TECHNICAL REPORT

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DEDICATED TO THE HEALTH OF ALL CHILDREN™

Breastfeeding and the Use of Human Milk

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abstract

Breastfeeding and human milk are the normative standards for infant feeding and nutrition. The short- and long-term medical and neurodevelopmental advantages of breastfeeding make breastfeeding or the provision of human milk a public health imperative. The American Academy of Pediatrics (AAP) recommends exclusive breastfeeding for ~6 months after birth. Furthermore, the AAP supports continued breastfeeding, along with appropriate complementary foods introduced at about 6 months, as long as mutually desired by mother and child for 2 years or beyond. These recommendations are consistent with those of the World Health Organization (WHO). Medical contraindications to breastfeeding are rare. The AAP recommends that birth hospitals or centers implement maternity care practices shown to improve breastfeeding initiation, duration, and exclusivity. The Centers for Disease Control and Prevention and The Joint Commission monitor breastfeeding practices in United States hospitals. Pediatricians play a critical role in hospitals, their practices, and communities as advocates of breastfeeding and, thus, need to be trained about the benefits of breastfeeding for mothers and children and in managing breastfeeding. Efforts to improve breastfeeding rates must acknowledge existing disparities and the impact of racism in promoting equity in breastfeeding education, support, and services.

Since the publication of the 2012 policy statement of the American Academy of Pediatrics (AAP) on breastfeeding and the use of human milk, research and systematic reviews have continued to reinforce the conclusion that breastfeeding and human milk are the normative standards for infant feeding and nutrition.[1] More than 80% of women initiate breastfeeding in the United States,[2] and both federal and state laws protect a woman's right to breastfeed, as well as the right to breastfeed in public and to continue breastfeeding or expression of

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milk in the workplace. With most women choosing to initiate breastfeeding, breastfeeding has been established as the cultural norm in the United States. Furthermore, breastfeeding, or the provision of human milk, should be considered the reference standard to which all forms of infant feeding are compared from a biological, medical, and scientific standpoint. When comparing breastfeeding to other forms of infant feeding, breastfeeding should be considered the reference standard. In epidemiologic research, the reference standard is set as an odds ratio or relative risk of 1, whereas other exposures, or other feeding methods, are presented as comparisons to breastfeeding. For example, compared with breastfeeding, with a relative risk of 1, there is an increased risk of infant mortality associated with other forms of infant feeding. Another application of the normative standard is infant growth. Growth patterns of exclusively breastfed infants are the reference or normative standards, and therefore, growth charts endorsed by the Centers for Disease Control and Prevention (CDC) use data from a multinational growth reference study of exclusively breastfed infants. This technical report updates the evidence for the accompanying 2022 AAP policy statement "Breastfeeding and the Use of Human Milk"[3] and serves as a reference for other AAP policies and publications that address breastfeeding and infant nutrition.

EPIDEMIOLOGY

The CDC collects and publishes data from the National Immunization Survey annually and from the Maternity Practices and Infant Nutrition and Care Survey biannually to document current breastfeeding practices and describe trends.[2,4] Drawing on these data, the CDC publishes the "Breastfeeding Report Card" biannually to highlight the degree of progress in achieving the breastfeeding goals of the Healthy People 2020 and 2030 objectives (Table 1).[5–7]

The average national breastfeeding initiation rate for the total United States population, based on the latest National Immunization Survey data for the birth cohort from 2018, is 83.9%[2] (Fig 1). This figure represents any breastfeeding, not exclusive breastfeeding. Healthy People 2020 indicators have been met or exceeded for the 2018 birth cohort for initiation of any breastfeeding (83.9%), exclusive breastfeeding at 3 months (46.3%), exclusive breastfeeding at 6 months (25.8%), and any breastfeeding at 12 months of life (35.0%), but not for the 6-month rates of any breastfeeding (56.7%) (most recent data indicated in parentheses; Table 1). Furthermore, 19.4% of breastfed infants received supplements of commercial infant formula in the first 48 hours after birth, well above the Healthy People 2020 target of 14.2%.[2] The Healthy People 2030 goals for breastfeeding are to increase the proportion of infants exclusively breastfed for 6 months to 42.4%[7]and to increase the proportion of infants who continue to breastfeed for 12 months to 54.1%.[7]

Unfortunately, 60% of mothers in the United States report that they do not breastfeed as long as they intended to, citing issues with latch, the infant's weight, or concerns about medications.[8] Other studies show that unsupportive work policies, cultural norms, and lack of parental or family support are barriers to breastfeeding, indicating a need to improve support for breastfeeding families.[9]

Alternatively, women who are supported in breastfeeding are 2.5 times more likely to exclusively breastfeed for 6 months. This support includes maternity care practices that support breastfeeding, home visits, health care staff education, and peer support through the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).[10]

EQUITY

Overall rates of breastfeeding, however, obscure significant sociodemographic and cultural differences. For example, the breastfeeding initiation rate for the non-Hispanic White population in the 2018 data were 85.3% and for the Hispanic or Latino population was 85.0%, but for the non-Hispanic Black or African American population, initiation rates were 75.5%.[2] (Figs 1 and 2). Unfortunately, none of the Healthy People 2020 objectives for breastfeeding were met for non-Hispanic Black mothers and infants among the 2018 birth cohort.[2] Among mothers with low income (participants in WIC), the breastfeeding initiation rate was 76.9%, but for those with a higher income who were ineligible for WIC, the initiation rate was 91.6%. Older women (>30 years) and those with higher education are more likely to breastfeed than are younger women (<20 years) or those with high school education or less. These disparities in breastfeeding practices reflect different populations as well as social determinants of health and hospital practices but also represent a significant inequity issue that has disproportionate impact on the non-Hispanic Black population. Implicit bias, structural bias, and structural racism should be addressed to eliminate disparities in breastfeeding and improve the health and well-being of all children and families.[11]

TABLE 1 Healthy People 2020 Objectives and Outcomes for Breastfeeding

Maternal Child Health Indicators[a]	Healthy People 2020 Objectives	Target, %	Current Rates[b], %
MICH-21.1	Increase the proportion of infants who are breastfed ever	81.9	83.9
MICH-21.2	Increase the proportion of infants who are breastfed at 6 mo	60.6	56.7
MICH-21.3	Increase the proportion of infants who are breastfed at 1 y	34.1	35.0
MICH-21.4	Increase the proportion of infants who are breastfed exclusively through 3 mo	46.2	46.3
MICH-21.5	Increase the proportion of infants who are breastfed exclusively through 6 mo	25.5	25.8
MICH-23	Reduce the proportion of breastfed newborns who received formula supplementation with the first 2 d of life	14.2	19.4

[a] Source: Healthy People 2020 (https://www.healthypeople.gov/2020/data-search/Search-the-Data#topic-area=3492)
[b] Source: National Immunization Survey, representing infants born in 2018 (https://www.cdc.gov/breastfeeding/data/nis_data/results.html)

It has been estimated that suboptimal breastfeeding in a non-Hispanic Black population is associated with a 1.7 times excess number of cases of acute otitis media, 3.3 times excess cases of necrotizing enterocolitis, and 2.2 times excess number of child deaths, compared with a non-Hispanic White population.[12] A nationally representative sample found that ever breastfeeding was associated with a 21% reduced risk of postneonatal death for all infants and a 31% reduced risk for Black infants.[13] A recent analysis linking birth and death certificates for all US births in 2017 found that any breastfeeding of non-Hispanic Black infants is associated with a reduction in infant deaths.[14] Targeted interventions have shown improvement in breastfeeding initiation and duration rates among those groups with lower breastfeeding rates. For example, implementation of the "Ten Steps to Successful Breastfeeding" from the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF)[15] was shown to decrease the disparity in breastfeeding initiation between Black and White infants by 9.6%.[16] In addition, a systematic review by the Agency for Healthcare Research and Quality (AHRQ) concluded that, for women enrolled in WIC, peer-support interventions offered by WIC agencies improves rates of breastfeeding initiation and duration.[10]

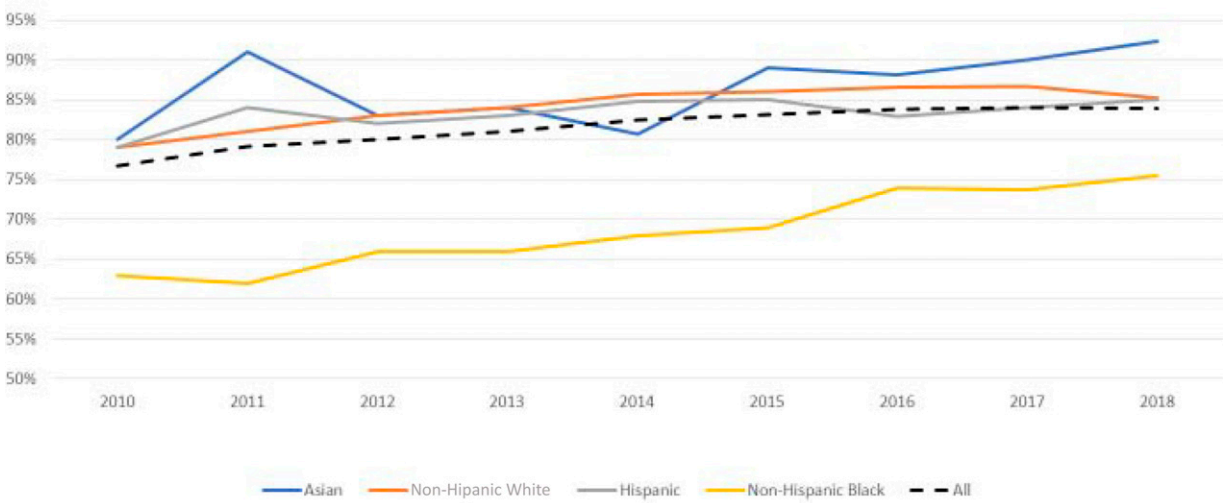

FIGURE 1
Initiation of any breastfeeding in the United States by race and ethnicity. From the Centers for Disease Control and Prevention, Department of Health and Human Services, and National Immunization Survey (2021). Available at: https://www.cdc.gov/breastfeeding/data/nis_data/rates-any-exclusive-bf-socio-dem-2018.html. Accessed November 4, 2021.

