

# Breastfeeding and Later Psychosocial Development of Children at 6 Years of Age

## abstract

**OBJECTIVE:** To examine the association of breastfeeding duration with psychosocial development at 6 years of age.

**METHODS:** We analyzed data from the 2005–2007 Infant Feeding Practices Study II and its 2012 Year 6 Follow-Up ( $N = 1442$ ). Our breastfeeding duration variable combined overall and exclusive breastfeeding reported during infancy (never breastfed, breastfed <6 months, breastfed  $\geq 6$  months + exclusive breastfeeding <3 months, and breastfed  $\geq 6$  months + exclusive breastfeeding  $\geq 3$  months). Maternal responses to the Strengths and Difficulties Questionnaire were used to create our child psychosocial outcome domains (emotional symptoms, conduct problems, hyperactivity, peer problems, prosocial behavior, and total difficulties). Separate multivariable logistic regression models controlling for maternal sociodemographic characteristics, maternal mental health, and child characteristics were used to assess the likelihood of having difficulties on the 6 domains based on breastfeeding duration.

**RESULTS:** Compared with children who were never breastfed, those who were breastfed for  $\geq 6$  months and exclusively breastfed for  $\geq 3$  months had decreased odds of difficulties with emotional symptoms (odds ratio [OR]: 0.52; 95% confidence interval [CI]: 0.27–0.99), conduct problems (OR: 0.24; 95% CI: 0.10–0.54), and total difficulties (OR: 0.39; 95% CI: 0.18–0.85) before adjustment. These associations were no longer significant after adjustment.

**CONCLUSIONS:** Although in our unadjusted analyses we observed significant associations between breastfeeding duration and later psychosocial development, including decreased odds of emotional, conduct, and total difficulties at 6 years of age, these findings were no longer detectable after adjusting for the many potential confounding factors that play a role in psychosocial development. *Pediatrics* 2014;134:S36–S41

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### KEY WORDS

breastfeeding, child, social psychology, behavior, Strengths and Difficulties Questionnaire

### ABBREVIATIONS

CI—confidence interval  
IFPS II—Infant Feeding Practices Study II  
NHIS—National Health Interview Survey  
OR—odds ratio  
PROBIT—Promotion of Breastfeeding Intervention Trial  
SDQ—Strengths and Difficulties Questionnaire  
WIC—Special Supplemental Nutrition Program for Women, Infants, and Children  
Y6FU—Year 6 Follow-Up

Dr Lind conceptualized and designed the study and drafted the initial manuscript; Drs Li, Perrine, and Schieve provided input during the conceptualization and study design and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

[www.pediatrics.org/cgi/doi/10.1542/peds.2014-0646G](http://www.pediatrics.org/cgi/doi/10.1542/peds.2014-0646G)

doi:10.1542/peds.2014-0646G

Accepted for publication May 20, 2014

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PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

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**FINANCIAL DISCLOSURE:** The authors have indicated they have no financial relationships to disclose.

**FUNDING:** This study was funded by the US Food and Drug Administration, Centers for Disease Control and Prevention, Office on Women's Health, National Institutes of Health, and Maternal and Child Health Bureau in the US Department of Health and Human Services.

**POTENTIAL CONFLICT OF INTEREST:** The authors have indicated they have no potential conflicts of interest to disclose.

Many health benefits associated with breastfeeding, such as a lower risk of several infections and diseases for infants and a lower risk of certain cancers for mothers, are well established.<sup>1</sup> Nonetheless, knowledge gaps remain in several areas, including whether breastfeeding is associated with any subsequent psychosocial effects in the child. Often, a mother reports that a desire for a close bond with her infant is a major factor in her decision to breastfeed,<sup>2–5</sup> and it has been theorized that this intimate mother-infant bond could be a potential mechanism by which breastfeeding may lead to improved social and behavioral outcomes later in childhood.<sup>6,7</sup> Data from the 2001–2007 National Health Interview Survey (NHIS) indicate that ~7% of US children aged 4 to 17 years have some type of emotional or behavioral problem.<sup>8</sup> Moreover, NHIS 2006–2008 data indicate that 15% of US children aged 3–17 years have been diagnosed with a developmental disability (physical, mental, or behavioral),<sup>9</sup> a 17% increase in prevalence compared with the 1997–1999 time period. The increase is driven by 2 behavioral conditions, autism and attention-deficit/hyperactivity disorder. Given the high prevalence of psychosocial problems in children, it is important to examine potential protective factors, such as breastfeeding.

