

Breastfeeding Rates in the United States by Characteristics of the Child, Mother, or Family: The 2002 National Immunization Survey

Ruowei Li, MD, PhD*; Natalie Darling, MPH‡; Emmanuel Maurice, MS, MA‡; Lawrence Barker, PhD‡; and Laurence M. Grummer-Strawn, PhD*

ABSTRACT. *Objective.* In the third quarter of 2001, the National Immunization Survey (NIS) began collecting data on the initiation and duration of breastfeeding and whether it was the exclusive method of infant feeding. Using the data from the 2002 NIS, this study estimates breastfeeding rates in the United States by characteristics of the child, mother, or family.

Methods. The NIS uses random-digit dialing to survey households nationwide with children 19 to 35 months old about vaccinations and then validates the information through a mail survey of the health care providers who gave the vaccinations. In 2002, ~3500 households from the NIS were randomized to 1 of the 3 rotating topical modules that covered breastfeeding.

Results. More than two thirds (71.4%) of the children had ever been breastfed. At 3 months, 42.5% of infants were exclusively breastfed, and 51.5% were breastfed to some extent. At 6 months, these rates dropped to 13.3% and 35.1%, respectively. At 1 year, 16.1% of infants were receiving some breast milk. Non-Hispanic black children had the lowest breastfeeding rates. Breastfeeding rates also varied by participation in day care or the Women, Infants, and Children program, socioeconomic status, and geographic area of residence.

Conclusions. Although the rate of breastfeeding initiation in the United States is near the national goal of 75%, at 6 and 12 months postpartum the rates of breastfeeding duration are still considerably below the national goals of 50% and 25%, respectively. In addition, rates of exclusive breastfeeding are low. Strenuous public health efforts are needed to improve breastfeeding behaviors, particularly among non-Hispanic black women and socioeconomically disadvantaged groups. *Pediatrics* 2005;115:e31–e37. URL: www.pediatrics.org/cgi/doi/10.1542/peds.2004-0481; *breastfeeding, National Immunization Survey, surveillance, statistics.*

ABBREVIATIONS. AAP, American Academy of Pediatrics; NIS, National Immunization Survey; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children; CI, confidence interval.

From the *Division of Nutrition and Physical Activity and ‡Data Management Division, National Center for Chronic Disease Prevention and Health Promotion and the National Immunization Program, Centers for Disease Control and Prevention, Atlanta, Georgia.

Accepted for publication Aug 26, 2004.

doi:10.1542/peds.2004-0481

No conflict of interest declared.

Reprint requests to (R.L.) Division of Nutrition and Physical Activity, MS K-25, Centers for Disease Control and Prevention, 4770 Buford Hwy NE, Atlanta, GA 30341-3717. E-mail: ril6@cdc.gov

PEDIATRICS (ISSN 0031 4005). Published in the public domain by the American Academy of Pediatrics.

Worldwide, breastfeeding is recognized as beneficial for both infants and mothers.^{1–3} In addition, the American Academy of Pediatrics (AAP) has stated that human milk is the preferred feeding for all infants including premature and sick newborns, with rare exceptions.¹ In the United States, the goals of *Healthy People 2010*⁴ are to increase the proportion of mothers who breastfeed their infants to 75% in the early postpartum period, 50% 6 months postpartum, and 25% 1 year postpartum.

Although several national surveys collect breastfeeding data, including the National Health and Nutrition Examination Survey and the National Survey of Family Growth, none are ideal for breastfeeding surveillance, and none monitor rates of breastfeeding annually.⁵ Accordingly, the goals on breastfeeding in *Healthy People 2010* were established and have been tracked with data collected by Ross Products Division of Abbott Laboratories (Abbott Park, IL), manufacturers of infant formula.⁴ To date, most of the statistics quoted for the national breastfeeding rates have been derived from the Ross Laboratories Mothers Surveys, in which questionnaires are mailed to a large sample of mothers who gave birth within the 12 months before the survey. Although the survey has been a valuable resource for establishing national goals and monitoring infant-feeding trends in the United States over the past 2 decades, it has a relatively low response rate (28%) and has no data on the introduction of any foods and liquids other than breast milk to estimate the exclusivity of breastfeeding.⁶

Appropriate monitoring of the goals and objectives in *Healthy People 2010* is a high priority for the US Department of Health and Human Services. In response to requests from the United States Breastfeeding Committee, in November 1999 the Centers for Disease Control and Prevention held a meeting on breastfeeding surveillance to review current methodologies for assessing this practice.⁵ Attendees recommended using existing surveillance systems to immediately improve data collection. As a result, beginning in the third quarter of 2001, 3 questions on breastfeeding were added to the rotating modules of the National Immunization Survey (NIS). An overall report using the data from this initial quarter has been published, but stratified analyses were not included because the samples were too small.⁷ To further explore the rates of breastfeeding in the United

States by characteristics of the child, mother, and family, we conducted a stratified analysis using combined data from 4 consecutive quarters of the 2002 NIS.

