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Trends in Breastfeeding Initiation and Duration by Birthweight among US children, 1999-2012

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Keywords

breastfeeding; birth weight; survey	

Introduction

In the United States, breastfeeding initiation rates have risen to 80%. We report secular trends of breastfeeding initiation and duration by birth weight using nationally representative data from the National Health and Nutrition Examination Survey (NHANES).

Methods

The NHANES is a complex, stratified, multistage probability sample of the US civilian noninstitutionalized population, conducted by the National Center for Health Statistics, Centers for Disease Control and Prevention. The NHANES was approved by the National Center for Health Statistics Research Ethics Review Board.

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Contributors' Statements:

Kirsten Herrick: Dr. Herrick conceptualized and designed the study, drafted the initial manuscript, performed analyses and approved the final manuscript as submitted.

Lauren Rossen: Dr. Rossen conceptualized and designed the study, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Brian Kit: Dr. Kit conceptualized and designed the study, performed analyses, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Chia-Yih Wang: Dr. Wang conceptualized and designed the study, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Cynthia Ôgden: Dr. Ogden conceptualized and designed the study, reviewed and revised the manuscript, and approved the final manuscript as submitted.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Disclaimer: The findings and conclusions in this paper are those of the authors and do not necessarily represent the views of the National Center for Health Statistics, Centers for Disease Control and Prevention.

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Conflict of Interest: The Authors have no conflicts of interest to disclose.

Using data from 13,859 children ages 0 to 6 years who participated in the NHANES from 1999 to 2014, we constructed birth year cohorts (1997–2000, 2001–2004, 2005–2008, and 2009–2012) and birth weight categories (<2500 g [low birth weight (LBW)], 2500 g). Birth weight and breastfeeding history (ever breastfed or received breast milk) were obtained by proxy interview, most commonly by a parent ². The unweighted response rate ranged from 77% to 93% ³. Written parental consent was obtained for those younger than 18 years.

We estimated the proportion of infants ever breastfed (initiated) and those reporting any breastfeeding at 1 month, 4 months, and 6 months by birthweight categories and birth year cohorts. Infants were excluded if they had not attained the age at which breastfeeding was being estimated. Significance was set at $\alpha < .05$ for adjusted Wald method and orthogonal contrast matrices for linear tests of trends over time. Taylor series linearization was used for variance estimation and 95%CIs were computed by the Wald method. Kaplan-Meier curves and log-rank tests assessed differences in the duration of breastfeeding by birth weight cohort from 2009 to 2012. LOESS smoothed curves and 95% CIs from Kaplan-Meier curves are presented. Infants were censored at the time of interview if they were currently receiving breast milk (12% of respondents, unweighted n = 324). Overall, 8% of infants were LBW (unweighted n = 1279). SAS version 9.3 (SAS Institute) and SUDAAN version 11.0 (RTI International) were used. Survey design variables and interview sample weights, which account for differential probabilities of selection, nonresponse, noncoverage, and sample design, were used to obtain estimates representative of the civilian noninstitutionalized US population.

Results

Among all infants, breastfeeding initiation rates increased from 65.7% (95% CI, 62.4% -69.1%) in 1997–2000 to 76.7% (95% CI, 73.5%–79.8%) (P < .001) in 2009–2012. Over the same period, breastfeeding initiation rates increased from 48.8% (95% CI, 39.6% -57.9%) to 65.4% (95% CI, 55.4%–75.3%) (P = .01) for LBW infants and from 67.4% (95% CI, 64.0%–70.8%) to 77.5% (95% CI, 74.3%–80.8%) (P < .001) for infants weighing 2500 g or more at birth (Table). An increasing secular trend in the percentage of infants still breastfeeding at 1 month (59.7% [95% CI, 56.2%–63.2%] to 68.7% [95% CI, 65.0–72.4%]; P < .001), 4 months (42.6% [95% CI, 39.3%–46.0%] to 49.6% [95% CI, 45.6%–53.7%]; P = .005), and 6 months (36.2% [95% CI, 33.0%–39.5%] to 43.1% [95% CI, 39.3%–47.0%]; P = .002) was observed for infants weighing 2500 g or more. For LBW infants, the increase in the percentage still breastfeeding over time was not significant at any time after birth. This is likely owing to insufficient power arising from the small sample of LBW infants.