To date, there have been relatively few studies conducted to investigate this relationship. Among the limited number of studies, there have been inconsistent findings, with some studies observing that breastfeeding is associated with fewer psychosocial difficulties later in life,<sup>10–12</sup> whereas others observed that, after adjusting for the many potential confounding factors that may play a role in psychosocial development (ie, socioeconomic, parental, and behavioral factors), the association was either greatly reduced<sup>13,14</sup> or no longer

present.<sup>15–17</sup> The purpose of the current analysis was to examine the association of breastfeeding duration with later psychosocial development of children at 6 years of age by using data from a large longitudinal study, which provided an opportunity to more fully adjust for potential confounding factors than most previous studies.

## METHODS

### Study Population and Data Collection

The Infant Feeding Practices Study II (IFPS II) and its Year 6 Follow-Up (Y6FU) is the largest longitudinal study in the United States to examine infant feeding practices and their long-term consequences.<sup>18,19</sup> The IFPS II followed mothers and infants from late pregnancy through 1 year postpartum to understand infant feeding patterns, infants' health, factors that may affect infant feeding, and mothers' health and diet. Data were collected from May 2005 through June 2007 by using a nationally distributed consumer opinion panel.

In 2012, the Y6FU contacted members of the original sample when the children were ~6 years old to collect data regarding the child's diet quality, health, and development. Questionnaires were sent to 2958 mother-infant pairs from IFPS II who had completed the original neonatal questionnaire and were not subsequently disqualified; 52% ( $n = 1542$ ) responded and provided data for the follow-up study. The Y6FU data were collected through mail questionnaires and telephone interviews from March through June 2012. All questionnaires and procedures were approved by the US Food and Drug Administration's institutional review board and the US Office of Management and Budget. Detailed information on the Y6FU is available in the methods article by Fein et al<sup>19</sup> in this supplement.

### Variable Definitions

Data on breastfeeding were collected in each questionnaire of the IFPS II throughout infancy. These data were used to construct the overall breastfeeding duration and exclusive breastfeeding duration composite variables included in the final IFPS II database. Overall breastfeeding duration was asked directly and calculated on the basis of each mother's report of her infant's age when she completely stopped breastfeeding and pumping milk. Exclusive breastfeeding was defined as having received breast milk only and no other solid or liquid. Duration of exclusive breastfeeding was not asked directly; therefore, exclusive breastfeeding duration was calculated by estimating the midpoint between the infant's age on the last questionnaire in which the mother indicated exclusive breastfeeding and the infant's age on the first questionnaire in which she indicated that she was not exclusively breastfeeding.<sup>18</sup> Our predictor variable, breastfeeding duration, combined the overall and exclusive breastfeeding duration composite variables and was categorized as follows: never breastfed, breastfed <6 months, breastfed ≥6 months but exclusively breastfed <3 months, and breastfed ≥6 months and exclusively breastfed ≥3 months.

