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Breast Is Best. Part 2. Factors Affecting Breast-feeding Worldwide

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The argument for breast-feeding is a strong one. Not surprisingly, as stated in Part 1,[1] there is worldwide support for breast-feeding among health professionals.[2-4] In his keynote address to the Surgeon General's Workshop on Breast-feeding and Human Lactation, held in June 1984, Surgeon General C. Everett Koop made these observations:

> We know that breastfeeding gives babies complete nutrition plus immunologic benefits to launch them on a healthy life. Breastfeeding also provides its particular benefits at a low cost. We must therefore identify and reduce those barriers which keep women from initiating or continuing to breastfeed their infants.[2] (p. 6)

Breast-feeding Statistics

From the end of World War II until the early 1970s, formula feeding was replacing breast-feeding throughout much of the industrialized world. Gilbert A. Martinez and colleagues at Ross Laboratories, Columbus, Ohio, have been conducting marketing surveys on infant feeding since 1955. Results for the period 1955 to 1971 showed a steady decline in the number of American women who breast-fed their babies.[5]

Although this decline occurred first in the industrialized Western countries, evidence from developing nations also shows that the incidence of breast-feeding declines with urbanization. Barry M. Popkin and colleagues, University of North Carolina, Chapel Hill, reviewed reports on the incidence and duration of breast-feeding in low-income countries and found that the percentage of children breast-fed was almost always lower in urban than in rural areas.[6] Other studies also report lower incidence and duration of breast-feeding among urban populations in Mexico,[7] Malaysia,[8] Haiti,[9] South Africa,[10] Nigeria,[11] Thailand,[12] and other countries.[13]

Zhi-chien Ho, Department of Nutrition, Zhong Shau Medical College, Guong zhau, China, reports that the duration of breast-feeding is shorter among urban mothers in China.[14] This observation is particularly interesting because there is strong governmental and cultural support for breast-feeding in China, and there is no infant-formula industry.

Chinese mothers who wean their children before one year give them something called "milk cake," composed of rice powder, flour, and sometimes sugar. Insufficient milk, possibly attributable to work obligations, related stress, and time and energy constraints, is usually given as the reason for early weaning. In this study, although 80 percent of urban mothers left the Shanghai Children's Hospital breast-feeding exclusively and 10 percent left breast-feeding with supplementation, over 59 percent of the mothers had begun supplementing the baby's diet at one month. By four months, 75 percent of the mothers had weaned their babies completely.[14] However, in rural China, where over 90 percent of the people live, up to 99 percent of mothers breast-feed their infants for the first year of life.

Ironically, the decline in breast-feeding with urbanization in the developing nations has coincided with a reversal of this trend in Western industrialized nations. Beginning in 1971 and continuing through 1982, the number of American women breast-feeding increased from about 25 percent to 60 percent, according to the Ross Laboratories surveys.[15]

One sign that more women in the US and in other nations have taken an active interest in breast-feeding in recent years is the increase in the number of La Leche League groups. La Leche League International, an organization founded by mothers, offers education and support for women who wish to breast-feed. The number of groups worldwide rose steadily from 16 in 1960 to over 3,000 in 1980, with the majority occurring in the US.[16]

The most recent figures from Ross Laboratories indicate that the trend toward breast-feeding may be leveling off; the percentage of American women breast-feeding plateaued at around 60 percent between 1982 and 1984.[15]

To anyone who has recently had a child in the US, news that there has been a resurgence of interest in breast-feeding will not be surprising. The social and medical context of the birth experience has changed drastically, and one result has been the vast improvement in childbirth education available to the expectant couple. And part of any childbirth-education program is a discussion of infant-feeding alternatives. Although such programs do not reach all expectant women, they have surely played a role in changing prevailing attitudes about breast-feeding. For example, the participation of fathers in the births of their children has probably encouraged them to be more understanding and supportive of breast-feeding.

