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Rev. ed.
1980

PN-AAK-023

BREAST IS BEST:
AN INTERNATIONAL BIBLIOGRAPHY ON BREAST
FEEDING AND INFANT HEALTH

OFFICE OF INTERNATIONAL HEALTH
PUBLIC HEALTH SERVICE
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

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This bibliography is based on the 1979 document, Breast is Best: A Bibliography on Breast Feeding and Infant Health, written by Naomi Baumslag, M.D., Lynne Grace-Mason, Chris Roesel and Edward Sabin under contract No. 782-77-0132 KS to the Office of International Health. The 1979 document was funded by the Office of Nutrition, Development Support Bureau, U.S. Agency for International Development. The information presented in this 1980 bibliography does not necessarily represent endorsement by the Department of Health and Human Services or the U.S. Agency for International Development.

PREFACE

Both the U.S. Department of Health and Human Services, and the Agency for International Development have an on-going concern and responsibility for addressing the problem of malnutrition. Through an interagency agreement, HHS has been provided funding by the Office of Nutrition of AID, for preparing technical studies related to infant and maternal nutrition in developing countries. The present breast-feeding bibliography represents one of these efforts.

The bibliography primarily consists of annotated references on breast-feeding, breast milk and related infant and maternal health and nutrition subjects. ~~Additional unannotated references are also provided at the end of each chapter.~~ Many of these references treat several aspects of breast-feeding, making it difficult to neatly categorize them under any one specific subject area. Therefore, the reader is urged to pursue various sections of the bibliography related to his/her subject of primary interest.

The authors wish to thank Claudia Kinsey, Fred Clarkson, Pam Hands, Linda Worthington and Brenda Kwon for their valuable assistance in the preparation of this document. They also would like to acknowledge Professors Derrick Jelliffe, of UCLA; Joe Wray of Harvard University; and Roy Brown of Mt. Sinai School of Medicine; and Dr. Tina Sanghvi of the Office of Nutrition, AID, for their advice and suggestions regarding articles cited in this bibliography.

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INTRODUCTION

Each year an estimated 15 million children under age five die from the combined effects of malnutrition and infection. Most of these deaths occur in developing countries. These deaths are often due to diarrhea or respiratory illnesses that are not fatal to well-nourished children. A natural resource exists which, if utilized more fully, could significantly reduce the number of child deaths -- a resource which requires no advanced technology nor dependence on industrial nations. That resource is human breast milk,.

Breast milk is an ideal food for infants. It is sterile, which protects the infant from infection, and temperature controlled. The chemical and nutrient composition of breast milk is species specific so that breast milk, unlike cow's milk, is uniquely suited to the nutritional requirements of the human infant. Recent research has identified an increasing number of immunological factors for resistance to disease that are present in breast milk and colostrum. One public health expert has calculated that if breast-feeding could be reinstated in developing countries, some 10 million children could be saved from diarrheal disease and marasmus each year.¹ In addition, a little recognized benefit of breast-feeding is its child spacing effect.

Yet with all the advantages of human milk, the practice of breast-feeding is declining in many developing countries, precisely where malnutrition takes its greatest toll. Factors frequently cited to explain the decline include urbanization; lack of breast-feeding incentives for working mothers; disruption of the family leading to a gap in knowledge about breast-feeding; the desire to be "modern"; and infant formula advertising.

Breast milk as a public health resource has only recently received the attention it deserves.² Health professionals have often been poorly informed about research on this subject and about the "how to" mechanics of breast-feeding. The purpose of this bibliography is to readdress this problem by providing, in one document, a review of recent articles and research on breast-feeding, with emphasis on developing countries.

¹ Derrick Jelliffe, testimony before the Senate Subcommittee on Health and Scientific Affairs; Hearings on the Marketing and Promotion of Infant Formula in Developing Countries, May 23, 1978.

² An April, 1979 International Conference on Infant and Young Child Feeding, sponsored by the World Health Organization and UNICEF, focussed much attention on the promotion of breast-feeding. See the WHO/UNICEF entry in Chapter I, Breast Feeding-General.

Certain basic themes emerge from the articles in this bibliography:

1. The mother's nutritional status is critical for fetal stores, lactation calories and adequate breast milk. Infant health depends on the health and nutrition of the mother. Several studies show that poorly nourished mothers have low birth weight infants. Mortality rates are high for low birth weight babies. Supplementation of the mother's diet has been shown to increase the birth weight of the infant.

2. Breast milk alone, from adequately nourished mothers, is sufficient food for the infants up to six months of age. After six months, breast milk is a valuable supplement to weaning food. This is even more important in poor environments.

3. Poorly nourished mothers produce milk for their infants, but in less volume than well-nourished mothers. Extra food for mothers to increase breast milk volume is cheaper than breast milk substitutes for infants.

4. Successful breast-feeding depends on the mother's knowledge and confidence which influences the let-down reflex. Present practices in many maternity wards fail to encourage breast-feeding, and may even discourage it.

5. Several other factors reduce lactation, such as birth control pills containing a high estrogen content, lack of "lactation calories" in pregnancy, and maternal malnutrition while nursing.

6. The weaning period is a critical time for infants in many developing countries. Infants require calorie dense and frequent feedings. During this period, there is a danger of deficient caloric intake with detrimental effects on growth and development. In children, diarrhea and parasitic infestations further reduce the child's often limited food intake.

Considering the basic health importance of breast-feeding as previously outlined, the provision of relevant data is paramount. This bibliography provides the health professional and the consumer with the information necessary for a better understanding of the technical and social aspects of breast-feeding. It also presents the framework for identifying those policy issues essential to more coordinated nutrition and health programming and planning efforts in developing countries.

I. MATERNAL NUTRITION

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I. MATERNAL NUTRITION

APPEL, J.A., AND KING, J.C. "ENERGY NEEDS DURING PREGNANCY AND LACTATION," J. OF FAM. COMM. HLTH., 1:7-18, 1979.

This is a comprehensive article on principles of energy metabolism during pregnancy and lactation. Both the risks of excessive weight gain and inadequate energy intake are reviewed, including the normal physiological gain (about 12.5 kg.) and the optimal birth-weight, which is somewhere between 3 and 4.5 kg.

It appears that women who gain little weight during pregnancy or who show habitually low nutrient intakes during pregnancy have decreased milk production even though nutrient intake during lactation is adequate. The three basic reasons given here for achieving good energy status during pregnancy include the following: 1) for the deposition of new tissue associated with pregnancy, 2) for the increased metabolic expenditure of energy to maintain the new tissue repositied, 3) for the increased activity level associated with the movement of a heavier body as pregnancy progresses.

HYTTEN, R.E. AND LEITCH, I. "PREPARATIONS FOR BREAST-FEEDING," IN THE PHYSIOLOGY OF HUMAN PREGNANCY, PP. 234-241, EDITED BY R.E. HYTTEN AND I. LEITCH. OXFORD: BLACKWELL, 1971.

The average increase in body fat of about 9 lbs. in pregnancy may represent the energy store of 35,000 K Cals. available for mobilization for the production of breast milk.

MURRAY, M. J. ET. AL. "THE EFFECT OF IRON STATUS OF NIGERIAN MOTHERS ON THAT OF THEIR INFANTS AT BIRTH AND 6 MONTHS, AND ON THE CONCENTRATION OF FE IN BREAST MILK," BRIT. J. NUTR., 39:627-630, 1978.

This study, conducted in two parts, attempted to determine if maternal iron status influenced iron status of the newborn infant, the iron content of breast milk and the iron status of the 6 month old infant.

In the first part of the study, women were given a general physical examination with special attention to clinical signs of malaria and nutritional disorder. In the second part, the mothers, their breast milk and their infants were examined 2 weeks and 6 months after delivery. Blood samples were obtained from mothers 2 weeks postpartum.

None of the women received dietary supplementations, medicinal vitamins or iron during pregnancy or lactation, as these were not available. Since famine conditions prevailed in eastern Niger throughout the study, the women's diet was restricted largely to millet, occasionally supplemented by small amounts of cassava and rice.

The women were divided into three groups according to their iron status (hg concentration and transferrin saturation). Twenty-nine were normal, 33 were deficient and 7 had an iron overload (these women were members of a small band of nomadic Fulani).

No significant difference could be found between levels of serum Fe, percentage saturation of transferrin and hemoglobin concentration of infants born to mothers in each group despite wide maternal variations in Fe status. No significant differences were noted between mean weights of babies born to all three groups. No infants were anemic or Fe-deficient by Western standards.

READ, M.S., ET AL., "MATERNAL NUTRITION AND INFANT HEALTH: REPORT FROM AN INTERNATIONAL WORKSHOP; SUMMARY OF A WORKSHOP IN PANAJACHEL, GUATEMALA, MARCH 1979. IN PRESS, J. OF CLINIC. NUTR.

Eight completed studies of interventions in maternal nutrition were reviewed at the workshop. In general these studies showed that nutritional supplementation increased birth weight in malnourished populations. This was most marked when supplementation was provided during the third trimester. Increased birth weight leads to a reduction in perinatal and infant mortality and effects subsequent child development.

Whether the effects are due to added protein or energy is not clear although energy would appear to be very important under the life conditions of the population studies.

This report makes clear the intimate connection between maternal nutrition and infant health and survival. Maternal malnutrition presents a potentially very serious obstacle to social development. This review includes a valuable table which summarizes the results of all eight studies.

Long term goals should include education for better use of locally available foods, and the encouragement of self-sufficiency in food production.

SCOTT, S. "FOOD BELIEFS AFFECTING THE NUTRITIONAL STATUS OF PEOPLE IN SIERRA LEONE," CARE PUBLICATION, 1978.

Those working in nutrition education in Sierra Leone will find this information very useful, especially as it relates to vulnerable groups such as pregnant and lactating women and infants. Village women normally breast-feed their children for long periods which may extend into the second year of life. Some form of porridge made from cassava or rice is usually given as a supplement.

An extensive list of food beliefs that apply to pregnant and lactating women includes taboos on eggs, certain types of nuts, meats, fish, fruit, vegetables, legumes and other miscellaneous foods. Food beliefs which apply to infants (under 1 year) include taboos on eggs, fish, evaporated milk, meat, certain fruits and other foods such as honey, kolanuts, sweets, and salted foods.

THOMSON, A.M. ET. AL. "BODY WEIGHT CHANGES DURING PREGNANCY AND LACTATION IN RURAL AFRICAN (GAMBIAN) WOMEN," J. OF OBSTET. AND GYNEC. OF THE BRIT. COMMON., 73:624-733, 1966.

Pregnant and lactating women in "bush" conditions tended to lose weight from late July to early October and regain it thereafter. At other times weight was well maintained and only pregnant women gained weight. The total amount of weight gain varied. Average weight gain from mid-February to mid-August was 12 lbs. (5.5 Kg.). The gain was roughly half as much at birth during other times of the year. Birth weight season changes were not significant.

THOMAS, J., AND ELLIS, F.R., "THE HEALTH OF VEGANS DURING PREGNANCY," PROC. NUTR. SOC., 36:46A, 1977.

This study was conducted on 14 vegans (28 pregnancies) and eighteen controls (41 pregnancies) to determine whether a vegan diet (no animal products) had any adverse effects on the health of mothers during and after pregnancy or on the health of their babies. All subjects were healthy; the average age of the vegans at time of their first pregnancy was 30 years (range 19-34) and of the controls 25.5 years (17-36). Although only 3% of vegans took iron supplements and none took vitamin B₁₂ supplements, still births, toxemia and anemia during pregnancy were not significantly more prevalent in vegans than in controls. The difference in the birthweights of the two groups was not statistically significant. There was an increased incidence of breast-feeding in the vegan group and their babies were weaned onto a vegetable preparation.

	Vegans	Controls
Live Births	24 (86%)	36 (88%)
Still births/miscarriages	4 (14%)	5 (12%)
Toxaemia of Pregnancy	4 (17%)	7 (19.5%)
Anaemia of Pregnancy	3 (12.5%)	2 (5.5%)
Iron Supplements	3 (21%)	12 (66%)
Breast fed, 3 months +	23 (96%)	12 (31%)
Birth weight (kg)	3.1 [±] 0.8	3.3 [±] 1.2

VEMURY, M. AND LEVINE, H., BELIEFS AND PRACTICES THAT AFFECT FOOD HABITS IN DEVELOPING COUNTRIES: A LITERATURE REVIEW, NEW YORK: CARE, INC. 1978.

This extensive review is divided into sections by regions - South America, Central America, The Caribbean, South Africa, East Africa, West Africa, North Africa, and the Near East, East and Southeast Asia, and Central Asia. Each of these nine sections contains an introduction and information on general food consumption patterns, general food beliefs, social role of food, and food habits and practices of vulnerable groups (food beliefs relating to breast-feeding are included here). Certain foods are believed to transmit illness to the infant when consumed by the lactating mother, for example, in Colombia, green vegetables eaten by the mother cause sickness and fruits cause worms in the nursing child. A "hot" and "cold" food classification system is present in parts of Latin America, the Indian subcontinent and in South East Asia. Whether a food is considered "hot" or "cold" determines its suitability for pregnant and lactating women and infants.

This study of beliefs and practices affecting the eating habits of vulnerable groups can have great relevance in efforts to improve their nutritional status. It is of utmost importance to begin by examining the perspective held by people in a given community, and to deal with conflicting beliefs before carrying out nutrition activities.

WHO EXPERT COMMITTEE, "NUTRITION IN PREGNANCY AND LACTATION," GENEVA: WORLD HEALTH ORGANIZATION, 1965.

Diets of poor nutritive value have been generally associated with low birth weights and high fetal and infant mortality rates. The usual diet of women in developing countries is nutritionally inadequate and little attention is directed to special dietary needs during pregnancy and lactation. Although the weight gain of mothers during pregnancy in less developed countries is about half that of mothers in developed countries, the birth weight of offspring is not much less than that of babies born in developed countries. The trend towards shortened duration of lactation should not be encouraged, especially in developing countries because breast milk makes an important contribution to infant nutrition even at 12-18 months of age.

WRAY, J., "MATERNAL NUTRITION, BREAST-FEEDING AND INFANT SURVIVAL, IN NUTR. AND HUMAN REPRODUCTION, EDITED BY W.H. MOSELY. NEW YORK: PLENUM PRESS, 1978.

This paper presents all factors concerning breast-feeding with respect to infant survival. Significant changes in the quality of milk are found, especially with inadequate diet. Fat seems to be the component that varies the most; prolactin and lactose are maintained more consistently. There are two valid methods of evaluation of quantity: baby weight and breast milk volume. Output is greater on a demand schedule and babies gain more weight where calorie intake is adequate. Mothers produce 700-800 cc a day as opposed to an intake of 2000 calories per day; whereas with an intake of 2000 calories per day or less, the volume drops to 400-600 cc. Supplementation increases volume moderately. Increased protein seems to increase volume. Improvement of the maternal diet can increase milk output. Duration of breast-feeding is influenced by the next pregnancy, return to work, availability of alternatives in feeding, advertising pressure and medical advice. The Guatemala study of a group seemingly unaffected by advertising or working schedules has shown mothers who were able to breast-feed 9 months gained little weight during pregnancy and lost more weight in postpartum period. Those who breast-fed 21 months or more gained more weight during pregnancy and their postpartum.

