

# **The Neonatal Intensive Care Unit as a Facilitator of Breastfeeding Among a Nationally Representative Sample of Low Birth Weight Infants**

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## Introduction

Medical and public health literature has established breastfeeding as the preferred method of feeding for all infants due to the many documented benefits, such as improved cognitive performance (Kramer, 2008), decreased risk of sudden infant death syndrome (Hauck 2011), and a decreased risk for asthma and allergies (Heinig et al, 2001). Among low birth weight (LBW) infants, breastfeeding within the first 24 hours after birth can significantly reduce the infant's odds of neonatal mortality (Breastfeeding of low-birth-weight..., 2014), and increase protection from the complexities associated with being LBW, including neonatal death, decreased neurodevelopment and physical functioning, lung disease, necrotizing enterocolitis and decreased educational attainment in adulthood (Paneth, 1995; Vohr, 2000; Goldenberg & Culhane, 2007).

Currently, 77% of women in the United States initiate breastfeeding at some point with their infants ("Breastfeeding Report Card" 2013). However, there are no publications on rates of mothers in the United States who initiate breastfeeding among low birth weight infants. In addition, while there are studies on the potential effectiveness of interventions in neonatal intensive care units (NICU), no study has examined differences in breastfeeding of LBW infants by number of days in the NICU. Children who are born low birth weight are likely to have a number of risk factors that make them at risk for being bottle-fed rather than breastfed. However, if they are in the NICU for any amount of time, there is an opportunity for the hospital staff to intervene and encourage the mother to breastfeed her low birth weight infant. Previous studies have shown that women who have taken breastfeeding classes are more likely to breastfeed after the child is born and this type of intervention can work in a similar fashion for women who may not have had that type of opportunity (Persad, 2008).

Therefore, the objective of this study is twofold: 1) To describe characteristics of the mothers of the low birth weight infants and their breastfeeding behaviors that in a nationally representative sample; and 2) To investigate how number of days in the neonatal intensive care unit (NICU) is associated with the likelihood of LBW infants ever being breastfed. It is hypothesized that infants who spend any amount of time in the NICU will be more likely to breastfeed because they will be exposed to nursing staff who will encourage the mothers to breastfeed while the child is in the NICU.

## Data

The Early Childhood Longitudinal Program – Birth Cohort (ECLS-B) is a nationally representative survey of all children born in the United States in 2001 (Najarian 2010). Children were sampled by randomly selecting birth certificates registered with the National Center for Health Statistics. Ninety-six core counties were used as primary sampling units. Low birth weight infants were oversampled.

## Measures

**Ever Breastfed.** A dichotomous variables taken from the wave 1 questionnaire that is filled out when the child is ~9 months old (1=yes). Missing variables were filled in with data from the wave two data filled out when the child is ~2 years old.

**Number of Days in the Neonatal Intensive Care Unit (NICU).** This variable is taken from the 9-month questionnaire. It is coded as a set of three dummy variables, '0 days in the NICU,' '1 day to two weeks in the NICU' and 'more than two weeks in the NICU.' '1 day to two weeks in the NICU' is used as the reference.

**Control Variables.** A set of sociodemographic controls is also entered into the model to control for potential confounding factors. These variables are: mother's age, average number of years of education the mother has earned at the time of the child's birth, if the mother is living 185% of the poverty line or below, if the mother is foreign born and race. Variables for the mother are used, because these are the variables most likely to affect whether or not the child is born low birth weight.

Mother's age at the time of the child's birth is entered as a continuous variable. Mother's education is measured in years of schooling (ranging from 0 to 17) and also entered as a continuous variable. The poverty measure is dichotomized, 1 equals yes, living 185% of the poverty line or below. Foreign born is also dichotomized (1=yes). Mother's race/ethnicity was taken from the first wave questionnaire. A series of dummy variables was created for each of the following categories: 'Non-Hispanic White' (reference), 'Non-Hispanic Black,' 'Asian,' 'Hispanic,' and 'Other.'