Within each birth cohort, the percentage of infants initiating breastfeeding and breastfeeding at 1, 4, and 6 months was significantly smaller for LBW infants compared with their heavier counterparts. For example, in 2009–2012, 43.1% of infants (95% CI, 39.3%–47.0%) weighing 2500 g or more were breastfeeding at 6 months compared with 27.7% of LBW infants (95% CI, 18.2%–37.2%) (P < .001). The only exception was among those still breastfeeding at 1 month in 2001–2004; this difference was not statistically significant.

The Figure presents the smoothed Kaplan-Meier curves for the overall duration of breastfeeding in the first year of life by birth weight categories. Infants who never breastfed were censored at time zero. Among infants born in 2009–2012, LBW infants had a 38% (95% CI, 1.17-1.63) increased hazard of discontinuing breastfeeding compared with infants weighing 2500 g or more (P < .001).

Discussion

Although breastfeeding rates have increased over the past 2 decades, the percentage of LBW infants ever breastfed and continuing to breastfeed was lower than infants weighing 2500 g or more. These baseline estimates may be used to track current and future public health efforts.

Acknowledgments

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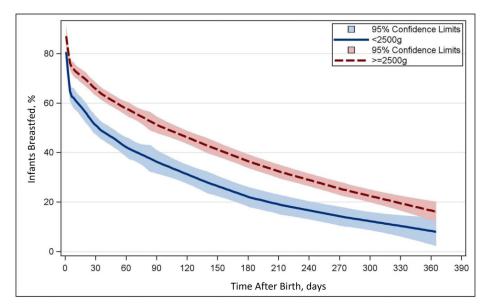
Abbreviations:

NHANES National Health and Nutrition Examination Survey

NCHS National Center for Health Statistics

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	Time Af	ter birth	, days											
	0	30	60	90	120	150	180	210	240	270	300	330	360	390
No. at risk														
< 2500 g	188	96	75	63	52	46	33	30	28	26	23	21	8	8
≥ 2500 g	2094	1197	1014	832	726	667	514	458	392	336	296	266	170	146

Figure:

Kaplan-Meier Curves for Duration of Breastfeeding by Birth Weight NOTE: Data derived from the National Health and Nutrition Examination Survey² birth cohort 2009–2012. Estimates derived from PROC KAPLANMEIER and plotted using LOESS. The number at risk is calculated from unweighted data and is therefore not directly comparable with the smoothed LOESS values in the plot.

Table.

Proportion of Children Ever Breastfed and Breastfed for 1 Month, 4 Months, and 6 Months, by Birth Weight and Birth Year Cohort