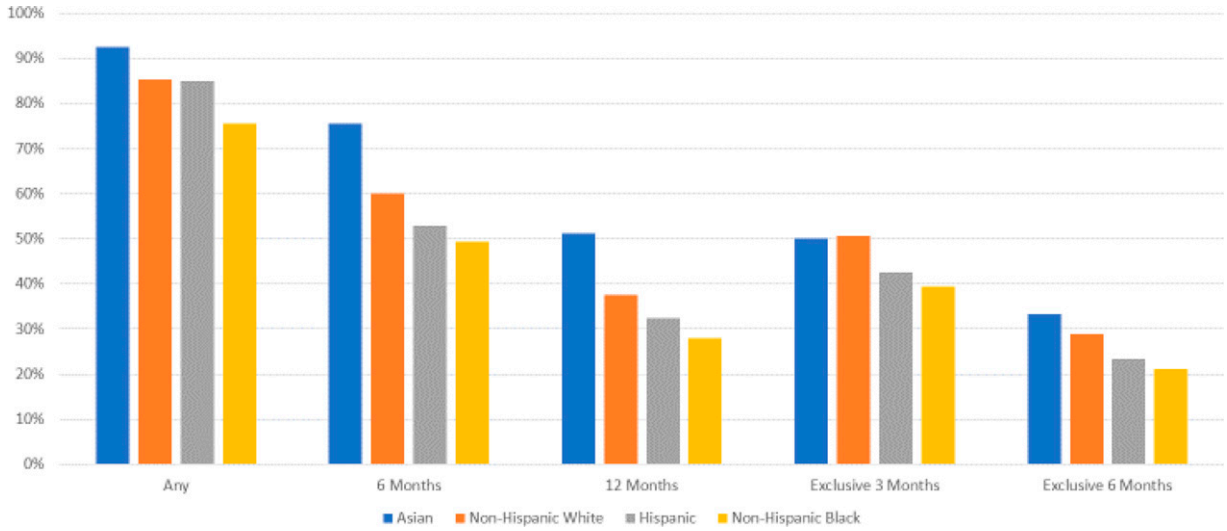

FIGURE 2

Breastfeeding rates by race and ethnicity. From the Centers for Disease Control and Prevention, Department of Health and Human Services, and National Immunization Survey (2021). Available at: https://www.cdc.gov/breastfeeding/data/nis_data/rates-any-exclusive-bf-socio-dem-2018.html. Accessed November 4, 2021.

EXCLUSIVE BREASTFEEDING

The AAP recommends exclusive breastfeeding for ~ 6 months. This recommendation is consistent with policies and guidelines of the WHO, American College of Obstetricians and Gynecologists (ACOG), American Academy of Family Physicians (AAFP), and Canadian Pediatric Society.[17–20] Human milk has a unique composition, with antimicrobial, anti-inflammatory, and immunoregulatory agents and living cells, all of which contribute to the developing immune system of the child.[21] Studies and meta-analyses have confirmed that 6 months of exclusive breastfeeding was associated with decreased lower respiratory tract infections, severe diarrhea, otitis media, and obesity (Table 2). A meta-analysis showed that less than 6 months of exclusive breastfeeding was associated with an abnormal microbiota and that the differences in gut microbiota persist after 6 months of age.[22]

The Pregnancy and Birth to 24 Months Project of the United States Department of Agriculture (USDA) concluded that complementary feeds introduced earlier than 6 months offer no benefit to the breastfeeding infant in growth or iron status but may be associated with an increased risk of being overweight or obese, especially if introduced before 4 months.[23] The European Food Safety Authority Panel on Nutrition, Novel Foods and Food Allergens concluded that the majority of infants do not need complementary feeds for nutritional reasons until around 6 months of age.[24] A trial of exclusively breastfed infants randomly assigned to start complementary feeds at 4 or 6 months of age revealed that the infants who started complementary feeds at 6 months received 83 g (range, 19–148 g) more human milk every day, with no significant difference in energy intake or infant growth.[25]

Breastfeeding exclusively for about 6 months is an evidence-based recommendation. In an individual counseling situation, pediatricians and families can discuss the desires of the family and cultural variations. Pediatricians can review the importance of exclusive breastfeeding and ensure mothers and families are fully informed about their decisions, while at the same time engaging in nonjudgmental conversations about the family's personal goals for breastfeeding.

DURATION OF BREASTFEEDING

The AAP supports continued breastfeeding, along with appropriate complementary foods introduced at about 6 months, for as long as mutually desired by mother and child for 2 years or beyond. This recommendation is consistent with guidelines and policies of the WHO, AAFP, and Canadian Pediatric Society.[17,19,20] Preliminary data reveal that human milk in the second year of life continues to be an important source of macronutrients and immunologic factors for the growing toddler, because it is composed of the same levels of lactose and fat as first-year milk, with significantly higher concentrations of protein, lactoferrin, lysozyme, and immunoglobulin A.[26,27] Studies emphasize the importance of

TABLE 2 Breastfeeding and Infant Outcomes

Outcome and Reference	% Lower Risk	Breastfeeding[a]	Compared with:	Comments[b]	OR or RR or HR	95% CI
SIDS[38]	40	2–4 mo	None	Breastfeed at least 2 mo to reduce SIDS	OR 0.60	0.44–0.82
	60	4–6 mo	None		OR 0.40	0.26–0.63
	64	>6 mo	None		OR 0.36	0.22–0.61
Infant mortality, US[231]	19	Ever	Never	US cohort	OR 0.81	0.68–0.97
Neonatal mortality (8–27 d)[231]	51	Ever	Never	US cohort	OR 0.49	0.34–0.72
Postneonatal mortality[13]	21	Ever	Never	US nationally representative sample	OR 0.79	0.67–0.93
	38	>3 mo	Never		OR 0.62	0.46–0.82
Infant Mortality (7–365 d)[14]	26	Ever	Never	US national cohort	OR 0.74	0.70–0.79
Neonatal mortality (7–27 d)[14]	40	Ever	Never	US national cohort	0.60	0.54–0.67
Postneonatal mortality (28–364 d)[14]	19	Ever	Never	US national cohort	0.81	0.76–0.87
Infant mortality developing countries[41]	33	Exclusive	Predominant		RR 0.67	0.52–0.88
	79	Exclusive	Partial		RR 0.21	0.20–0.22
	93	Exclusive	None		RR 0.07	0.03–0.16
Infant mortality developing countries[235]	25	Initiated in first hour	>1st hour		RR 0.75	0.64–0.88
Lower respiratory tract infection[44]	19	Exclusive 6 mo	Exclusive <4 mo	Cohort	RR 0.81	0.69–0.95
Severe or persistent diarrhea[44]	30	Exclusive 6 mo	Exclusive <4 mo	Cohort	RR 0.70	0.52–0.94
Otitis media[43]	33	Ever	Never		OR 0.67	0.56–0.80
	33	More	Less		OR 0.67	0.59–0.76
	43	Exclusive 6 mo	None		OR 0.57	0.44–0.80
Asthma 5–18 y[233]	10	More	Less		OR 0.90	0.84–0.97
	12	Ever	Never		OR 0.88	0.82–0.95
Asthma ever, all ages[234]	22	Longer	Shorter	Most protective for wheezing in first 2 y	OR 0.78	0.74–0.84
Eczema first, 2 y[233]	26	Exclusive 3–4 mo	Shorter		OR 0.74	0.57–0.97
Crohn's disease[48]	29	Ever	Never		OR 0.71	0.59–0.85
	80	12 mo	3–6 mo		OR 0.20	0.08–0.50
Ulcerative colitis[48]	22	Ever	Never		OR 0.78	0.67–0.91
	79	12 mo	3–6 mo		OR 0.21	0.10–0.43
Childhood obesity[49]	22	Ever	Never		OR 0.78	0.74–0.81
	10	<3 mo	Never		OR 0.90	0.84–0.95
	12	3–5 mo	Never		OR 0.88	0.79–0.97
	17	5–7 mo	Never		OR 0.83	0.76–0.90
	21	>7 mo	Never		OR 0.79	0.70–0.88
Childhood and adult obesity[50]	23	Ever	Never		OR 0.77	0.69–0.86
	26	Greater	Less		OR 0.74	0.68–0.80
	31	Exclusive	Nonexclusive		OR 0.69	0.61–0.79

TABLE 2 Continued

Outcome and Reference	% Lower Risk	Breastfeeding[a]	Compared with:	Comments[b]	OR or RR or HR	95% CI
Childhood obesity[51]	18	>6 mo	Never	European pooled analysis	OR 0.82	0.78–0.86
	11	>6 mo	<6 mo		OR 0.89	0.86–0.93
	20	Exclusive 6 mo	Nonexclusive		OR 0.8	0.74–0.85
Type 1 diabetes[52]	57	Fullly breastfeeding 6 mo	Never	Cohort	HR 0.43	0.21–0.90
	56	12 mo	Never	Cohort	HR 0.44	0.22–0.88
Type 2 diabetes[54]	33	Ever	Never		OR 0.67	0.56–0.80
Leukemia[56]	11	Ever	Never		OR 0.89	0.84–0.94
	19	6 mo	None or shorter		OR 0.81	0.73–0.89

CI, confidence interval; HR, hazard ratio; OR indicates odds ratio; RR, relative risk.
[a] Not necessarily exclusive breastfeeding unless specifically written.
[b] Data are from meta-analyses, unless another type of study is written.

nutrition during the "first 1000 days," the period from conception to 2 years of age, on a child's neurodevelopment and lifelong health.[28] This is the most active period of neurologic development. Child and adult health risks, including obesity, hypertension, and diabetes, are believed to be programmed during this period.[28]

In addition, studies have documented the importance of longer breastfeeding in increasing maternal attachment. One analysis of data from 1272 families in the National Institute of Child Health and Human Development's Study of Early Child Care and Youth Development found that longer breastfeeding duration, up to age 3, predicted increases in observed maternal sensitivity—for example, maternal responsiveness to infant, affect, flexibility, and ability to read infants' cues—up to age 11 in children, after accounting for multiple confounding variables.[29]

The health benefits of longer duration of breastfeeding may be most important for maternal outcomes. Studies and meta-analyses have confirmed the importance of breastfeeding >12 months on maternal health, as associated with decreasing maternal diabetes mellitus, hypertension, breast cancer, and ovarian cancer (Table 3). Longer duration of breastfeeding is associated with decreased risk of developing breast and ovarian cancer in the mother.[30–32]

TABLE 3 Breastfeeding and Maternal Outcomes (From Meta-Analyses)

Condition and Reference	% Lower Risk	Breastfeeding[a]	Compared with:	OR or RR	95% CI
Type 2 diabetes mellitus[71]	32	Longer	Shorter	RR 0.68	0.57–0.82
Diabetes mellitus[72]	30	>12 mo	Less	RR 0.70	0.62–0.78
Gestational diabetes mellitus and type 2 diabetes mellitus[73]	78	Longer	Shorter	OR 0.22	0.13–0.36
	58	Exclusive	None	OR 0.42	0.22–0.81
Hypertension[75]	8	<6 mo	None	OR 0.92	0.88–0.96
	11	6–12 mo	None	OR 0.89	0.86–0.92
	12	>12 mo	None	OR 0.88	0.84–0.93
Hypertension[72]	13	>12 mo	Less	RR 0.87	0.78–0.97
Premenopausal breast cancer[32]	14	Any	None	RR 0.86	0.80–0.93
Postmenopausal breast cancer[32]	11	Any	None	RR 0.89	0.83–0.95
Breast cancer[32]	28	Exclusive	None	RR 0.72	0.58–0.90
Breast cancer[77]	22	Any	None	OR 0.78	0.74–0.82
	7	<6 mo	None	OR 0.93	0.88–0.99
	9	6–12 mo	None	OR 0.91	0.87–0.96
	26	>12 mo	None	OR 0.74	0.69–0.79
Ovarian cancer[77]	30	Ever	Never	OR 0.70	0.64–0.77
	17	<6 mo	None	OR 0.83	0.78–0.89
	28	6–12 mo	None	OR 0.72	0.66–0.78
	37	>12 mo	None	OR 0.63	0.56–0.71
Endometrial cancer[83]	11	Ever	Never	OR 0.89	0.81–0.98
Thyroid cancer[84]	9	Ever	Never	RR 0.91	0.83–0.99

[a] Not necessarily exclusive breastfeeding unless specifically written.