As a part of the Y6FU, mothers were asked about 25 attributes that describe children's psychosocial development; these questions were used in the 2001 NHIS<sup>20</sup> and were derived from the Strengths and Difficulties Questionnaire (SDQ), a behavioral screening questionnaire valid for completion by parents or teachers of 4- to 16-year-olds.<sup>21</sup> The 25 attributes included in the Y6FU represent 5 SDQ scales (5 attributes for each scale): emotional symptoms, conduct problems, hyperactivity, peer problems, and prosocial behavior. Mothers ranked each of their child's

attributes during the previous 6 months by using a 3-point Likert scale: not true, somewhat true, and certainly true. Versions of the SDQ translated into >70 languages, as well as SDQ scoring algorithms, are available on the SDQ Web site ([www.sdqinfo.com](http://www.sdqinfo.com)); these scoring algorithms were used for our analysis.<sup>22</sup> Briefly, each attribute was scored as 0 = not true, 1 = somewhat true, or 2 = certainly true (positive items, with the exception of the prosocial scale, were reverse coded: 2 = not true, 1 = somewhat true, or 0 = certainly true), and scores for the 5 attributes in each scale were summed to generate scale scores that ranged from 0 to 10. The scores for the 4 problem scales (emotional symptoms, conduct problems, hyperactivity, and peer problems) were summed to generate a total difficulties score that ranged from 0 to 40. As is standard, the prosocial score was not included in the total difficulties score because it is considered a positive factor and “its absence is conceptually different from the presence of psychological difficulties.”<sup>21</sup>

For the 4 problem scales and total difficulties, lower scores are desirable and reflect lower difficulties, whereas higher scores are desirable for the prosocial scale.<sup>23</sup> Given that ~10% of a sample usually scores in the high difficulties category, we dichotomized our SDQ scale scores by defining >90th percentile (<10th percentile for the prosocial scale) of the distribution of the SDQ scores in our study population as high difficulties (Table 1).<sup>22</sup> The SDQ scales have been dichotomized similarly in previous studies<sup>10,13,16</sup> and our high difficulties cutoffs are consistent with those defined by using US normative data.<sup>23</sup> Throughout the remainder of this report we refer to a child having high difficulties, simply as having “difficulties.”

Covariates were selected on the basis of past research documenting associa-

**TABLE 1** Likelihood of Having High Difficulties in Domains Measured by the SDQ at 6 Years of Age, by Breastfeeding Duration: Y6FU

SDQ Domain (High Difficulties Scores)	Crude OR (95% CI)	aOR <sup>a</sup> (95% CI)
<b>Emotional symptoms (4–10)</b>		
Never breastfed	Reference	Reference
Breastfed <6 months	0.97 (0.57–1.63)	1.04 (0.59–1.81)
Breastfed ≥6 months + exclusive breastfeeding <3 months	1.05 (0.61–1.79)	1.39 (0.77–2.49)
Breastfed ≥6 months + exclusive breastfeeding ≥3 months	0.52 (0.27–0.99)	0.78 (0.39–1.55)
<b>Conduct problems (4–10)</b>		
Never breastfed	Reference	Reference
Breastfed <6 months	0.93 (0.54–1.60)	1.08 (0.60–1.95)
Breastfed ≥6 months + exclusive breastfeeding <3 months	0.60 (0.32–1.10)	0.87 (0.45–1.69)
Breastfed ≥6 months + exclusive breastfeeding ≥3 months	0.24 (0.10–0.54)	0.42 (0.17–1.02)
<b>Hyperactivity (8–10)</b>		
Never breastfed	Reference	Reference
Breastfed <6 months	1.42 (0.71–2.82)	1.45 (0.70–3.02)
Breastfed ≥6 months + exclusive breastfeeding <3 months	1.09 (0.52–2.27)	1.17 (0.53–2.54)
Breastfed ≥6 months + exclusive breastfeeding ≥3 months	0.74 (0.33–1.69)	0.99 (0.41–2.38)
<b>Peer problems (4–10)</b>		
Never breastfed	Reference	Reference
Breastfed <6 months	0.88 (0.49–1.57)	0.72 (0.38–1.34)
Breastfed ≥6 months + exclusive breastfeeding <3 months	0.53 (0.27–1.03)	0.50 (0.25–1.03)
Breastfed ≥6 months + exclusive breastfeeding ≥3 months	0.54 (0.27–1.09)	0.70 (0.33–1.51)
<b>Prosocial behavior (0–5)</b>		
Never breastfed	Reference	Reference
Breastfed <6 months	0.64 (0.36–1.14)	0.65 (0.35–1.21)
Breastfed ≥6 months + exclusive breastfeeding <3 months	0.60 (0.32–1.10)	0.53 (0.27–1.04)
Breastfed ≥6 months + exclusive breastfeeding ≥3 months	0.58 (0.30–1.11)	0.61 (0.30–1.27)
<b>Total difficulties (15–40)</b>		
Never breastfed	Reference	Reference
Breastfed <6 months	1.21 (0.68–2.14)	1.25 (0.67–2.34)
Breastfed ≥6 months + exclusive breastfeeding <3 months	0.84 (0.45–1.56)	1.19 (0.60–2.35)
Breastfed ≥6 months + exclusive breastfeeding ≥3 months	0.39 (0.18–0.85)	0.76 (0.33–1.78)