MATERNAL NUTRITION

ADAMS, O. SIMONE and BARR, O. GEORGE, "Effect of Nutritional Supplementation in Pregnancy." J. Amer. Dietetic Assoc., 72: 144-147, Feb. 1978.

ANON, The Human Lactation Center, "Mothers in Poverty." The Lactation Review, 2 (3), 1977.

BAUMSLAG, N., EDELSTEIN, T., and METZ, J., "Reduction of Incidence of Prematurity by Folic Acid Supplementation in Pregnancy." Br. Med. J., 1 (5687): 16-17, Jan. 3, 1970.

DI GIACOMO, R.F., "Relationship of Calorie, Protein and Fat Consumption to Fetal, Neonatal, and Infant Mortality." Nutr. Reports Internat., 17 (1), Jan. 1978.

EDITORIAL, "The Influence of Maternal Food Supplements on Birth-weight in Guatemala." Nutr., Reviews, 34 (6): 169-171, June 1976.

EDITORIAL, "Maternal Nutrition and Low Birth Weight." Lancet, 2: 445, Sept. 6, 1975.

EDITORIAL, "Requirement of Vitamin B₆ During Pregnancy." Nutr. Reviews, 30 (1): 15-17, Jan. 1976.

GROSS, B. A., et al., "Integrated Concentrations of Prolactin in Breast-feeding Mothers." Aust. N.Z.J. Obstet. and Gynecology. 1979 (in press).

HABICHT, J.P., DELGADO, H., YARBROUGH, C., and KLEIN, R. E., "Repercussions of Lactation on Nutritional Status of Mother and Infant." Proceedings of the 9th International Congress of Nutrition., 2: 106-114, Karger: Basel, 1975.

HART, D. and HARPENDING, H.C., "Iron, Folate and Vitamin B₁₂ Nutrition in a Hunter-Gatherer People: A Study of the Kung Bushmen." The Amer. J. Clin. Nutr., 24: 229-242, Feb. 1971.

MATERNAL NUTRITION

- JONES, K.L., et al., "Outcome in Offspring of Chronic Alcoholic Women." Lancet, 1 (1076), 1976.
- KATONA-APTE, J., "The Socio-Cultural Aspects of Food Avoidance in a Low-income Population in Tamilnad, South India." J. Trop. Pediatr. Environ. Child Hlth., pp. 83-90, April 1977.
- KOLATA, G. B., "Kung Hunter-Gatherers: Feminism, Diet, and Birth Control." Science, 185: 932-934, 1974.
- LECHTIG, A., et al., "Influence of Food Supplementation During Pregnancy on Birth Weight in Rural Populations of Guatemala." Report presented to the 9th International Nutrition Congress, Mexico, 1972.
- LECHTIG, A., "Effect of Food Supplementation During Pregnancy on Birthweight." J. of Pediatr., 56 (4): 508-520, Oct. 1975.
- LECHTIG, A., "Maternal Nutrition and Fetal Growth in Developing Societies." Amer. J. Dis. Child., 129: 434-437, April 1975.
- LECHTIG, A., "A Simple Assessment of the Risk of Low Birth Weight to Select Women for Nutritional Intervention." Amer. J. of Obstet. and Gynecology, 125: 25-34, 1976.
- LECHTIG, A., et al., "Maternal Nutrition, Human Milk Composition and Infant Nutrition in a Rural Population of Guatemala." Quebec; Proceedings of the Western Hemisphere Nutrition Congress, 1977.
- NATIONAL RESEARCH COUNCIL, Maternal Nutrition and the Course of Pregnancy. National Academy of Sciences, Washington, D. C., 1970.
- SCHWARTZ, N.E., "Mothers and Their Attitudes and Practices in Perinatal Nutrition." J. of Nutr. Educat., 9 (4), Oct. - Dec. 1977.
- STEIN, Z. and SUSSER, M., "Dutch Famine 1944-1945. I. Effects of Six Indices at Birth." Pediatr. Research, 9: 70-76, 1975.
- WILLIAMS, C. D. and JELLIFFE, D. B., Mother and Child Health: Delivering the Services, Oxford University Press, London, 1972.

II. BREAST-FEEDING PRACTICES

II. BREAST-FEEDING PRACTICES

AMERICAN ACADEMY OF PEDIATRICS, "BREAST-FEEDING,"
PEDIATR., 62 (4): 591-601, 1978.

This article examines and evaluates present information, provides up-to-date guidance for counseling mothers about feeding their infants, discusses factors related to the decline of breast-feeding in the United States and Canada, and proposes ways and means to encourage breast-feeding. The advantages of breast-feeding are reviewed both for the developing country setting and for the industrialized. Nutritional factors, particularly regarding obesity, immunology, and other advantages are reviewed.

ANON. NUTRITION-HEALTH AND FOOD SURVEY OF TURKEY
(CHAPTER 10), "CHILD NUTRITION, BREAST-FEEDING PRACTICES
AND SUPPLEMENTARY BABY FOODS," pp. 98-103, 281-289.

The percentage of infants insufficiently breast-fed is highest (20.4%) in the Aegean-Marmara-Thracian region. The percentage of those breast-fed for more than 2 years increased from West to East. When the mother was well educated the percentage of children breast-fed longer than 12 months decreased.

Practices such as not giving mother's milk to babies at all or insufficient breast-feeding may be connected with educated working mothers. However, mothers working for private sectors of the government have 6 weeks paid birth leave. In addition to work, the other cause affecting the length of breast-feeding is misleading information given to mothers. Psychological factors affecting the amount of milk produced, inadequate nutrition of the mother and the increased use of commercial and homemade baby foods should be considered. In Turkey, 12.5% of babies are given commercial baby food.

ANON., "RURAL CHILD HEALTH CARE IN KWANGTUNG PROVINCE,"
CHIN. MED. J., 4: 85-88, 1978.

A brief account of the rural child health care service in the Chinese province of Kwantung is presented which is given great importance at all levels of provincial government. Cooperative medical services have been instituted in 97% of the production brigades in Kwantung Province with over 3,000 mother and child health units. Every effort is made to ensure breast-feeding by the mother during the first 10 months of her infant's life. An infant feeding

survey carried out in 1975 on 3,183 infants (aged 3-10 months) showed that over 95% were either breast-fed exclusively or given mixed feeding with their mother's milk and other substitutes. Less than 5% were artificially fed. Better growth and development are observed among infants who were breast-fed for the first 6 months of life. However, cow's milk, goat's milk, or milk substitutes are given to infants whose mothers have inadequate supplies of breast milk.

BALAKRISHNAN, S., AND HUSSEIN, H.B.H., "BREAST-FEEDING IN KELANTAN," J. TROP. PEDIATR., 23:80-82, 1977.

Four hundred and sixty-one mothers were interviewed to determine the duration of breast-feeding (without supplemental foods), at what age solids were introduced and to assess the mothers' awareness of the benefits of breast milk. 18% of mothers were breast-feeding fully up to three months and 9% without added solids up to six months. Seventy-eight percent of the mothers were introducing solids before the third month; of these, one-third as early as the first month. Eighty-six percent agreed that breast milk was the best milk but only 59% agreed that breast-fed children got infections less frequently. Sixty-five percent were aware that after six months, solids should be introduced.

BROOKE, O.G., "INFANT FEEDING - THE PERENNIAL PROBLEM," THE PRACTITIONER, 221:314-319, 1978.

There are several topics in the field of infant feeding which cause much anxiety and these are discussed here. These include overnutrition and undernutrition, excess solute load and immunological problems. Some of the newer advances in knowledge about breast milk and the common problems of milk-fed weanling infants are summarized as well.

BROWN, R.E., "RELACTATION WITH REFERENCE TO APPLICATION IN DEVELOPING COUNTRIES." CLIN. PEDIATR., 17 (4): 333-337, 1978.

The utility and promotion of relactation for lesser developed countries (LDC's) are discussed in this article. Cases of relactation are cited even among nulliparous women. The entire range of nutritional, cost-benefit, hygienic, psychological, and microbiological reasons for breast-feeding is summarized. Hormonal and physiological aspects of milk production and let-down are quickly given; lactation, whether induced or natural, is the end result of the prolactin and let-down reflexes.

Lactation or relactation can be initiated using pharmacologic agents and/or healthy sucking. The requirements of successful lactation are (1) a healthy woman who wishes to nurse the infant, (2) a healthy baby, and (3) a support system. Pharmacologic agents which can help the process are estrogen, progesterone, oxytocin, the tranquilizer thiorazine, and metoclopramide. Relactation among Bengali refugees in India using suckling only after diarrheal episodes and among South Vietnamese women using thiorazine is discussed. Generally, once convinced that the approach worked, the women rapidly accepted it.

CHAVEZ, A., ET. AL. "ROLE OF LACTATION IN THE NUTRITION OF LOW SOCIO-ECONOMIC GROUPS," ECOLOGY OF FOOD AND NUTR., 4:159-169, 1975.

A two-year longitudinal study was made of the production and consumption of milk of 17 mother-child units in a poor and inadequately nourished rural community. A comparable group was studied with the exception that the diet of the mother was supplemented from the 45th day of gestation until weaning. The children of these mothers were also given food supplements, vitamins and minerals from the third month of age onwards. It was found that in the first six months of lactation, the consumption of milk by infants in the non-supplemented group followed a curve with a maximum peak of 650 ml. per day. After the sixth month, there was a tendency towards a plateau of about 450 ml. In supplemented mothers, the curve for the first semester was smoother and the volume secreted was 15 percent higher. There was also a decrease in production after the sixth month. It was also found that the milk of the supplemented mothers was more dilute, but it did not differ significantly in its total solid content from the milk produced by the non-supplemented mothers.

DARKE, S.J. "HUMAN MILK VERSUS COW'S MILK," J. OF HUMAN NUTR., 30(4):233-238, 1976.

Composition of human milk and cow's milk are compared. Cow's milk contains 3.3% protein per 100 ml., which is more than human milk. Human milk protein is 40% casein and 60% whey, cow's milk has 80% casein and only 20% whey. Whey is species specific. It is predominantly made up of lactalbumen in human milk, and B-lactoglobulin in cow's milk. It also contains small amounts of serum albumin, lactoferrin and traces of lysozyme. Human milk contains 7.09g. of lactose per 100 ml.; cow's milk contains only 4.8g. of lactose per 100 ml.. The fatty acid composition is very different but is to some extent determined by the maternal diet. Both differ in vitamin content. Cow's milk is richer in B vitamin and has less Vitamin C, A and E. Neither are a good source of Vitamin D; cow's milk contains less iron, copper and zinc than human milk.

Higher concentrations of protein in undiluted cow's milk can be associated with an increase in blood urea and abnormally high renal solute load, and neurological consequences have been reported in premature and full-term low birth weight infants. The problem with cow's milk manufacture is ensuring that the essential amino acids are present in at least the amounts found in human milk. The high concentration of inorganic nutrients in cow's milk may result in harm for some children, especially the high calcium phosphate ratio which may be a factor in the etiology of neonatal tetany. The immature kidney of the young infant seems to excrete excess potassium more easily than sodium, which may result in hypernatremia. Environmental climate and infections may increase hypertonic dehydration, and permanent neurological damage can result from hypertonic convulsions. More refined cow's milk formula is made when the milk is skimmed and the fat replaced by vegetable oils. Absorption of fat from these so-called "filled milks" is still not as complete as that of human milk.

DAVIES, D.P. "THE FIRST FEED OF LOW BIRTHWEIGHT INFANTS," ARCH. DIS. CHILD., 53:187-192, 1978.

Some of the important events concerning the early feeding practices of low birthweight (LBW) infants are traced from the beginning of the century to the present in this review article. As early as 1913, Goodhart recommended that infants not be allowed to wait 2 or 3 days for regular breast-feeding. Early feeding was challenged up to the 1940's when the accepted practice switched to delayed feeding until the second or third day after birth, a practice which originated in the United States. This practice was based on the beliefs that early feeding could cause pneumonia from aspirating milk into the respiratory passages and that newborn infants retained an excessive amount of extracellular fluid and early feeding was an unnecessary stress on the infant's kidneys. It was not until the early 1970's that early feeding was well established once again and was recognized as the best method for feeding LBW infants.

DICKMAN, S. R. "BREAST-FEEDING AND INFANT NUTRITION,"
J. FAM. COMM. HLTH., 1:19-29, 1979.

A comparison of nutrients in human and cow's milk is presented which includes all the latest findings in this area of research. Other aspects covered include a discussion of the numerous advantages of breast-feeding such as mother-infant bonding, positive effects on the mother, immunological factors, antiallergenic activity, reduction in likelihood of overfeeding, and prevention of nursing-bottle syndrome. The possible risks of breast-feeding discussed here are the effects of drugs on breast milk and the effect of conditions such as undernutrition and smoking on the quantity and quality of human milk. Specific drugs and chemicals to avoid include diuretics, oral contraceptives, atropine, reserpine, steroids, radioactive preparations, morphine and derivatives, hallucinogens, marijuana, anticoagulants, bromides, antithyroid drugs, anthraquinones, dihydrotachysterol and many antimetabolites.

EBRAHIM, G. J., BREAST-FEEDING: THE BIOLOGICAL OPTION.
 LONDON: MACMILLAN PRESS LTD., 1978.

This book describes the physiological mechanisms in the mother and child and analyzes the biological properties in human milk as well as the species specificity of human milk.

Composition of Various Milks (per 100 ml)

	Fat	Protein	Carbohydrate	g/100ml	Calories
Buffaloes' milk	7.5	3.8	4.9		101
Camels' milk	4.2	3.7	4.1		68
Cows' milk	3.5	3.3	4.7		62
Deers' milk	8.3	7.1	4.1		119
Goats' milk	4.1	3.8	4.6		69
Horses' milk	1.4	1.8	6.7		45
Human breast milk	3.3	1.5	7.0		62
Pigs' milk	8.5	5.8	4.8		118
Reindeers' milk	22.5	10.3	2.4		253
Sheep's milk	6.2	5.2	4.2		92
Yaks' milk	7.0	5.2	4.6		101

The author begins by stating that formula feeding is no older than three decades, as compared to the millions of years of human evolution during which milk evolved with the species. He points out that in rural areas of the developing world, infants who do not have access to their mother's milk fail to thrive or even survive.

According to Ebrahim, the two most prominent causes of the decline in breast-feeding are (1) the high pressure promotion of the infant foods; and (2) the absence of a firm stand in favor of breast-feeding by the health profession.

Another factor responsible for the decline in breast-feeding: the free distribution of powdered milk. The post-war years brought a major nutrition intervention program in many developing countries in the form of free distribution of powdered skimmed milk donated by various international agencies. These programs attracted mothers to MCH clinics but also gave rise to dependence and contributed to the trend of artificial feeding.

The author states that the "modern maternity ward" has become a place where mothers come to learn about artificial feeding. Ebrahim points out that the health worker carries a heavy responsibility, not only of ensuring the establishment of lactation at the time of delivery, but also of its maintenance through various family situations so that the infant can derive the benefits of mother's milk until weaned onto solids.