Mothers who decide to breastfeed past the first year need continued support. They often report feeling ridiculed or alienated in their choice and conceal their breastfeeding behavior to minimize unsolicited judgment and comments.[33,34] There is also evidence that only half of mothers who breastfeed beyond 1 year discuss their decision with their pediatric primary care provider and that 38% of women who reported that their pediatric primary care provider was unsupportive of breastfeeding past the first year elected to change providers.[35] In addition, laws protecting breastfeeding need to be extended beyond the first year. Section 4207 of the Patient Protection and Affordable Care Act (ACA) amends the Fair Labor Standards Act (FLSA) of 1938 (29 U.S. Code 207) to require an employer to provide reasonable break time for an employee to express milk for their nursing child each time an employee has need to express milk for 1 year after the child's birth.[36] Federal legislation and insurance-mandated supports of lactation disappear after the first year. State breastfeeding laws vary widely.[37]

INFANT OUTCOMES

Extensive data confirm that many acute and chronic pediatric disorders, such as otitis media, acute diarrheal disease, lower respiratory illnesses, sudden infant death syndrome (SIDS), inflammatory bowel disease, childhood leukemia, diabetes mellitus, obesity, asthma, and atopic dermatitis, occur less frequently among children who were breastfed as infants (Table 2). Some of these outcomes may be secondary to the biologic composition of human milk, which contains anti-infective and anti-inflammatory factors; oligosaccharides that promote a healthy gut microbiome; growth factors; microRNA that are important in modulating epigenetic regulators; cells such as neutrophils, leukocytes, and stem cells; and bacteria, including bifidobacteria and lactobacilli, all with important roles in establishing the neonatal immune system and gut microbiota. Studies emphasize the importance of the "early critical window" in the first year of life, during which breastfeeding can induce long-term effects.[38]

Methodology

Methodologic issues have been raised regarding the quality of breastfeeding studies, especially the sample size and quality of data sets. Many studies vary in their definitions of duration, exclusivity, and amount of milk consumed by the infant, or the method by which the milk is received (ie, direct breastfeeding versus expressed human milk). There are inherent practical and ethical issues that have precluded prospective randomized interventional trials of different feeding regimens. As such, most published reports are observational cohort studies. These studies must be careful to account for confounding of characteristics associated with both feeding decisions and health outcomes. For this report, we have emphasized the most recent meta-analyses and systematic reviews; however, these are only as reliable as the individual studies that are included in these combined analyses. The recently updated information is highlighted in the USDA Pregnancy and Birth to 24 Months Project systematic review[23] evaluating infant outcomes with breastfeeding and the AHRQ systematic review evaluating maternal health outcomes.[10] This report will also reference other recent meta-analyses and important recent studies. Summaries of the benefits are noted in the text with data provided in Tables 2 and 3.

SIDS and Infant Mortality

Meta-analyses from 8 large studies revealed that breastfeeding for more than 2 months was associated with a reduction in SIDS by 40%, by 60% if breastfeeding duration was at least 4 months, and by 64% if breastfeeding duration was longer than 6 months.[39] Public health messaging about SIDS risk reduction should, therefore, emphasize that breastfeeding, if it is to be protective, should continue for at least 2 months and that longer durations of breastfeeding will result in lower risk of SIDS and infant mortality. Because the peak incidence of SIDS occurs between 3 and 6 months, continued exclusive breastfeeding through 6 months will enhance protection during this high-risk period. Statistical modeling suggests that optimizing breastfeeding in the United States could prevent 492 infant deaths from SIDS every year.[40]

An analysis linking birth−death certificates for all United States births in 2017 found that any breastfeeding is associated with a 26% reduction in infant mortality (7–364 days), 40% reduction in neonatal mortality (7–27 days), and 19% reduction in postneonatal mortality (28–364 days). Significant effects of breastfeeding initiation were observed for deaths attributable to infection (adjusted odds ratio [AOR] = 0.81 [0.69–0.94]), sudden unexpected infant death (AOR = 0.85 [0.78–0.92]), and necrotizing enterocolitis (AOR = 0.67 [0.49 − 0.90]).[14] Previously, other investigators used the 1988 United States National Maternal and Infant Health Survey data to conduct a case-control study of 1204 infants who died between 28 days and 1 year of age from causes other than congenital anomaly or malignant tumor and 7740 children who were still alive at 1 year. They found that

children who were ever breastfed had 0.79 (95% confidence interval [CI], 0.67–0.93) times the risk of never breastfed children for dying in the postneonatal period.[13]

Although global studies are complex and may not be completely applicable in the United States, meta-analyses of infant mortality in developing countries revealed the importance of exclusive breastfeeding and early breastfeeding in the first hour of life.[41] It has been estimated that improving global breastfeeding could prevent 823 000 annual deaths in children younger than 5 years.[42]

Otitis Media

Confirming previous studies, a meta-analysis of 24 studies, all from the United States and Europe, revealed that breastfeeding is associated with decreased risk of otitis media in the first 2 years of life.[43]

Respiratory Tract Infections

The Millennium Cohort Study, a nationally representative longitudinal study of 18 818 infants in the United Kingdom, revealed that exclusive breastfeeding for 6 months as compared with <4 months was associated with a decreased risk of lower respiratory tract infections.[44] It has been estimated that if 90% of infants in the United States were exclusively breastfed for 6 months, this could prevent almost 21 000 hospitalizations and 40 deaths attributable to lower respiratory tract infections in the first year of life.[40]

Diarrhea

The Millennium Cohort Study showed that exclusively breastfeeding for 6 months as compared with <4 months was associated with a decreased risk of severe or persistent diarrhea.[44]

Asthma and Allergy

The AAP concluded that any duration of breastfeeding beyond 3 to 4 months is protective against wheezing in the first 2 years of life, and this effect is irrespective of duration of exclusivity.[45] There is some evidence that longer duration of any breastfeeding, as opposed to less breastfeeding, protects against asthma, even after 5 years of age. Exclusive breastfeeding for the first 3 to 4 months decreases the cumulative incidence of eczema in the first 2 years of life. There are no short- or long-term advantages for exclusive breastfeeding beyond 3 to 4 months for prevention of atopic disease. No conclusions could be made about the role of any duration of breastfeeding in either preventing or delaying the onset of specific food allergies. The USDA systematic review concluded, on the basis of moderate, mostly observational, evidence that any breastfeeding is associated with a lower risk of childhood asthma and that longer durations afforded more protection but found no relationship with atopic dermatitis or food allergies.[46]

No conclusions can be made about the role of any duration of breastfeeding in either preventing or delaying the onset of specific food allergies.

Celiac Disease

The USDA systematic review concluded, on the basis of limited case-control evidence, that breastfeeding is associated with a lower risk of celiac disease.[47]

Inflammatory Bowel Disease

A meta-analysis of 35 studies reported that any breastfeeding is associated with a reduced risk of Crohn's disease and ulcerative colitis.[48] The USDA systematic review concluded, on the basis of limited, but consistent, case control evidence, that longer durations of breastfeeding were associated with lower rates of inflammatory bowel disease.[47]

Obesity

Two meta-analyses and a pooled analysis of children in Europe showed that breastfeeding provides some level of protection against childhood, and even adult, obesity.[49–51] Exclusive breastfeeding protects more than mixed feeding.

Diabetes and Cardiovascular Disease

Two population-based cohorts of children from Denmark and Norway with a total of 155 000 children were prospectively followed from birth. Never having been breastfed was associated with a twofold increased risk of type 1 diabetes mellitus, compared with being breastfed for ≥12 months or full breastfeeding (breastfeeding and water-based drinks, but no formula or feeds) for ≥6 months.[52] The USDA systematic review concluded that, on the basis of observational evidence, any breastfeeding (limited evidence) was associated with decreased risk of type 1 diabetes mellitus and that longer durations of breastfeeding (moderate evidence) and exclusive breastfeeding (limited evidence) decreased risk more than shorter exposures.[53]

A meta-analysis of 14 studies revealed that breastfeeding was associated with decreased risk of type 2 diabetes mellitus. The protective effect of breastfeeding was higher for adolescents but also protected adults.[54] The USDA systematic review, however, did not find this association.[54] The USDA systematic review concluded, on the basis of limited evidence, that breastfeeding decreased blood pressure at 6 to 7 years of age but was not associated with other cardiovascular disease outcomes.[55]

Leukemia

A meta-analysis of 18 studies indicated that 19% of all childhood leukemia cases could be prevented by breastfeeding for 6 months or longer.[56] The USDA systematic review concluded that, on the basis of limited evidence, breastfeeding is associated with decreased risk of leukemia and that breastfeeding durations longer than 6 months are associated with an even lower risk.[57]

Dental Health

Three meta-analyses showed that breastfeeding is associated with decreased malocclusion or poor alignment of the teeth.[58–60]

A meta-analysis of 7 studies showed that breastfed children had a lower rate of dental caries than bottle-fed children (odds ratio [OR], 0.43; 95% CI, 0.23–0.80).[61] A second meta-analysis of 63 studies revealed that breastfeeding up to 12 months was associated with a reduced risk of caries (OR, 0.50; 95% CI, 0.25–0.99), but breastfeeding >12 months was associated with an increased risk of caries when compared with children breastfed <12 months (OR, 1.99; 95% CI, 1.35–2.95).[62] Among children breastfed >12 months, those fed nocturnally or more frequently had a further increased caries risk (OR, 7.14; 95% CI, 3.14–16.23). In addition, a study of oral health ($n = 1303$) nested in a birth cohort study found that children who were breastfed for ≥24 months had a 2.4 times higher risk of having severe early childhood caries (relative risk [RR], 2.4; CI, 1.7–3.3) than those who were breastfed up to 12 months of age, whereas breastfeeding between 13 and 23 months had no effect on dental caries.[63] In summary, there is a benefit of decreased caries with breastfeeding up to 12 months but more caries in children breastfed for more than 12 or 24 months, which may reflect a higher rate of night feeding among breastfed toddlers.

Neurodevelopmental Outcomes

A meta-analysis revealed that being breastfed in early life is associated with an increase in mean IQ of 3.4 points on the basis of the findings of 16 observational studies that controlled for several confounding factors.[64] Nine of the studies also adjusted for maternal intelligence, revealing a breastfeeding benefit of 2.6 points. A prospective, population-based birth cohort study of neonates was launched in 1982. When the cohorts reached 30 years of age, IQ, educational attainment, and income of 3500 of the participants were measured.[65] In the adjusted analysis, participants who were breastfed for 12 months or longer had higher IQ scores by 3.8 points, more years of education, and higher monthly incomes than did those who were breastfed for less than 1 month. The analysis suggested that income was responsible for 72% of the effect on IQ.