*N* = 1442. aOR, adjusted odds ratio.

<sup>a</sup> Adjusted for mother's education, poverty-to-income ratio, postnatal WIC, race/ethnicity, prepregnancy BMI, marital status, birth weight, gestational age, possible postpartum depression, maternal smoking in the first year of life, birth order, child's gender, maternal age, and enrichment activities.

tions with both child psychosocial development and breastfeeding duration and/or if they were considered as a potential confounder in previous studies.<sup>10–14,16,24–29</sup> Covariates from IFPS II included the following: race/ethnicity (white, black, Hispanic, and other); maternal age (18–24, 25–29, 30–34, and ≥35 years); maternal education (high school or less, some college, college graduate, and not specified); prepregnancy BMI (<18.5, 18.5–24.9, 25.0–29.9, and ≥30); possible maternal postpartum depression (based on the Edinburgh Postnatal Depression Scale: ≥10 = yes, 0 to <10 = no, and “not specified” for missing or incomplete responses)<sup>30</sup>; maternal smoking in the first year (none and any); marital status (married, unmarried, and not specified); poverty-to-

income ratio (<185%, 185%–349%, and ≥350%)<sup>31</sup>; postnatal participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC; yes or no); child gender (male or female); birth weight of child in grams; and gestational age of child at birth in weeks.

Data were collected on the number of other children the mother had before IFPS II and the number of children the mother reported giving birth to after the study index child; these data were used to create a birth order at Y6FU variable, which we categorized as only child, youngest child, middle child, and oldest child. Data on child enrichment activities were obtained from Y6FU: individual activities included child's participation in lessons/organizations

that encourage activities such as sports, music, art, dance, drama, etc, and being taken to any type of musical/theatrical performance within the past year. We broadly categorized child enrichment as “none” versus “any” on the basis of these 2 items.

### Analytic Population and Statistical Analyses

Of the 1542 mother-child pairs included in Y6FU, 99.6% ( $n = 1535$ ) had complete SDQ data. Twelve participants were excluded because they were missing breastfeeding data, and an additional 81 were excluded because of missing data on covariates. Our final analytic sample included 1442 mother-child pairs. Mothers who were excluded were less likely to be college graduates but more likely to report postnatal WIC participation, to have a race/ethnicity other than white, to be unmarried, to possibly have postpartum depression, and to be  $\leq 29$  years of age. Children who were excluded had a lower mean birth weight and were more likely to not have received any enrichment. Other characteristics were similar among the groups.

SAS 9.3 (SAS Institute, Cary, NC) was used for all analyses. We used  $\chi^2$  tests to assess whether difficulties on each of the domains varied by breastfeeding duration. Separate logistic regression models were used to model the likelihood of having difficulties on each SDQ outcome domain by breastfeeding duration during infancy. A likelihood ratio test was used to determine whether the effect between breastfeeding duration and total difficulties was modified in groups at high risk of difficulties (we tested gestational age, birth weight, poverty-to-income ratio, maternal education, marital status, maternal smoking in the first year, and child enrichment). None of the interaction terms were significant at a  $P < .05$  level; thus, interaction terms were not included in the final models.