Breastfeeding Status Total No. 1997-2000 2001-2004 2005-2008 2005-2010 Ever Breastfed NA 3480 4108 3989 2282 No. 13859 657 (624-69.1) 677 (650-70.4) 72.9 (70.8-75.1) 767 (73.5-79.8) Total group 12880 657 (624-69.1) 677 (650-70.4) 72.9 (70.8-75.1) 767 (33.5-79.8) Actorog 12880 657 (624-69.1) 677 (650-70.4) 74.0 (70.8-75.1) 767 (33.5-79.8) Actorog 12880 674 (640-70.8) 68.6 (65.8-71.4) 74.0 (72.9-76.4) 76.7 (33.2-79.8) Act I mo NA 3444 4014 3913 76.7 (33.2-79.8) No. 1250 411 (317-50.4) 35.5 (44.5-62.6) 76.4 (33.2-79.8) 76.6 (63.9-71.4) Actorog 1754 411 (317-50.4) 35.5 (44.5-62.6) 65.4 (43.1-57.7) 67.6 (63.9-71.4) Actorog 1754 411 (317-50.4) 35.4 (44.5-62.6) 65.4 (43.1-57.7) 67.0 (63.9-71.4) Actorog 1754 411 (317-50.4) 35.5 (44.5-62.6) 65.			Breastfeeding, % (95% CI)	(95% CI)			
reastfed NA 3480 4108 3989 pp 13859 65.7 (62.4-69.1) 67.7 (65.0-70.4) 72.9 (70.8-75.1) g 12580 65.7 (62.4-69.1) 67.7 (65.0-70.4) 72.9 (70.8-75.1) g 12580 67.4 (64.0-70.8) 68.6 (65.8-71.4) 74.1 (72.0-76.2) 74.1	Breastfeeding Status	Total No.	0007-2661	2001–2004	2002-2008	2009-2012	P value
phy 3480 4108 3989 pp 13859 65.7 (62.4–69.1) 67.7 (65.0–70.4) 7.2.9 (70.8–75.1) g 1279 48.8 (39.6–57.9) 58.0 (490–67.0) 59.5 (52.5–66.4) g 12580 67.4 (64.0–70.8) 68.6 (65.8–71.4) 74.1 (72.0–76.2) g 12580 67.4 (64.0–70.8) 68.6 (65.8–71.4) 74.1 (72.0–76.2) p 13593 38.0 (34.5–61.5) 58.8 (55.8–61.8) 64.5 (61.8–67.1) g 1271 41.1 (31.7–50.4) 53.5 (44.5–62.0) 50.4 (43.1–57.7) g 1274 41.0 (37.8–44.2) 50.2 (56.2–62.3) 65.1 (62.9–68.4) g 1274 41.0 (37.8–44.2) 42.4 (39.1–45.7) 46.0 (43.4–48.5) g 1159 24.6 (17.6–31.5) 32.5 (24.3–40.7) 34.8 (27.2–42.3) p 11545 42.6 (39.3–46.0) 33.00 34.8 (31.2–34.6) 34.8 (31.2–34.6) g 1150 24.6 (17.6–31.5) 34.8 (31.9–37.8) 40.0 (37.6–42.4) 34.8 (31.2–34.5) g 1150 19.7 (13.7–25.8) <	Ever Breastfed						
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g 11279 48.8 (39.6-57.9) 58.0 (49.0-67.0) 59.5 (52.5-66.4) g 11280 67.4 (64.0-70.8) 68.6 (65.8-71.4) 74.1 (72.0-76.2) g 12580 67.4 (64.0-70.8) 68.6 (65.8-71.4) 74.1 (72.0-76.2) h A p 13593 58.0 (54.5-61.5) 58.8 (55.8-61.8) 64.5 (61.8-67.1) g 12317 59.7 (56.2-63.2) 59.2 (56.2-62.3) 65.7 (62.9-68.4) g 12317 59.7 (56.2-63.2) 59.2 (66.2-62.3) 65.7 (62.9-68.4) g 12317 59.7 (56.2-62.3) 59.2 (66.2-62.3) 65.7 (62.9-68.4) g 11244 41.0 (37.8-44.2) 42.4 (39.1-45.7) 46.0 (43.4-48.5) g 11545 42.6 (39.3-46.0) 43.3 (39.8-46.8) 46.9 (44.2-49.6) p NA 3186 36.2 (36.2-6.3) 46.0 (44.2-49.6) g 11547 34.8 (31.7-37.8) 34.8 (31.9-37.8) 40.0 (37.6-42.4) g 1150 19.7 (13.7-25.8) 26.6 (18.6-34.6) 27.5 (20.5-34.5)	Total group	13859	65.7 (62.4–69.1)	67.7 (65.0–70.4)	72.9 (70.8–75.1)	76.7 (73.5–79.8)	<0.001