## **Results**

Only 42% of low birth weight infants were found to be ever breastfed (Table 1). Surprisingly, 91% of infants born low birth weight are able to go home without spending any time in the NICU. However, 5% of these infants spend 1 day to two weeks in the NICU and 4% spend over 2 weeks. The average education of the mother's is 12 years and the percent living at only 185% of the poverty line or less is 60%. White women make up 47% of the low birth weight infant mothers, but 77% of the U.S. population is White. Black women make up 25% of the low birth weight infant mothers, but only 13.2% of the U.S. population is Black (USA: State & County QuickFacts, 2014).

Table 2 illustrates the results of univariate and multivariate logistic regressions. The univariate logistic regression results suggest that infants who spend 0 days in the NICU and infants who spend more than 2 weeks in the NICU are 74% ( $p < .01$ ) and 78% ( $p < .01$ ) less likely to ever breast feed relative to infants spend 1 day to 2 weeks in the NICU. When sociodemographic controls are entered into the model we find that infants who spend 0 days in the NICU and infants who spend more than 2 weeks in the NICU are 78% ( $p < .001$ ) to 82% ( $p < .001$ ) less likely to ever breast feed relative to infants spend 1 day to 2 weeks in the NICU. Controlling for relevant predictors of breastfeeding such as marital status, poverty and education actually made the results stronger. This disproves the hypothesis that infants who spend longer amounts of time in the NICU will be less likely to breastfeed. Instead, a pattern emerges where infants who spend a moderate amount of time (1 day to 2 weeks) in the NICU are more likely to breastfeed than infants who spend no time or more than 2 weeks).

## **Discussion**

This study contributes to the public health and demographic literature in two ways. First, it utilizes a unique dataset and provides the first set of descriptive characteristics of low birth weight infants that are nationally representative. Second, it answers a unique research question, "how is time in the NICU associated with the likelihood that an infant will ever be breastfed?" that has previously been unanswered due to a lack of data. We obtained the surprising result that spending no time in the NICU or spending more than 2 weeks in the NICU are both associated with lower relative odds of ever breastfeeding than spending 1 day to 2 weeks in the NICU.

However, the descriptive statistics of the mother's of the infants revealed that these mothers have an average education of only 12 years (high school), are likely to be either living at the poverty line or slightly above the poverty line when the child is nine months old. These are all risk factors choosing not to breastfeed. It is possible that that spending a short of amount of time in the hospital with knowledgeable staff may serve as a breastfeeding intervention for mother's of low

birth weight infants. It may be the first time these mothers are exposed to information on the benefits of breastfeeding as well help from a trained professional on how to breastfeed an infant appropriately. This may be especially important when the baby is born low birth weight and the mother is unsure if breastfeeding is still appropriate.

This study is limited by the lack of any type of measure of breastfeeding intent or variable for having taken a breastfeeding class prior to giving birth. Both of these variables would be helpful in figuring out if time in the NICU is truly acting as an intervention. Therefore, future research should compare the low birth weight breastfeeding rates of women in the NICU to those who did not enter the NICU as well as obtain some measure of their pre-partum intent. It is not clear if women who do not spend time in the NICU are less likely to breastfeed than women who spend a short to moderate amount of time in the NICU because never intended to breastfeed, or because they think should not breastfeed a child who is low birth weight. This information may allow researchers to understand the mechanism behind these results so that a potentially low-cost intervention could be attempted outside of the NICU environment for all mothers of low birth weight infants to increase breastfeeding rates among this disadvantaged group.

**Table 1. Descriptive Statistics of Mothers and Infants Born Low Birth Weight**

<b>Variable</b>	<b>Mean or Percent</b>	<b>SD</b>
Infant Ever Breastfed ( <i>I=yes</i> )	42%	
Number of Days Infant in the Neonatal Intensive Care Unit (NICU)		
0 Days	91%	
1 day - 2 weeks ( <i>reference</i> )	5%	
More than 2 weeks	4%	
<i>Sociodemographic Characteristics</i>		
Mother's Age in years at Time of Birth	27	6.83
Mother's Average Number of Years of Education at Time of Birth	12	2.64
Mother Married at Time of Birth ( <i>I=yes</i> )	54%	
Living at 185% of Poverty Line or Below when child is 9 months ( <i>I=yes</i> )	60%	
Mother is Foreign Born ( <i>I=yes</i> )	22%	
Mother's Race ( <i>I=yes</i> )		
White Non-Hispanic ( <i>reference</i> )	47%	
Black	25%	
Asian	3%	
Hispanic	22%	
Other	3%	