METHODS

The NIS is conducted annually by the Centers for Disease Control and Prevention to obtain national, state, and selected urban-area estimates of vaccination coverage rates for US children. The NIS uses random-digit dialing to survey households with children 19 to 35 months old. After the telephone survey, a mail survey is sent to the health care providers who gave the vaccinations to validate the information on immunization. Details of the design and methodology are given elsewhere.^{8,9}

In addition to immunization data, the NIS collects socioeconomic and demographic data about the child, mother, and family. Respondents are asked to identify the child's race/ethnicity and report what type of child care they used at 6 months old. In this analysis, we classified race/ethnicity as non-Hispanic white, non-Hispanic black, Hispanic, or other. Attendance at child care was classified as "yes" vs "no," with "yes" including nursery, preschool, a Head Start program, home day care, day care center, or care by someone other than the parents. The area in which the child lived was defined by the US Census Bureau's definition, and the poverty-income ratio was calculated as the ratio of self-reported family annual income to the appropriate poverty-threshold value used by the US Census Bureau. Ratios <100% indicate that the income for the respective family was below the official definition of poverty, whereas a ratio of ≥100% indicates income at or above the poverty level. To evaluate the child's participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), respondents were asked "Did [child's name] ever receive WIC benefits between birth and [his/her] first birthday?" To compare WIC participants with those income-eligible for WIC but not enrolled, we further divided non-WIC participants into 2 subgroups using the poverty income ratio of 185% (a common criteria used in WIC for eligibility) as a cutoff.

For 2002 as a whole, 13.2% of households interviewed in the NIS were selected randomly to answer questions pertaining to day care arrangements/breastfeeding practices/WIC participation, which is 1 of the 3 rotating topical modules added to the core questionnaire. Among the 3507 expected interviews, the module interviews were completed in 3483, yielding a completion rate of 99.3%. The CASRO response rate (a standard calculation developed by the Council of American Survey Research Organizations) for the core questionnaire of the 2002 NIS was 75.2%.¹⁰ The respondent was asked whether the infant was ever breastfed or fed breast milk. For those answering "yes," subsequent questions were asked to determine the total length of time the child was breastfed and at what age anything other than breast milk or water had been introduced, including formula, cow's milk, juice, and solid foods. Respondents could give answers in days, weeks, or months. Breastfeeding was classified as "exclusive" if the child had not consumed any foods/liquids other than breast milk and water by a given age.

Each child with household data in the NIS receives a base sampling weight equal to the reciprocal of the probability of selecting the household's telephone number into the sample. Because nonresponse can occur at several points in the interview process, all the calculations for this study used base sampling weights adjusted for nonresponse to represent the US population of 19- to 35-month-old children. We calculated the percentage of children who were ever breastfed and the percentage who remained breastfed at 7 days and at 1, 3, 6, and 12 months, as well as the percentage who were exclusively breastfed up to 7 days and 1, 3, and 6 months. In estimating the proportion of children who were exclusively breastfed at a given age, a child was counted as being exclusively breastfed only if he or she had been breastfed at least up to the given age and had not had anything other than breast milk or water until after that age. We should note that, because the NIS was conducted throughout 2002 for children who were 19 to 35 months old, the estimates presented pertain to children born between February 1999 and June 2001.

All calculations were performed by using SUDAAN to take the complex sampling design into consideration.¹¹ Sampling uncer-

tainty was expressed through 95% confidence intervals (CIs). We estimated the statistical difference between 2 levels within each stratum by using *t* tests computed in SUDAAN.

RESULTS

The current study included 3444 children with complete information on ever breastfeeding, 3439 on breastfeeding duration, and 3376 on age at introduction of something other than breast milk and water. Overall, 71.4% of children had ever been breastfed (Table 1). The percentage who continued breastfeeding to any extent at 6 and 12 months was 35.1% and 16.1%, respectively (Table 2). Although 63.4% of children were exclusively breastfed at 7 days, this figure dropped to 42.5% at 3 months and 13.3% at 6 months (Table 3).

The bivariate analyses (Tables 1–3) revealed significant differences relating to race/ethnicity, day care, and WIC participation, maternal age, socioeconomic

TABLE 1. Proportion of Children Who Were Ever Breastfed (Percent ± Half 95% CI) by Sociodemographic Characteristics

Characteristic	Sample Size	Ever Breastfed, %
US national	3444	71.4 ± 2.3
Gender		
Male	1770	70.4 ± 3.3
Female (ref)	1674	72.5 ± 3.2
Birth order		
First-born	2099	70.3 ± 3.1
Not first-born (ref)	1345	73.1 ± 3.6
Child race/ethnicity		
Non-Hispanic White (ref)	1888	72.1 ± 3.0
Non-Hispanic Black	502	51.5 ± 7.2*
Hispanic	715	80.3 ± 4.7*
Other race	339	70.6 ± 8.2
Day care at 6 mo		
Yes	1572	68.5 ± 3.8*
No (ref)	1870	73.4 ± 2.9
Received WIC during first year		
Yes (ref)	1705	63.2 ± 3.7
No but eligible	165	86.0 ± 6.8*
No and ineligible	1436	80.1 ± 3.0*
Maternal age, y		
<20	95	61.9 ± 13.6*
20–29	1473	63.9 ± 4.0*
≥30 (ref)	1876	78.3 ± 2.7
Maternal education		
<High school	459	68.0 ± 6.8*
High school	999	61.7 ± 4.4*
Some college	639	70.7 ± 5.6*
College graduate (ref)	1347	83.1 ± 3.0
Marital status		
Married (ref)	2459	77.0 ± 2.6
Unmarried	985	57.0 ± 4.8*
Region		
New England	287	76.6 ± 7.3*
Middle Atlantic	251	73.0 ± 7.1*
East north central	501	64.6 ± 6.2*
West north central	278	68.6 ± 7.3*
South Atlantic	596	68.8 ± 5.5*
East south central	289	50.0 ± 8.0*
West south central	439	68.1 ± 7.7*
Mountain	379	80.3 ± 4.9
Pacific (ref)	424	84.9 ± 5.3
Poverty income ratio, %		
<100	646	59.3 ± 6.0*
100–184	642	67.1 ± 5.9*
185–349	853	73.3 ± 4.7*
≥350 (ref)	982	79.9 ± 3.6

* Significantly different from the reference level (ref) with *P* < .05.