g 112580 67.4 (64.0-70.8) 68.6 (65.8-71.4) 74.1 (72.0-76.2) nA p 13593 58.0 (54.5-61.5) 58.8 (55.8-61.8) 64.5 (61.8-67.1) g 1276 41.1 (31.7-50.4) 53.5 (44.5-62.6) 50.4 (43.1-57.7) g 1276 41.1 (31.7-50.4) 53.5 (44.5-62.6) 50.4 (43.1-57.7) g 1274 41.1 (31.7-50.4) 53.5 (44.5-62.6) 50.4 (43.1-57.7) p NA 3300 3784 365.1 (62.9-68.4) g 11744 41.0 (37.8-44.2) 42.4 (39.1-45.7) 46.0 (43.4-48.5) g 11545 42.6 (39.3-46.0) 43.3 (39.8-46.8) 46.9 (44.2-49.6) g 11545 42.6 (39.3-46.0) 40.0 40.0 (37.6-42.3) p NA p 12147 34.8 (31.7-37.8) 34.8 (31.9-37.8) 40.0 (37.6-2.4.3) g 1150 19.7 (13.7-25.8) 25.6 (32.4-3.4.8) 41.1 (38.5-3.4.3) g	<2500 g	1279	48.8 (39.6–57.9)	58.0 (49.0–67.0)	59.5 (52.5–66.4)	65.4 (55.4–75.3)	0.01
NA < 0.001 0.03 < 0.001 nA 3444 4014 3913 p 13593 58.0 (54.5-61.5) 58.8 (55.8-61.8) 64.5 (61.8-67.1) g 1276 41.1 (31.7-50.4) 53.5 (44.5-62.6) 50.4 (43.1-57.7) g 1276 41.1 (31.7-50.4) 53.5 (44.5-62.6) 50.4 (43.1-57.7) g 12317 59.7 (56.2-63.2) 59.2 (56.2-62.3) 65.7 (62.9-68.4) p 12744 41.0 (37.8-44.2) 42.4 (39.1-45.7) 46.0 (43.4-48.5) g 1199 24.6 (17.6-31.5) 32.5 (24.3-40.7) 34.8 (27.2-42.3) g 11545 42.6 (39.3-46.0) 43.3 (39.8-46.8) 46.0 (43.4-48.5) g 11546 42.6 (39.3-46.0) 43.3 (39.8-46.8) 46.0 (44.2-49.6) p NA 3186 360.2 34.92 g 11547 34.8 (31.7-37.8) 34.8 (31.9-37.8) 40.0 (37.6-42.4) g 1150 19.7 (13.7-25.8) 26.6 (18.6-34.6) 27.5 (20.5-34.5) g 10997 36.2 (33.0-39	2500 g	12580	67.4 (64.0–70.8)	68.6 (65.8–71.4)	74.1 (72.0–76.2)	77.5 (74.3–80.8)	<0.001
ph 3444 4014 3913 pp 13593 58.0 (54.5-61.5) 58.8 (55.8-61.8) 64.5 (61.8-67.1) g 1276 41.1 (31.7-50.4) 53.5 (44.5-62.6) 50.4 (43.1-57.7) g 12317 59.7 (56.2-63.2) 59.2 (56.2-62.3) 65.7 (62.9-68.4) g 12317 59.7 (56.2-63.2) 59.2 (56.2-62.3) 65.7 (62.9-68.4) pp NA 3300 3784 3651 g 11544 41.0 (37.8-44.2) 42.4 (39.1-45.7) 46.0 (43.4-48.5) g 11545 42.6 (39.3-46.0) 43.3 (39.8-46.8) 46.9 (44.2-49.6) p NA <0.001 0.02 0.003 p 12147 34.8 (31.7-37.8) 34.8 (31.9-37.8) 40.0 (37.6-42.4) g 11560 19.7 (13.7-25.8) 26.6 (18.6-34.6) 27.5 (20.5-34.5) g 11697 36.2 (33.0-39.5) 35.6(32.4-38.8) 41.1 (38.5-43.7) g 10997 36.2 (33.0-39.5) 35.6(32.4-38.8) 41.1 (38.5-43.7)	P value $^{\mathcal{C}}$	NA	<0.001	0.03	<0.001	0.02	NA