Cost of formula can vary from 1/4 to 1/3 of the national minimum wage in developing countries. Imported, powdered milk can be a serious drain on foreign exchange. In Tanzania, if there was only a 20% decline in breast-feeding, it would require milk imports costing £2 million at the prices of 1970. The decline in breast-feeding in Chile between 1951 and 1970 is equal to a loss of 78.6 thousand tons of breast milk costing 18.86 million!

TABLE 6.3 Cost of infant formula as a % of minimum wage

Country	Minimum wage per week (U.S.\$)	Cost of formula to mother per month (U.S.\$)	% of wage
United Kingdom	39.20	1.14	2.9
India	5.31	0.81	15.3
Peru	5.00	1.30	26.0
Philippines	9.69	2.59	26.7
Indonesia	5.60	1.62	28.9
Tanzania	7.62	2.44	32.0
India	1.62	1.62	35.1
Nigeria	5.18	2.14	47.1
Afghanistan	2.80	1.62	57.9
Pakistan	5.18	3.23	62.4
EGYPT	4.00	2.59	64.8

In all future action programs, the role of the health professional will be crucial, Ebrahim argues. Not enough importance has been given to teaching the subject in the curricula of training institutions. To a large extent, the medical and nursing professions have allowed themselves to be influenced by semi-promotional literature put out by the manufacturers of baby foods; many of the scientific and literary activities of professional bodies are supported by the manufacturers.

GERARD, J.H. "BREAST FEEDING: SECOND THOUGHTS,"
PEDIATR., 54 (6): 757, 1974.

A number of studies have shown that breast-feeding not only supplies the infant with nourishment but gives him immunologic protection against infection as well. Infants slowly develop their own immunologic defenses in the months after birth, and breast-feeding is a hygienic, gradual method of protection during the transition to immunologic independence. Best protection is achieved when the infant receives breast milk alone for, at least, the first six months of life.

GLAVIS, J. "A CASE STUDY OF INFANT FEEDING PRACTICES IN GUATEMALA," INCAP PUBLICATION, 1973.

Among the traditional indigenous peoples of Guatemala, breast-feeding is a universal practice and the child may still be at the breast well into his or her third year of life. However, there has been a rapid decline in breast-feeding in the Ladino villages in the costal plains of southern Guatemala. This decline can be partially attributed to media campaigns by commercial infant formula and powdered milk companies which have introduced and popularized artificial feeding. Also, the increased exposure to western medical services has resulted in encouragement by an unenlightened medical profession to employ artificial feeding.

A surprising number of culturally defined beliefs that associate breast-feeding with different infant illnesses (such as diarrhea) are prevalent in the population. The majority of women do not start nursing until several days after birth, mainly because it is believed that colostrum is harmful to the child and is capable of producing diarrhea or infection. The sinking of the fontanelle, thought to be caused by vigorous sucking or abrupt removal of the infant from the breast, is believed to cause diarrhea, fever, loss of appetite, etc. The foods a lactating mother eats are also associated with diarrhea, as they are believed to transmit certain effects through mother's milk. This often results in avoidance of nutritious foods by lactating mothers.

GOYEA, H.S., AND JOHNSON, E.J., "BENIN CITY MOTHERS; THEIR BELIEFS CONCERNING INFANT FEEDING AND CHILD CARE," TROP. AND GEOG. MED., 29:103-108, 1977.

One hundred and forty-three mothers living in Benin City, Nigeria, were interviewed concerning their beliefs about child care, nutrition, and their source of information regarding child care. All mothers believed that breast-feeding should begin from birth. Eighty-one percent of the mothers believed that breast-feeding should be continued for a year or more. However, 58% of the mothers would introduce artificial milk within the first month after birth. Only 19% of the mothers would give breast milk alone for the first three months.

GUERI, M, ET AL, "BREAST-FEEDING PRACTICES IN TRINIDAD,"
BULL. PAN AM. HLTH. ORGAN., 12:316-322, 1978.

Four hundred and eighteen women who gave birth to live infants in two Trinidad hospitals were included in this study to determine breast-feeding practices in the area. The women were interviewed within 48 hours after delivery, and as close to four months after the first interview to collect information on actual feeding practices.

The majority of women (98.3%) initially planned to breast-feed their babies. However, 62.6% felt that bottle feeding should be introduced before the baby was two months old despite common beliefs that breast-feeding was more convenient, cheaper and better for the baby.

In the initial interview, 64% of mothers had not breast-fed yet because the baby had not been brought to them. Nearly half (45%) of all children put to the breast before the interview had received a milk powder formula or glucose water before the first nursing session.

Follow-up interviews revealed that almost half (40.8%) of the infants had been completely weaned from the breast and only 28.7% were still breast-fed five or more times daily. The most common reason for introducing artificial feeding was that the mother had insufficient milk. A significant correlation was found between early bottle feeding (before the first nursing session) and completed weaning by the follow-up interview.

Reasons why artificial feeding was started.

Reasons	No.	%
Insufficient milk	116	35.6
Baby not satisfied	43	13.2
Wanted baby to get used to the bottle	43	13.2
Medical reasons (mother or baby)	27	8.3
Baby refused breast	26	8.0
Was planning to go out to work	21	6.4
Had to work	13	4.0
Other reasons	13	4.0
No reason	13	4.0
Breast problems	9	2.8
Reasons not stated	2	0.6
Total	326	100.1

Reasons why a particular brand of milk was used.

Reasons	No.	%
Recommended by friend or relative	74	24.5
Recommended by nurse or doctor	68	22.5
Baby satisfied with it	58	19.2
Thought it was the best	55	18.2
No particular reason	29	9.6
Less expensive	5	1.7
Other reasons	5	1.7
Saw it being used at the hospital	3	1.0
Saw it advertised	2	0.7
Not stated	2	0.7
Sample given free at the hospital	1	0.3
Total	302	100.1

HELSEING, E., LACTATION IN PRACTICE. OSLO, NORWAY: INSTITUTE FOR NUTRITION RESEARCH, 1978.

This book is lengthy but it is easily understood by mothers and untrained health workers. The present situation of breast-feeding is discussed considering practices in industrialized and developing countries. The "Prerequisites for Breast-Feeding" is a thorough chapter that examines the promoting and inhibiting factors of the lactation mechanism. The area of composition explains the exact components and their relevance for infants. The chapter on anatomy and physiology of the process examines the distinction and importance of the first milk and mature milk. The section on diet provides maternal requirements and the importance of distribution of food within the family. Relactation and induced lactation are covered. Child feeding with respect to cultural practices and their detrimental influence are examined. Recognition of special problems for the mother and infant is especially useful, for example: breast inflammation, mastitis, allergies, low birth weight, premature infants and biocides in milk.

HENIG, R.M., "THE CASE FOR MOTHER'S MILK," N.Y. TIMES MAG., SECTION 6, PP. 40, 42, 57, JULY 8, 1979.

The cases of two American women who encountered negative social pressures while attempting to breast-feed their infants is described. One woman had her family's pool membership cancelled for nursing in public and the other (a firefighter) was suspended from work for breast-feeding while on duty.

Social and psychological obstacles which women encounter while breast-feeding are discussed. Obstetrical procedures are often not conducive to establishing successful lactation and are a major reason for discouraging women from breast-feeding. A general review of the benefits of breast-feeding, both to the mother and infant is discussed; these include immunological, nutritional and psychological aspects.

HOFVANDER, Y. AND PETROS-BARVAZIAN, A., "WHO COLLABORATIVE STUDY ON BREAST-FEEDING," ACTA, PAEDRIATR. SCAN., 67: 556-576, 1978.

This study was started in 1975 and concentrated on the epidemiology of breast-feeding among three different socio-economic groups, namely the urban elite, urban poor and traditional rural. Almost 24,000 mother/child pairs from nine countries (Chile, Ethiopia, Guatemala, Hungary, Indian, Nigeria, Philippines, Sweden, Zaire) participated in the study, which was conducted on the basis of a questionnaire interview.

Results of a few of the preliminary findings showed that breast-feeding declines most rapidly among the urban elite group and is most prolonged in the rural traditional populations. Other findings showed that about 20% of the urban poor mothers who were delivered in the hospital were provided with free milk samples and 10% were given free feeding bottles.

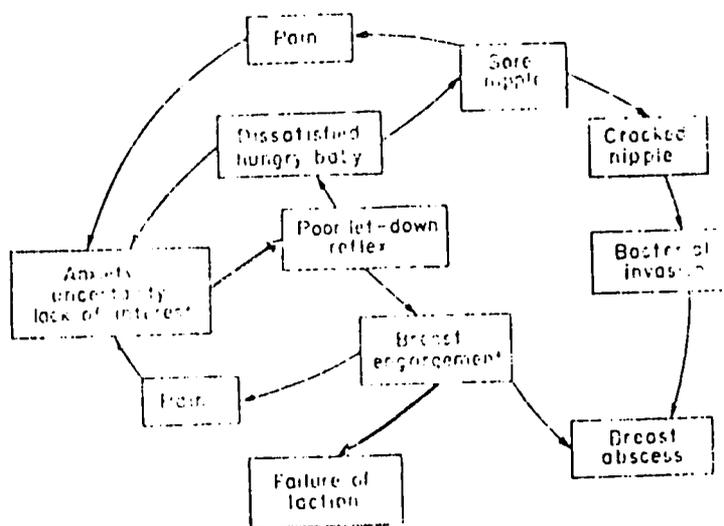
Some of the reasons given for not breast-feeding included insufficient milk (the child was hungry), and "the milk had dried up." There are also indications that the advice and influence of health personnel may have played a part in the promotion of early supplementation and weaning.

INTENGAN, C. "NUTRITIONAL EVALUATION OF BREAST-FEEDING PRACTICES IN SOME COUNTRIES IN THE FAR EAST," J. TROP. PEDIATR. ENVIRON. CHILD. HLTH., 22:63-67, 1976.

Although breast-feeding is still practiced in many countries in the Far East, bottle-feeding is becoming increasingly popular. In the lower income groups, reasons for not breast-feeding include insufficient milk or a return to work. Bottle-feeding is the popular choice in many affluent homes. The greatest danger associated with bottle-feeding is the prevailing poor hygiene and sanitation in rural areas. Feeding bottles are not properly cleaned and water is contaminated; these conditions contribute to the high incidence of gastroenteritis. Industrialization and urbanization are also noted as reasons for the shift from bottle-feeding to breast-feeding mainly because of increasing exposure to highly commercialized milk substitutes. Reasons for weaning in urban areas include inadequacy of mother's milk, child old enough for weaning, and pregnancy.

JELLIFFE, D.B., AND JELLIFFE, E.F. "BREAST-FEEDING: A KEY MEASURE IN LARGE-SCALE DISASTER RELIEF," DISASTERS, 1:199-203, 1977.

Communal disasters affect such physiologically vulnerable groups as young children in the transitional or weaning period, the aged, the sick, and pregnant and lactating women. Breast-fed babies are well protected up to the point when food becomes scarce, lactation declines due to malnutrition and eventually ceases. Young infants then become highly susceptible to such diseases as marasmus and diarrhea. Two practical approaches in areas affected by large-scale disasters should be incorporated into disaster relief programs -- 1) to restrict the use of artificial feeding, and 2) to reinforce lactation in the mothers concerned, which depends on adequate maternal prolactin and let-down reflexes, and on the mother's nutritional condition. Regimen for re-establishing lactation is included; it was used successfully in Kampala, Uganda and Bangladesh.



The "Anxiety-causing failure syndrome": Anxiety, uncertainty or lack of interest can inhibit the let-down reflex, often leading to failure of lactation.

Re-establishment of lactation regimen suggested in an emergency situation in Bangladesh

1. Establish whether the mother is definitely interested in breast feeding the infant.
 2. Provide adequate food and liquid for the mother's dietary needs so that she will be able to produce breast milk.
 3. Indicate that there is a "powerful and special medication" which will stimulate the production of large quantities of breast milk (Thorazine or Largactyl, 50-100 mg tablets).
 4. Mention that the special medication will be provided three times daily for a period of 10 days, during which time the adequate flow of breast milk will be established.
 5. Make certain that the infant has a good sucking reflex and that the mother knows that she should nurse for 5-10 min on each breast at the time of feeding. The more times the infant is put to the breast at the onset of this process, the faster and more adequate will be the lactation; 2-3 hourly feedings are advised.
 6. Return to the mother during the first 3 days to encourage her feeding, reinforce the fact that the infant will be getting excellent food. Do not interrupt lactation in the presence of loose stools or any other complication.
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Table from Jelliffe and Jelliffe, "Breast Feeding: A Key Measure in Large-Scale Disaster Relief", Disasters, 1:199-203, 1977.

JELLIFFE, D.B. AND JELLIFFE, E.F.P. "BREAST-FEEDING IS BEST FOR INFANTS EVERYWHERE," NUTR. TODAY, 12-16, MAY/JUNE 1978.

As a response to an earlier article (Aykroyd, 1977), this paper summarizes the recent rapid growth of information regarding the advantages of breast-feeding as well as encapsulating an epidemiological analysis of breast-feeding and infant mortality rates (IMR). IMR is shown to decline in unsanitary situations when improved public hygiene and socio-economic situations are combined with either breast-feeding or proper bottle feeding; however, reviews of Chilean and Libyan reports indicate that provision of sufficient cow's milk without other improvements does not impact on the infant marasmus-diarrhea cycle. The recent research as to the advantages of breast-feeding show many biochemical, physiological, immunological and economic strengths.

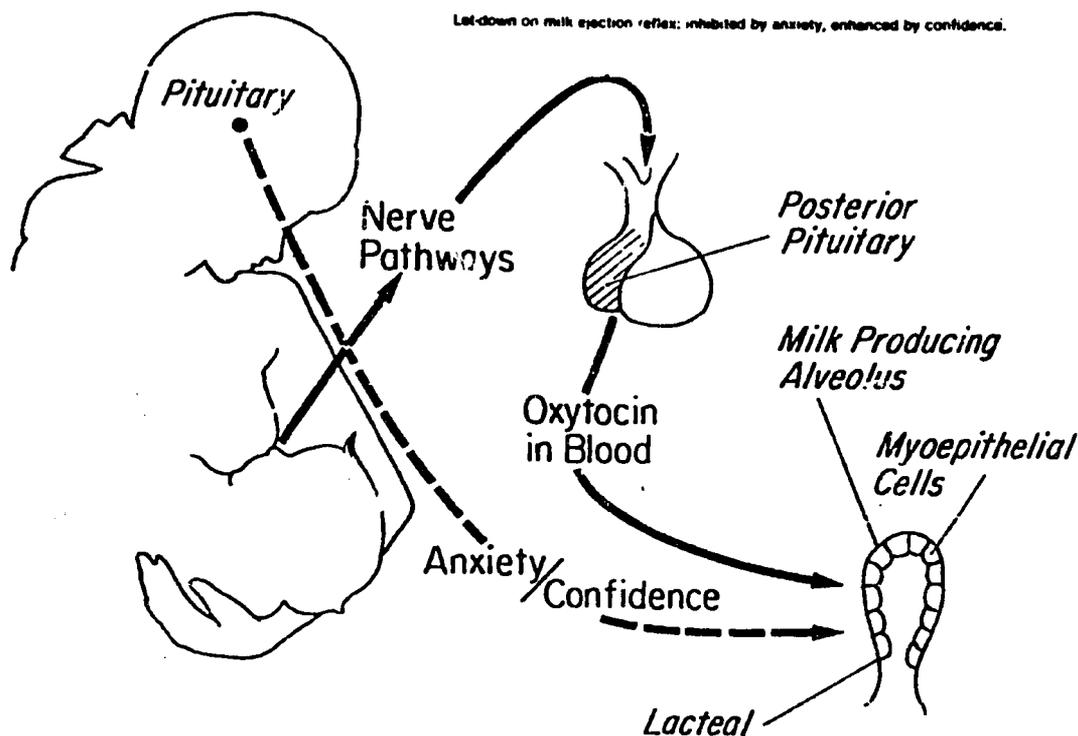


Figure from Jelliffe and Jelliffe, "Breast Feeding is Best for Infants Everywhere" *Nutr. Today*, May/June 1978.