TABLE 2. Proportion of Children Who Were Breastfed to Any Extent (Percent \pm Half 95% CI), by Sociodemographic Characteristics

Characteristic	Breastfed at 7 d	Breastfed at 1 mo	Breastfed at 3 mo	Breastfed at 6 mo	Breastfed at 12 mo
US national	68.4 \pm 2.4	63.2 \pm 2.5	51.5 \pm 2.7	35.1 \pm 2.5	16.1 \pm 1.9
Gender					
Male	67.5 \pm 3.5	62.0 \pm 3.6	50.0 \pm 3.6	34.0 \pm 3.4	15.0 \pm 2.4
Female (ref)	69.5 \pm 3.4	64.5 \pm 3.5	53.3 \pm 3.8	36.2 \pm 3.8	17.4 \pm 2.9
Birth order					
First-born	67.0 \pm 3.2	62.0 \pm 3.4	51.1 \pm 3.5	35.4 \pm 3.3	16.6 \pm 2.3
Not first-born (ref)	70.7 \pm 3.7	65.1 \pm 3.9	52.3 \pm 4.2	34.6 \pm 4.0	15.4 \pm 3.1
Child race/ethnicity					
Non-Hispanic White (ref)	68.8 \pm 3.3	63.2 \pm 3.3	52.0 \pm 3.4	36.6 \pm 3.3	16.4 \pm 2.3
Non-Hispanic Black	49.1 \pm 7.3*	43.6 \pm 7.4*	35.4 \pm 7.3*	19.7 \pm 5.5*	7.9 \pm 3.6*
Hispanic	78.2 \pm 4.9*	73.4 \pm 5.2*	61.0 \pm 5.9*	40.2 \pm 6.1	19.0 \pm 4.7
Other race	67.0 \pm 8.3	63.1 \pm 8.5	45.9 \pm 8.4	33.9 \pm 7.6	18.2 \pm 6.0
Day care at 6 mo					
Yes	64.8 \pm 4.0*	59.1 \pm 4.1*	49.5 \pm 4.1	29.7 \pm 3.5*	10.8 \pm 2.2*
No (ref)	71.1 \pm 3.0	66.2 \pm 3.2	53.1 \pm 3.5	38.9 \pm 3.5	20.0 \pm 2.7
Received WIC during first year					
Yes (ref)	59.5 \pm 3.8	53.4 \pm 3.9	42.2 \pm 3.9	26.4 \pm 3.5	12.1 \pm 2.4
No but eligible	82.7 \pm 7.8*	82.7 \pm 7.8*	64.4 \pm 11.8*	55.8 \pm 11.9*	25.9 \pm 10.4*
No and ineligible	77.9 \pm 3.1*	72.9 \pm 3.3*	61.8 \pm 3.8*	43.8 \pm 4.0*	19.6 \pm 3.0*
Maternal age, y					
<20	58.5 \pm 14.1*	47.0 \pm 15.3*	26.4 \pm 13.7*	17.4 \pm 12.2*	10.9 \pm 11.3
20–29	60.8 \pm 4.0*	54.2 \pm 4.1*	41.7 \pm 4.1*	26.7 \pm 3.6*	11.8 \pm 2.5*
\geq 30 (ref)	75.6 \pm 3.0	71.8 \pm 3.2	61.4 \pm 3.5	43.3 \pm 3.6	20.2 \pm 2.8
Maternal education					
<High school	65.4 \pm 6.9*	60.8 \pm 7.2*	48.4 \pm 7.6*	32.5 \pm 7.3*	19.0 \pm 5.8
High school	58.6 \pm 4.5*	52.3 \pm 4.6*	40.0 \pm 4.5*	25.0 \pm 4.0*	11.1 \pm 2.8*
Some college	68.4 \pm 5.7*	63.0 \pm 6.0*	50.3 \pm 6.3*	34.5 \pm 5.8*	14.1 \pm 3.7*
College graduate (ref)	79.7 \pm 3.6	75.4 \pm 3.8	65.2 \pm 4.2	46.7 \pm 4.4	20.6 \pm 3.2
Marital status					
Married (ref)	73.9 \pm 2.8	68.6 \pm 2.9	56.5 \pm 3.2	39.6 \pm 3.1	18.0 \pm 2.2
Unmarried	54.3 \pm 4.9*	49.3 \pm 4.9*	38.8 \pm 5.0*	23.3 \pm 4.3*	11.3 \pm 3.4*
Region					
New England	74.4 \pm 7.5	71.3 \pm 7.6	53.4 \pm 8.7	38.6 \pm 8.1	19.4 \pm 5.8
Middle Atlantic	69.2 \pm 7.5*	62.8 \pm 7.8*	52.3 \pm 8.1*	38.8 \pm 7.9	19.6 \pm 6.2
East north central	61.7 \pm 6.3*	54.6 \pm 6.5*	44.6 \pm 6.3*	28.3 \pm 5.3*	13.8 \pm 3.9
West north central	64.5 \pm 7.5*	58.1 \pm 7.8*	47.0 \pm 7.5*	32.0 \pm 7.0*	11.3 \pm 4.4*
South Atlantic	66.1 \pm 5.6*	60.0 \pm 5.9*	48.2 \pm 6.1*	33.5 \pm 5.9*	15.6 \pm 4.9
East south central	47.5 \pm 7.9*	41.5 \pm 7.6*	30.3 \pm 6.7*	19.4 \pm 5.5*	8.7 \pm 3.7*
West south central	67.0 \pm 7.7*	63.7 \pm 7.8*	50.7 \pm 8.4*	29.0 \pm 7.9*	11.8 \pm 4.2*
Mountain	78.4 \pm 5.1	76.1 \pm 5.3	63.8 \pm 5.9	47.3 \pm 6.1	21.9 \pm 5.3
Pacific (ref)	80.5 \pm 6.7	76.4 \pm 6.9	64.9 \pm 7.7	45.5 \pm 8.1	20.8 \pm 5.9
Poverty income ratio, %					
<100	56.1 \pm 6.1*	50.9 \pm 6.3*	42.1 \pm 6.5*	28.5 \pm 6.2*	13.9 \pm 4.1
100–184	64.0 \pm 6.1*	60.3 \pm 6.2*	46.7 \pm 6.4*	32.2 \pm 5.8*	14.8 \pm 4.6
185–349	68.7 \pm 5.3*	63.0 \pm 5.4*	50.0 \pm 5.4*	34.4 \pm 4.7*	15.9 \pm 3.2
\geq 350 (ref)	78.2 \pm 3.7	72.4 \pm 4.0	62.3 \pm 4.6	43.3 \pm 4.9	18.2 \pm 3.8