It is important to note that, although the trend toward breast-feeding seems to have affected all ethnic and economic groups in the US, the greatest increase has occurred among white women with at least some college education. Also, the incidence of breast-feeding mothers seems to increase with household income, and fewer mothers employed full-time outside the home breast-feed their babies than do those who remain at home with their infants. Full-time employed mothers who did nurse their babies tended to nurse for shorter durations.[17,18]

Some of these observations have been confirmed by Kenneth W. Eckhardt, associate professor, Department of Sociology, University of Delaware, Newark, and Gerry E. Hendershot, now at the National Center for Health Statistics, Department of Health and Human Services, Washington, DC, who examined data from 1970 to 1972 and 1973 to 1975.[19] They found that breast-feeding was more common among middle-class, college-educated women; white women; women who had good prenatal medical care; and women who did not have to work outside the home.

Other researchers have asked why and to what degree low-income American women are underrepresented among breast-feeding women. In a survey of 379 mothers who gave birth at the University of Texas Medical Branch, Galveston, David K. Rassin and colleagues, Department of Pediatrics, Office of Academic Computing and Biostatistics, found that youth, low income, little education, single marital status, and unemployed head of household were characteristics that correlated significantly with a low incidence of breast-feeding.[20] Among the ethnic populations represented in this group (Anglo-American, black American, Mexican American, and other), black Americans showed the lowest incidence of breast-feeding (9.1 percent). Rassin and coworkers report that only 14 percent of the young low-income mothers they surveyed had participated in any kind of childbirth-education program.

Factors Affecting the Decision to Breast-feed

Despite the recent trend back to breast-feeding among some middle-class American women, there are strong forces in the modern world that work against a woman's resolve to breast-feed

her child. By comparing the daily lives of mothers and infants in a rural Taiwanese village and those in Western urban societies, obstetrician Barbara B. Harrell, University of Washington, Seattle, shows how Western culture fails to support lactation.[21] She identifies many attitudes and practices that contribute to mother-infant separation and undermine extended, successful breast-feeding. Chief among these are the following: limited physical contact between mother and child (intrusion of clothing, high-chairs, strollers, toys, and other baby paraphernalia); separation of the infant from the parent at bedtime; the perceived need to follow a set feeding and sleeping schedule; social restrictions on nursing in public (which stem from the Western view of the breast as a sexual object); the need for the mother to work outside the home; and separation of a working mother from her infant.

Pediatrician Derrick B. Jelliffe and colleague E.F. Patrice Jelliffe, Division of Population, Family, and International Health, School of Public Health, University of California, Los Angeles (UCLA), summarize the ways in which Western governmental, medical, and commercial institutions have failed to support breast-feeding. They cite insufficient workplace facilities for child care and breast-feeding; inflexibility in work schedules; nutrition welfare programs that diminish breast-feeding (by supplying formula); lack of nutritional knowledge among health professionals; hospital practices that separate mother and infant and make breast-feeding difficult; and widespread, aggressive marketing of infant formulas.[22] (p. 204-5)

In view of the significant contribution breast-feeding can make to infant health, it is not surprising that the recommendations outlined by the Surgeon General's Workshop on Breast-feeding include, among many others, the following: increasing efforts to provide breast-feeding education to all segments of society and specifically targeting those currently not reached, increasing awareness and knowledge of lactation and breast-feeding among health professionals, making support services available to all breast-feeding women, promoting research on breast-feeding, and advocating infant-care centers that provide breast-feeding facilities for working women.[2] In a previous essay on child care, I discussed the issue of support for all working parents and the special importance to nursing mothers of nearby child-care sites.[23]

Breast-feeding Versus Infant Formula in the Third World

On May 21, 1981, the World Health Assembly voted 118 votes to 1 (the US cast the lone dissenting vote) to adopt an International Code of Marketing of Breast-Milk Substitutes designed to limit marketing of infant formulas in developing nations.[4] The US voted against the code on the grounds that it violated free speech and free trade.

The action of the World Health Assembly came after a lengthy campaign against aggressive promotion of formulas in developing countries.[24] The argument given for establishing this code was that the formula manufacturers were using sophisticated advertising to sell formulas to women who could not afford them, did not understand how to use them properly, and did not have access to a safe water supply to mix them with nor refrigeration to retard microbial growth. Certain practices by the formula companies were thought to be especially deceitful: companies sent employees dressed as nurses into the field to sell the product to uneducated women who were likely to defer to this sign of authority; posters promoting formula were hung on clinic walls and free samples of formula were given out at clinics, implying professional endorsement of the products; and advertisements and labels picturing fat babies led parents to believe that their thinner babies would thrive better on the formula.