JELLIFFE, D.B., ET AL., "BREAST-FEEDING AND WEANING FOODS: AN ANNOTATED BIBLIOGRAPHY OF RECENT PUBLICATIONS," WASHINGTON, D.C., AGENCY FOR INTERNATIONAL DEVELOPMENT PUBLICATION, 1974.

Four patterns of infant feeding emerge in this review of sources on infant feeding: (1) the traditional total breast-feeder; (2) the recently urbanized poor, an emerging bottle feeder; (3) the elite bottle feeder; and (4) the elite naturalist breast-feeder. This bibliography contains 185 references and covers a wide range of articles on the impact of infant feeding practices on health, particularly in developing countries. Topics of the articles selected in this bibliography include: weaning practices in different cultures, the need for the health professions to realize the value of breast-feeding; and the importance of knowledge of breast-feeding technique for mothers cut off from traditional sources of information about breast-feeding. Several articles describe organizations, such as La Leche League, which seek to reintroduce breast-feeding into industrial countries.

JELLIFFE, D., AND JELLIFFE, E.F.P., "HUMAN MILK, NUTRITION AND THE WORLD RESOURCE CRISIS," SCIENCE, 188:557-561, 1975.

Recently, the pattern of malnutrition has altered in many developing countries due to urbanization and a decline in breast-feeding. Nutritional marasmus with diarrhea in the first year of life is more common. Much illness in early childhood is related to infection which occurs more easily in those with malnutrition and aggravates that condition. Breast-feeding also has a contraceptive effect aiding child spacing. Human milk should be considered a priority resource in national development policy and international planning for health.

JELLIFFE, D.B., AND JELLIFFE, E.F.P., HUMAN MILK IN THE MODERN WORLD, NEW YORK: OXFORD UNIVERSITY PRESS, 1978.

This is a comprehensive book on breast-feeding and human milk and its significance in the modern world, both in industrialized and developing countries. The book draws together the issues, influencing factors, and long range planning involved in solving the problem of high mortality and morbidity of infants. The chapters cover the following areas: the composition of human milk, the distinguishing components, and how species specific human milk is. Also covered are physiological and biochemical mechanisms, the maternal state, protection and hazards of breast milk, and the economics and convenience, and mother-infant interactions. The book covers practices in agrarian and in industrial societies; pointing out the recent changes in non-Western countries and the consequences of early weaning in industrial and developing countries.

The authors also deal with trends and influences favoring breast-feeding which they state have been effective in small-scale programs. Community directed education and information reorientation of health professionals, reorientation of maternity units, and provision of facilities for working women, and monitoring advertising and formula promotion are also discussed.

The book is well illustrated with many charts and tables including a table which follows on maternity ward practices which interfere with lactation and breast-feeding.

MATERNITY WARD PRACTICES WHICH HINDER BREAST-FEEDING

Practice

Effect

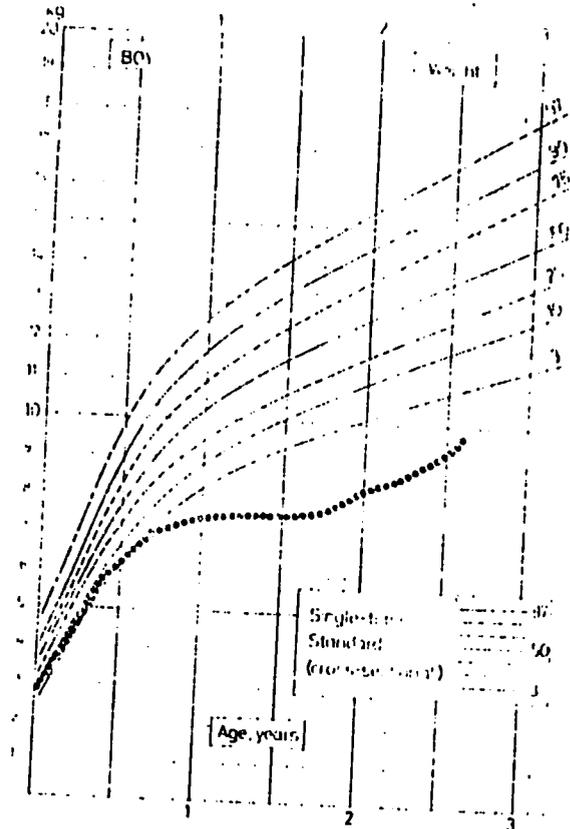
Delaying first breast-feed	
Sedated newborn (excess maternal anesthesia)	
Supplying prelacteal feeds	Limitation of
Regular and limited feeds (4 hours and no night feeds)	sucking and
Separation of mother and infant	prolactation
Free supply of formula and infant food industry literature	secretion
Uninformed and confused mother	Anxiety and
Weighing before and after test feeds	interference
Restricting visitors	with the
Unsympathetic staff	let-down reflex

Table adapted from Jelliffe and Jelliffe, Human Milk in the Modern World, Oxford University Press, 1978, p. 351.

JIVANI, S.K.M, "THE PRACTICE OF INFANT FEEDING AMONG ASIAN IMMIGRANTS," ARCH. DIS. CHILD. 53:69-73, 1978.

This article attempts to give general guidelines on the problems of feeding children of Asian immigrant families in the United Kingdom, with an emphasis on the different religious and cultural customs which affect diets.

The acceptance and adoption of bottle feeding as a legitimate or even desirable method of feeding by immigrant mothers may be a conscious adoption of the ways of the host community. However, poor standards of hygiene combined with lack of knowledge regarding cleaning of feeding bottles leads to gastroenteritis. In fact, in areas with high immigrant populations, the admission rate for gastroenteritis is proportionately higher for immigrants than for the local population. The weaning process often leads to problems among immigrants due to the mother's lack of familiarity with local foods. Many Hindus are strict vegetarians and do not eat meat, fish or eggs; consequently babies will not be given these foods and often the end result is a 2 to 3 year old child living entirely on milk and a few starchy puddings. This accounts for the poor growth rate seen between 6 months and 2 years of age, which resembles the weight pattern found in malnourished children in both Africa and Asia.



Typical weight chart of an Asian infant with inadequate weaning.

Table from Jivani, "The Practice of Infant Feeding Among Asian Immigrants" Arch. Dis. Child. Vol. 53, 1978.

JOHNSON, C.A. "BREAST-FEEDING AND SOCIAL CLASS MOBILITY: THE CASE OF MEXICAN MIGRANT MOTHERS IN HOUSTON, TEXAS," UNPUBLISHED PAPER PRESENTED IN PART AT THE ANNUAL MEETING OF THE AMERICAN ANTHROPOLOGICAL ASSOCIATION, 1977.

In an analysis of interview data from one hundred and ninety-six deliveries of women born in Mexico or border towns who were living in Houston, it was found that 60% of their Houston-born children were given only commercial formulas from birth. In contrast, 92% of the infants born in Mexico were breast-fed for at least seven months. Contact with hospitals and clinics in Houston resulted in anesthesia use during labor and delivery, milk-inhibiting injections (deladamum) following delivery, and the heavy use of drugs both pre- and post-partum. Both traditional midwives and health personnel were found to counsel against breast-feeding. No instruction as to advantages of breast milk to either the babies' or the mothers' health was recalled to have been given by the clinic, hospital or indigeneous personnel. Infant formulas and formula substitutes including highly sugared and colored beverages such as fruit or rice drinks were found to have high prestige values in both the village and Houston settings.

JONES, R.A.K., AND BELSEY, E.M., COMMON MISTAKES IN
 INFANT FEEDING: SURVEY FROM A LONDON BOROUGH,"
 BRIT. MED. J., 2: 112-115, 1978.

Artificial methods should be taught so that mistakes which could lead to overfeeding and hypernatraemia do not occur.

246 mothers were questioned as to the feeding methods used. Sixty-two percent had attempted breast-feeding but by 12 weeks 89% were giving artificial formula and 74% were giving solids. Only 7% gave breast milk alone for 12 weeks.

Very few (23%) followed the manufacturer's instructions exactly. Twenty-eight percent added an extra ounce of water or too little sugar despite having measured the milk accurately. Inaccuracies were more likely with increasing parity. Regular attenders at child health clinics were more likely to make up feeds accurately than those who rarely or never visited a clinic. Mothers from social classes I and II did not differ in food preparation.

Early introduction of solids was associated with lower social class, less maternal education, and bottle feeding, but was not related to attendance at child health clinics.

The health visitor was the most frequent source of advice, although nearly two-thirds of mothers decided on a particular feeding method themselves.

It is of extreme importance that all mothers, including those who are breast-feeding be given careful instructions on feed preparation and an explanation of the hazards of inaccurate measurement before leaving the hospital. From the questionnaires used, it was discovered that 49% of mothers were making serious mistakes in preparing powdered or evaporated milk feeds.

Relation between correct or incorrect preparation of powdered and evaporated milk feeds and parity. Figures are numbers (%) of mothers

Preparation of feeds	Parity				Total
	1	2	3	4	
correct	51 (60.0)	43 (52.4)	12 (42.9)	8 (28.6)	114 (51.1)
slightly incorrect	19 (22.4)	27 (32.9)	5 (17.9)	11 (39.3)	62 (27.8)
seriously incorrect	15 (17.6)	12 (14.6)	11 (39.3)	9 (32.1)	47 (21.1)
Total	85 (100.0)	82 (100.0)	28 (100.0)	28 (100.0)	223 (100.0)

16 63; P < 0.02.

Parity-two mothers never used powdered or evaporated milk.

correct - Following manufacturer's instructions exactly, or adding 1.1 oz (14-28 ml) water or too little sugar. Slightly incorrect - Powdered milk scoops shaken flat or flattened box edge, or too much sugar added. Seriously incorrect - Feeds too weak, too strong, or with cereals or other additives.

LA LECHE LEAGUE INTERNATIONAL, THE WOMANLY ART OF
BREAST-FEEDING, INTERSTATE PUBLISHERS: ILLINOIS,
1958

A basic manual which offers mothers encouragement and practical help, with emphasis on the satisfaction and security felt by both the mother and baby in the good mothering that starts with breast-feeding.

LAMBERT, J. AND BASFORD, J. "PORT MORESBY INFANT FEEDING SURVEY," PAPUA NEW GUINEA MED. J., 20:175-179, 1977.

An infant feeding survey was carried out during the months of December 1975 and January 1976 in Port Moresby. 136 mothers were interviewed and their infants weighed to determine their nutritional status. Over one-third of the infants seen were artificially fed; 69% of these were malnourished (between 60 and 80% of standard weight for age), and 23% were marasmic (below 60% weight for age). Of the 88 breast-fed infants, only 26% were malnourished.

Lactogen, the most expensive brand of formula was purchased by 53% of mothers who fed their infants artificially. Twenty-six percent used condensed milk and the rest used Sunshine Milk Powder.

Among the reasons given for artificial feeding, 39% of mothers stated that they were working, 26% said it was more convenient, 12% stated they did not have enough breast milk, 9% thought they were doing the best for their baby and 7% had become pregnant again. Only 15% of the mothers who gave their infants artificial feeds used the cup and spoon method recommended by the Department of Health. However, all infants fed this way were malnourished. This indicates that this method may not be suitable, especially for infants less than 3 months of age.

NUTRITIONAL STATUS BY METHOD OF INFANT FEEDING

	Group 1 Breast fed infants	Group 2 Artificially fed infants
Number of infants seen	88	48
Number between 80% and 60% of standard weight for age	20 (23%)	22 (46%)
Number below 60% of standard weight for age	3 (3%)	11 (23%)
Total number below 80% for age	23 (26%)	33 (69%)

LAPPE, F.M., AND COLLINS, J., FOOD FIRST: BEYOND THE MYTH OF SCARCITY. BOSTON: HOUGHTON-MIFFLIN, 1977.

Despite economic gains in recent decades, poverty and hunger persist in the world. There are indications the gap between rich and poor grows wider rather than narrower. Lappe and Collins examine (and reject) several theories which account for the continued existence of poverty including the "myth of overpopulation." Lappe and Collins maintain there is sufficient food in the world to feed everyone but that food resources are unevenly distributed. They argue that poverty is not the result of population growth, ignorance or outmoded agricultural practices. Instead poverty is constantly in the process of creation through the dispossession of the poor of the means to survival by the actions of domestic and foreign elite groups. Poverty doesn't just happen for Lappe and Collins, but is created by powerful elites.

The book contains a chapter on the breast-feeding versus baby bottle issue, as well as a chapter on the unintended effects of food aid. The authors predicted that their book would be criticized by professionals working in the development field as lacking enough research to warrant the book's broad generalizations which call into question commonly accepted assumptions in the field of international development.

LATHAM, M.C. "INFANT FEEDING IN NATIONAL AND INTERNATIONAL PERSPECTIVE: AN EXAMINATION OF THE DECLINE IN HUMAN LACTATION AND THE MODERN CRISIS IN INFANT AND YOUNG CHILD FEEDING PRACTICES," ANN. NEW YORK ACAD. SCI., 300:197-209, 1977.

The transitions regarding infant feeding in industrialized, developing and socialist countries are discussed, including the impact of these changes on child morbidity and mortality. It is of interest to note that although China has undergone rapid industrialization the transition from breast to bottle has not occurred. The infant mortality rate in cities where figures are available are incredibly low and knowledgeable visitors returning from China are impressed by the health and growth of young children.

The author disputes the argument that a decline in breast-feeding is almost inevitable where there is industrialization and urbanization. Other topics covered include the following: 1) adverse results of shift from breast to bottle, 2) economics for the family and the nation, 3) commerciogenic nutritious foods, 4) water requirements of infants, 5) milk in the treatment of protein-calorie malnutrition (PCM), and 6) improving infant nutrition.

MARSHALL, L.B. AND MARSHALL, M. "BREASTS, BOTTLES, AND BABIES: HISTORICAL CHANGES IN INFANT FEEDING PRACTICES IN A MICRONESIAN VILLAGE," ECOLOGY OF FOOD AND NUTR., (IN PRESS), 1979.