p NA 3444 4014 3913 p 13593 58.0 (54.5–61.5) 58.8 (55.8–61.8) 64.5 (61.8–67.1) g 1276 41.1 (31.7–50.4) 53.5 (44.5–62.6) 50.4 (43.1–57.7) g 12317 59.7 (56.2–63.2) 59.2 (56.2–62.3) 65.7 (62.9–68.4) p 12317 59.7 (56.2–63.2) 50.2 (62.9–68.4) 6.0001 p 12744 41.0 (37.8–44.2) 42.4 (39.1–45.7) 46.0 (43.4–48.5) g 11199 24.6 (17.6–31.5) 32.5 (24.3–40.7) 34.8 (27.2–42.3) g 11545 42.6 (39.3–46.0) 43.3 (39.8–46.8) 46.9 (44.2–49.6) p NA <0.001	At 1 mo						
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g 1276 41.1 (31.7–50.4) 53.5 (44.5–62.6) 50.4 (43.1–57.7) g 12317 59.7 (56.2–63.2) 59.2 (56.2–62.3) 65.7 (62.9–68.4) NA <0.001	Total group	13593	58.0 (54.5–61.5)	58.8 (55.8–61.8)	64.5 (61.8–67.1)	67.6 (63.9–71.4)	<0.001
g 12317 59.7 (56.2-63.2) 59.2 (56.2-62.3) 65.7 (62.9-68.4) NA <0.001	<2500 g	1276	41.1 (31.7–50.4)	53.5 (44.5–62.6)	50.4 (43.1–57.7)	54.0 (45.6–62.3)	0.07
NA <0.001 0.22 <0.001 NA 3300 3784 3651 p 12744 41.0 (37.8-44.2) 42.4 (39.1-45.7) 46.0 (43.4-48.5) g 1199 24.6 (17.6-31.5) 32.5 (24.3-40.7) 34.8 (27.2-42.3) g 11545 42.6 (39.3-46.0) 43.3 (39.8-46.8) 46.9 (44.2-49.6) p NA <0.001	2500 g	12317	59.7 (56.2–63.2)	59.2 (56.2–62.3)	65.7 (62.9–68.4)	68.7 (65.0–72.4)	<0.001
p 3300 3784 3651 p 12744 41.0 (37.8-44.2) 42.4 (39.1-45.7) 46.0 (43.4-48.5) g 1199 24.6 (17.6-31.5) 32.5 (24.3-40.7) 34.8 (27.2-42.3) g 11545 42.6 (39.3-46.0) 43.3 (39.8-46.8) 46.9 (44.2-49.6) g NA <0.001 0.02 0.003 p 12147 34.8 (31.7-37.8) 34.8 (31.9-37.8) 40.0 (37.6-42.4) g 1150 19.7 (13.7-25.8) 26.6 (18.6-34.6) 27.5 (20.5-34.5) g 110997 36.2 (33.0-39.5) 35.6 (32.4-38.8) 41.1 (38.5-43.7) NA <0.001 0.04 <0.001	P value $^{\mathcal{C}}$	NA	<0.001	0.22	<0.001	<0.001	NA
pp 3300 3784 3651 pp 12744 41.0 (37.8-44.2) 42.4 (39.1-45.7) 46.0 (43.4-48.5) g 1199 24.6 (17.6-31.5) 32.5 (24.3-40.7) 34.8 (27.2-42.3) g 11545 42.6 (39.3-46.0) 43.3 (39.8-46.8) 46.9 (44.2-49.6) p NA <0.001	At 4 mo						
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B 1199 24.6 (17.6–31.5) 32.5 (24.3–40.7) 34.8 (27.2–42.3) 31.5 (24.3–40.7) 34.8 (27.2–42.3) 31.5 (24.3–40.7) 34.8 (27.2–42.3) 31.5 (24.3–40.8) 34.9 (24.2–49.6) 34.8 (21.2–49.6) 34.8 (21.2–42.4) 34.8 (31.7–37.8) 34.8 (31.9–37.8) 34.8 (31.9–37.8) 35.6 (31.6–34.5) 35.6 (31.6–34.5) 35.6 (31.6–34.8)	Total group	12744	41.0 (37.8–44.2)	42.4 (39.1–45.7)	46.0 (43.4–48.5)	48.6 (44.6–52.7)	0.002