A meta-analysis of 11 articles demonstrated that children with attention-deficit and hyperactivity disorder (ADHD) had breastfed shorter periods than controls, were less likely to have breastfed for 6 to 12 months or >12 months, less likely to have exclusively breastfed for >3 months, and more likely not to have breastfed.[66] Meta-analysis of 7 articles revealed that children with autism spectrum disorder (ASD) were less likely to have been breastfed (OR, 0.61; 95% CI, 0.45–0.83).[67] Subgroup analyses revealed that results remained significant for children who were breastfed with additional supplementation. With both ADHD and ASD, there may be a possibility of reverse causality, in that infants with these diagnoses may have poor oral motor skills and be inattentive at breastfeeding skills, leading to earlier weaning.

MATERNAL OUTCOMES

Table 3 contains a summary of maternal outcomes associated with breastfeeding.

Postpartum Weight Retention

Studies of the overall effect of breastfeeding on postpartum weight retention have been inconclusive. A meta-analysis of 14 studies comparing breastfeeding and formula-feeding mothers may provide insights into the complexity of this statistically significant, although clinically modest, association of breastfeeding with postpartum weight.[68] That analysis demonstrated that breastfeeding for <3 months was not associated with a significant effect on postpartum weight retention, breastfeeding for 3 to 6 months was associated with a minimal decrease, breastfeeding for 6 to 12 months was associated with the largest decrease, and breastfeeding for >1 year was associated with a smaller decrease. In addition, the results suggested that breastfeeding may be more effective for lactating women who are younger than 30 years, primiparous, or had a normal prepregnancy body mass index (BMI). The AHRQ review of 16 cohort studies found an unclear association between breastfeeding and postpartum weight change but also noted that postpartum weight change varied by breastfeeding exposure.[10]

Rheumatoid Arthritis

A meta-analysis of 6 studies found that breastfeeding was associated with a decreased risk of maternal rheumatoid arthritis by 32%.[69] In the subgroup analysis, breastfeeding for 1 to 12 months decreased the risk of maternal rheumatoid arthritis 22%, but breastfeeding >12 months decreased the risk

42%. However, a more recent Swedish Epidemiologic Investigation with 2641 cases and 4251 controls did not find an association between breastfeeding and maternal rheumatoid arthritis.[70]

Type 2 Diabetes Mellitus, Cholesterol, Blood Pressure, and Cardiovascular Disease

A meta-analysis of 6 studies concluded that longer breastfeeding was associated with a decreased risk of type 2 diabetes mellitus by 32% and that for every year of lifetime breastfeeding, the risk of type 2 diabetes mellitus decreased by 9%.[71] A meta-analysis of 4 studies found that breastfeeding for more than 12 months was associated with a 30% decreased risk of diabetes mellitus, compared with those who breastfed shorter periods.[72] A meta-analysis of 9 studies showed that in mothers with gestational diabetes mellitus, longer lactation (>4 to 12 weeks versus shorter) was associated with a 78% reduced risk of type 2 diabetes mellitus in the next 5 years, and exclusive lactation (>6 to 9 weeks versus not breastfeeding) with a 58% reduction.[73] The AHRQ review likewise found a consistent association between ever breastfeeding and longer durations of breastfeeding, with a decreased risk of type 2 diabetes mellitus among women with and without gestational diabetes mellitus, and the magnitude varied according to breastfeeding exposure.[10] The nationally representative Korea NHANES 2010 to 2014 found that breastfeeding duration for more than 24 months decreased the risk of low-density lipoprotein cholesterol disorder by 16% and that of nonhigh-density lipoprotein cholesterol disorder by 25%.[74]

Meta-analysis of 7 studies with 444 759 participants revealed an association of reduced risk of hypertension by months of breastfeeding: >0 to 6, >6 to 12, and >12 months of breastfeeding were associated with decreased risks of 8%, 11% and 12%, respectively, compared with nonbreastfeeding mothers.[75] A meta-analysis of 5 studies found that breastfeeding for more than 12 months decreased the risk of hypertension 13%, compared with those who breastfed for a shorter period.[72] The AHRQ review also found a consistent association between a longer duration of breastfeeding (>6 to 12 months) and lower rates of hypertension.[10]

The AHRQ systematic review of 3 cohort studies including 301 989 women found an unclear association between breastfeeding duration and lower cardiovascular disease rates.[10] Likewise, it found an unclear association between breastfeeding and cardiovascular mortality.

Osteoporotic Fractures

Although breastfeeding may be associated with short-term bone loss, a meta-analysis of 12 studies revealed that breastfeeding did not increase the risk of osteoporotic and forearm fractures in women and may be associated with a 28% reduced risk of hip fracture (highest versus lowest duration; RR, 0.72; 95% CI, 0.52–0.99).[76] In subgroup analysis, this association was strongest among postmenopausal women (RR, 0.66; 95% CI, 0.47–0.93). In dose-response analysis, each month increment of breastfeeding was associated with a 1.2% decrease in hip fracture risk. The AHRQ review, however, found no association between breastfeeding and fractures.[10]

Breast Cancer

A meta-analysis of 65 studies demonstrated that breastfeeding was associated with a decreased risk of breast cancer compared with parous and nulliparous women who have never breastfed, in both premenopausal and postmenopausal women.[32] Exclusive breastfeeding had a stronger association. Breastfeeding duration is important. A meta-analysis of 98 studies revealed breastfeeding for <6 months was associated with a decreased risk of breast cancer by 7%, for 6 to 12 months by 9%, and for >12 months by 26%.[77] Breast cancer subtype also is important. A meta-analysis of 27 studies with a total of 36 881 breast cancer cases revealed that breastfeeding was associated with decreased risk of breast cancer negative for both estrogen receptors (ERs) and progesterone receptors (PRs) and triple-negative breast cancer but not ER+ and PR+ or ER+ and/or PR+ breast cancers.[78] Another meta-analysis of 11 studies revealed that breastfeeding was associated with a reduced risk of developing both luminal and triple-negative subtypes of breast cancer.[79] A case-control study of 1665 pairs of women with a mutation in either BRCA1 or BRCA2 revealed that among BRCA1 mutation carriers, breastfeeding for at least 1 year was associated with a 32% reduction in risk (OR, 0.68; 95% CI, 0.52–0.91); breastfeeding for 2 or more years conferred a greater reduction in risk (OR, 0.51; 95% CI, 0.35–0.74). Among BRCA2 mutation carriers, there was no significant association between breastfeeding and breast cancer risk.[80]

The AHRQ systematic review likewise found a consistent association of ever breastfeeding and longer breastfeeding with reduced breast cancer.[10] The authors noted an unclear association between breastfeeding and breast cancer mortality. However, others have estimated, based on mortality models, that improving global breastfeeding could prevent 20 000 annual deaths from breast cancer.[42]

Ovarian Cancer

A meta-analysis of 41 studies revealed that any breastfeeding was associated with decreased overall risk of ovarian cancer by 30%; the association increased with increasing duration, as breastfeeding <6 months was associated with decreased risk of ovarian cancer by 17%, 6 to 12 months by 28%, and >12 months by 37%.[77] Breastfeeding was also associated with a reduced risk of ovarian cancer for carriers of BRCA1 mutations (OR, 0.74; 95% CI, 0.56–0.97; $P = .03$); an association of similar magnitude was observed for carriers of BRCA2 mutations (OR, 0.72; 95% CI, 0.41–1.29; $P = .27$), but this was not statistically significant.[81]

A meta-analysis of 19 studies revealed that every 1-month increase in breastfeeding duration was associated with a 2% decrease in ovarian cancer.[82] The AHRQ review reported a consistent association between ever breastfeeding and longer durations of breastfeeding with lower risk of ovarian cancer.[10]

Endometrial Cancer

A meta-analysis from the Epidemiology of Endometrial Cancer Consortium revealed that any breastfeeding was associated with an 11% reduction in endometrial cancer.[83] Longer durations of breastfeeding were associated with lower risks; for example, a mother with a lifetime duration of >36 months had a decreased risk of endometrial cancer by 33%.

Thyroid Cancer

A meta-analysis of 9 studies revealed that breastfeeding was associated with a decreased risk of thyroid cancer by 9%, and for every 1-month increase in breastfeeding, the risk decreased 2%.[84]

SOCIETAL BENEFITS

Breastfeeding has been described as environmentally friendly. A 2015 report on the carbon footprint of infant formula in the Asia-Pacific region reported that the total greenhouse gas emissions from formula sold in just 6 countries in 2012 was 2.89 million tons, which is roughly equivalent to a car driving 6888 million miles or burning 3107 million pounds of coal.[85] Nearly half of these emissions reportedly come from toddler formula, a product that the AAP does not recommend. More than 4000 L of water are estimated to be needed along the production pathway to produce just 1 kg of powdered formula.[85] The contribution of breastfeeding to reducing the carbon footprint, environmental sustainability, and food security year-round should be considered in development goals at national and global levels.[86]

BREASTFEEDING IN SPECIAL CIRCUMSTANCES

Metabolic Diseases

A review of breastfed infants with other metabolic diseases concluded that breastfeeding is feasible in organic acidemias, aminoacidopathies, fatty acid oxidation disorders, and urea cycle disorders and should be encouraged because of the multiple immunologic and developmental advantages of human milk for the infant.[87] Breastfed infants with phenylketonuria had higher weight gain and lower serum phenylalanine concentrations in the first year of life than did nonbreastfed infants.[88] Classic galactosemia in the infant is an absolute contraindication to breastfeeding; however, a study demonstrated that Duarte variant galactosemia (DG), diagnosed on newborn metabolic tests, is not associated with an increased risk of developmental abnormalities and does not benefit from dietary restrictions of galactose. Breastfeeding should be encouraged with DG.[89] Although breastfeeding can be beneficial and should be encouraged for many infants with inborn errors of metabolism, they would benefit from consultation with a metabolic specialist to monitor growth, development, and laboratory profiles.