The mothers of 375 children born in a Micronesian village during the past 50 years were interviewed about their infant feeding practices. It was found that in the period 1945-1975, use of commercial formula increased steadily, breastfeeding declined, age at weaning from breast decreased, and consumption of milk by 1-2 year olds increased. These trends accelerated in the 1970's. The use of powdered or evaporated milk for infant feeding was introduced into Truk prior to 1940. Educational level and employment history of the mother were significantly associated with bottle-feeding. The mothers most commonly reported convenience as their reason for bottle-feeding. Historical factors which appear to have influenced the course of infant feeding practices in the village as a whole are discussed.

Reasons provided by Peniyesene mothers for selecting bottlefeeding for their children

Reason(s) Given	Number of Women
Visiting, chores, sleep away from baby	19
Wage employment away from home	12
Inadequate supply of breast milk	5
Infant adopted	3
Infant rejected breast	2
School attendance away from home	2
To fatten a low birthweight baby	1
Infant had cleft palate	1
No data obtained	18
Total	63*

*Three women offered two different reasons for selecting the bottle and this accounts for the total of 63 shown here.

MATA, L.J. THE CHILDREN OF SANTA MARIA CAUQUÉ: A PROSPECTIVE FIELD STUDY OF HEALTH AND GROWTH. CHAPTER 10 "FEEDING PRACTICES." (CAMBRIDGE, MIT PRESS, 1978). PP. 202-227.

This study illustrated that failure to nurse was not a problem in the Indian village of Santa Maria Cauqué. Mothers massaged their breasts, took steam baths and drank hot chocolate to increase milk output during the first week post-partum. Half of the mothers gave sugar water through the first week by putting a piece of cloth soaked in this solution into the child's mouth. Milk was secreted during the pregnancy by approximately half of the mothers. One-third offered colostrum and the rest offered only "mature milk".

The weaning process begins when infants are given supplemental foods, fluids and gruels on a regular basis at 2-5 months. Mothers stopped breast-feeding in 75% of cases when there was a tangible event such as another pregnancy or an abortion.

The calm, relaxed, but formal disposition observed with the first baby or in the early months of lactation eventually becomes a more casual and informal relation as the child grows older.

Frequency and Percentage of Events Associated with Termination of Breast-Feeding, 250 Cases, 1964-1972

Event	Frequency (percentage)
Pregnancy	150 (60.0)
Birth of sibling	32 (12.8)
Abortion	4 (1.6)
Other	
Child refused breast	24 (9.6)
Child too large	10 (4.0)
Milk scarce	7 (2.8)
Child eating well	5 (2.0)
Illness of mother	4 (1.6)
Child hospitalized	4 (1.6)
Child bothersome	4 (1.6)
Death of mother	1 (0.4)
Other reasons	5 (2.0)

Note: 59 children died and were excluded.

MATA, L. "BREAST-FEEDING: MAIN PROMOTER OF INFANT HEALTH,"
AMER. J. CLIN. NUTR., 31:2058-2065, 1978.

Unique immunological factors in breast milk are responsible for the protection it affords infants against pathogenic agents. This protection is particularly effective against the infectious agents which invade or colonize the small and large intestine. Factors interfering with enterotoxigenic and enteroinvasive bacteria, and with enteroviruses, have already been detected in colostrum and mature human milk. Moreover, the biochemical composition of human milk makes it the best infant food during the first 6 months of life, and with supplementation, for months thereafter. At the same time, optimal maternal-infant interactions are effected during breast-feeding which strengthen infant care in health, in illness and during convalescence. The low cost of breast-feeding when compared to other types of alimentation, coupled with its unparalleled nutritive, anti-infectious, and behavior stimulating properties makes it the main promoter of infant health. There remains a need for investigation of the factors that have brought about a reduction in breast-feeding throughout the world. New methodologies to increase the incidence of breast-feeding, particularly in the developing nations, are critical. The availability of such methodologies could facilitate delivery of other health interventions ideally delivered by the mother, the most important agent for improving the health of infants and children. (Author's abstract).

NUTRITION COMMITTEE OF THE CANADIAN PEDIATRIC SOCIETY,
"BREAST-FEEDING: WHAT IS LEFT BESIDES THE POETRY?,"
CANAD. J. OF PUB. HLTH., 69:13-20, 1978.

This article reviews recent literature and concludes that breast-feeding is the feeding method of choice for infants in industrialized as well as pre-industrial countries. Nutritional, immunological, economic and other factors indicate that breast-feeding is preferable to formula feeding. Factors responsible for the decline in breast-feeding and suggestions as to how to increase it are elaborated. Free access to the baby by the mother, knowledgeable help, encouragement, and instruction are important for breast-feeding; when present, one study found that 96% of mothers were able to breast-feed successfully. The Committee strongly recommends that breast milk should be the only source of nutrients for the first 3-5 months of life. Other promotional recommendations are also included.

RODGERS, B. "FEEDING IN INFANCY AND LATER ABILITY AND ATTAINMENT: A LONGITUDINAL STUDY," DEVELOP. MED. CHILD. NEUROL., 20:421-426, 1978.

This paper presents data from the National Survey of Health and Development which indicate the extent of the influence of type of infant feeding on intellectual development. 1133 survey children were known to have been entirely bottle-fed and 1291 were never bottle-fed. Scores were available for 86.7 percent of this sub-sample on tests of picture intelligence and mechanical word reading completed at eight years of age. Scores for reading attainment (sentence completion), non verbal ability and mathematical attainment at 15 years of age were available for 80.9 percent of the sub-sample. A preliminary analysis indicated that low scores were more likely for those who had been bottle-fed than for those who were breast-fed. The exact percentages varied for different tests, but in all cases the difference between the two groups was significant at the 0.1 percent level. Breast-feeding was found to be more common in families of higher social-class, in families where either parent had received some secondary schooling, in families where parents showed more interest in the survey child's primary education, and for children of lower birth rank (i.e. first born children were most likely to have been breast-fed). It was less common for boys than girls and for those of lower birthweight.

SENECHAL, P.K. "LONG-TERM EFFECTS OF EARLY MOTHER/INFANT CONTACT," THE J. OF FAM. PRAC., 8(3):511-516, 1979.

This study attempts to investigate the following questions: are the positive effects of early maternal-infant contact from contact in the first few hours or from prolonged contact in the first few days; are there differences in early contact effects between multiparas and primiparas or between bottle-feeders and breast-feeders; can the differences be seen in child development, and are mothers aware of any differences when they have early contact? To investigate these questions, 94 American women were placed in one of two groups, by date, on the day of delivery. The control group were not allowed contact with their infants for an average of 10½ hours. The experimental group had prolonged contact within the first two hours. Daily 12-hour rooming-in was practiced with both groups thereafter. Babies were examined with their mothers at six months of age. Early contact with mothers was not found to show differences in behavior, health, or development, however, it was safe and preferred by the mothers. Breast-feeding was not effected by early contact. Multiparous mothers had greater success at breast-feeding. Breast-feeding was found to improve both the health of the babies and the closeness of the infant-mother relationship.

Protein-energy malnutrition (PEM) is a major clinical problem in pediatric practice among the non-white population in Johannesburg, South Africa. Health professionals possess little knowledge of the health attitudes of the patients they treat or advise. In a random sampling of houses in Soweto township, it was found that of the 176 new mothers interviewed, 28% never breast-fed. Of these 49 mothers, 51% felt it hampered their independence, 25% thought it would affect their health, 12% stated their child had been ill and 12% gave no reason. The majority of mothers had two feeding bottles. The most striking finding is that 41% of the mothers had no method of cleaning the bottles.

Beliefs about several common pediatric disorders varied greatly. Causes ranged from blaming teething as a major cause of diarrhea to mother's misbehaving as the reason for marasmus. The solutions to the problems indicated many medically unacceptable methods such as weaning to 'cure' marasmus though the favored treatment in all cases was to seek medical help.

METHOD OF BOTTLE CLEANING EMPLOYED

Cleaning Method	% Prevalence
No method at all	41.6
Bottle Brush	22.7
Boiling water	20.5
Water and salt	5.4
Water and soap	3.8
Milton	2.2
Water and Vim	2.2
Running tap water	1.1
Ash and Water	0.5

STANWAY, P. AND STANWAY, A. BREAST IS BEST: A COMMON SENSE APPROACH TO BREAST-FEEDING. LONDON: PAN BOOKS LTD., 1978, 205 PP.

Breast is Best is a fact filled book for everybody who wants to learn about breast-feeding. The book is written in a clear, understandable manner that reassures even the most doubtful. The authors point out problems and how to avoid them, as well as the advantages of breast-feeding: "Of all the phases in a woman's reproductive life, lactation has been the least understood and most debased," according to the Stanways. They point out that the unnatural change in diet from breast milk to cows milk, at so crucial a period in our lives, is a modern intervention without parallel in the history of mankind. So massive and uncontrolled a change is it, that it has led one researcher in the field to call it "the greatest uncontrolled trial ever to have been done on human beings."

In this book, breast-feeding is discussed as a dynamic biological process involving the interaction of mother and infant during a vital part of child rearing. The Stanway's stress that breast milk is species-specific and that its protein content is related to growth rate; the value of colostrum is also discussed.

The physiological processes of prolactin and the let down reflex are explained. The importance of frequent sucking, day and night, to promote milk production is discussed. The authors note that the clock has no part to play in breast-feeding. They discuss the let down reflex and its dependence on lack of anxiety. The let down reflex is responsible for two-thirds of the milk released which is calorie dense, providing 30 calories per ounce hindmilk, in contrast to only 1.5 calories per ounce in foremilk, which is obtained via the sucking reflex. This changing composition of breast milk appears to guard against obesity in early infancy.

It is pointed out that for two-thirds of the world's population feeding babies with cow's milk is tantamount to "signing a death warrant". Comments such as "it is cheaper to feed malnourished mothers than to formula feed infants, providing they are not fed caviar and champagne" are present throughout the book. Practical advice, such as how to avoid cracked nipples, is something many health professionals need to be more aware of. There is also a chapter for fathers. One can only congratulate the authors on a superb effort indicating much research, practical experience, and a very positive attitude to breast-feeding rarely evident in many health professionals.

WHITEHEAD, R.G. ET. AL. "FACTORS INFLUENCING LACTATION PERFORMANCE IN RURAL GAMBIAN MOTHERS," THE LANCET, 2:178-181, 1978.

Breast milk consumption was measured by the test-weighing procedure in 81 children (1-18 months old) in Keneba, a rural African community. Although true demand feeding was practiced, the mother's long term capacity for breast milk was determined by the end of the second month of lactation. (Daily milk consumption was limited by the amount delivered per feed and regardless of the frequency of feeding). Yield was closely correlated with the infant's birth weight; the relation between weight-for-age of the infant and breast milk intake was maintained up to 12 months. Lactation capacity was significantly influenced by several other factors. Output was much greater in the post-harvest season when food was more plentiful, infection was low and women had domestic rather than agricultural duties. Primipara were able to produce enough breast milk to meet the infant's needs up to 9 months.

WILLIAMS, C.D., AND JELLIFFE, D.B., MOTHER AND CHILD HEALTH: DELIVERING THE SERVICES. LONDON: OXFORD UNIVERSITY PRESS, 1972.

This excellent book covers many aspects of feeding. The factors that tend to reduce breast-feeding are listed, e.g., dress in Ethiopia with buttons down the back requires major gymnastics for the breast to reach the baby. Advertising pressure in favor of bottle feeding; episiotomies make it dreadfully hard for women to sit up; separation of mother and baby after delivery; delay in offering the food to the baby; four hourly feeds; lack of support and advice; supplementary feeds with sweet water or sweetened milk give the infant a taste for sweetness. A blocked nose or undiagnosed sore throat are physiological reasons that make sucking difficult or painful.

WOODRUFF, C.W. "THE SCIENCE OF INFANT NUTRITION AND THE ART OF INFANT FEEDING," J. AMER. MED. ASSOC., 240:657-661, 1978.

Using the recommendations of the Committee on Nutrition of the American Academy of Pediatrics for infant formulas as a scientific base, practical guidelines for feeding infants are given. Breast-feeding or the use of a prepared formula meets these recommendations, while evaporated milk, fresh cow's milk, and skimmed milk, despite widespread use for many years, do not. The feeding of strained foods and infant cereals should be begun when the infant has reached the stage of development appropriate for feeding from a spoon and swallowing nonliquid foods, usually between 3 and 6 months of age. Lifelong eating patterns begin during this period. Adjusting caloric intake to needs and learning to enjoy a variety of foods are major objectives of feeding practices.

WORLD HEALTH ORGANIZATION AND UNICEF, "STATEMENT ON INFANT
AND YOUNG CHILD FEEDING," AND "RECOMMENDATIONS."
MEETING ON INFANT AND YOUNG CHILD FEEDING, GENEVA,
APRIL 9-12, 1979.

In October, 1979, the WHO and UNICEF sponsored a meeting on Infant and Young Child Feeding, attended by 140 participants representing governments, international agencies, infant food and formula companies and the private sector. A conference report will be issued, but this short statement identified poor infant feeding practices as "one of the world's major problems." The participants unanimously agreed that breast feeding is the natural and ideal method of infant feeding, and issued detailed recommendations regarding the encouragement and support of breast feeding.

BREAST-FEEDING PRACTICES

- ADEBONOJO, F., "Artificial v. Breast-feeding." Clin. Pediatr., 2 (1): 25-29, 1972.
- ADELUSI, B., and LADIPO, D.A., "Low Birth Weight Babies in Nigeria." Trop. Geo. Med., 28: 216-219, 1976.
- ANTROBUS, A., "Child Growth and Related Factors in a Rural Community in St. Vincent." Environ. Child Hlth., 17: 188-210, 1971.
- AYKROYD, W. R., "Is Breast-feeding Best for All Infants, Everywhere?" Nutr. Today, 12 (1): 15-21, Jan.-Feb. 1977.
- BERG, A., The Nutrition Factor: Its Role in National Development, The Crisis in Infant Feeding Practices, Brookings Institute, Washington, D.C., Chapter 7, 1973.
- BROWN, R. E., "Breast-feeding in Modern Times." The Amer. J. of Clin. Nutr., 26: 556-562, May 1973.
- BURGESS, A.P., "Concepts regarding breast-feeding among health personnel in Pasay City," Acta Medica Phil., 13: 23-28, 1977.
- BURKHALTER, B. R., "Breast-feeding Pilot Projects in Child." Community Systems Foundation, Ann Arbor, Michigan, pp. 1-4, March 1977.
- CAMERON, M. and HOFVANDER, Y., Manual on Feeding Infants and Young Children, (2nd Edition), United Nations, 1976.
- CHAVEZ, A., and MARTINEZ, C., "Nutrition and Development in Infants of Poor Rural Areas." Nutr., Reports Internat., 7: 1-8, April 1971.
- CIBA FOUNDATION SYMPOSIUM 45, Breast-feeding and the Mother, Elsevier Publishers, New York, N.Y., 1976.
- COMMITTEE ON NUTRITION OF THE MOTHER AND PRESCHOOL CHILD. A Selected Annotated Bibliography on Breast-feeding 1970-1971. Food and Nutrition Board, National Research Council, in press.
- COOK, R., "The Financial Cost of Malnutrition in the Commonwealth Caribbean." J. Trop. Pediatr., 14 (2): 52-54, Jan. 1968.
- CRAWFORD, M.A., et al., "Essential Fatty Acid Requirements IN Infancy," Perspectives in Nutr., 31: 2181-2185, 1978.
- DE CHAVEZ, M., and AGUIRRE, J., "Practices in Infant Feeding in the Rural Areas of Mexico," Monograph 7-24, Division of Nutrition, National Institute of Nutrition, Mexico City, 1975.
- DUGDALE, A., "Effect of the Type of Feeding on Weight Gain and Illness in Infants." Br. J. of Nutr., 26: 423-432, 1971.