Jelliffe and Jelliffe, in presenting the case against the use of infant formulas and other breast-milk substitutes in less-

developed countries, make the following observations:

> Bottle-feeding in the type of circumstances found in rural and urban areas of resource-poor, less developed countries is extremely difficult if not impossible to undertake adequately because of extremely small purchasing power, defective environmental hygiene, and low levels of maternal education. Under such circumstances, infants usually receive dilute, contaminated feeds containing homeopathic doses of nutrients and massive quantities of bacteria.... Nutrition deteriorates, infections (particularly diarrhoeal disease) increase, and pregnancies become more frequent, closely spaced and hazardous, with greater risk of maternal mortality.[22] (p. 296-7)

The Jelliffes also recount a history of problems with the continually changing composition of formulas.[22] (p. 205-9) Instances of nutrient imbalance or a nutrient deficiency in marketed formulas have led to serious health problems. A recent background paper on infant formulas prepared by the US Food and Drug Administration summarized some of the medical problems that have been associated with formulas in the past.[25] Various vitamin and mineral deficiencies occurred in early formulas. Excess protein and salt in certain formulas were thought to overload the immature kidneys of some infants. Also, physicians have learned the hard way that a formula that is fine for healthy full-term infants may not be appropriate or adequate for preterm infants or infants with metabolic disorders. For example, additional zinc supplementation was found to be necessary for the survival of formula-fed infants with acrodermatitis enteropathica, a rare, often fatal gastric disorder of zinc metabolism. Although the formulas fed to these infants contained zinc concentrations similar to those in breast milk, the zinc in breast milk was found to be more easily absorbed than the zinc in formula.[25] (p. 24)

The American Academy of Pediatrics Committee on Nutrition fully supports breast-feeding as the best way to feed babies but also acknowledges the need for safe, adequate substitutes. The committee has recently revised its standards for infant formulas.[26]

We noted in Part 1 of this review that some studies have shown fairly minor differences between breast-fed and formula-fed babies.[1] It is important to point out that such studies have often focused on highly educated, middle-to-upper income populations. Some researchers, notably the Jelliffes, suggest that this is not the case among less educated, poorer groups.[22]

Others seriously question many of the conclusions reached by these advocates of breast-feeding. Fred D. Miller, Jr., Social Philosophy and Policy Center, Bowling Green State University, Bowling Green, Ohio, has reviewed the evidence on both sides of the infant-formula controversy. He concludes the following:

> The most important contentions offered by critics of the marketing of infant formula in developing countries are not sustained by the preponderance of scientific research. Responsible research does indicate that breast-milk offers distinctive benefits and that faulty methods of infant feeding are associated with grave health problems. But it does not establish that infant formula is a dangerous, unneeded, unaffordable, unethically marketed product.[27] (p. 76-7)

He also concludes that the US vote against the International Code of Marketing of Breast-Milk Substitutes was a justified defense of the individual's right to choose and a vote against governmental control of what should be a personal choice.[27] (p. 78-81)

We should note, however, that the code does not ban infant formula, but restricts its marketing in developing nations. The code prohibits the formula companies from marketing directly to the public, distributing free samples of formula, displaying promotional materials at health-care facilities, using company employees to advise mothers, and offering sales incentives to increase product demand.[4]

Despite those who criticize the rhetoric and tactics of the antiformula fac-

tion, no one argues *against* breast-feeding. Even the infant-formula companies agree that breast milk is the most appropriate food for most full-term infants. However, they do point out that not every woman can or wants to breast-feed her child and that today's infant formulas are the best substitutes available. In a letter to the *New York Times* in 1981, Richard L. Gelb, chairman, Bristol-Myers Company, states:

> Although all agree that breast feeding is the best form of infant feeding, there is also widespread agreement among physicians that infant formula is the best alternative for those who cannot or do not wish to breast-feed.[28]

Gelb goes on to say that, where infant formula is not available, more primitive supplements, such as sugar, corn, or flour mixed with water, are often used, which deprive the infant of essential nutrition.