Infections

Mothers in the United States should not breastfeed or feed expressed breast milk to their infants if they have HIV infection, human T-cell lymphotropic virus type I or type II infection, untreated brucellosis, or suspected or confirmed Ebola virus disease.[90]

The AAP recommends that women in the United States living with HIV infection should not breastfeed their infants. HIV may be transmitted in human milk and even with effective HIV treatment, the risk may not be 0, whereas formula-fed infants of women with HIV infection face no transmission risk postpartum. In mothers with HIV infection, chemoprophylaxis cannot be assumed to be completely protective against HIV transmission to the infant. If a woman living with HIV infection chooses to breastfeed, a pediatric HIV expert should be consulted on how to minimize transmission risk, including exclusive breastfeeding, along with the continuation of infant and maternal antiretroviral therapy.[91] In low-resource settings where diarrheal diseases, pneumonia, and malnutrition are common and access to clean water is limited, the WHO recommends exclusive breastfeeding for 6 months and continued breastfeeding up to 24 months with ongoing antiretroviral therapy for mother and infant.[92]

Mothers with tuberculous disease who are suspected of being contagious should refrain from

breastfeeding and from other close contact with the infant because of the risk of spread through respiratory secretions. Expressed milk can be fed to the infant, if there is no evidence of tuberculosis mastitis, a rare condition. Direct breastfeeding can be resumed when the mother with tuberculosis has been treated for a minimum of 2 weeks and is no longer infectious (ie, have negative sputum specimens).[90,93]

Mothers who develop varicella 5 days before until 2 days after delivery should be separated from their infants, but their expressed milk can be used for feeding.[90,93]

Mothers infected with untreated brucellosis temporarily should not breastfeed and should not feed expressed milk to their infants. Women with active herpetic lesions on a breast should refrain from breastfeeding or using expressed milk from the affected breast until lesions have resolved. They may breastfeed from the unaffected breast if lesions on the affected breast are covered completely so the infant does not come into direct contact with the lesions.[90,93]

Women infected with West Nile virus may breastfeed.[94] Likewise, a systematic review of breastfeeding with maternal Zika virus found no documented studies to date of suspected, probable, or confirmed Zika transmission through human lactation, so breastfeeding should be encouraged.[95,96]

Infants born to women who are hepatitis B surface antigen positive should receive the initial dose of hepatitis B vaccine and Hepatitis B Immune Globulin within 12 hours of birth.[90,97] There is no need to delay initiation of breastfeeding until after the infant is immunized. Although hepatitis C virus can be detected in maternal milk, transmission of hepatitis C virus via breast milk has not been documented, so neither the AAP nor the CDC consider maternal hepatitis C virus infection a contraindication to breastfeeding.[90,98] Mothers with hepatitis C who have cracked or bleeding nipples should refrain from breastfeeding from the affected breast or feeding expressed milk from that breast until the nipple has healed.

There is no contraindication to breastfeeding for a full-term infant whose mother is seropositive for cytomegalovirus (CMV). Very low birth weight preterm infants, however, are at risk for developing symptomatic disease. A meta-analysis of 17 studies found that 19% of very low birth weight infants consuming mother's raw milk developed asymptomatic CMV infection, and 4% developed CMV sepsis-like syndrome with respiratory decompensation and thrombocytopenia.[99] Decisions about breastfeeding of preterm infants by mothers known to be CMV positive should include consideration of the benefits of human milk and the risk of CMV.

Pasteurization of human milk can decrease the likelihood of CMV transmission. Both Holder pasteurization (62.5°C for 30 minutes) and short-term pasteurization (72°C for 5 seconds) inactivate CMV, but short-term pasteurization may preserve other beneficial components of human milk more readily.[90] Freezing of mother's milk for the sole purpose of reducing CMV infectivity is not advised, because although it may reduce the viral load of CMV, it does not change the risk of CMV sepsis-like syndrome, and freezing reduces the bioactivity of mother's milk.[99–101] Data on the impact of breast milk-associated postnatal CMV infection on long-term neurodevelopmental outcome of preterm infants have yielded conflicting findings. A prospective study of preterm infants conducted in the Netherlands did not find an increased risk compared with uninfected preterm infants, but this study included few infants with birth weight <1000 g, who are at highest risk for these complications.[102] The Dutch study also did not determine the actual timing of CMV infection, which may be an important modifier of risk. Further investigation is needed, especially regarding the very low birth weight infant. At the current time, there is not enough evidence to support withholding mother's own milk because of the risk of CMV.[103]

Influenza vaccination is recommended in breastfeeding mothers.[90,104] Special effort should be made to vaccinate all women who are breastfeeding, if they did not receive the influenza vaccine during pregnancy or are breastfeeding into the next influenza season.

Mothers acutely infected with H1N1 influenza should temporarily be isolated from their infants until they are afebrile, but they can provide expressed milk for feeding. The CDC recommends that facilities consider temporarily separating the postpartum hospitalized mother with suspected or confirmed influenza from her infant, but the mother should be encouraged to provide expressed milk for feeding.[105] It is suggested that isolation continue until the mother is afebrile for >24 hours and is able to control her cough and respiratory secretions.

Evidence regarding emerging pathogens, such as severe acute respiratory syndrome-coronavirus 2, and breastfeeding is available from the AAP and the CDC, and current guidance should be consulted. In

most cases, breast milk provides antibodies and protection, with little to no direct evidence of the virus causing infections to infants, so breastfeeding is encouraged.[106–109] Hand hygiene and covering the nose and mouth with a mask is recommended when the mother is breastfeeding directly.[110] Updated guidance from the AAP and the CDC should be consulted.

Mastitis occurs in one third of women postpartum. Mothers with mastitis are encouraged to continue to breastfeed. Regular feeding or expression of milk is an adjunct to other treatment. Antibiotics may be indicated. Approximately 10% of cases progress to breast abscesses, which require drainage. Breastfeeding can continue on the affected side as long as the infant's mouth does not contact purulent drainage from the breast.[90,111]

A pediatric infectious disease specialist, the AAP *Red Book: Report of the Committee on Infectious Diseases*,[90] or the CDC Web site should be consulted for current guidance regarding breastfeeding and infectious diseases.

Perinatal Mood Disorders

The AHRQ review found insufficient evidence regarding whether breastfeeding is associated with postpartum depression, also described as perinatal mood and anxiety disorders, because of heterogeneity and inconsistent results of the systemic review of a total of 62 cohort studies, inclusive of more than 100 000 women overall.[10] Although breastfeeding may be associated with decreased risk of postpartum depression, breastfeeding problems can be associated with postpartum depression, underscoring the need to provide sufficient breastfeeding support and management to new mothers. Selective serotonin reuptake inhibitors may be used in breastfeeding women who experience perinatal mood and anxiety disorders. Pediatricians are encouraged to screen postpartum mothers for depression, provide breastfeeding support, and refer for treatment.[112]

Maternal Substance Use

Substances such as illicit opioids, cocaine, and PCP (phencyclidine), are considered contraindications to breastfeeding because of concerns about the infant's long-term neurobehavioral development. Similar to the increases seen in the general population, the use of illicit opioids in pregnant women in the United States increased from 0.8% in 2015 to 1.4% in 2017.[113] Because of the high rate of use of opioids in the United States population in general and among pregnant women, many newborn infants experience neonatal opioid withdrawal syndrome. For mothers who discontinue illicit opioids or other substances and are on stable methadone or buprenorphine maintenance therapy, breastfeeding should be encouraged. In most cases, it is preferable if mothers with prenatal opioid use initiate breastfeeding and practice exclusive breastfeeding to mitigate the impact of potential withdrawal on the newborn infant. Some newborn infants also may require pharmacologic treatment, but maternal rooming in and continued breastfeeding is desirable.[114–116] Breastfed infants require less treatment of neonatal abstinence and have a shorter duration of treatment than nonbreastfed infants. Both mothers and infants should be monitored closely throughout the hospitalization and in the outpatient setting for signs and symptoms of withdrawal and for appropriate weight gain. Breastfeeding is associated with reduced need for pharmacologic therapy and length of stay.[116–118] Women should be counseled about the need to suspend breastfeeding in the event of a relapse.

A survey of women in treatment of opioid dependence found that although most desire and attempt to establish breastfeeding, they encounter significant challenges, including long NICU stays and lack of support and education that compromise their success.[119] Women taking buprenorphine have a higher prevalence of breastfeeding and exclusive breastfeeding compared with women taking methadone, despite no difference in their prenatal intention to breastfeed.[120] This may be secondary to the decreased need to treat neonatal withdrawal in newborn infants of buprenorphine-treated mothers, as compared with mothers treated with methadone, and, therefore, less separation of mother and infant.[121] Buprenorphine has poor oral bioavailability, and only small amounts of buprenorphine enter human milk, with no adverse effects found in infants. A meta-analysis of 6 studies comprising 549 patients revealed that rooming-in was associated with a reduction in the need for infant treatment of neonatal abstinence syndrome and a shorter hospital stay when compared with standard NICU admission.[122]

The use of marijuana in pregnant women in the United States doubled from 3.4% in 2015 to 7.1% in 2017.[113] According to the 2018 AAP clinical report, current data are insufficient to assess the effects of exposure of infants to maternal marijuana use during breastfeeding. As a result, maternal marijuana use while breastfeeding is discouraged. Because the potential risks of infant exposure to marijuana metabolites are unknown, women should be informed of the potential risk of exposure during lactation,

encouraged to abstain from using any marijuana products while breastfeeding, and avoid secondhand smoke exposure.[123]

From 2015 to 2019, the rate of alcohol use during pregnancy was 9.3% and 9.5% respectively, with a spike in 2017 (11.5%).[113] Breast milk alcohol concentrations closely parallel blood alcohol concentrations, with highest levels in human milk occurring 30 to 60 minutes after consuming alcohol.[124,125] Alcohol is not a galactagogue and may have a negative effect on infant development. Moderate alcohol consumption by a breastfeeding mother (up to 1 standard drink per day) is not known to be harmful to the infant, especially if the mother waits at least 2 hours after a single drink before nursing or expressing milk to be fed to the infant. The National Institute on Alcohol Abuse and Alcoholism (NIAAA) defines a standard alcohol drink as 5 ounces of wine, 12 ounces of beer, or 1.5 ounces of distilled spirits.[126] Moderate alcohol intake does not appear to affect breastfeeding duration.[122] Daily intake of more than 2 standard alcoholic beverages is discouraged, because it has been associated with excessive sedation, decrease in maternal prolactin concentrations, a decrease in the length of time that mothers breastfeed their infants and is more likely to be associated with neurodevelopmental sequelae.[127,128] A large prospective cohort study in Australia found that greater or riskier maternal alcohol intake while breastfeeding, determined by a maternal questionnaire, was associated with decreased nonverbal reasoning at 6 to 7 years of age but not at 8 to 11 years of age.[129]

Almost 15% of pregnant women used tobacco products during pregnancy in 2017.[113] Nicotine accumulates in human milk, and maternal smoking is a risk factor for SIDS, asthma, and other respiratory illnesses.[130] However, it is difficult to separate the effects of smoking during breastfeeding from the effect of prenatal smoking and postnatal secondhand smoke. A Dutch study of 142 cases of SIDS and 2841 matched controls analyzed separately cases and controls where it was reported that no maternal prenatal smoking was involved. That analysis revealed that paternal postnatal smoking was associated with an increase in SIDS, but maternal postnatal smoking was not ($P = .01$ versus $P = .41$), suggesting that postnatal secondhand smoking may pose a greater risk than exposure to tobacco products via breastfeeding.[131] A study of more than 5000 Australian infants recruited at birth showed no evidence of reduced cognition in children whose mothers smoked tobacco compared with those mothers did not. In this study, breastfeeding women smoked fewer cigarettes on average per day than women who were not breastfeeding.[129]

Maternal smoking is associated with reduced milk production, decreased breastfeeding rates, and changes in the composition of human milk. Breastfeeding infants of mothers who smoke ingest less milk, possibly because of flavor changes, and are at risk for shorter lactation or failure to thrive.[130] Secondhand smoke from either parent is associated with an increase in SIDS, asthma, and other respiratory illnesses.[131] If, after counseling, a breastfeeding mother chooses to smoke or vape, she should be advised to minimize her smoking, never smoke while breastfeeding, and never smoke inside the home or car. Breastfeeding mothers also should be aware of indirect exposure from partners, coworkers, or other environmental contacts who use tobacco products, even if the mother does not.[132] Because nicotine concentration peaks in human milk at a half-hour and disappears by 3 hours, to minimize the transmission of nicotine and other byproducts to the infant, it is preferable for the mother to smoke or vape immediately after breastfeeding.[133] Nicotine cessation products may be used while breastfeeding.[134]

MATERNAL MEDICATIONS

Most maternal medications and radiologic contrast agents are compatible with breastfeeding. There are a limited number of agents that are contraindicated, and an appropriate substitute usually can be found. The most comprehensive source of information regarding the safety of maternal medications when the mother is breastfeeding is the Drugs and Lactation Database (LactMed), published by the National Library of Medicine and National Institutes of Health, and available via the internet.[124] See other medication references in Table 4.