BREAST-FEEDING PRACTICES

- EGLI, G.E., "The Influence of Number of Breast-feedings on Milk Production." Pediatr., 27: 314-317, 1961.
- EKSMEYR, R., "A Trial to Change Infant Feeding Priorities in an Ethiopian Village." Addis Ababa: Ethiopian Nutrition Institute, 1969.
- GHOSH, S., Feeding and Care of Infants and Young Children. Voluntary Health Association of India, UNICEF Publication: New Delhi, India, 1976.
- GHOSH, S., GIWANI, S., MITTAL, S. K., and VERMAN, R. K., Socio-Cultural Factors Affecting Breast-feeding and other Infant Feeding Practices in an Urban Community." Indian Pediatr., 13 (11): 827-832.
- GOPALAN, C., "Studies on Lactation in Poor Indian Communities." J. Trop. Pediatr., 14: 87-97, 1958.
- GOGEA, S., "Benin City Mothers: Their Beliefs Concerning Infant Feeding and Child Care." Trop. Geo. Med., 29: 103-108, March 1977.
- GRATHAN-MCGREGOR, S.M. and BOCH, E. H., "Breast-feeding in Kingston Jamaica." West Indian Med. J., 45: 404, 1970.
- GUERI, M. "Evaluation of a Breast-feeding Campaign in Trinidad." Caribbean Food and Nutrition Institute, Mico, 1975.
- HANSEN, J.D., et al., "A Socio-economic Health and Cultural Survey in Soweto." South Afr. Med. J., 51: 495-500, 1977.
- JACKSON, R. L., et al., "Growth of 'Well-Born' American Infants Fed Human and Cow's Milk." Pediatr., 33: 643, 1964.
- JACKSON, R. L., "Longterm Consequences of Suboptimal Nutritional Practices in Early Life. Some Important Benefits of Breast-feeding." Pediatr. Clin. of North Amer., 24 (1): 63-70, 1977.
- JELLIFFE, D. B., and JELLIFFE, E. F. P., "Douglas, Confidence and the Science of Lactation." J. of Pediatr., 84 (3): 462-464, March 1974.

BREAST-FEEDING PRACTICES

- JELLIFFE, D. B., "Nutrition in Early Childhood." Nutr. and Hlth., 16: 1-21, 1973.
- JELLIFFE, D. B., "World Trends in Infant Feeding." Amer. J. of Clin. Nutr., 29: 1227-1237, Nov. 1976.
- KAMAL, I., "Clinical, Biochemical and Experimental Studies on Lactation." Amer. J. Obstet. and Gynecology, 105 (3), Oct. 1, 1979.
- KNUTSON, K.E., et al., "Breast-feeding Habits and Cultural Context: (A Study of Ethiopian Communities)." J. Trop. Pediatr., 15: 40-49, 1969.
- MARTINEZ, C., "Nutrition and Development in Infants of Poor, Rural Areas." Nutr. Reports Interna., 3: 139-149, Sept. 1971.
- MORLEY, D., "Breast-feeding and the Difficulties of Artificial Feeding" Chapter 6, Pediatric Priorities in the Developing World, Butterworth, London, 1973
- NIEHOFF, A. and MESITER, N., "The Cultural Characteristics of Breast-feeding: A Survey." J. of Trop. Pediatr. Environ. Chil. Hlth., 18: 16-20, March 1972.
- PAKMAL, M.A., "Social Attitudes, Beliefs and Practices that Affect the Nutritional Status of Pregnant Women, Lactating Mothers and Young Children in Three Afghan Villages." Mimeograph Report (AID).
- PAREDES, W. C., et al, "The prevalence of breast and bottle feeding in Pasig." Phil. J. Nutr., 30: 9, 1977.
- PETROA-BARVAZIAN, A. and HOFVANDER, Y., "Frequency and Duration of Breast-feeding. A Collaborative WHO/CIE Study in Seven Third-World Countries." New Developments in Pediatric Research, p. 35, Oct. 1977.
- POEPLAU, W. and SCHLAGE, C., "Nutrition and Health - Usumbara." Investigations into Health and Nutrition in East Africa, Welfform Verlag, Munich, 1969.
- RAPHAEL, D., The Tender Gift, Prentice Hall: Princeton, New Jersey, 1973
- National Research Council Committee on Nutrition of the Mother and Preschool Child, A Selected Annotated Bibliography on Breast Feeding, 1970-1977. Washington, 1978.

BREAST-FEEDING PRACTICES

SCHWARTZ, N.E., "Mothers - Their attitudes and Practices in Perinatal Nutrition." J. of Nutr. Educa., 9 (4): 169-172, Oct.-Dec. 1977.

TALC teaching slides "Breast-feeding". 24 slides and teaching notes from the Institute of Child Health, 30 Guildford St., London.

THOMAN, E., "Development of Synchrony in Mother-Infant Interaction in Feeding and Other Situations." Fed. Proc., 34: 1587-1589, 1975.

US Dept. of Health, Education, and Welfare, PHS/HSA/BCHS, Breast Feeding. Washington, GPO, 1979, DHEW Pub. No. (HSA) 79-5109.

WALETZHEY, Lucy R., editor Symposium on Human Lactation
US Dept. of Health, Education, and Welfare, PHS/HSA/Bureau of
Community Health Services. Washington, GPO, 1979. DHEW Pub. No. (HSA)
79-5107.

WELBOURNE, H.F., "Bottle Feeding, a Problem of Modern Civilization." J. Trop. Pediatr., 4: 157, 1958.

WHITTLESTONE, W.G., "The Biologic Specificity of Milk." La Leche League International, Inc., Information Sheet No. 14, 1976, 7 pp.

WICKES, I.G., "A History of Infant Feeding (in five parts)." Arch. Dis. Child., 28: 151-158, 232, 416, 522, 495-502, 1953.

WILLIAMS, L., "Reports Confirm Changes in Asian Breast-feeding Patterns." Intercom, 7: 7-0, 1979.

YU, V., "Feeding the Newborn Infant." Med. J. Aust., 1: 22-26, 1978.

III. SUPPORT AND PROMOTION OF BREAST-FEEDING

III. SUPPORT AND PROMOTION OF BREAST-FEEDING

AMERICAN ACADEMY OF PEDIATRICS, "BREAST-FEEDING,"
PEDIATR., 62 (4): 591-601, 1978.

Recommendations to support and promote breast-feeding have been made by professional groups in developing and developed countries including the American and Canadian Academies of Pediatrics:

1. Full-term newborn infants should be breast-fed except if there are specific contraindications or when breast-feeding is unsuccessful.
2. Education about breast-feeding should be provided in schools for all children, and better education about breast-feeding should be provided in the curriculum of physicians and nurses. Information about breast-feeding should also be presented in public communications media.
3. Prenatal instruction should include both theoretical and practical information about breast-feeding.
4. Attitudes and practices in prenatal clinics and in maternity wards should encourage a climate which favors breast-feeding. The staff should include nurses and other personnel who are not only favorably disposed toward breast-feeding but also knowledgeable and skilled in the art.
5. Consultation between maternity services and agencies committed to breast-feeding should be strengthened.
6. Studies should be conducted on the feasibility of breast-feeding infants at day nurseries, adjacent to places of work subsequent to an appropriate leave of absence following the birth of an infant.

BERGER, L.R. "FACTORS INFLUENCING BREAST-FEEDING,"
J. CONTINUING EDUC. IN FAMILY MED., 25:17-30, 1977.

A review of major clinical, social, and physiologic factors involved at each of the following stages is presented: 1) making the decision to nurse; 2) establishing lactation and 3) maintaining satisfactory growth of the infant until the time of voluntary weaning. The focus is on practical information for the physician interested in promoting the successful breast-feeding of healthy newborns. References include excellent discussions of breast-feeding techniques (e.g., different positions, massage, manual expression).

BIDDULPH, J. "PROMOTION OF BREAST-FEEDING -- EXPERIENCE
IN PAPUA NEW GUINEA," ADVANCES IN CHILD HEALTH, IN PRESS.
UNIVERSITY OF PAPUA NEW GUINEA, 1979.

Since independence in September, 1975, the government of Papua New Guinea has become concerned about malnutrition and diarrheal diseases in young children and has taken steps to decrease them. The increase in diarrheal disease morbidity and mortality is associated with a decline in breast-feeding. In 1977, the government initiated a two-pronged approach, education and legislation, to promote breast-feeding. The results of the far-reaching efforts described in this article show that in one area (Port Moresby) the prevalence of artificial feeding among children under two years old declined from 35% in 1976 to 12% in 1979.

BIERING-SORENSEN, F. ET. AL. "BREAST-FEEDING ON THE
INCREASE," J. TROP. PED. ENVIRON. CHILD. HLTH.,
(IN PRESS), 1979.

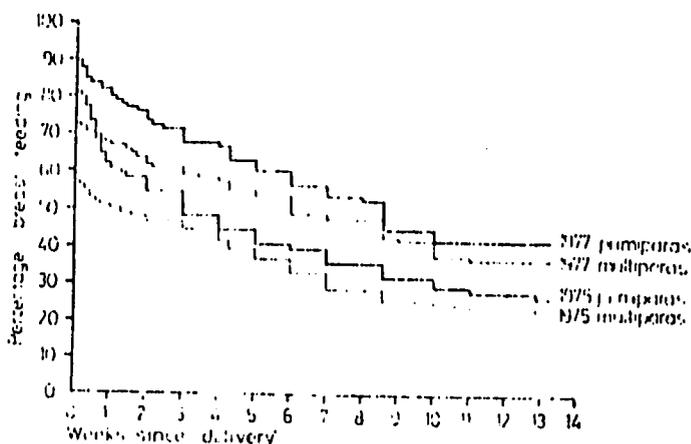
The reasons for the recent increase in breast-feeding include the following: 1) extended childbirth leave, 2) increasing unemployment, and 3) the revolt against the tyranny of the bra. It can also be ascribed to the more positive attitude towards breast-feeding among mothers and health personnel, including doctors, nurses, and infant health visitors. This positive attitude has resulted in hospital practices which promote rooming-in and allow more flexible time schedules in the maternity wards, including self-demand feeding. Also, better information is being offered to mothers about the advantages of and possible problems connected with breast-feeding. At the same time advertising of breast milk substitutes has become duly restrained.

BIERMANN, G. "ROOMING-IN AND NURSING," PSYCHOHYGIENE IN OBSTETR., 95:2021-2027, 1977. (IN GERMAN).

Highly technical and computerized labour rooms do not meet the needs of the mother for close personal contact with her baby and for close personal caring. The mother must be psychologically prepared for pregnancy and birth, the father should be admitted into the labour room and rooming-in of the mother and new born baby should be allowed. Breast-feeding is the beginning of the basic trust relationship between mother and child. Only 40% of the mothers continue breast-feeding after discharge from the hospital. Only 5.7% breast-feed their babies for more than 3 months. Babies miss the intensive skin contact between mother and child that is so important for the child's development. These practices are related to diminished infant mortality. In the Federal Republic of Germany, 105 maternity hospitals and wards allow mothers and new born babies to be together without restriction.

COLES, E.C. ET. AL. "INCREASING PREVALENCE OF BREAST-FEEDING," BRIT. MED. J., 2:1122, 1978.

Two studies were performed in Middlesex, England to determine the prevalence of breast-feeding following a promotional campaign in 1977 as compared to 1975. All women delivered in the hospital during one month of each year were studied at one and three months after delivery as to whether or not they were breast-feeding. The prevalence of breast-feeding increased from 25% to 40% at three months of age. Both the incidence and duration of breast-feeding increased significantly with appropriate encouragement.



Proportion of the population of primiparas or multiparas mothers in surveys who were breast-feeding their infants (totally or partially) up to one month after delivery.

DE CHATEAU, P. ET. AL. "A STUDY OF FACTORS PROMOTING AND INHIBITING LACTATION," DEVELOP. MED. CHILD. NEUROL., 19:575-584, 1977.

The present series of studies, made between 1972 and 1975, has shown that existing routines in the maternity ward, such as weighing the baby before and after breast-feeding can inhibit the establishment of lactation and increase the number of early failures. Giving information to the father in the maternity ward may be an important factor in promoting breast-feeding, as judged from the findings on duration of breast-feeding and from the mothers' comments. The greatest effect observed was that of skin-to-skin and suckling contact during the first hour after delivery, which increased the median duration of breast-feeding by 2½ months. These findings illustrate that existing routines during the neonatal period should be re-examined as to their influence in promoting or inhibiting breast-feeding. (Author's abstract).

GUERI, M. ET. AL. "BREAST-FEEDING CAMPAIGN AND HOSPITAL PRACTICES AS FACTORS AFFECTING AGE OF WEANING," J. TROP. PEDIATR., 23:276, 1977.

A comparison of the results of a 1974 Breast-Feeding Campaign and hospital practices in Trinidad and Tobago on the age of weaning were studied in this paper. The age at which weaning had been completed was then compared with the "recognition score" (recognition of breast-feeding ads and agreement with the message) and with whether or not the child had received a bottle in the hospital before the first breast-feeding session. Results showed that there was an association between whether or not the bottle had been introduced by the age of 2 months and the recognition score. A highly significant association was found between whether or not weaning had been completed at the time of the second interview and whether or not the child had received something the first nursing session, but no significant association was found with the mother's recognition score.

GUERI, M. ET. AL. "EVALUATION OF A BREAST-FEEDING CAMPAIGN IN TRINIDAD," BULL. PAN AM. HLTH. ORGAN., 12:1-6, 1978.

A campaign to promote breast-feeding was organized in 1974 by a Housewives' Association in Trinidad. This article provides an assessment of that campaign, based on interviews with mothers delivering babies at Trinidad's two largest public hospitals just after the end of the campaign.

Analysis of these interviews indicates that the campaign reached a large proportion of the target population. A close relationship was observed between the respondents' exposure to mass media and their knowledge concerning breast-feeding and the value of human milk. There was also a positive correlation, significant at the 10% level, between avoidance of bottle-feeding before infants were two months old and maternal familiarity with the campaign's media messages. (Author's abstract).

GUTHRIE, H.A. AND KAN, E.J. "INFANT FEEDING DECISIONS - TIMING AND RATIONALE," J. TROP. PEDIATR., 23:264-266, 1977.