Most breast-feeding advocates would agree that substitutes are sometimes necessary. For example, some medical conditions, as we will discuss later, preclude breast-feeding for the safety of the mother or the infant or both. Part of the controversy seems to lie in the question of whether formulas are truly needed as often as they are used.

Insufficient Milk Syndrome

"Insufficient milk" is the reason women most often give for supplementation or cessation of breast-feeding. Judith D. Gussler, a research specialist on the Third World Project, Ross Laboratories, and her associate Linda H. Briesemeister describe what they call "insufficient milk syndrome."[29] They suggest that this is a real physical phenomenon that results from the disruption of a traditional pattern of continual mother-infant contact and frequent feeding, a pattern that may no longer be possible or desirable in today's urban, fast-paced societies. Although some middle-class women in Western countries have successfully overcome the obstacles to breast-feeding found in modern life, Gussler and Briesemeister suggest:

> Structural and institutional changes are necessary...to establish an optimal setting for breastfeeding among working class women (and women who must work), single mothers, and women in certain urban ethnic communities, in both the developed and developing worlds.[29]

They conclude that supplementation of breast-feeding has become a necessity for some women in the modern urban world.

Writing in opposition to this view, Ted Greiner and colleagues, Division of Nutritional Sciences, Cornell University, Ithaca, New York, agree that reduced milk supply may precede termination of breast-feeding, but they submit that this reduction usually *follows* the introduction of supplements.[30] They suggest that "constant contact" is not necessary for successful breast-feeding and adequate lactation and that milk production can normally be increased simply by increasing the frequency of suckling. Further, they suggest that "insufficient milk" is often given as the reason for ceasing breast-feeding because it is perceived as a common, acceptable reason for weaning a child. They also note that formula manufacturers deliberately encourage this notion through advertising themes such as "when breast milk fails" and "when nature is inadequate."

Contraindications for Breast-feeding

There are a few conditions that preclude breast-feeding. The American College of Obstetricians and Gynecologists Committee on Obstetrics: Maternal and Fetal Medicine makes the following recommendations:

> Patients who have a known transmissible viral disease, such as hepatitis, rubella, cytomegalovirus, or, possibly, acquired immune deficiency syndrome (AIDS), should not nurse. Also, mothers with active tuberculosis should not nurse, because the disease can be transmitted directly to the infant. If the mother is being treated with an antituberculous drug and is culture negative, however, breast-feeding is allowed.... Infants with galactos-

emia should not be breastfed but rather given formula that contains neither lactose nor galactose. Infants with phenylketonuria require a formula low in phenylalanine, although they may be able to tolerate small amounts of breast milk.[31]

Some conditions formerly considered contraindications are not considered so now. Saroj Saigal and colleagues, Department of Pediatrics, McMaster University, Hamilton, Ontario, Canada, report that hyperbilirubinemia in the first week of life occurs more frequently in breast-fed than in bottle-fed infants.[32] Recent evidence suggests that high levels of the enzyme beta-glucuronidase in breast milk may cause the hyperbilirubinemia reaction.[33] Because most such cases are very mild, Saigal and colleagues suggest there is no need to terminate breast-feeding or separate mother and child unnecessarily.[32] Other researchers agree with this position.[34] Lucy M. Osborn and Roger Bolus, Department of Pediatrics, UCLA Medical Center, suggest that this kind of mild jaundice in full-term infants can be treated with greatest ease and economy by short-term feeding with formula before returning to the breast.[35]

Until recently, some doctors discouraged feeding breast milk to premature infants (by manual expression of breast milk), because it was thought to be nutritionally deficient for the special needs of the premature infant. This finding was based on studies of pooled breast milk from human milk banks (usually obtained from mothers of full-term infants, one or more months into lactation), and it did not take into account the possibility that milk from the baby's own mother may have a different composition.[36] G. Harvey Anderson, Department of Nutritional Sciences, Faculty of Medicine, University of Toronto, Ontario, and colleagues have published a number of studies that suggest that breast milk produced by the mothers of premature infants is more suited to the nutritional needs of the preterm infant than milk produced at full term.[37-40] Philippe Chessex, fellow, Medical Research Council of Canada, and colleagues recorded energy intake and growth of 11 very low-birth-weight preterm infants fed their own mothers' milk (with sodium and calcium supplements). They found that "172 ml/kg/day of preterm milk (if supplemented with sodium and calcium) provides a source of energy and macronutrients sufficient to promote growth of similar quality to that of the third trimester fetus."[41]