Because insufficient adjustment for potential confounding factors has been cited as 1 explanation for inconsistent findings among previous studies,<sup>10,12–14,16,17</sup> we adjusted for all covariates in our adjusted modeling analyses.

### RESULTS

In general, as any breastfeeding and exclusive breastfeeding duration increased, the percentage of reported difficulties appeared to decrease (Fig 1). The overall differences were significant for conduct problems and total difficulties.

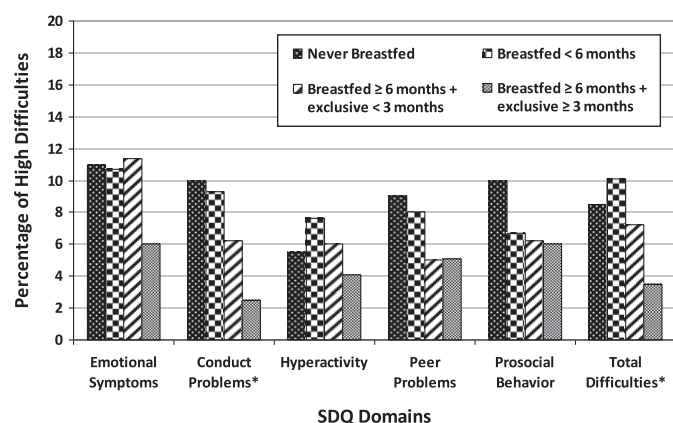
In crude logistic regression analyses, breastfeeding duration was not associated with decreased odds of difficulties with hyperactivity, peer problems, or prosocial behavior (Table 1), whereas children who were breastfed for  $\geq 6$  months and exclusively breastfed for  $\geq 3$  months had decreased odds of difficulties with emotional symptoms (odds ratio [OR]: 0.52; 95% confidence interval [CI]: 0.27–0.99), conduct problems (OR: 0.24; 95% CI: 0.10–0.54), and total difficulties (OR: 0.39; 95% CI: 0.18–0.85) compared with children who were never breastfed.

However, after adjusting for all covariates, these associations were no longer

significant. Adjusting for birth order was the most influential factor in reducing the association between breastfeeding duration and decreased difficulties with conduct problems and also played a role in reducing the associations with emotional symptoms and total difficulties (data not shown). Additionally, maternal education, postnatal WIC participation, prepregnancy BMI, marital status, possible postpartum depression, maternal smoking in the first year, maternal age, and child enrichment also played a role in the reduction in the associations observed in the crude logistic regression analyses (data not shown).

### DISCUSSION

Before adjusting for potential confounding factors, children who were breastfed for  $\geq 6$  months with exclusive breastfeeding for  $\geq 3$  months had decreased odds of difficulties with emotional symptoms, conduct problems, and total difficulties compared with children who were never breastfed. However, after adjustment, no association remained between breastfeeding and decreased odds of having difficulties with any of the domains measured by the SDQ. The results



**FIGURE 1**

Percentage of high difficulties in domains measured by the SDQ in children by breastfeeding duration ( $N = 1442$ ): Y6FU. \* $P < .05$ .

observed in our analysis are consistent with the hypothesis that the association between breastfeeding and later psychosocial development in children may be affected by residual confounding, particularly maternal sociodemographic factors and child characteristics such as birth order.

There are similarities and differences between our findings and those of previous studies. In the large, prospective Millennium Cohort Study, term children who were breastfed for  $\geq 4$  months had decreased odds of high total difficulties as measured by the SDQ in adjusted models (adjusted OR: 0.67; 95% CI: 0.54–0.83).<sup>10</sup> Julvez et al<sup>11</sup> found that breastfeeding  $\geq 12$  weeks was associated with higher social competence scores (relative risk: 0.57; 95% CI: 0.52–0.66) as well as lower attention-deficit scores (relative risk: 0.56; 95% CI: 0.37–0.85) after adjustment for covariates. In another long-term cohort study, breastfeeding for  $< 6$  months was associated with poorer behavior compared with breastfeeding for  $\geq 6$  months after adjustment ( $P < .02$ ), and children had improved behavior with each additional month of breastfeeding.<sup>12</sup> The results of these studies are consistent with our unadjusted analyses findings; however, we did not confirm these associations after adjustment.