A group of 226 unmarried girls between eight and twenty-one years of age (from both rural and urban areas of Central Pennsylvania) participated in this study to determine if young girls give thought to the question of infant feeding during adolescence and which considerations influence their choice. Among 20 percent of the 8-11 year olds who chose breast-feeding as the preferred method only half were able to explain their choice (49% chose bottle feeding). Of the 12 to 14 year olds, 54 percent indicated bottle feeding and 43 percent breast-feeding as the most appropriate method. Among the oldest group from 15 to 21 years of age, 69 percent preferred breast-feeding while 21 percent chose bottle feeding. The results showed that unmarried girls not only think about how they will feed their babies but reach a decision considerably before pregnancy. This suggests that information regarding infant feeding should be provided in the elementary and secondary school curricula and that health personnel be prepared to lend guidance and support to mothers in reaching and maintaining a decision which greatly effects the health of their children.

JELLIFFE, D.B., "BREAST MILK AND THE WORLD PROTEIN GAP," CLIN. PEDIATR., 7:96-99, 1968.

Under average conditions in most developing countries, artificial feeding is hazardous because of expense and hygiene. In tropical countries, especially, breast milk provides a rich, economically irreplaceable source of good quality protein. To control the decline in breast-feeding, the status of breast-feeding should be raised, girls should be educated to its value, and unsuitable advertising of breast milk substitutes should be controlled.

JELLIFFE, D.B., AND JELLIFFE, E.F.P. "IMPROVING THE NUTRITION OF MOTHERS AND YOUNG CHILDREN," CONTACT, 50: 2-16, 1979.

The impact and severity of the declining pattern of breast-feeding and ways of promoting breast-feeding in areas where there has been a decline (or where the situation is still satisfactory) is discussed in this article. Programs which promote breast-feeding should include 4 major components: a) information and education, b) modification of health services, c) modification of infant-food industry practices, and d) facilities for working women.

Approaches to inadequate lactation (especially in developing countries) are presented; even mothers whose nutrition is poor or marginal can breast-feed with little or no supplementation during the first 5 to 6 months of life. However, if the growth curve of an infant begins to flatten out by the third month, the decision to supplement should be made earlier.

Other topics discussed which influence lactation include interference with maternal reflexes and inadequate maternal nutrition. Current views on weaning mixtures in both industrialized and developing areas of the world are covered at length.

**POSSIBLE MODIFICATIONS IN HEALTH SERVICES
DESIGNED TO PROMOTE BREAST FEEDING IN A COMMUNITY**

Health Service	Modifications
Prenatal Care	Information on breast feeding, preferably from breast-feeding mothers. Breast preparation. Maternal diet. Emotional preparation for labour.
Perinatal Care	Avoid maternal fatigue, anxiety, pain (e.g. allow mothers to eat in early labour, avoid unnecessary episiotomy, allow relatives and visitors, ensure privacy and relaxed atmosphere at parturition, with breast feeding in mind). Stimulate lactation (e.g. give <i>no</i> prelacteal feeds, schedule first breast feeding as soon as possible, avoid unnecessary maternal anaesthesia, allow permissive schedule and rooming-in). Provide lactation "consultants" (advisers), preferably women who have breast fed. Allow for adequate "lying-in period". In hot weather, give extra water to baby by dropper or spoon.
Premature Unit	Use expressed breast milk, preferably fresh. Promote contact between mother and baby with earliest possible return to direct breast feeding.
Children's Wards	Provide accommodation in hospital or nearby for mothers of breast-fed babies.
Home Visiting	Encourage, motivate and support breast feeding.
Health Centre	Allow supplementary food distribution (e.g. formulae and weaning foods) only according to defined, locally relevant policy.
General	Ensure supportive atmosphere from all staff. Avoid promotion of unwanted commercial infant foods (e.g. samples, posters, calendars, brochures, etc.). Adopt minimal bottle-feeding policy and practical health education concerning "biological breast feeding".

KEMBERLING, S. R. "SUPPORTING BREAST-FEEDING," PEDIATR.,
63:60-63, 1979.

The author states that the single most important determinant of successful breast-feeding is confidence on the mother's part. Other positive influences on the success of breast-feeding include frequent communication between parents and the physician, an encouraging husband who has no cultural, psychological or sexual hang-ups about mother's breasts, and rooming-in after the baby's birth with as short a hospital stay as possible.

Breast-feeding failures in the author's practice generally fall into three categories: 1) unsupportive husband, 2) physical factors (such as breast engorgement, mastitis, or "insufficient milk"), 3) absent pediatrician, especially during the critical first three weeks.

LOZOFF, B. ET. AL. "THE MOTHER-NEWBORN RELATIONSHIP:
LIMITS OF ADAPTABILITY," J. OF PEDIATR., 91:1-12, 1977.

There is now clear evidence that certain maternity hospital practices interfere with breast-feeding and early maternal affection. Healthy mothers and infants are routinely separated after delivery, a practice which approaches the limit of minimal contact below which disruptions occur for some mothers. Breast-feeding may be impaired by other hospital routines which use intrapartum medication, delay nursing, separate mothers and infants, provide supplementary bottles, enforce four-hour feeding schedules, weigh babies before and after nursing, exclude fathers and give little support to the breast-feeding mother. The following approaches are recommended for increasing involvement between parents and newborns: 1) any aspect of peripartum care not based on sound scientific evidence should be left to parental choice, 2) the new awareness of the neonate's capacities should be shared with families, for example, the newborn can be examined in the parents' presence, 3) early and extended contact between mother and infant should include suckling in the first hour, frequent nursing, elimination of supplementary feeding, paternal involvement, and social support for the nursing couple, 4) hospital routines that separate mothers and infants should be abolished to encourage an early positive mother-infant relationship.

OLSON, C.M. AND PSIAKI, D.L. "IMPARTING INFORMATION ON BREAST-FEEDING TO MEDICAL STUDENTS," J. MED. EDUC., 53: 843-487, 1978.

A monograph and a videotape on breast-feeding were designed by the authors to be used in educational programs for medical practitioners. These materials were tested in a group of 56 medical students in six obstetric or pediatric rotations in three upstate New York medical schools. A pretest and posttest were given to measure changes in knowledge and attitudes as a result of receiving only the monograph or both the monograph and videotape. Controls received only the pretest and posttest. The evaluation indicated that medical students who read the monograph either with or without viewing the videotape, made significant improvements in their knowledge scores and rated their knowledge level higher. The effect of these materials on attitudes was significant.

SALARIYA, E.M. ET. AL. "DURATION OF BREAST-FEEDING AFTER EARLY INITIATION AND FREQUENT FEEDING," THE LANCET, 2:1141-1141, 1978.

The effects of early initiation of breast-feeding - within 10 minutes of delivery and increased early contact (frequent feedings) on the duration of breast-feeding were examined in this study. All of the 111 pregnant women selected for the study were primiparous and had already decided to breast-feed. Women were randomly assigned to one of four groups, each with one of the following feeding instructions: 1) baby put at breast within 10 minutes of delivery and fed at 2-hour intervals; 2) baby put to breast within 10 minutes of delivery and fed at 4-hour intervals; 3) baby put to breast 4-6 hours after delivery - according to normal hospital practice and fed at 2-hour intervals; 4) baby put to breast 4-6 hours after delivery and fed at 4-hour intervals. Babies in all four groups stayed for an average of 6 days in the hospital. Mothers feeding at 2-hour intervals continued this practice until lactation was established, thereafter feeding on demand (about every 4 hours). Follow up over 18 months showed that both early initiation and increased frequency of breast feeding extended the nursing period, but increased frequency of feedings had the greatest impact on overall success of breast-feeding.

SJOLIN, S. ET. AL. "FACTORS RELATED TO EARLY TERMINATION OF BREAST-FEEDING," ACTA. PAEDIATR. SCAND., 66:505-511, 1977.

In 1972, 298 mothers representative of the city of Uppsala in general breast-fed their babies for only a brief period of time despite a clear wish to continue - 36% up to 8 weeks. The most common reason for terminating breast-feeding was that the "milk dried up" (66%). More precise reasons commonly mentioned were anxiety of all kinds, lack of motivation, stress, tiredness and work outside the home. It was further found that mothers who enjoyed their breast-feeding, were well educated, were older than 25 years and belonged to social class 1, tended to breast-feed longest. (Author's abstract).

TECHNICAL GROUP MEETING ON TECHNIQUES TO PROMOTE BREAST-
FEEDING. PRELIMINARY DRAFT GUIDELINES FOR DEVELOPING
TECHNIQUES TO PROMOTE SUCCESSFUL BREAST-FEEDING,
BARBADOS, 1979.

This paper, elaborated by authorities on breast-feeding in the Caribbean, includes guidelines for promoting breast-feeding through legislation and national development programs in health and education. The nature of the problem is analyzed as being a widespread occurrence of malnutrition, particularly marasmus, in young children. The causes are seen as the decline in breast-feeding and the concomitant increase in bottle-feeding due to formula promotion by the infant formula industry and uninformed health professionals. Women entering the work force without strong support of breast-feeding in the workplace is also seen as a contributing cause of the decline of breast-feeding. The paper includes techniques for promotion of breast-feeding in medical schools and health clinics as well as the suppression of contrary forces. Ideas and techniques for the promotion of breast-feeding by the ministry of education and the legislature are also discussed.

WHITLEY, N. "PREPARATION FOR BREAST-FEEDING - A ONE-YEAR
FOLLOWUP OF 34 NURSING MOTHERS," JOURNAL OF NURSING, 7:44-48,
1978.

A retrospective survey of 34 breast-feeding mothers was conducted one year after each woman had finished classes in conventional prenatal and Lamaze classes. There were 22 primiparas (65%) and 12 multiparas (35%) in the group. Only 25 of the women surveyed had attended the optional classes on breast-feeding.

Data on duration of breast-feeding showed that 6 women (32%) breast-fed for less than 6 weeks (Group I), 11 women (32%) breast-fed from 6-23 weeks (Group II) and 17 women (50%) breast-fed for 24 or more weeks (Group III). All 6 women who took an entire series of breast-feeding classes fell into the long-term lactation group.

The short-term lactation group (Group I), on the average, introduced formula before the baby was a week old. Group II introduced formula about 2½ weeks after delivery and the long-term lactation group (Group III) waited an average of 8.1 weeks before they gave the first bottle of formula (once weekly or less often).

The short-term lactation group was influenced more by advice from doctors and nurses. However, many of the women expressed dissatisfaction with the breast-feeding counseling given by professionals.

SUPPORT and PROMOTION OF BREAST-FEEDING

BROWN, R. E., "Relactation: an Overview." Pediatr. 60 (1): 116-119, July 1970.

DE CHATEAU, P., "A Study of Factors Promoting and Inhibiting Lactation." Development Medical Child Neurology, 19: 575-584, 1977.

GHOSH, S. and MOHAN, M.Y.T., "A Better Approach to Child Care at the Hospital Outpatients Through an Under-Fives Clinic." Environ. Child Hlth., 23: 207-210, Oct. 1976.

HANSEN, et al, "A Socio-economic, Health, and Cultural Survey in Soweto." South Afr. Med. J., 51: 495-500, Oct. 1976.

HUNTER, M., "Where Do Hospitals Stand? Breast-feeding Vs. Bottle-feeding." Australian Nurses J., 7 (3): 37-38, Sept. 1977.

OBERDORFER, L. and MEJIA, W., "Statistical Analysis of the Duration of Breast-feeding (A Study of 200 Mothers of Antiqua Province, Columbia)." J. Trop. Pediatr., 14: 27-42, 1968.

RICHARDSON, J.L., "Review of International Legislation Establishing Nursing Breaks." J. Trop. Pediatr. Environ. Child Hlth, 21: 249-258, 1975.

SOSA, R., "The Effect of Early Mother-Infant Contact on Breast-feeding, Infection and Growth." Breast-feeding and the Mother, CIBA Foundation Symposium 45, Elsevier Publishers, New York, Y.Y., pp. 179-193, 1976.

SVEJCAR, J., "Methodical Approaches to the Promotion and Maintenance of Breast-feeding." Klinische Paediatric, 189: 333-336, 1977.

THOMPSON, M., "The Effectiveness of Mother-to-Mother Help-Research on the La Leche League International Program." La Leche League International, Inc., Reprint No. 138, 1977.

IV. COMPOSITION OF HUMAN BREAST MILK

IV. COMPOSITION OF HUMAN BREAST MILK

AITCHISON, J.M. ET. AL, "INFLUENCE OF DIET ON TRANS FATTY ACIDS IN HUMAN MILK," AMER. J. OF CLIN. NUTR., 30:3006-2015, 1977.

Diets of women lacking sufficient calories produce milk which is similar to the fatty acid pattern of adipose tissues. When calories were adequate for energy needs, diet was the main influence. A high carbohydrate diet had a greater influence than a high fat intake of fatty acid patterns throughout the day. Many factors are involved, but diet lipids influence trans fatty acids and polyunsaturated ratios of the fatty acids in human milk.

ALMROTH, S.G. "WATER REQUIREMENTS OF BREAST-FED INFANTS IN A HOT CLIMATE," AMER. J. CLIN. NUTR., 31:1154-1157, 1978.

Since the water in most developing countries is likely to be contaminated and is a potential source of infection, it is important to determine whether additional water is required in breast-fed infants.

This study attempted to estimate the water requirements of 16 exclusively breast-fed Jamaican infants from 2 weeks to 4 months of age. Mothers who were giving bush tea (in addition to their breast milk) agreed to discontinue this practice during the study period. The specific gravity and osmolality of all urine samples taken showed that these infants did not require additional water. It was concluded that healthy, exclusively breast-fed infants living in a hot, humid climate will manage well without additional water. However, it may be desirable to give additional water during illness.

ANON, "THE SPECIAL CARE OF HUMAN MILK," BRIT. MED. J., 2:781-782, 1978.

A short history of the development of human milk banks is presented, along with a discussion of current issues such as the treatment of human milk to preserve its antimicrobial properties. There are many unanswered questions about human milk banking which involve issues such as 1) the effects of bacterial contamination on nutritive properties of human milk, 2) heat-stable enterotoxins such as Staph aureus, 3) effects of freezing, storing and thawing human milk on nutritive and antimicrobial properties, 4) pharmacological and environmental contaminants in human milk. Before human milk banks are accepted unceremoniously, it is necessary to show (by controlled trials) that feeding banked human milk compared with standard formula feeds actually reduces the incidence of necrotizing enterocolitis and other infections.

ANSELL, C., "ELECTROLYTE AND PH CHANGES IN HUMAN MILK,"
PEDIATR. RES., 11:1177-1179, 1977.

Milk samples from 100 lactating mothers in the 10 days following delivery have been analyzed for Ph, sodium and potassium. Ph fluctuated widely from day to day through a range of 6.75 - 7.42 with a mean Ph of 7.09. Considerable variations were shown in individuals from day to day and from the beginning to the end of feeds. Increased sodium in the first few days may be an important defense mechanism against dehydration and hyponatremia during a period of relative thirst and starvation. The variation in the Ph and electrolyte content of human milk may be expected to have some influence on the acid base and electrolyte status of the infant. Hyponatremia and acidosis in neonates in the first few weeks may be attributed in part to the inappropriate Ph and electrolyte content of artificial milk formulas based on mature human milk. The addition of sodium and base to formulas may be a desirable modification both for premature infants and for term infants in the first few weeks of life.

ATKINSON, S. A. ET. AL. "HUMAN MILK: DIFFERENCE IN NITROGEN
CONCENTRATION IN MILK FROM MOTHERS OF TERM AND PREMATURE
INFANTS," J. OF PEDIATR., 93:67-69, 1978.

