your son/ daughter, but weighed more, did you feel like you were not doing a good job feeding your son/ daughter”, “I believed it was important for my baby to finish all the formula in his bottle.”, and “I was worried that my baby would become

overweight.”. Surprisingly, depression was not a significant predictor for the one question that addressed social interaction during feeding, “Did you talk or sing to your baby when you fed him/ her?”

For feeding practices questions, mothers at risk for depression were twice more likely to report feeding their children extra to be sure that they had enough to eat,  $p = .03$ , 95% CI: (1.06, 3.33), and they were 3.5 times more likely to report worrying that they were not doing a good job feeding their children,  $p < .001$ , 95% CI: (1.84, 6.55). For feeding beliefs questions, mothers at risk for depression were 2.5 times more likely to believe that it is important for their children to finish all of the formula in his or her bottle,  $p = .005$  95% CI: (1.32, 4.73), and they were twice more likely to be worried that their children will become overweight,  $p = .015$ , 95% CI: (1.15, 3.81). Depression was not a significant predictor for the questions, “Did you let your baby decide when he/ she was finished eating?” or “Did you talk or sing to your baby while you fed him/ her?”

## Discussion

The increasing prevalence of childhood obesity has made it necessary to find successful interventions for changing this trend. Since children are not in control of what they eat, or the social interactions surrounding food, it is necessary to intervene upon their parents to ensure success (Davis et al., 2007). Very few studies have examined the relationship between maternal depression and feeding practices after breastfeeding has been discontinued. This study found that depression is a significant predictor for feeding practices that are nonresponsive in nature. Maternal depression is a significant predictor for

reporting feeding children extra to be sure that they get enough to eat and believing that it is important for their babies to finish all of the formula in their bottles. These items are significant in the framework of responsive feeding because when mothers answer that they do feed their children extra or that they are reliant upon a number on a bottle, they are not relying on their child's hunger and satiety cues to ensure that they are eating enough. Therefore, children who are fed this way may grow up without being able to recognize their own hunger and satiety cues. Indeed, these items are examples of the main focus of responsive feeding because of their importance in children's later eating habits (Hurley, Black, Papas, & Caufield, 2008).

Additionally, mothers who are at risk of depression are more likely to report worrying that they are not doing a good job of feeding their children. This item is an important part of the responsive feeding framework in that those mothers who have this concern may be more likely to encourage excess food consumption in their children. Mothers who are at risk of depression may, therefore, be doubly likely to exhibit nonresponsive feeding behaviors because of the complex relationship between their concerns about their feeding practices and their inability to effectively rely on their children's hunger cues.

In addition, mothers at risk for depression were more likely to express concern about their children becoming overweight. This item is important because it may encourage mothers to overly restrict certain foods when their children get older. Research has shown that when foods are restricted too much, children actually tend to have more weight problems (Black & Aboud, 2011).

Therefore, this item may be an indicator of mothers who could become too restrictive in their feeding practices. Indeed, those mothers who are too restrictive are also not giving their children the right amount of control in their food intake.

The current body of literature does not include information about responsive feeding practices as children grow out of breastfeeding. This study is one of the first to explore the relationship between maternal depression and feeding practices, as children get older. Finding that depression does inhibit responsive feeding practices is important for our ability to create interventions based on responsive feeding practices in the future. From a public health perspective, prevention through early interventions with families is the best possible solution to the problem of obesity among children.

This study was limited in its inability to control for breastfeeding among these mother-child pairs. Some research has suggested that women who breastfeed are more likely to exhibit responsive feeding practices because they are accustomed to giving their child more control of the amount of food that he or she consumes. Indeed, those women who are breastfeeding will not be focused on a certain number of ounces of milk that their child needs to finish, but will be more familiar with the child's satiety cues. The roles of breastfeeding and maternal depression need to be examined thoroughly to ensure adequate understanding of their relationship with feeding practices. Additionally, this study was unable to control for the mother's weight at the one-year clinic visit. Certainly, weight may have an effect not only on depression in the mothers, but also on their feeding practices and concerns about their child becoming

overweight. While this study did include African American mothers, it did not include enough Hispanic or Latino mothers to examine their feeding practices in detail.