*Source:* Waves 1 and 2 of the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B)

**Table 2. Logistic Regressions Examining the Relationship Between Number of Days in the NICU and Ever Breastfeeding Among Low Birth Weight Infants in the United States**

	Univariate	95% CI	Multivariate	95% CI
<i>Number of Days Infant in the Neonatal Intensive Care Unit (NICU)</i>				
0 Days	0.26**	.12 - .54	0.22***	.10 - .54
1 day - 2 weeks ( <i>reference</i> )	--		--	
More than 2 weeks	0.22**	.09 - .53	.18***	.07 - .47
<i>Sociodemographic Variables</i>				
Mother's Age in years at Time of Birth ( <i>cont.</i> )			0.97**	.95 - .99
Mother's Average Number of Years of Education at Time of Birth ( <i>cont.</i> )			1.13**	1.05 - 1.21
Mother Married at Time of Birth ( <i>1=yes</i> )			2.02***	1.44 - 2.81
Living at 185% of Poverty Line or Below when child is 9 months ( <i>1=yes</i> )			.69*	.47 - .99
Mother is Foreign Born ( <i>1=yes</i> )			2.29***	1.49 - 3.51
Mother's Race ( <i>1=yes</i> )				
White Non-Hispanic ( <i>reference</i> )			--	
Black			.69*	.50 - .94
Asian			0.79	.4 - 1.54
Hispanic			1.45	.95 - .99
Other			0.82	.36 - 1.86
Constant	5.21***	2.43-11.15	2.17	.53 - 8.94

\*p<.05 \*\*p<.01 \*\*\*p<.001

Source: Waves 1 and 2 of the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B)

## References

- Breastfeeding Report Card. (2013) Retrieved September 23, 2013, from <http://www.cdc.gov/breastfeeding/pdf/2013BreastfeedingReportCard.pdf>
- Breastfeeding of low-birth-weight infants. (2014). e-Library of Evidence for Nutrition Actions (eLENA) Retrieved September 12, 2014, from [http://www.who.int/elena/titles/supplementary\\_feeding/en/](http://www.who.int/elena/titles/supplementary_feeding/en/)
- USA: State & County QuickFacts. (2014) Retrieved September, 23, 2014, from <http://quickfacts.census.gov/qfd/states/00000.html>
- Goldenberg, R. L., & Culhane, J. F. (2007). Low birth weight in the United States. *Am J Clin Nutr*, 85(2), 584S-590S.
- Hauck, F. R., Thompson, J. M. D., Tanabe, K. O., Moon, R. Y., & Vennemann, M. M. (2011). Breastfeeding and Reduced Risk of Sudden Infant Death Syndrome: A Meta-analysis. *Pediatrics*, 128(1), 103-110. doi: 10.1542/peds.2010-3000
- Heinig, M. J. (2001). Host Defense Benefits of Breastfeeding for the Infant: Effect of Breastfeeding Duration and Exclusivity. *Pediatric Clinics of North America*, 48(1), 105-123. doi: [http://dx.doi.org/10.1016/S0031-3955\(05\)70288-1](http://dx.doi.org/10.1016/S0031-3955(05)70288-1)
- Kramer, M. S., Aboud, F., Mironova, E., & et al. (2008). Breastfeeding and child cognitive development: New evidence from a large randomized trial. *Archives of General Psychiatry*, 65(5), 578-584. doi: 10.1001/archpsyc.65.5.578
- Najarian, M., Kyle Snow, Jean Lennon, Susan Kinsey, Gail Mulligan. (2010). Early Childhood Longitudinal Study, Birth Cohort (ECLS-B): Preschool—Kindergarten 2007 Psychometric Report. Retrieved from <http://nces.ed.gov/pubs2010/2010009.pdf>
- Paneth, N. S. (1995). The Problem of Low Birth Weight. *The Future of Children*, 5(1), 19-34.
- Vohr, B. R., Wright, L. L., Dusick, A. M., Mele, L., Verter, J., Steichen, J. J., . . . Kaplan, M. D. (2000). Neurodevelopmental and functional outcomes of extremely low birth weight infants in the National Institute of Child Health and Human Development Neonatal Research Network, 1993-1994. *Pediatrics*, 105(6), 1216-1226.