Drugs and environmental toxins can be transferred from the lactating mother to her infant. The American Academy of Pediatrics has published an extensive list summarizing transmissibility of particular drugs and their effects on the infant.[42] Lawrence R. Berger, Department of Pediatrics, University of New Mexico, Albuquerque, points out that the issue is not so much whether the drug is transmitted, "but how much and with what consequences for the infant?"[43] Nevertheless, it goes without saying that a nursing mother should avoid any drug that is not absolutely necessary.

Pesticides, such as dichloro-diphenyl-trichloroethane (DDT), mirex, and heptachlor and other contaminants, such as polychlorinated biphenyls (PCBs) or polybrominated biphenyls (PBBs), are fat soluble and tend to accumulate in body fat. During lactation, the body sometimes breaks down fat stores for extra calories to produce breast milk. There is concern that these pollutants might be passed along to infants.[43] Walter J. Rogan and Beth C. Gladen, Biometry and Risk Assessment Program, National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina, found PCBs and 2,2-bis(4-chlorophenyl)-1,1-dichloroethylene (DDE) to be widespread in breast milk of mothers participating in a long-term research project.[44] Not much is known about the degree of risk to the infants, but in general experts seem to agree that, unless the mother's exposure was extreme, the benefits of breast-feeding outweigh the risks of exposure to low levels of these toxins. Berger makes the grim observation that "the infant will not

Table 1: Selected list of journals that report on breast-feeding research. A = title, first year of publication, and publisher. B = 1984 impact factor.

A	B
Acta Paediatrica Scandinavica (1921) Almqvist & Wiksell, Stockholm, Sweden	1.03
American Journal of Clinical Nutrition (1952) American Society for Clinical Nutrition, Bethesda, MD	2.65
American Journal of Diseases of Children (1911) American Medical Association, Chicago, IL	1.32
American Journal of Public Health (1911) American Public Health Association, Washington, DC	1.89
Archives Francaises de Pediatrie (1942) Doin Editeurs, Paris, France	.33
Archives of Diseases in Childhood (1926) British Medical Association, London, UK	1.52
Australian Paediatric Journal (1965) (Australian College of Paediatrics) Blackwell Scientific, Victoria, Australia	.48
British Journal of Nutrition (1947) Cambridge University Press, Cambridge, UK	1.49
Bulletin of the World Health Organization (1947) World Health Organization, Geneva, Switzerland	1.40
Clinical Pediatrics (1962) Lippincott, Philadelphia, PA	.39
Early Human Development (1977) Elsevier Biomedical Press, Amsterdam, The Netherlands	1.14
Ecology of Food and Nutrition (1971) Gordon and Breach, London, UK	.60
European Journal of Pediatrics (1910) Springer-Verlag, New York, NY	1.07
Human Nutrition—Applied Nutrition (1982) Food & Nutrition Press, Westport, CT	.61
Journal of Biosocial Science (1969) (Galton Foundation) Biochemical Society, Essex, UK	.45
Journal of Nutrition (1928) American Institute of Nutrition, Bethesda, MD	1.80
Journal of Nutrition Education (1969) Society for Nutrition Education, Oakland, CA	.39
Journal of Pediatric Gastroenterology and Nutrition (1982) Raven Press, New York, NY	.74
Journal of Pediatrics (1932) Mosby, St. Louis, MO	2.40
Journal of Perinatal Medicine (1973) Walter de Gruyter, Berlin, FRG	.51
Journal of the American Dietetic Association (1925) American Dietetic Association, Chicago, IL	.74
Journal of Tropical Pediatrics (1954) Oxford University Press, Oxford, UK	.31
Klinische Paediatrie (1880) Ferdinand Enke Verlag, Stuttgart, FRG	.38
Monatsschrift fur Kinderheilkunde (1903) Springer-Verlag, New York, NY	.21
Pediatric Annals (1972) Charles B. Slack, Thorofare, NJ	.27
Pediatric Research (1967) (International Pediatric Research Foundation, Inc.) Williams & Wilkins, Baltimore, MD	2.86
Pediatrics (1948) American Academy of Pediatrics, Elk Grove Village, IL	2.81
Rivista Italiana di Pediatria (1975) Pensiero Scientifico, Rome, Italy	.10
Zeitschrift fur Geburtshilfe und Perinatologie (1876) Ferdinand Enke Verlag, Stuttgart, FRG	.34

escape exposure to potentially hazardous substances by avoiding breast milk."[43]