Future research should focus on expanding this framework of responsive feeding, as well as designing a tool to collect more detailed information on responsive feeding practices. Including the mother's physical measurements and breastfeeding history in future analyses will help further our understanding of this phenomenon. Also, future research should address the characteristics of feeding practices in Hispanic and Latino communities that may be influenced by their unique social and cultural factors. Comprehending the complex relationship between maternal depression and infant feeding practices will be imperative if we are to identify and intervene on behalf of the families who are at risk of creating a lifetime of unhealthy eating habits. Within the CANDLE study, it will be possible to examine this relationship more thoroughly after the fourth year clinic visits are complete. This visit will collect information on breastfeeding practices, maternal physical measurements, child physical measurements, feeding practices, and depression.

Once we have a thorough understanding of the relationship between maternal depression and infant feeding practices, researchers can design appropriate interventions and perform the necessary trials to test them, targeting at-risk families where children are likely to experience nonresponsive feeding practices. Additionally, researchers may be able to take into account cultural factors in order to tailor interventions to suit the needs of different cultural groups.



Obesity in childhood is not only a problem for the future; indeed, obese children have also recently been shown to have worse health in childhood, as well. More missed school, more visits to the pediatrician, and lower general health scores are all norms for children who are obese (Wijga et al., 2010). Sadly, obese children often face psychological battles, like self-esteem issues, which are also related to their weight because of the stigmatization that comes with this health condition (Hesketh, Wake, & Waters, 2004). Since children who are overweight or obese are more likely to suffer these deleterious physical, emotional, and social problems (Wijga et al., 2010), it is important that our goal remains prevention of this epidemic. Understanding the role of maternal depression and infant feeding practices is crucial for our ability to create tailored interventions to prevent this epidemic in the future.

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Appendix A

Table 1

*Background Characteristics of study participants (n = 1,001)*

	Average	SD
<i>Maternal Characteristics</i>		
Age (years)	28	5.50
<i>Race</i>		
	n	%
Caucasian	338	33.8
African American	639	63.8
Other	24	2.4
<i>Ethnicity</i>		
	n	%
Not Hispanic/ Latino	981	98.0
Hispanic/ Latino	20	2.0
<i>Education Level</i>		
	n	%
Less than college degree	597	59.6
College degree or beyond	404	40.4
<i>Mother's Insurance</i>		
	n	%
Public/ TennCare	524	52.3
Private	453	45.3

Table 1

*Background Characteristics of study participants (n = 1,001)*

<i>Mother's Insurance</i>	n	%
Other	24	2.4
<i>Maternal Depression</i>	n	%
Mothers who are not depressed	952	95.1
Mothers at risk for depression	49	4.9
<i>Infant Characteristics</i>	Average	SD
Gestational age at Birth (weeks)	38.8	1.90
Weight at birth (grams)	3227.2	567.3
<i>Sex of infant</i>	n	%
Male	496	49.6
Female	505	50.4

Table 2

Question 1 “Did you let your baby decide when he/she was finished eating?”

	OR	95% CI	p-value
At risk of depression compared to no depression	1.38	(.32, 5.95)	.664
Maternal Age	1.01	(.95, 1.07)	.762
Other compared to African American	1.22	(.14, 10.74)	.856
Caucasian compared to African American	3.42	(1.16, 10.06)	.025
Hispanic/ Latino compared to not Hispanic/ Latino	.49	(.10, 2.43)	.386
College degree and above compared to no college degree	3.64	(1.32, 10.08)	.013

Table 3

Question 2 “Did you feed your baby extra just to be sure he/she got enough to eat?”