CONTRACEPTION

Contraception is an important topic for all women, and comprehensive discussion of methods should be encouraged for breastfeeding women. Early introduction of hormonal methods of contraception, especially combined oral contraceptives, may be associated with disruption of lactation—ie, establishment and maintenance of the maternal milk supply.[135] Exclusive breastfeeding has an inhibitory effect on ovulation in the first 6 months after childbirth. Meta-analysis of 12 studies showed that the probability of continued amenorrhea at 6 months postpartum for exclusive or predominant breastfeeding was 23% higher compared with no breastfeeding and 21% higher when

TABLE 4 Medications and Breastfeeding References

Reference	Website
Drugs and Lactation Database (LactMed), National Library of Medicine/ National Institutes of Health, available via the internet or through mobile applications	https://www.ncbi.nlm.nih.gov/books/NBK501922/?report=classic
Dr Thomas Hale's Medications and Mother's Milk; Infant Risk Center at Texas Tech University	https://www.infantrisk.com/
Mother To Baby medication fact sheets	https://mothertobaby.org/fact-sheets-parent/
Sachs HC; American Academy of Pediatrics, Committee on Drugs. Clinical report: The transfer of drugs and therapeutics into human breast milk: an update on selected topics. Pediatrics. 2013;132(3):e796-e809. Reaffirmed May 2018	https://pediatrics.aappublications.org/content/132/3/e796

compared with partial breastfeeding.[77] Although breastfeeding without introducing any complementary solids or formula will, in most cases, prevent ovulation and, thus, pregnancy for up to 6 months after giving birth, it will do so only when women are fully or nearly fully breastfeeding with intervals between feedings not exceeding 4 hours during the day and 6 hours at night, and there is continued amenorrhea. If not started prior, additional contraceptive methods should be considered at 6 months postpartum. Additional information about breastfeeding and contraception is available through ACOG and the CDC Medical Eligibility Criteria.[136,137]

RADIOLOGIC PROCEDURES

According to the American College of Radiology in its *ACR Manual on Contrast Media,* the routine administration of gadolinium or iodinated contrast medium is not a contraindication to breastfeeding.[138] Very small amounts of contrast enter breast milk, and less than 1% of that ingested by the infant is absorbed from its gastrointestinal tract for a net absorption of $<0.0004\%$ of the intravenous dose of gadolinium and $<0.01\%$ of the intravenous dose of iodinated contrast being absorbed systemically. Mothers receiving these contrast agents should not be told to stop breastfeeding and/or to express and discard their milk.

HOSPITAL SUPPORT

The AAP recommends that birth hospitals or centers implement maternity care practices shown to improve breastfeeding initiation, duration, and exclusivity. The AAP acknowledges the findings of the Agency for Healthcare Research and Quality that the Baby-Friendly Hospital Initiative[139,140] (BFHI) increases breastfeeding initiation and duration.[10] Although health care staff education may be important, it is insufficient as a single measure to increase breastfeeding initiation.[10] The CDC National Survey of Maternity Practices in Infant Nutrition and Care, conducted from 2007 to 2015, assessed lactation practices in more than 80% of US hospitals and birthing centers and noted that the mean score for implementation of the Ten Steps in 2015 was 79 (out of a possible 100), an improvement from 63 in 2007.[3] In 2015, 83% of the responding facilities reported skin-to-skin contact for at least 30 minutes within the first hours of life after an uncomplicated vaginal birth, and 80% reported breast milk as the first feeding after vaginal birth.[141]

As of January 2022, 29% of all births in the United States occur in facilities that are designated Baby-Friendly, accounting for more than 1 million births per year in 509 facilities.[140] The Joint Commission monitors exclusive breastfeeding, or breastmilk feeding, as a core quality and safety measure in maternity facilities, and these data are publicly available.[142]

Implementation of at least 5 of the Baby-Friendly hospital practices, including breastfeeding in the first hour after birth, exclusive breastfeeding, rooming-in, breastfeeding on demand, avoidance of pacifiers, and information on breastfeeding support after discharge, enabled women to be more successful at meeting their prenatal desire for exclusive breastfeeding.[143] Data compiled by the CDC Maternal Practices in Infant Nutrition and Care survey of infant feeding data and maternity practices at more than 1300 US hospitals revealed that higher scores on implementation of the Ten Steps were associated with higher rates of exclusive breastfeeding at the time of hospital discharge[144] and with any and exclusive breastfeeding at 8 weeks postpartum.[145] In addition, the AHRQ systemic review of 40 studies concluded that the BFHI is associated with improved rates of breastfeeding initiation and duration.[10]

Practices shown to improve breastfeeding rates include skin-to-skin care immediately after birth for newborn infants delivered both vaginally and by cesarean. Early skin-to-skin contact decreases the risk of hypoglycemia.[146] Frequent feeding on demand, at least 8 times in 24 hours, decreases newborn weight loss and the need for supplements and decreases the risk of clinically

significant hyperbilirubinemia.[147] Continuous rooming-in with recommendations to breastfeed exclusively and avoid supplements that are not medically necessary should be followed. Supplementation of infants with formula in the hospital is associated with double the risk of breastfeeding cessation by days 30 to 60, triple the risk of breastfeeding cessation by day 60, and 2.5 times the risk of premature weaning over the first year of life.[148,149] Implementation of skin-to-skin care and rooming in have been shown to impact overall breastfeeding rates and decrease racial disparities in southern United States.[16] Breastfeeding initiation increased from 66% to 75% for all races combined, and exclusivity increased from 34% to 39%. Initiation and exclusive breastfeeding among Black infants increased from 46% to 63% ($P < .05$) and from 19% to 31% ($P < .05$), respectively (Fig 2).

There is a growing awareness of the risk of newborn infants dying from sudden unexpected postnatal collapse.[150] Prone positioning and early skin-to-skin contact without adequate surveillance by trained staff have been identified as risk factors.[151] Mothers who are sedated or have an infection, as well as infants with any signs of distress, should receive continuous clinical supervision. The postnatal health teams should emphasize safe skin-to-skin care with secure positioning. In a survey of hospital staff throughout Pennsylvania, gaps in staff education and monitoring during skin-to-skin contact were notable and highlight opportunities for ongoing quality improvement.[152] There is also some evidence that these sentinel events may not be directly related to initiatives associated with the BFHI and that increasing rates of skin-to-skin care and other BFHI interventions have been associated with decreased rates of sudden unexpected infant death (SUID) among infants within 7 days of birth.[153] The frequency of SUID during the neonatal period warrants ongoing attention to all circumstances contributing to this category of deaths. Ongoing research on the effects of early neonatal practices on postneonatal SUID should also be encouraged.[154]

The AAP recommends breastfeeding as 1 strategy to decrease the risk of SIDS and SUID.[155] The AAP has issued recommendations for SIDS and SUID prevention, as well as safe sleep and skin-to-skin care.[155–157] These recommendations provide detailed guidance to support breastfeeding mothers, while preventing the tragic death of infants as a result of sudden unexpected postnatal collapse in neonates or from unsafe sleep in infants. Safe sleep practices are outlined (Table 5) for the newborn hospital stay and include education of parents, as well as frequent staff monitoring, especially in situations in which the mother is drowsy or sedated.[157]

Delayed bathing of the newborn until 12 hours after birth allows more uninterrupted skin-to-skin contact and has been shown to improve exclusive in-hospital breastfeeding rates.[158,159] The AAP does not provide a recommendation on infant bathing, except in cases of maternal HIV, hepatitis B or C, herpes simplex, or other infections transmitted via blood or other bodily fluids. This guidance is based on expert opinion.

Formal hospital staff training should focus not only on updating knowledge and techniques for breastfeeding support but also should acknowledge the need to change attitudes about the equivalency of breastfeeding and commercial infant formula feeding. Emphasis should be placed on the numerous benefits of exclusive breastfeeding and emphasize the role of staff in decreasing use of unnecessary supplementation, decreasing disparities and providing culturally congruent care. Commercial infant formula discharge packs provided at hospital discharge or in provider offices provide mixed messaging to families about the importance of exclusive breastfeeding, so their use is discouraged.

PACIFIER USE

A Cochrane review found that pacifier use in healthy term infants before and after lactation is established does not reduce the duration of breastfeeding up to 4 months of age, but there was insufficient evidence on the potential harms of pacifiers on infants and mothers.[160] The

TABLE 5 Components of Safe Positioning for the Newborn While Skin-to-Skin

1	Infant's face can be seen
2	Infant's head is in "sniffing" position
3	Infant's nose and mouth are not covered
4	Infant's head is turned to one side
5	Infant's neck is straight, not bent
6	Infant's shoulders and chest face mother
7	Infant's legs are flexed
8	Infant's back is covered with blankets
9	Mother-infant dyad is monitored continuously by staff in the delivery environment and regularly on the postpartum unit
10	When mother wants to sleep, infant is placed in bassinet or with another support person who is awake and alert

recommendation was that mothers who are well-motivated to breastfeed should be encouraged to decide on pacifier use based on personal preference. Nonnutritive sucking has been shown to reduce the time that preterm infants need to transition to oral feedings and to reduce the length of the hospital stay.[161] The WHO recommends that mothers should be supported in recognizing and responding to their infant's cues for feeding and counseled about the use and potential risks of pacifier use. Pacifier use has been associated with a reduction in SIDS incidence, when used consistently.[162]

ESTABLISHMENT OF BREASTFEEDING

Most mothers experience lactogenesis II, or more copious milk production, by the third to fourth day after delivery. Early skin-to-skin care and frequent feeding facilitate this transition from drops of colostrum to ounces of milk. Risk factors for delayed lactogenesis II include maternal obesity, polycystic ovarian syndrome, maternal diabetes mellitus, pregnancy-induced hypertension, preterm labor, cesarean delivery, and intrapartum complications, such as excessive blood loss.[163,164] In cases of maternal diabetes mellitus complicated by maternal obesity, rates of cesarean deliveries are higher, which may also interfere with the initiation of breastfeeding. Signs of physiologic transition to lactogenesis II, such as breast fullness or tenderness, visible leaking of milk, and more frequent infant swallowing, should be tracked, along with the infant elimination patterns and weight trajectory.