Other potential hazards in breast milk include lead and cadmium.[45] Substances such as alcohol, caffeine, and nicotine are also transferred in breast milk. Although some doctors do not appear to be particularly alarmed about moderate consumption of alcohol[46] or caffeine[47-49] by lactating mothers, others have recommended monitoring caffeine levels in breast-fed infants, because they found very slow rates of caffeine elimination in some infants.[50] On the other hand, most doctors discourage smoking during pregnancy and lactation. If a woman does not wish to stop smoking, she is nonetheless encouraged to breast-feed but advised to limit her smoking as much as possible.[51] Smoking has been implicated as a factor influencing failure of breast-feeding, possibly because chemicals in tobacco smoke inhibit milk production.[52,53]

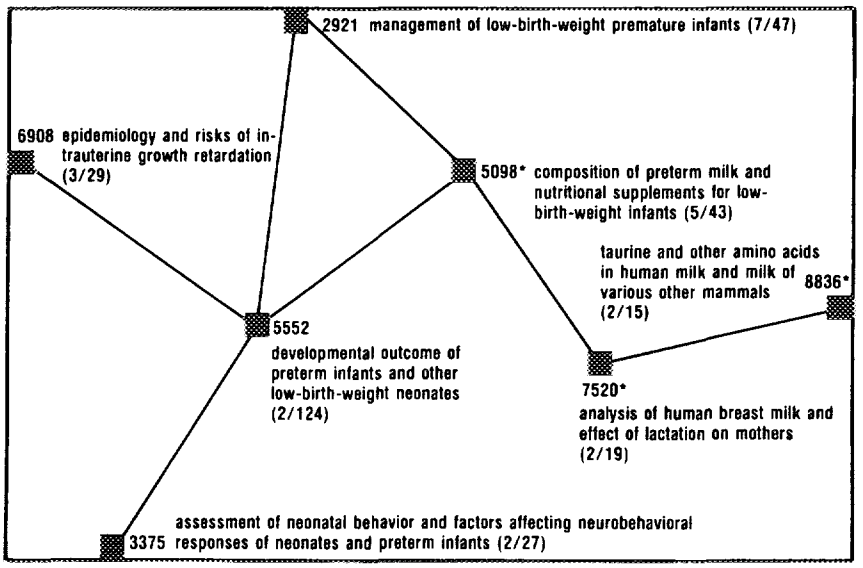
ISI Research Fronts

Several hundred articles and books related to breast-feeding are published each year. The principal journals in which this topic is covered are listed in Table 1. Not surprisingly, many are

Table 2: *SCI®/SSCI®* research fronts on breast-feeding. A = number. The first two numbers indicate the year of the research front. B = name. When a 1984 research front carries through to a 1985 front, the number of the 1985 front is given in parentheses. C = number of core items. D = number of published items for 1984 or 1985. E = number of 1985 papers citing the 1984 research fronts.

A	B	C	D	E
84-4250	Epidemiology and outcome of otitis media with effusion in children and the influence of antibodies from breast-feeding on the occurrence of middle-ear diseases in infants	7	45	38
84-5098	Composition of preterm milk and nutritional supplements for low-birth-weight infants	5	43	87
84-5178	Effects of breast-feeding and other maternal behaviors on mother-infant bonding	5	67	14
84-7520	Analysis of human breast milk and effect of lactation on mothers (85-1105)	2	19	9
84-7614	Determinants of infeeding and breast-feeding in developing countries (85-2903)	2	10	1
84-7642	Breast-feeding in developing countries (85-3259)	4	28	21
84-8836	Taurine and other amino acids in human milk and milk of various other mammals	2	15	12
84-9034	Nutritional effects on human pregnancy and lactation	2	15	15
85-1105	Fatty acid and bile acid content of human milk causing breast milk jaundice in infants	2	16	-
85-2903	Trends in breast-feeding and determinants of fertility in developing countries	4	21	-
85-3259	Nutrition studies of breast-feeding and human milk and bilirubin levels in infants	24	162	-

Figure 1: Multidimensional-scaling map for C2-level research front #84-0910, "Management of low-birth-weight infants," showing links between C1-level research fronts. The numbers of core/published items are given in parentheses following the research-front title. An asterisk (*) next to the research-front number indicates that the research front appears in Table 2.



pediatrics journals, several of which appeared in my 1974 *Current Contents®* essay on pediatrics journals.[54] Nutrition journals also figure prominently in Table 1.