* Significantly different from the reference level (ref) with $P < .05$.

status, and geographic area. Mothers of non-Hispanic black children were less likely to initiate and maintain breastfeeding than mothers of non-Hispanic white children (51.5% vs 72.1% for ever breastfeeding, 19.7% vs 36.6% for continuing at 6 months). Only 5.4% of non-Hispanic black infants were exclusively breastfed at 6 months, compared with 14.6% of non-Hispanic white infants and 13.8% of Hispanic infants.

Children who attended day care at 6 months were less likely both to have ever been breastfed (Table 1) and to be breastfed continuously or remained exclusively breastfed at different time points (Tables 2 and 3). In addition, mothers of children who received WIC benefits during the first year of life were less likely to initiate or maintain breastfeeding than were mothers whose child was not in WIC (Tables 1 and 2). Differences by WIC status were particularly large between those who participated and those who were eligible but not enrolled (63.2% vs 86.0% for ever

breastfeeding, 26.4% vs 55.8% for continuing at 6 months). Similarly, at all time points after birth (Table 3), children in WIC were less likely to be exclusively breastfed than were children not in WIC (either eligible or noneligible).

Older mothers and those with higher socioeconomic status had consistently higher breastfeeding rates. For example, compared with children whose mothers had only a high school education, those whose mothers had graduated from college had rates that were 21%, 22%, and 9% higher for initiating (Table 1), maintaining to 6 months (Table 2), and exclusive breastfeeding at 6 months (Table 3), respectively. The rates of initiation, duration, and exclusivity of breastfeeding were generally higher among children whose mothers lived in the Pacific, Mountain, and New England regions than those of mothers who lived elsewhere in the United States. The lowest rates of initiation, duration, and exclusive breastfeeding were found in the east south-central

TABLE 3. Proportion of Children Who Were Exclusively Breastfed (percent \pm half 95% CI), by Sociodemographic Characteristics at Various Time Points