Two previous studies also found no association between breastfeeding and psychosocial development after adjusting for potential confounding factors. In the large Avon Longitudinal Study of Parents and Children, Waylen et al<sup>15</sup> found that although never being breastfed predicted pure oppositional development disorder/conduct disorder in unadjusted analyses, this association was no longer observed after adjusting for maternal age and education, family adversity during pregnancy, and whether the mother smoked ciga-

rettes during pregnancy. Similarly, in the large cluster-randomized Promotion of Breastfeeding Intervention Trial (PROBIT), Kramer et al<sup>16</sup> found no significant treatment effects from prolonged or exclusive breastfeeding on child behavior at 6.5 years of age, as measured by the SDQ. The 2 randomized groups included in the PROBIT were similar in baseline sociodemographic and clinical variables.

Two other studies found a reduced association between breastfeeding and psychosocial development after adjustment; however, the authors attributed their findings to residual confounding factors rather than to an actual association.<sup>13,14</sup> When Kramer et al<sup>13</sup> used an observational study design to analyze the behavioral outcome data from the PROBIT, they found small but statistically significant associations between breastfeeding cessation before 3 months and increased odds of high total difficulties, conduct problems, and hyperactivity after multivariable adjustment. After taking into account effects of random errors of measurement, method factors, and social and familial background of the child, Fergusson et al<sup>14</sup> observed weak associations between increasing breastfeeding duration and declining maternal ratings of generalized conduct disorder in children 6 to 8 years of age (standardized regression coefficients [ $\beta$ ] ranged from  $-0.11$  to  $-0.16$ ;  $P < .001$ ). However, teacher ratings of the same children revealed no significant associations for measures taken at 6 or 8 years of age and a small but significant association between increasing breastfeeding duration and conduct disorder ratings at 7 years ( $\beta = -0.09$ ,  $P < .01$ ).

As one of the largest longitudinal studies in the United States to examine infant feeding practices and their long-term consequences, IFPS II and the Y6FU provide an opportunity to examine in detail the relationship between breastfeeding

and psychosocial development in children. Furthermore, the numerous covariates collected in the study and relatively large sample size allowed us to more fully adjust for potential confounding factors than in most previous studies.

Although this study has several strengths, our analysis is not without limitations. Even though our data come from a large study, the study sample is not nationally representative and our results are not generalizable to the US population. Furthermore, although taking a total confounding adjustment approach was necessary to address concerns regarding insufficient adjustment for potential confounding factors in previous studies, it may have decreased our power to detect any modest associations. However, even after fully adjusting for all covariates, the estimated effect size of the association between breastfeeding duration and decreased odds of conduct problems was relatively strong and came close to reaching statistical significance.

## CONCLUSIONS

Although we observed significant associations between breastfeeding duration and later psychosocial development, including decreased odds of emotional, conduct, and total difficulties of children at 6 years of age, in our unadjusted analyses, these findings were no longer evident after adjusting for numerous potential confounding factors. Our analysis adds to the relatively small body of literature evaluating the association between breastfeeding and psychosocial development in childhood. Future large studies are warranted, especially those capable of accounting for the many potential confounding factors that play a role in psychosocial development and with the power to detect modest associations after adjustment.

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*Pediatrics* 2014;134;S36

DOI: 10.1542/peds.2014-0646G

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## **Breastfeeding and Later Psychosocial Development of Children at 6 Years of Age**

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*Pediatrics* 2014;134;S36

DOI: 10.1542/peds.2014-0646G

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