Weight loss of the newborn infant in the postpartum period should be monitored by using the nomograms based on a cohort of 108 907 term newborn infants.[164] Infants who are born in hospitals with breastfeeding-friendly maternity care practices are less likely to lose excessive weight.[165]

Weight loss may be increased secondary to high volumes of fluid administered in conjunction with maternal epidural for pain management or in cases of maternal obesity with large-for-gestational-age infants.[166] Weight loss $>75^{th}$ percentile for mode of delivery and infant age on the nomograms should prompt a thorough evaluation of the mother and infant pair for maternal milk production, effectiveness and comfort of latch, milk transfer, clinical context, and signs and symptoms of neonatal dehydration. Infants who continue to lose weight 5 to 6 days after birth should be closely monitored in the outpatient setting until weight gain is well established. Evidence-based guidance for assessment and monitoring of breastfeeding in the first week of life should be implemented.[147]

If supplementation is necessary, expressed maternal human milk or pasteurized donor human milk (PDHM) in physiologic volumes (ie, ~ 5–10 mL on day 1, 10–15 mL on day 2) should be used whenever possible instead of infant formula.[147] When the infant receives anything other than the mother's own expressed milk, the mother should either hand express or pump to provide signaling to her body to either keep up with or boost her supply. Administration of oral dextrose gel to manage hypoglycemia has been shown to decrease the need for use of supplemental feedings and minimize maternal-infant separation.[167,168]

At least once every 8 to 12 hours during the hospitalization of the mother and infant, including once within 8 hours before hospital discharge, a health professional trained in formal assessment of breastfeeding should perform and document an assessment of breastfeeding effectiveness.

BREASTFEEDING AND HUMAN MILK FOR THE VERY LOW BIRTH WEIGHT INFANT

The AAP has provided clinical guidance to support breastfeeding and the use of human milk among very low birth weight infants (VLBW).[103] Mother's milk for very low birth weight infants (≤1500 g) in the NICU provides short- and long-term health benefits, including reduction of necrotizing enterocolitis, late-onset sepsis, chronic lung disease, and retinopathy of prematurity in addition to improved neurodevelopment.[103] Mother's milk should be considered medical therapy, with higher doses associated with maximal health benefits.[169] Pediatricians can emphasize the importance of early and frequent milk expression for mothers of VLBW infants. The AAP recommends PDHM as the alternative for mother's own milk while in the NICU.[170]

PDHM should be provided when mother's milk is not available or is contraindicated. A Cochrane meta-analysis of 11 trials of very preterm infants fed PDHM as a sole diet or as supplement to mother's milk showed protection against necrotizing enterocolitis but no difference in other outcomes.[171] Either mother's own milk or PDHM modulates development of the preterm infant's gut microbiome more preferably compared with infant formula.[172] The data are clear that mother's milk should be the primary diet of preterm infants. Fortification of mother's milk or donor milk with bovine protein hydrolysate-based or human milk-derived human milk fortifiers is necessary to optimize growth in the VLBW infant.[173]

LATE PRETERM AND EARLY TERM INFANTS

Late preterm infants, born at 34 to 36 weeks' gestational age, and early term infants, born at 37 to 38 weeks' gestation, have decreased

breastfeeding rates compared with term newborn infants.[174,175] Multiple factors may contribute to breastfeeding difficulties, including maternal delayed onset of lactation, infant immaturity, decreased effectiveness of milk emptying, and separation of infants from their mothers. Inadequate human milk intake in the first days after delivery can contribute to longer hospital stays and higher rates of hospital readmissions.[176] Late preterm infants admitted to the NICU were equally likely to initiate breastfeeding but less likely to continue breastfeeding at 10 weeks compared with those not admitted to the NICU.[177] An intervention to promote parents' education and involvement and avoid separation for phototherapy increased breastfeeding rates at discharge.[178] Infant supplementation, when necessary, should preferably be with expressed maternal milk or PDHM, when available, because formula supplementation has been associated with increased exclusive formula feeding at discharge.[179] Informal milk sharing may be associated with infectious risks as well as contaminants.[180]

HYPERBILIRUBINEMIA

Infants who are breastfeeding tend to have higher mean concentrations of bilirubin. This is believed to be physiologic, and there is some evidence that the presence of some bilirubin in neonates is beneficial, because bilirubin is a potent antioxidant.[181] Poor intake of the exclusively breastfed infant in the first days of life, however, can be associated with pathologic hyperbilirubinemia. A study has documented that decreased frequency of breastfeeding, especially ≤7 times a day, is associated with higher bilirubin concentrations, whereas breastfeeding 9 to 10 times a day is associated with lower bilirubin concentrations.[182] Mothers should receive lactation support and be encouraged to breastfeed early and frequently. Infant supplementation, when necessary, should preferably be with expressed maternal milk. Feedings of colostrum increase stooling in the newborn infant, which increases bilirubin excretion in the stools. The need for phototherapy in an otherwise healthy infant without signs of dehydration and/or insufficient intake is not an indication for supplementation with formula unless the levels are approaching exchange transfusion levels.[183] Infants requiring phototherapy benefit from remaining close to the mother to facilitate cue-based feeding and additional breastfeeding support.

Some breastfed infants experience breast milk jaundice, a benign condition, that may persist up to 3 months of age. The bilirubin is unconjugated and occurs in a healthy, thriving infant who is gaining weight appropriately and stooling frequently. No treatment is necessary.[183]

ADOPTION OR SURROGACY

Breastfeeding is possible in cases of adoption or surrogacy but optimally requires advance preparation through hormonal stimulation as well as signaling of the breasts through pumping in advance of delivery. Women may produce at least a partial milk supply. Expressed milk or PDHM, if readily available and affordable, as well as infant formula, may be provided at the breast through use of supplemental nursing systems.[184] Referral to a breastfeeding medicine specialist should be encouraged.

INFANTS BORN TO GENDER-DIVERSE PARENTS

Children of gender-diverse parents may have less access to human milk because of both social and biological constraints. The word "breastfeeding" itself may be both triggering, and less accurate, for gender diverse parents, who may prefer the term "chestfeeding," which may be more inclusive of lactation in the context of varying physiologic anatomies.

ROLE OF THE PARTNER AND SUPPORT SYSTEM

The mother's support system plays an important role in encouraging the mother to initiate breastfeeding, to continue breastfeeding, and to enable each mother to reach her personal breastfeeding goals. Education of the partner, as well as other key support people, such as mothers, aunts, and grandmothers, is important.[185] The father of the infant or the mother's partner can provide many other types of care to the infant beyond feeding and reinforce the role of the nonnutritive caregiver. Partners can provide skin-to-skin care after delivery when the mother is unavailable.[186] Initiatives to support families include places of worship, community centers, and peer support organizations (eg, WIC, Reaching our Sisters Everywhere, HealthConnectOne, and Baby Cafes).[187–190]

INFANTS WITH SPECIAL NEEDS

It is beyond the scope of this technical report to address infants with all possible clinical diagnoses that may affect the success of breastfeeding. Infants with anatomic differences, such as cleft palate, may be breastfed directly in some cases or through delivery of expressed human milk via alternative feeding devices. Consultation with a feeding team may be beneficial to develop a plan. Infants with neurologic disorders that decrease tone may benefit from special positioning to optimize transfer of milk. Physicians who specialize in breastfeeding medicine across the United States and internationally have special skills in caring for the breastfeeding dyad and are available through the AAP Section on Breastfeeding.

VITAMIN AND MINERAL SUPPLEMENTS

Intramuscular vitamin K1 (phytonadione) at a dose of 1.0 mg should be routinely administered to all infants >1500 g within 6 hours of birth to reduce the risk of vitamin K deficiency bleeding.[97,191] The dose may be delayed until after the first feeding at the breast. Oral vitamin K is not recommended, because the oral dose is variably absorbed and may not provide adequate concentrations or stores.[97]

Vitamin D deficiency or insufficiency and rickets has increased in all infants as a result of decreased sunlight exposure secondary to changes in lifestyle, dress habits, and use of topical sunscreen preparations.[192] To maintain an adequate serum vitamin D concentration, all infants consuming less than 28 ounces of commercial infant formula per day routinely should receive an oral supplement of vitamin D 400 IU per day, beginning at hospital discharge and throughout breastfeeding.[192] This applies to both exclusively and partially breastfed infants. An alternative strategy to vitamin D supplementation of the infant is to supplement the mother who is breastfeeding with 6400 IU of vitamin D.[193]

Supplemental fluoride should not be provided during the first 6 months. From age 6 months to 3 years, fluoride supplementation should be limited to infants residing in communities where the fluoride concentration in the water is <0.3 ppm.[193,194]

Complementary foods rich in iron and zinc should be introduced at about 6 months of age. The AAP has published recommendations for supplementing iron in infants.[195] More studies are needed, however, as delayed cord clamping has been shown to increase iron stores in healthy term newborn infants.[196] Supplementary oral iron drops before 6 months may be needed to support iron stores in cases of prematurity, blood loss, documented iron deficiency anemia, or small-for-gestational-age infants. Preterm infants should receive both a multivitamin preparation and an oral iron supplement until they are ingesting a completely mixed diet and their growth and hematologic status are normalized.[197]

COMPLEMENTARY FEEDINGS

As noted, the AAP recommends exclusive breastfeeding for approximately 6 months. Complementary solids should be introduced at about 6 months for most children.[198] Foods rich in protein, iron, and zinc, such as finely ground meats, chicken, or fish, are good choices to complement the infant's diet of breast milk. Breast milk remains the major component of the infant's diet, and foods from the family's diet are gradually introduced with appropriate modification of texture and avoidance of added sugar and fat.[199,200] An expert panel has advised peanut introduction as early as 4 to 6 months of age for infants at high risk for peanut allergy because of the presence of severe eczema and/or egg allergy, but not until 6 months for infants at moderate or low risk.[45]

MATERNAL DIET

Well-nourished lactating women have an increased daily energy need that can be met by a modest increase in a normally balanced, varied diet. The total additional kcals required may vary depending on the mother's prepregnancy BMI, age, and activity level.[199] The 2020 to 2025 Dietary Guidelines for America[200] (DGAs) address nutrition during pregnancy and lactation. The DGAs recommend an additional 330 kcal per day beyond prepregnancy caloric requirements for the first 6 months of lactation and 400 kcal per day for the second 6 months while continuing breastfeeding.[200]

Many clinicians recommend a multivitamin supplement during lactation. This may be even more important if the mother is producing milk for multiples (ie, twins or triplets). Folic acid supplementation is recommended for all women of reproductive age[201] The DGAs encourage women who are lactating to consume a wide variety of foods and discourage the use of prenatal vitamin and mineral supplements, because the iron and folic acid contents are formulated for pregnancy and not lactation.[200] Women on vegan diets or those who have gone undergone gastric bypass surgery may require additional supplements, such as B_{12} or docosahexaenoic acid (DHA).[202,203] Consultation with a nutritionist is advised.