Characteristic	7 d	1 mo	3 mo	6 mo
US national	63.4 \pm 2.5	56.9 \pm 2.6	42.5 \pm 2.7	13.3 \pm 1.7
Sex				
Male	61.7 \pm 3.6	55.5 \pm 3.6	39.7 \pm 3.5	13.4 \pm 2.3
Female (ref)	65.3 \pm 3.5	58.5 \pm 3.7	45.6 \pm 4.0	13.3 \pm 2.4
Birth order				
First-born	62.5 \pm 3.3	56.0 \pm 3.4	41.9 \pm 3.4	14.0 \pm 2.1
Not first-born (ref)	64.9 \pm 4.0	58.4 \pm 4.1	43.4 \pm 4.3	12.4 \pm 2.8
Child race/ethnicity				
Non-Hispanic White (ref)	62.3 \pm 3.4	54.8 \pm 3.4	40.9 \pm 3.3	14.6 \pm 2.2
Non-Hispanic Black	45.9 \pm 7.4*	39.5 \pm 7.4*	28.9 \pm 7.2*	5.4 \pm 2.9*
Hispanic	75.4 \pm 5.1*	70.5 \pm 5.5*	55.3 \pm 6.1*	13.8 \pm 4.0
Other race	62.8 \pm 8.7	57.8 \pm 8.8	36.9 \pm 8.1	16.1 \pm 5.8
Day care at 6 mo				
Yes	59.6 \pm 4.1*	52.7 \pm 4.1*	38.9 \pm 4.0*	10.6 \pm 2.2*
No (ref)	66.2 \pm 3.2	60.0 \pm 3.3	45.1 \pm 3.5	15.3 \pm 2.4
Received WIC during first year				
Yes (ref)	55.9 \pm 3.9	49.8 \pm 3.9	36.5 \pm 3.9	9.7 \pm 2.0
No but eligible	79.5 \pm 8.5*	73.0 \pm 10.3*	56.2 \pm 12.2*	22.0 \pm 10.4*
No and ineligible	71.0 \pm 3.4*	64.1 \pm 3.6*	48.8 \pm 3.9*	16.7 \pm 2.9*
Maternal age, y				
<20	53.6 \pm 15.3*	42.7 \pm 15.7*	20.2 \pm 12.8*	3.9 \pm 4.0*
20–29	56.9 \pm 4.1*	50.5 \pm 4.1*	35.8 \pm 4.1*	8.9 \pm 1.8*
\geq 30 (ref)	69.6 \pm 3.2	63.4 \pm 3.4	49.5 \pm 3.6	17.7 \pm 2.7
Maternal education				
<High school	63.4 \pm 7.1*	58.2 \pm 7.4	44.7 \pm 7.8	10.6 \pm 3.8*
High school	54.3 \pm 4.6*	47.7 \pm 4.6*	33.4 \pm 4.5*	9.8 \pm 2.7*
Some college	63.2 \pm 6.0*	55.5 \pm 6.2*	40.6 \pm 6.1*	12.3 \pm 3.6*
College graduate (ref)	72.6 \pm 3.9	66.1 \pm 4.1	51.2 \pm 4.3	18.9 \pm 3.3
Marital status				
Married (ref)	68.1 \pm 2.9	61.1 \pm 3.1	45.6 \pm 3.2	14.9 \pm 2.1
Unmarried	51.5 \pm 5.0*	46.1 \pm 5.0*	34.4 \pm 5.0*	9.4 \pm 2.7*
Region				
New England	69.1 \pm 7.9	61.6 \pm 8.3	42.0 \pm 8.3*	14.2 \pm 5.0
Middle Atlantic	61.0 \pm 7.9*	55.0 \pm 8.2*	42.9 \pm 8.0*	16.1 \pm 6.0
East north central	57.7 \pm 6.5*	50.0 \pm 6.5*	35.7 \pm 6.1*	10.4 \pm 3.5*
West north central	58.0 \pm 7.9*	50.1 \pm 7.9*	37.1 \pm 7.2*	11.4 \pm 4.7*
South Atlantic	60.5 \pm 5.9*	52.2 \pm 6.1*	39.2 \pm 6.1*	11.9 \pm 3.4*
East south central	42.8 \pm 7.7*	33.7 \pm 6.9*	21.6 \pm 5.7*	6.8 \pm 3.3*
West south central	64.6 \pm 7.9*	57.8 \pm 8.1*	42.2 \pm 8.8*	9.2 \pm 3.8*
Mountain	74.9 \pm 5.4	71.6 \pm 5.5	52.1 \pm 6.2	19.6 \pm 4.9
Pacific (ref)	75.7 \pm 7.0	72.5 \pm 7.1	57.6 \pm 7.9	19.0 \pm 5.8
Poverty income ratio, %				
<100	53.4 \pm 6.2*	47.5 \pm 6.4*	37.3 \pm 6.4*	11.2 \pm 3.6*
100–184	60.8 \pm 6.2	55.9 \pm 6.3*	40.8 \pm 6.5	12.7 \pm 3.8
185–349	64.0 \pm 5.4*	57.1 \pm 5.4*	40.6 \pm 5.3*	12.4 \pm 2.9
\geq 350 (ref)	70.6 \pm 4.1	63.2 \pm 4.3	48.2 \pm 4.7	17.1 \pm 3.8

* Significantly different from the reference level (ref) with $P < .05$.

region (Alabama, Kentucky, Mississippi, and Tennessee).

DISCUSSION

This analysis shows that although considerable progress had been made toward the *Healthy People 2010* goal of 75% for initiation of breastfeeding, the rates of continuing breastfeeding at 6 and 12 months lagged well behind the national goals (by 15% and 9%, respectively). Although the national objectives do not include a goal for exclusive breastfeeding, both the AAP and the World Health Organization recommend exclusive breastfeeding for the first 6 months postpartum.^{1,12} In contrast, we found that only 63.4% in our sample of the US infants are exclusively breastfed in the early postpartum period, with this rate dropping to just 13.3% at 6 months postpartum.

The similarity of the rates at which any breastfeeding and exclusive breastfeeding dropped off in the first couple of months (Fig 1) implies that the factors

associated with exclusive breastfeeding might be similar to those associated with any breastfeeding in early life.¹³ Special attention needs to be paid to the sharp decline in exclusive breastfeeding between 3 and 5 months; for many mothers, this is the time at which they return to work or school and need additional support to continue exclusive breastfeeding. Lack of support for lactation in the workplace has been cited as a major barrier to maintaining breastfeeding.^{14,15} In addition, other than the social and environmental constraints identified previously,¹⁶ the barriers for exclusive breastfeeding might include the belief that breast milk cannot provide sufficient nutrition to infants beyond the first couple of months.¹⁷ Our previous study found that 31% of US adults believe that infants ought to be fed cereal or infant food by 3 months.¹⁸ If mothers are told by their family and friends that their infants should be fed solid foods in the first few months, they will find it difficult to avoid feeding their infants solids until 6