B 11545 42.6 (39.3-46.0) 43.3 (39.8-46.8) 46.9 (44.2-49.6) NA <0.001 0.002 0.003 NA 3186 3602 3492 PD 12147 34.8 (31.7-37.8) 34.8 (31.9-37.8) 40.0 (37.6-42.4) B 1150 19.7 (13.7-25.8) 26.6 (18.6-34.6) 27.5 (20.5-34.5) NA <0.001 0.04 0.04 <0.001	<2500 g	1199	24.6 (17.6–31.5)	32.5 (24.3–40.7)	34.8 (27.2–42.3)	36.1 (26.0–46.2)	0.05
NA <0.001 0.02 0.003 nA 3186 3602 3492 np 12147 34.8 (31.7–37.8) 34.8 (31.9–37.8) 40.0 (37.6–42.4) g 1150 19.7 (13.7–25.8) 26.6 (18.6–34.6) 27.5 (20.5–34.5) g 10997 36.2 (33.0–39.5) 35.6(32.4–38.8) 41.1 (38.5–43.7) NA <0.001	2500 g	11545	42.6 (39.3–46.0)	43.3 (39.8–46.8)	46.9 (44.2–49.6)	49.6 (45.6–53.7)	0.005
NA 3186 3602 3492 ip 12147 34.8 (31.7–37.8) 34.8 (31.9–37.8) 40.0 (37.6–42.4) g 1150 19.7 (13.7–25.8) 26.6 (18.6–34.6) 27.5 (20.5–34.5) g 10997 36.2 (33.0–39.5) 35.6 (32.4–38.8) 41.1 (38.5–43.7) NA <0.001 0.04 <0.001	P value $^{\mathcal{C}}$	NA	<0.001	0.02	0.003	900'0	NA
pp 3186 3602 3492 pp 12147 34.8 (31.7–37.8) 34.8 (31.9–37.8) 40.0 (37.6–42.4) g 1150 19.7 (13.7–25.8) 26.6 (18.6–34.6) 27.5 (20.5–34.5) g 10997 36.2 (33.0–39.5) 35.6 (32.4–38.8) 41.1 (38.5–43.7) NA <0.001	At 6 mo						
pp 12147 34.8 (31.7–37.8) 34.8 (31.9–37.8) 40.0 (37.6–42.4) g 1150 19.7 (13.7–25.8) 26.6 (18.6–34.6) 27.5 (20.5–34.5) g 10997 36.2 (33.0–39.5) 35.6 (32.4–38.8) 41.1 (38.5–43.7) NA <0.001 0.04 0.04	No.	NA	3186	3602	3492	1867	NA
g 1150 19.7 (13.7–25.8) 26.6 (18.6–34.6) 27.5 (20.5–34.5) g 10997 36.2 (33.0–39.5) 35.6 (32.4–38.8) 41.1 (38.5–43.7) NA <0.001 0.04 <0.04	Total group	12147	34.8 (31.7–37.8)	34.8 (31.9–37.8)	40.0 (37.6–42.4)	42.0 (38.1–45.8)	0.001
36.2 (33.0–39.5) 35.6(32.4–38.8) 41.1 (38.5–43.7) NA <0.001 0.04 <0.001	<2500 g	1150	19.7 (13.7–25.8)	26.6 (18.6–34.6)	27.5 (20.5–34.5)	27.7 (18.2–37.2)	0.16
NA <0.001 0.04 <0.001	2500 g	10997	36.2 (33.0–39.5)	35.6(32.4–38.8)	41.1 (38.5–43.7)	43.1 (39.3–47.0)	0.002
, varia	P value $^{\mathcal{C}}$	NA	<0.001	0.04	<0.001	<0.001	NA

Abbreviations: NA, not applicable.

^aData are derived from the National Health and Nutrition Examination Survey, 1999–2014 for birth cohorts above. Birth cohorts 1993–1996 and 2013–2014 are excluded from analysis because the sample sizes did not produce reliable estimates. Sample sizes are unweighted and prevalence estimates are weighted.

 $\stackrel{b}{\text{Linear}}$ test for trend from 1997–2000 to 2009–2012.

 C Differences between infants <2500 g and infants 2500 g or more were tested using a t statistic with the appropriate df at the P < 0.05 significance level