The mother's diet should include an average daily intake of 200 to 300 mg of the omega-3 long-chain polyunsaturated fatty acids for adequate preformed docosahexaenoic acid DHA in the mother's milk and to improve the infant's fatty acid status. Seafood consumption by the breastfeeding mother provides DHA, protein, vitamin B_{12}, selenium, zinc, and iodine and offers health benefits for mother and infant. Consumption of 2 to 3 servings (4 oz each) a week of seafood or fish that are low in mercury (eg, herring, canned light tuna, salmon) per week is recommended. Concern regarding the possible risk from intake of excessive mercury or other contaminants can be lessened by minimizing the intake of predatory fish (eg, pike, marlin, mackerel, tile fish, swordfish). See guidance from the US Food and Drug

Administration for more detailed recommendations.[204]

Studies have not supported a protective effect of a maternal exclusion diet, including the exclusion of cow milk, eggs, and peanuts, during lactation on the development of atopic disease in infants.[45]

NATURAL DISASTERS

Natural disasters and emergency situations require prompt attention to safe and adequate nutrition for infants and children. Breastfed infants should continue breastfeeding on demand with provision of food and water to the lactating mother and secure shelter for the breastfeeding mother.[205] New mothers who had not considered lactation or those who had stopped breastfeeding should be assisted in lactating or reinitiating lactation to provide a safe source of fluids and nutrition for the infant.[206]

BREASTFEEDING IN THE WORKPLACE

Most reproductive-aged women are employed, so a breastfeeding-friendly worksite is critical to achieving the duration of breastfeeding recommended. Workplace support for breastfeeding provides benefits to employers, including a reduction in company health care costs, lower employee absenteeism, reduction in employee turnover, and increased employee morale and productivity. The return on investment has been calculated that for every $1 invested in creating and supporting a lactation support program (including a designated place to express milk with a mechanical pump that guarantees privacy, availability of refrigeration and a hand-washing facility, and appropriate mother break time), there is a $2 to $3 return.[207] Resources are available to provide guidance for employers through the United States Department of Health and Human Services "The Business Case for Breastfeeding," which provides details of economic benefits to the employer, toolkits for the creation of such programs, and suggested implementation plans in a variety of unique workplace settings.[208] The Center for WorkLife Law provides guidance and resources for medical professionals to support families in securing breastfeeding accommodations. A sample "Lactation Accommodation Work Note" is available.[209]

On-site child care options are preferable to solutions that involve only milk expression and storage because colocation of workplace and child care facilitates direct breastfeeding during the workday. A study from the Canadian CHILD birth cohort suggested that feeding human milk from a bottle may be associated with increased BMI at 1 year, asthma at 3 years, and a less beneficial microbiota at 3 to 4 months, with increased potential pathogens and decreased bifidobacteria, compared with direct breastfeeding.[210–212] Although many US mothers will need to or choose to express and feed their milk from a bottle, these data suggest that direct breastfeeding may be best, whenever possible and for as long as possible. The Patient Protection and Affordable Care Act (ACA) mandates that employers provide "reasonable break time" for nursing mothers and private, nonbathroom areas to express breast milk during their workday.[213,214] The establishment of these initiatives as the standard workplace environment supports mothers in their goal of supplying only breast milk to their infants beyond the immediate postpartum period. This law currently applies only to hourly employees and exempts salaried workers. Amendments to close this loophole are being considered. Many states also have laws to protect and support breastfeeding in the workplace.[37] The ACA also mandates that insurance companies provide breast pumps and supplies as well as breastfeeding consultation as covered benefits. These benefits are not available universally to women covered by Medicaid or Medicaid managed care plans.[215] Pediatricians can assist mothers with getting the appropriate pump for their needs, either through their insurance or WIC.

The Fairness for Breastfeeding Mothers Act of 2019 requires that certain public buildings that contain a public restroom also provide a lactation room, other than a bathroom, that is hygienic and available for use by a member of the public.[216] Federal agencies also provide designated spaces for employees to express breast milk during the workday.

The United States is 1 of only 2 countries worldwide with no national policy guaranteeing paid leave to employed women who give birth. This lack of paid parental leave may be a barrier to continued breastfeeding, and some mothers fail to initiate breastfeeding at all because they need to return to work soon after delivery.[217] Many pediatricians themselves may have experienced unmet breastfeeding goals because of the rigor of school and residency training and limited time off. In a study of female physicians who are mothers, only approximately 40% percent reported breastfeeding for a year, fewer than one third reported they were able to breastfeed for as long as they wanted, and nearly half said they would have breastfed longer, had their jobs been more accommodating.[218] Workplace support for physicians and physicians-in-training is important in shaping attitudes and promoting a culture of wellness and support.[219]

ROLE OF THE PEDIATRICIAN

The AAP is cognizant that for women to be successful in achieving the recommended breastfeeding goals, significant societal changes are required. The 2011 United States Surgeon General's Call to Action called for action steps and implementation strategies to address changes in health care, communities, the workplace, public health infrastructure, and support and engagement with families.[86] Specific barriers, in the health care system and among providers, that women face in achieving 6 months of exclusive breastfeeding include limited provider awareness, knowledge, skills, and practices; unnecessary use of medical interventions during labor and delivery; and insufficient attention to evidence-based maternity care practices, such as immediate skin-to-skin contact at birth and minimizing mother and infant separations.[10,220]

Policies and societal changes that permit continued exclusive and direct breastfeeding, such as guaranteed paid maternity leave; flexible work schedules, including work-from-home arrangements; and on-site child care are essential to sustaining breastfeeding.[221] Pediatricians can raise awareness among their patients about the provisions stipulated in the ACA and subsequent legislation that support a women's desire to express and store milk in the workplace.[215,216]

Studies have demonstrated lack of preparation and knowledge and declining attitudes regarding the feasibility of breastfeeding among pediatricians.[222] The AAP Section on Breastfeeding Web site provides a wealth of breastfeeding-related material and resources to assist and support pediatricians in their critical roles as advocates of infant well-being.[223] The AAP collaborates with the CDC and other stakeholders, including the ACOG, AAFP, the Academy of Breastfeeding Medicine, the American College of Osteopathic Pediatricians, Association of Women's Health, Obstetric and Neonatal Nurses, National Hispanic Medical Association, National Medical Association, Reaching Our Sisters Everywhere, and United States Breastfeeding Committee, to improve physician education in breastfeeding by establishing and implementing an action plan[224] and developing breastfeeding educational objectives and skills for the physicians in undergraduate, graduate, and postgraduate medical education.[225]

Evidence-based clinical guidelines and protocols from organizations such as the AAP provide detailed guidance for management of specific issues. The critical role that pediatricians play is highlighted by the recommended health supervision visit within 48 to 72 hours after discharge from the hospital or at 3 to 5 days of age in *Bright Futures Guidelines for Health Supervision of Infants, Children, and Adolescents*.[198] Pediatricians are encouraged to avoid use of nonmedically indicated supplementation with commercial infant formula.[146] Many breastfeeding problems occur between 4 and 7 days of age, the timeframe when it is recommended that newborn infants have their first hospital follow-up visit with the pediatrician. Therefore, the pediatrician has the best opportunity to identify and manage breastfeeding concerns. The pediatrician needs to be able to assess the effectiveness of breastfeeding, manage common problems, provide guidance for preservation of the milk supply if supplementation is needed, and provide appropriate referrals.[226] Pediatricians are encouraged to implement evidence-based management and guidance and not rely on their own personal experience in counseling families.[227]

TABLE 6 Summary of Breastfeeding-Supportive Office Practices

Number	Practices
1	Have a written breastfeeding-friendly office policy
2	Train staff in breastfeeding support skills
3	Discuss breastfeeding during prenatal visits and at each well-child visit
4	Encourage exclusive breastfeeding for ~6 mo
5	Provide appropriate anticipatory guidance that supports the continuation of breastfeeding as long as desired
6	Incorporate breastfeeding observation into routine care
7	Educate mothers on breast milk expression and return to work
8	Provide noncommercial breastfeeding educational resources for parents
9	Encourage breastfeeding in the waiting room, but provide private space on request
10	Eliminate the distribution of free formula
11	Train staff to follow telephone triage protocols to address breastfeeding concerns
12	Collaborate with the local hospital or birthing center and obstetric community regarding breastfeeding-friendly care
13	Link with breastfeeding community resources
14	Monitor breastfeeding rates in your practice

Meek JY, Hatcher AJ; American Academy of Pediatrics, Section on Breastfeeding. The breastfeeding-friendly pediatric office practice. *Pediatrics*. 2017;139(5):e20170647

Pediatricians are ideally positioned to serve as breastfeeding advocates and educators and not solely delegate this role to staff or nonmedical or lay volunteers. Pediatricians can communicate directly with families that breastfeeding is a medical and health priority as 1 way to build support for mothers in the early weeks postpartum. Pediatricians play a role in providing the most up-to-date information and recommendations so that parents have all the information needed to make an informed decision about infant feeding. The parental feeding decision should be fully supported without pressure or guilt by the entire health care team. Collaboration with the maternal health provider can improve the overall care for the infant and mother, especially when the mother experiences complications, such as, mastitis, breast or nipple pain, delayed lactogenesis, or low milk supply. The evidence-based Breastfeeding Residency Curriculum has been demonstrated to improve knowledge, confidence, practice patterns, and breastfeeding rates, which assists in the education of future physicians.[228,229]

The AAP has outlined how a pediatrician's own office-based practice serves as a model for how to support breastfeeding in the workplace (Table 6).[230] The pediatrician can work collaboratively with other health care professionals as an interdisciplinary team to engage his or her affiliated hospitals to enact maternity care practices that support breastfeeding and provide proper support and facilities for their breastfeeding employees. Colleagues practicing obstetrics and gynecology, family medicine, and neonatology are critical partners in the support of women, children, and families, and can assist in advocating for needed changes in the health care system to implement breastfeeding supportive policies and improve practices. In addition, pediatricians can collaborate with all members of the health care team to have maximal impact. Partnering with a lactation consultant or specialist, or training office staff to provide effective counseling, should be considered.

CONCLUSIONS

Research reinforces the conclusion that breastfeeding and the use of human milk confer unique nutritional and other benefits to the infant and the mother and, in turn, optimize infant, child, and adult health as well as child growth and development. Evidence-based studies have confirmed and quantified the benefits of breastfeeding and the consequences of not breastfeeding. Thus, breastfeeding should be considered an important public health intervention. As such, the pediatrician's engagement in advocating and supporting optimal breastfeeding practices is essential in achieving this public health priority.

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ABBREVIATIONS

AAFP: American Academy of Family Physicians
AAP: American Academy of Pediatrics
ACOG: American College of Obstetricians and Gynecologists
AHRQ: Agency for Healthcare Research and Quality
BFHI: Baby-Friendly Hospital Initiative
CDC: Centers for Disease Control and Prevention
SIDS: sudden infant death syndrome
PDHM: pasteurized donor human milk
SUID: sudden unexplained infant death
USDA: U.S. Department of Agriculture
WIC: Special Supplemental Nutrition Program for Women, Infants, and Children

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