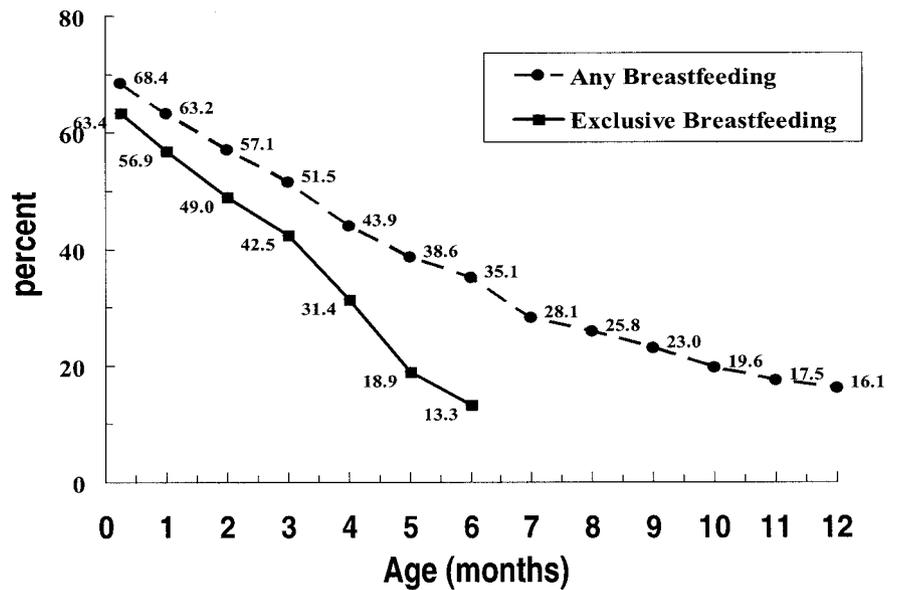


Fig 1. Any and exclusive breastfeeding rate by age (2002 NIS).

months of age, despite the recommendations by the World Health Organization and AAP to exclusively breastfeed for the first 6 months of life.

Overall, mothers of non-Hispanic black children had very low rates of breastfeeding (Fig 2). The percentages of non-Hispanic black children who were ever breastfed (Table 1), received any breast milk at 6 months (Table 2), or were exclusively breastfed at 6 months (Table 3) were 21%, 17%, or 9% lower, respectively, than those of white children. These findings are consistent with previous observations in the United States that black women were less likely to breastfeed than nonblack women.^{19–22} Consistent with observations in other developed countries,^{23,24} we also observed a strong inverse association between how poor a family was and the rate of breastfeeding. Although we did not investigate whether the low breastfeeding rates among black women could be attributed to generally poorer socioeconomic status, the evidence of racial/ethnic disparities in breastfeeding supports the need for research that identifies social, cultural, economic, and psycho-

logical factors that can be targeted for interventions to increase breastfeeding rates among black women.

Women with infants and children are the fastest-growing segment of the US labor force.²⁵ Approximately 70% of employed mothers with children <3 years old work full-time; one third of these mothers return to work within 3 months after birth, and two thirds return within 6 months.²⁶ At the same time, millions of young children spend part or most of each day in day care.²⁷ With so many children in day care, and given our findings that mothers of children in day care are relatively less likely to breastfeed, it will be important for the staff of day care centers to accommodate mothers who wish to breastfeed their children or to have their children fed expressed milk at the center.

As in previous studies,^{6,28} we found that breastfeeding was much less common among children who received WIC benefits during the first year than among those who did not. Only ~63.2% of WIC children were ever breastfed, versus 86.0% of children who were eligible but not enrolled and 80.1% of

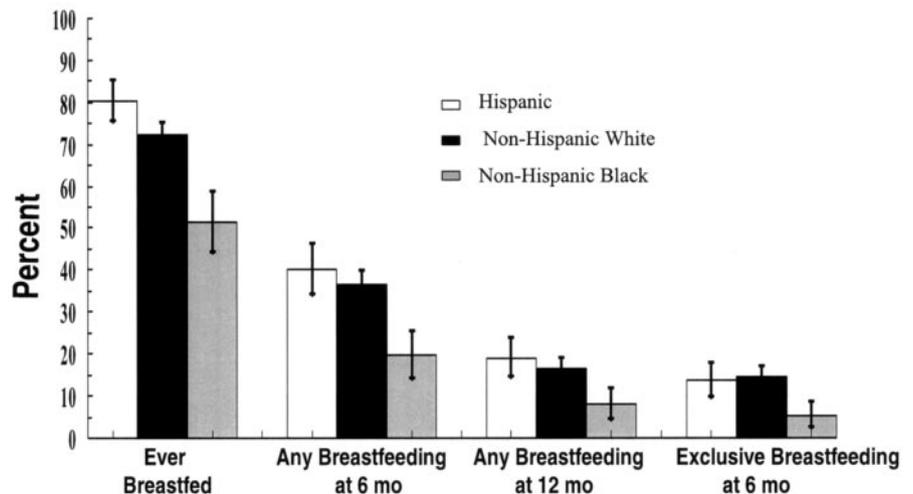


Fig 2. Racial/ethnic disparities in breastfeeding rates (percent and 95% CI; 2002 NIS).

those whose household income was $\geq 185\%$ of the poverty level and thus would generally not be eligible. There are multiple reasons why WIC participants had lower rates of breastfeeding.^{29–34} Previous studies indicate that low-income breastfeeding mothers usually acknowledge the health benefits of breastfeeding but face barriers that override this fact.^{34,35} These barriers include lack of peer and family support, returning to work or school, receiving information or hospital services not conducive to breastfeeding, and poor living conditions associated with poverty. It is not clear why mothers of children who were eligible for WIC but did not enroll had much higher breastfeeding rates. Because WIC provides free formula for eligible children, it is possible that women who are determined to breastfeed feel less need to participate in WIC.