	OR	95% CI	p-value
At risk of depression compared to no depression	1.96	(1.11, 3.48)	.021
Maternal Age	1.00	(.97, 1.02)	.728
Other compared to African American	.92	(.38, 2.24)	.847
Caucasian compared to African American	.82	(.61, 1.11)	.199
Hispanic or Latino compared to not Hispanic/Latino	.41	(.13, 1.25)	.115
College degree and above compared to no college degree	.85	(.62, 1.16)	.307



Table 4

Question 3 “Did you talk or sing to your baby while you fed him/her?”

	OR	95% CI	p-value
At risk of depression compared to no depression	1.38	(.48, 3.96)	.546
Maternal Age	1.05	(1.00, 1.10)	.036
Other compared to African American	2.48	(.32, 19.26)	.385
Caucasian compared to African American	1.72	(.99, 2.96)	.053
Hispanic or Latino compared to not Hispanic/Latino	.86	(.19, 3.91)	.847
College degree and above compared to no college degree	1.11	(.65, 1.89)	.706

Table 5

Question 4 “If you saw a baby who was the same age as your son/daughter, but weighed more, did you feel like you were not doing a good job feeding your son/daughter?”

	OR	95% CI	p-value
At risk of depression compared to no depression	3.47	(1.84, 6.55)	<.001
Maternal Age	.97	(.94, 1.01)	.168
Other compared to African American	1.24	(.39, 3.89)	.717
Caucasian compared to African American	.56	(.35, .90)	.016
Hispanic or Latino compared to not Hispanic/Latino	.84	(.19, 3.81)	.824
College degree and above compared to no college degree	1.26	(.80, 2.00)	.321

Table 6

Question 5 “I believed it was important for my baby to finish all of the formula in his bottle.”

	OR	95% CI	p-value
At risk of depression compared to no depression	2.50	(1.32, 4.73)	.005
Maternal Age	.96	(.94, .99)	.002
Other compared to African American	2.41	(.99, 5.90)	.054
Caucasian compared to African American	.83	(.62, 1.11)	.210
Hispanic or Latino compared to not Hispanic/Latino	.87	(.34, 2.18)	.759
College degree and above compared to no college degree	.80	(.59, 1.09)	.157

Table 7

Question 6 “I was worried that my baby would become overweight.”

	OR	95% CI	p-value
At risk of depression compared to no depression	2.10	(1.15, 3.81)	.015
Maternal Age	.99	(.96, 1.02)	.451
Other compared to African American	1.45	(.51, 4.12)	.482
Caucasian compared to African American	1.36	(.95, 1.93)	.093
Hispanic or Latino compared to not Hispanic/Latino	.35	(.08, 1.57)	.170
College degree and above compared to no college degree	.60	(.41, .88)	.009

Table 8

*Frequencies of answers to selected questions from the Infant Feeding Practices Questionnaire.*

	“Never” N(%)	“Rarely” N(%)	“Sometimes” N(%)	“Often” N(%)	“Always” N(%)
Question 1*	25(2.5)	19(1.9)	115(11.5)	291(29.1)	551(55.0)
Question 2*	324(32.4)	299(29.9)	272(27.2)	69(6.9)	37(3.7)
Question 3*	38(3.8)	58(5.8)	317(31.7)	330(3.3)	258(25.8)
Question 4*	770(7.7)	104(10.1)	78(7.8)	27(2.7)	22(2.2)
Question 5*	305(30.5)	198(19.8)	212(21.2)	201(20.1)	85(8.5)
Question 6*	679(67.8)	110(11.0)	88(8.8)	99(9.9)	25(2.5)

\*Question 1- “Did you let your baby decide when he/she was finished eating?”

Question 2- “Did you feed your baby extra just to be sure he/ she got enough to eat?”

Question 3- “Did you talk or sing to your baby while you fed him/ her?”

Question 4- “If you saw a baby who was the same age as your son/ daughter, but weighed more, did you feel like you were not doing a good job feeding your son/ daughter?”

Question 5- “I believed it was important for my baby to finish all the formula in his bottle.”

Question 6- “I was worried that my baby would become overweight.”