Each year we identify thousands of first-level (C1) research fronts, or active areas of research. This is done through the process of co-citation clustering. We examine which papers or books are cited together by the literature published in a specific year. Co-citation demonstrates that works are linked intellectually. Works that are linked by the published (or citing) literature are known as the core literature of that specialty, or research front. The prefix in the research-front number indicates the year of the citing literature.

In 1984 there were eight research fronts directly related to breast-feeding. (See Table 2.) Some of the core articles for these fronts have been cited in this essay. We have also included three 1985 research fronts identified as we went to press.

Research fronts #84-5098, #84-7520, and #84-8836, shown in Table 2, are all related to the biochemical analysis of human breast milk. Figure 1 is a multidimensional-scaling map for the second-level research front #84-0910, "Management of low-birth-weight infants." A second-level, or C2, research front is a group of C1 research fronts that are linked together by co-citation; C2-level research fronts show connections between very specific subject areas and how these form broader areas of research. Figure 1 shows the relationship between seven 1984 C1-level fronts, including three directly related to breast-feeding.

One active research area is "Breast-feeding in developing countries" (#84-7642), with 4 core papers; in 1984 28 articles cited 1 or more of them. The most frequently cited core article in this front was "The recent trend in breast-feeding" by Martinez and J.P. Nalezienski, one of the demographic surveys from Ross Laboratories that we discussed earlier.[5] This paper was cited by 11 articles in 1984. Two other papers by Martinez[17,55] and one by Jelliffe and Jelliffe[56] form the core for research front #84-7642.

Another active research area was the "Effects of breast-feeding and other maternal behaviors on mother-infant bonding" (#84-5178). The most frequently cited core publication was the book *Maternal-Infant Bonding* by coauthors Marshall H. Klaus and John H. Kennell,[57] Case Western Reserve University School of Medicine, Cleveland, Ohio, which summarizes their observations of animal and human parent-infant interactions. This book was cited over 530 times in the *Science Citation Index®* and the *Social Sciences Citation Index®* between 1976 and 1985.

Research front #84-7520, "Analysis of human breast milk and effect of lactation on mothers," consisted of 2 core works and 19 citing papers. This research carried through to #85-1105, "Fatty acid and bile acid content of human milk causing breast milk jaundice in infants," with 2 core and 16 citing papers. The reason why some research fronts do not continue from year to year is that the population of published papers changes each year. However, the previous year's core literature continues to be cited. This is why we've indicated the number of 1985 papers citing into the 1984 core.

The fact that middle-ear infections are common in very young children probably accounts in part for the activity in "Epidemiology and outcome of otitis media with effusion in children and the influence of antibodies from breast-feeding on the occurrence of middle-ear diseases in infants" (#84-4250). There were 7 core papers in this front that were cited by 45 papers in 1984. In 1985 this research front carried over to #85-1140, "Branhamella catarrhalis infection and treatment of middle-ear effusions in children with otitis media," which was not specifically related to breast-feeding.

The most active research front was #85-3259, "Nutrition studies of breast-

feeding and human milk and bilirubin levels in infants," with 24 core documents, cited by 162 papers in 1985. The most highly cited paper was another one by Martinez and colleagues, cited by 21 papers in 1985.[18]

Summary

The evidence suggests that, whenever possible, breast-feeding ought to be encouraged as the most desirable form of infant feeding for all mothers. It offers the infant unique nutritional and immunological advantages. However, we cannot overlook the stresses of modern life that influence a woman's decision to breast-feed or not. This decision is particularly difficult for mothers who work, for mothers who are single, and for mothers who have other young children to care for.

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