The national average statistics mask considerable geographic variation across the United States. For example, the proportion of children ever breastfed ranged from just 50.0% in the east south-central region to 84.9% in the Pacific. For breastfeeding to any extent and exclusively at 6 months, the differences between the lowest and highest region were 28% and 13%, respectively. The large geographic variation in breastfeeding rates may be attributed to multiple factors including socioeconomic and environmental influences. Social and cultural norms also vary by geographic areas, and our previous study indicates a large regional variation in public attitudes toward breastfeeding.¹⁸ Unfortunately, the sample size in the 2002 NIS did not allow us to estimate state-specific rates of breastfeeding. Future studies examining this geographic variation when more NIS data become available are warranted to aid the setting of targets and also to evaluate the initiatives designed to promote breastfeeding.

This study has several major limitations. First, although strictly speaking the definition of exclusive breastfeeding specifies that no other liquids or solids except breast milk are given to the infant,³⁶ this study includes water feeding in the definition of exclusive breastfeeding. Second, family income and place where the child lived were those when the interview was conducted and may have differed from the time at which the child was being breastfed. Third, there might have been some recall bias, especially for older children. Previous studies indicate that the recall of initiation and duration of breastfeeding is more accurate than recall of when other foods were introduced,^{37,38} and thus the estimates of exclusive breastfeeding may not be as reliable as others. Because prospective studies are very often not feasible for large-scale surveys, maternal recall of breastfeeding practice, especially on doing it exclusively,³⁹ needs to be validated further.

CONCLUSIONS

Although the national goal for initiation of breastfeeding has nearly been reached, the gaps remain large in achieving the goals for continuation of this practice. Only ~35% and 16% of US infants are receiving breast milk at 6 and 12 months, respectively. Because there are significant inequalities in breastfeeding practice, inter-

ventions should focus on improving rates in the sectors that have the lowest breastfeeding rates. The *Healthy People 2010* objectives do not currently include an objective for exclusive breastfeeding, because until now, national data on exclusive breastfeeding were not available. The NIS fills some of the important gaps in our national monitoring of breastfeeding and would make monitoring an objective for exclusive breastfeeding possible.

REFERENCES

1. American Academy of Pediatrics, Work Group on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics*. 1997;100:1035–1039
2. World Health Organization, United Nations Children's Fund. The Innocenti declaration on the protection, promotion and support of breastfeeding. 1990. Available at: www.cdc.gov/breastfeeding/policy-innocenti.htm. Accessed October 13, 2004
3. American Dietetic Association. Position of the American Dietetic Association: promotion of breastfeeding. *J Am Diet Assoc*. 1986;86:1580–1585
4. US Department of Health and Human Services. *Healthy People 2010: Conference Edition*. Vols I and II. Washington, DC: US Government Printing Office; 2000:47–48
5. Grummer-Strawn LM, Li R. US national surveillance of breastfeeding behavior. *J Hum Lact*. 2000;16:283–290
6. Ryan AS, Zhou W, Acosta A. Breastfeeding continues to increase into the new millennium. *Pediatrics*. 2002;110:1103–1109
7. Li R, Zhao Z, Mokdad A, Barker L, Grummer-Strawn L. Prevalence of breastfeeding in the United States: the 2001 National Immunization Survey. *Pediatrics*. 2003;111:1198–1201
8. Smith PJ, Battaglia MP, Huggins J, et al. Overview of the sampling design and statistical methods used in the National Immunization Survey. *Am J Prev Med*. 2001;20(4 suppl):17–24
9. Zell ER, Ezzati-Rice TM, Battaglia MP, Wright RA. National Immunization Survey: the methodology of a vaccination surveillance system. *Public Health Rep*. 2000;115:65–77
10. Council of American Survey Research Organizations Task Force on Completion Rates. On the definition of response rates. Available at: www.casro.org/resprates.cfm. Accessed March 2, 2004
11. Shah BV, Barnwell BG, Bieler GS. *SUDAAN User's Manual, Release 7.5*. Research Triangle Park, NC: Research Triangle Institute; 1997
12. World Health Organization. The optimal duration of exclusive breastfeeding. Note for the press no. 7. April 2, 2001. Available at: www.who.int/inf-pr-2001/en/note2001-07.html. Accessed March 2, 2004
13. Li R, Ogden C, Ballew C, Gillespie C, Grummer-Strawn L. Prevalence of exclusive breastfeeding among US infants: the Third National Health and Nutrition Examination Survey (Phase II, 1991–1994). *Am J Public Health*. 2002;92:1107–1110
14. Lindberg L. Trends in the relationship between breastfeeding and postpartum employment in the United States. *Soc Biol*. 1996;43:191–202
15. Fein SB, Roe B. The effect of work status on initiation and duration of breastfeeding. *Am J Public Health*. 1998;88:1042–1046
16. Scott JA, Binns CW. Factors associated with the initiation and duration of breastfeeding: a review of the literature. *Breastfeed Rev*. 1999;7:5–16
17. Obermeyer CM, Castle S. Back to nature? Historical and cross-cultural perspectives on barriers to optimal breastfeeding. *Med Anthropol*. 1996;17:39–63
18. Li R, Fridinger F, Grummer-Strawn L. Public perceptions on breastfeeding constraints. *J Hum Lact*. 2002;18:227–235
19. Wiemann CM, DuBois JC, Berenson AB. Racial/ethnic differences in the decision to breastfeed among adolescent mothers. *Pediatrics*. 1998;101(6). Available at: www.pediatrics.org/cgi/content/full/101/6/e11
20. Timbo B, Altekruze S, Headrick M, Klontz K. Breastfeeding among black mothers: evidence supporting the need for prenatal intervention. *J Soc Pediatr Nurs*. 1996;1:35–40
21. Kurinij N, Shiono PH, Rhoads GG. Breast-feeding incidence and duration in black and white women. *Pediatrics*. 1988;81:365–371
22. Rassin DK, Richardson CJ, Baranowski T, et al. Incidence of breastfeeding in a low socioeconomic group of mothers in the United States: ethnic patterns. *Pediatrics*. 1984;73:132–137
23. Donath S, Amir LH. Rates of breastfeeding in Australia by state and socio-economic status: evidence from the 1995 National Health Survey. *J Paediatr Child Health*. 2000;36:164–168
24. Rogers IS, Emmett PM, Golding J. The incidence and duration of breastfeeding. *Early Hum Dev*. 1997;49(suppl):S45–S74

25. US Department of Labor. Women's Jobs: 1964–1999. Washington, DC: US Department of Labor, Women's Bureau; 1999
26. US Department of Health and Human Services. *HHS Blueprint for Action on Breastfeeding*. Washington, DC: US Government Printing Office; 2000
27. US Department of Health and Human Services. *National Health and Safety Performance Standards: Guidelines for Out-of-Home Child Care Programs*. Arlington, VA: US Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau; 1992:117–120
28. Baydar N, McCann M, Williams R, Vesper E, McKinney P. *WIC Infant Feeding Practices Study: Summary of Findings*. Alexandria, VA: US Department of Agriculture, Food and Nutrition Service, Office of Analysis and Evaluation; 1997
29. Walker M. Expanding breastfeeding promotion and support in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC). *J Hum Lact*. 2002;18:115–124
30. Barton SJ. Infant feeding practices of low-income rural mothers. *MCN Am J Matern Child Nurs*. 2001;26:93–97
31. Zimmerman DR. You can make a difference: increasing breastfeeding rates in an inner-city clinic. *J Hum Lact*. 1999;15:217–220
32. Zimmerman DR, Guttman N. "Breast is best": knowledge among low-income mothers is not enough. *J Hum Lact*. 2001;17:14–19
33. Reifsnider E, Eckhart D. Prenatal breastfeeding education: its effect on breastfeeding among WIC participants. *J Hum Lact*. 1997;13:121–125
34. Bentley ME, Caulfield LE, Gross SM, et al. Sources of influence on intention to breastfeed among African-American women at entry to WIC. *J Hum Lact*. 1999;15:27–34
35. McLorg PA, Bryant CA. Influence of social network members and health care professionals on infant feeding practices of economically disadvantaged mothers. *Med Anthropol*. 1989;10:2652–2678
36. World Health Organization. *Indicators for Assessing Breast-feeding Practices*. Geneva, Switzerland: World Health Organization; 1991
37. Eaton-Evans J, Dugdale AE. Recall by mothers of the birth weights and feeding of their children. *Hum Nutr Appl Nutr*. 1986;40:171–175
38. Tienboon P, Rutishauser IHE, Wahlqvist ML. Maternal recall of infant feeding practices after an interval of 4–15 years. *Aust J Nutr Diet*. 1994;51:25–27
39. Bland RM, Rollins NC, Solarsh G, Van den Broeck J, Coovadia HM, for the Child Health Group. Maternal recall of exclusive breastfeeding duration. *Arch Dis Child*. 2003;88:778–783

Breastfeeding Rates in the United States by Characteristics of the Child, Mother, or Family: The 2002 National Immunization Survey

Ruowei Li, Natalie Darling, Emmanuel Maurice, Lawrence Barker and Laurence M. Grummer-Strawn

Pediatrics 2005;115:e31

DOI: 10.1542/peds.2004-0481

Updated Information & Services	including high resolution figures, can be found at: http://pediatrics.aappublications.org/content/115/1/e31
References	This article cites 28 articles, 5 of which you can access for free at: http://pediatrics.aappublications.org/content/115/1/e31#BIBL
Subspecialty Collections	This article, along with others on similar topics, appears in the following collection(s): Fetus/Newborn Infant http://www.aappublications.org/cgi/collection/fetus:newborn_infant_sub Allergy/Immunology http://www.aappublications.org/cgi/collection/allergy:immunology_sub
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://www.aappublications.org/site/misc/Permissions.xhtml
Reprints	Information about ordering reprints can be found online: http://www.aappublications.org/site/misc/reprints.xhtml

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®



PEDIATRICS[®]

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Breastfeeding Rates in the United States by Characteristics of the Child, Mother, or Family: The 2002 National Immunization Survey

Ruowei Li, Natalie Darling, Emmanuel Maurice, Lawrence Barker and Laurence M. Grummer-Strawn

Pediatrics 2005;115:e31

DOI: 10.1542/peds.2004-0481

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/115/1/e31>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 345 Park Avenue, Itasca, Illinois, 60143. Copyright © 2005 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN[®]