At specific day intervals from two to 29 days postpartum, 42 complete 24-hour collections of milk were obtained from seven mothers giving birth at 26 to 33 weeks of gestation, and 27 collections were obtained from 8 mothers giving birth at 38 to 49 weeks of gestation. The mean age of the mothers in the two groups was similar. Analysis of the samples showed that nitrogen (N) concentration decreased significantly with progressing lactation at a similar rate in both groups. However, the N concentration was higher in milk from mothers giving birth prematurely (PT) than in milk from mothers giving birth at term. Throughout the first month of lactation the daily volume of milk produced by the PT mothers was more than adequate to meet the infants' fluid requirements. This data suggests that the nutrient content of milk from mothers giving birth prematurely may be of a composition uniquely suited to optimizing growth and development in the premature infant.

BEZKORAVIANY, A., "HUMAN MILK AND COLOSTRUM PROTEINS: A REVIEW," J. OF DAIRY SCI., 60(7):1023-1037, 1977.

Human milk contains a number of protein factors such as immunoglobins, lactoferrin and lysozyme which prevent infectious diseases and provide the infant with a proper balance of essential amino acids. The protein content of colostrum is 2.3g./100 ml. and for transitional milk 1.6 g./100 ml. The increased content is due to whey protein. Major proteins of human milk in whey are lactalbumin, lactoferrin, serum albumin and lysozyme. The author discusses the biochemical and physiological attributes in detail.

BOERSMA, E.R. "CHANGES IN FATTY-ACID COMPOSITION OF BODY FAT BEFORE AND AFTER BIRTH IN TANZANIA: AN INTERNATIONAL COMPARATIVE STUDY," BRIT. MED. J., 1:850-853, 1979.

Changes in the fatty-acid composition of human adipose tissue before birth and during infancy and childhood were studied in Tanzania and compared with data for British and Dutch infants in relation to their diet. The food staple for pregnant and lactating mothers in Tanzania is maize or cassava supplemented with some vegetables, resulting in a diet low in energy, fat and proteins but relatively rich in carbohydrates. Tanzanian breast milk showed a different fatty-acid composition when compared with the fat of milk formula based on cow's milk, with formula which had cow's milk fat replaced entirely with maize oil and even with human milk from British mothers. The specific fatty-acid composition of the fat in Tanzanian breast milk might ensure even better intestinal absorption by the newborn infant when compared with the fatty-acid composition of human milk in Great Britain.

BRILLIANT, L.B. ET, AL. "BREAST MILK MONITORING TO MEASURE MICHIGAN'S CONTAMINATION WITH POLYBROMINATED BIPHENYLS," THE LANCET, 2:643-646, 1978.

To determine the extent of human exposure to polybrominated biphenyls (P.B.B.) as a result of an industrial accident in Michigan, P.B.B. concentrations were measured in human breast milk. Samples were collected in a random-sample survey from nursing mothers throughout Michigan. 96% of 53 samples from Michigan's lower peninsula and 43% of 42 samples from the less densely populated upper peninsula contained detectable levels of P.B.B. If there is a stable relationship between the concentrations of chemicals in various tissues, the authors suggest that breast milk is a good indication of the extent of population exposure.

EDOZIEN, J.C. ET. AL. "HUMAN PROTEIN DEFICIENCY: RESULTS OF A NIGERIAN VILLAGE STUDY," J. NUTR., 106:312-328, 1976.

This three-year longitudinal study was undertaken in a rural Yoruba community to identify early biological effect of protein deficiency and metabolic changes which occur during the transition from subclinical malnutrition to kwashiorkor. Infant mortality rate was 180/1000 live births, mortality within the first five years was 40%. Analysis of diet indicated 5-8% of the energy was derived from protein, 10-15% from fat and the remainder from carbohydrates. Energy intake was 90-120% of requirement. Twelve women's lactation performances were studied. Eight were fed a diet similar to their usual one - 50 grams of protein/day. The composition of breast milk was measured daily. By the third and fourth weeks, they were given a supplement of skimmed milk powder adding 50 g/day of protein. Energy intake was maintained at 60 kcal/kg.

The effect of protein deficiency on milk secretion was a decrease in volume. Skimmed milk protein, also fed as a supplement to subclinically malnourished village children, caused an increase in growth rate, plasma amino acids, total body albumin, albumin, gammaglobulin turnover, plasma levels of insulin and thyroid hormones. The essential role of the hormonal changes in the adaptive responses to low protein intake was emphasized. The authors further stated that the level of hormones in plasma, as well as the concentration of total essential amino acids and the turnover of plasma proteins, are useful early indicators of the relative adequacy of protein intake by human population groups.

Effect of Protein Intake on Milk Secretion

	Daily protein intake			
	50g Initially, mean ± s.d.	100g mean ± s.d.	25g Initially mean ± s.d.	100g mean ± s.d.
No. of subjects	7	7	3	3
Total milk solids, g/100 ml	13.8 ± 1.3	13.4 ± 0.9	12.0 ± 0.6	11.9 ± 0.5
Milk protein, g/100 ml	1.61 ± 0.15	1.57 ± 0.19	1.20 ± 0.21	1.23 ± 0.23
Milk lactose, g/100 ml	8.1 ± 0.9	7.9 ± 1.0	7.3 ± 1.4	8.0 ± 1.8
Milk produced, ml/day	742 ± 16	872 ± 32	817 ± 59	1002 ± 63
Milk consumed, ml/day	617 ± 15	719 ± 10	777 ± 38	900 ± 74
Weight gained by baby, g/day	30.4 ± 3.6	45.7 ± 2.0	10.5 ± 3.6	32.2 ± 10.0

EMERY, W. B., ET AL., "INFLUENCE OF SAMPLING ON FATTY ACID COMPOSITION OF HUMAN MILK," AMER. J. CLIN. NUTR., 31: 1127-1130, 1978.

To study effects of sampling on the fat and fatty acid composition of human milk, three subjects each obtained four complete expressions of milk in sequential fractions from each breast. Two subjects collected partial expressions of about 5 ml of milk from each breast frequently over a 2 month period. Milk samples were analyzed gravimetrically for fat and by gas chromatography for fatty acids. While hindmilk contained a higher percentage of fat than foremilk, fatty acid composition of the milk fat did not vary throughout a nursing. Fatty acid composition from pairs of left and right breast samples collected at the same nursing did not differ. Therefore, fatty acid analyses of human milk will be representative of the entire nursing if the sample is taken from either breast at any time during the nursing.

ERKKI, V. AND KUITUNEN, P., "THE CONCENTRATIONS OF COPPER AND ZINC IN HUMAN MILK," ACTA. PAEDIATR. SCAND., 68: 33-37, 1979.

Twenty-seven healthy Finnish mothers were followed during the course of their entire lactation period. A total of 229 individual milk samples, collected in the beginning and at the end of each feed during a 24-hour period, were obtained from the 2nd week to the 9th month of lactation. The copper and zinc concentrations were determined by atomic absorption spectrophotometry. The concentrations of the trace-elements investigated were dependent on the stage of lactation. The median copper and zinc concentrations decreased during the course of lactation from about 0.60 mg/l and 4.0 mg./l to 0.25 mg./l and 0.5 mg./l respectively. The importance of considering the stage of lactation in the evaluation of the trace-element nutrition value of breast milk should be emphasized. The calculated means of the concentrations of these trace-elements in mature human milk presented in the literature seem to overestimate the actual levels in prolonged lactation. (Author's abstract.)

EVANS, T.J., ET AL., "EFFECT OF STORAGE AND HEAT ON ANTI-MICROBIAL PROTEINS IN HUMAN MILK," ARCH. OF DIS. IN CHILD. 53: 329-341, 1978.

Human milk banks are becoming more common. This study investigated the effects of heating and storing of human milk on its immunoglobulins and other antimicrobial factors.

Milk was collected by mothers in their own homes and kept for two days in the family refrigerators. Aliquots were analyzed raw, after deep freezing, lyophilization, or pasteurization. Pasteurization at 73° C caused major losses of IgA, IgG lactoferrin, lysozyme and C3 complement; at 62.5° C, much lesser losses occurred. Prompt deep freezing for 3 months produced negligible losses. Therefore, it is recommended that sterile collection be maintained scrupulously, prompt deep-freezing occur, and pasteurization, if used be at 62.5°C.

"EXAMINATION OF THE PROBLEM OF THE CONTAMINATION OF MOTHERS' MILK WITH ENVIRONMENTAL TOXINS," IN HEARINGS OF THE SUBCOMMITTEE ON HEALTH AND SCIENTIFIC RESEARCH OF THE U.S. SENATE ON OVERSIGHT OF BIOMEDICAL AND BEHAVIORAL RESEARCH IN THE UNITED STATES, JUNE 8, 1977. GOVERNMENT PRINTING OFFICE NUMBER 96-493 0.

A comprehensive 500 page hearing on the risks of chemical contamination of mothers' milk in the United States which incorporates the testimony of dozens of expert witnesses. Opening the hearings, Senator Kennedy, subcommittee chairman, noted that the more we look, the more man-made chemicals seem to appear in the milk of nursing mothers. Some experts feel the hazards posed by industrial chemicals in mothers' milk has been overblown and that the benefits of breastfeeding far outweigh the risks of contamination. Other experts disagree.

Will control of chemicals entering our environment solve this problem? Unfortunately not, because too many pounds of too many chemicals are already polluting our environment. "The horse is out of the barn and we are now faced with the job of minimizing the damage. That is why research in this area is so important," said Senator Kennedy.

FOMAN, S., ET AL., "RECOMMENDATIONS FOR FEEDING NORMAL INFANTS." PEDIATR. 63 (1), 1979.

Most infants of well-fed mothers seem to grow normally regardless of method of feeding the child. For those breast-feeding, this article states that breast-feeding provides a complete and highly desirable total diet for the infant until 5-6 months of age. However, based on studies of less-than-well-fed mothers it recommends adding vitamin D and iron to the baby's diet, and in specific cases, adding fluoride. Foman concludes that commercial formulas are complete foods for infants without additional vitamin and iron supplementation since these have already been added in the processing. Food other than milk formula should not be given a child before 5-6 months of age as it represents force feeding. Preferably such food should be fed through the use of a cup and a spoon. When an infant over six months of age is started on cow's milk, preferably whole milk, Foman recommends it be vitamin-D fortified. The use of skimmed milk is not advocated since it lacks fat and calories, but "2% milk" is acceptable.

GIBBS, J.H., ET AL., "DRIP BREAST MILK: ITS COMPOSITION, COLLECTION, AND PASTEURIZATION," EARLY HUMAN DEVELOP., 1 (3): 227-245, 1977.

'Drip breast milk' is that milk which spontaneously drips from the contralateral breast during the suckling of an infant. Biochemically and immunologically, pooled drip milk resembled pooled mature expressed breast milk, although it has a lower fat concentration. About 15% of lactating women are capable of producing drip milk; volumes produced are up to 188 ml/donor/day.

A milk bank is described which processes 1400 litres of drip milk/year. Heat treatment of this milk with a semi-automated holder pasteurizer caused a 21% reduction in IgA concentration and a 36% reduction in lysozyme activity, as well as a decrease in the ability of the milk to inhibit the growth of E. coli. In comparison with boiling, pasteurization was effective in reducing total bacterial content provided the milk initially contained fewer than 10^6 bacteria/ml.

HALL, B. "CHANGING COMPOSITION OF HUMAN MILK AND EARLY DEVELOPMENT OF APPETITE CONTROL," LANCET, 1:779-781, 1975.

At the end of feeding, human milk contains 4-5 times as much lipid and 1½ times as much protein than at the beginning of the feeding, in all women examined regardless of the postpartum stage of lactation. During the feed, 60% of the total milk volume, 60% of the total protein and carbohydrate, 40% of the total lipids, and 50% of the total energy are provided in the first five minutes of suckling. Since each breast shows similar changes in breast milk composition, the infant's hunger as well as thirst is satisfied, which is not the case with cow's milk. Sixty percent of bottle-fed babies had weight gain above the 90th percentile, while only 19% of breast-fed had. Hall hypothesized that artificial food preparations, because of their constant flavor and composition, would not cause changes in appetite control.

HALL, B. "UNIFORMITY OF HUMAN MILK," AMER. J. CLIN. NUTR., 32:304-312, 1979.

The composition of mature milk from seven white London women on an adequate diet taken ad libitum was examined for total protein, lipid and lactose content, and fatty acid composition. Related factors studied included which breast was suckled, the time of day, relationship to feed, and length of lactation. While the lipid content rose significantly during the feed (from 2.4 to 7.5 g/100 ml on the average), both the protein and lactose content and the pH remained constant. These findings applied to both breasts. The total lipid content of the milk rose throughout the day, with highest levels measured at 2 P.M. Despite these fluctuations in the lipid content, the fatty acid pattern was found to be remarkably constant (subjects were on adequate and balanced diets). One woman who had received dietary supplementation of unsaturated fats had a significantly higher concentration of linoleic acid and lower levels of stearic and palmitic acids in her milk. The amount of arachidonic acid in her milk was not significantly different from the other women's milk.

Changes in composition of human milk during one feed

Donor	pH		Protein		Lipid		Dry wt		Lactose	
	Before	After	Before	After	Before	After	Before	After	Before	After
	<i>g./100 ml milk</i>									
1	6.8	6.8	1.33	1.65	1.57	9.28	9.7	16.6	8.34	7.83
2	6.7	6.7	1.21	1.50	2.41	8.26	12.05	17.0	8.28	7.83
	7.1	7.5	1.52	2.42	3.31	9.80	11.6	17.0		
3	7.4	7.7	0.88	2.61	1.24	12.05	9.55	20.45	8.11	8.0
	7.3	7.25	0.82	1.06	1.04	8.35	9.3	16.0	8.1	7.37
4	7.2	7.2	1.05	1.28	1.85	5.46	9.9	13.0	8.64	8.74
	7.1	7.3	1.16	1.92	5.05	7.38	11.8	15.5		
5	7.2	7.4	0.92	1.31	2.07	5.95	10.4	13.7		
	7.2	7.4	0.92	1.31	0.87	4.55	8.8	12.5		
6	7.4	7.5	0.65	0.76	2.29	3.20	10.4	12.0		
	7.2	7.3	0.79	0.82	2.61	8.27	11.4	15.8		
Mean of 15	7.45	7.65	0.93	0.89	2.75	7.5	10.9	15.2		
	7.75	7.8	0.89	0.97	3.90	8.5	11.8	16.4		
± 1 SE	7.8	7.7	1.00	1.00	1.78	7.65	10.7	16.0		
	7.8	7.8	0.93	0.93	3.63	5.98	12.1	14.7		
Mean of 15	7.27	7.38	1.00	1.36	2.42	7.48	10.9	15.46	8.29	7.95
± 1 SE	0.09	0.09	0.06	0.16	0.3	0.57	0.28	0.55	0.10	0.22

The evidence here shows that human milk not only has a uniform composition, but also has a consistence in variability. There may be a physiologic importance for the lipid content variability. Variations in the fatty acid composition are not random and can be predicted from the mother's diet.

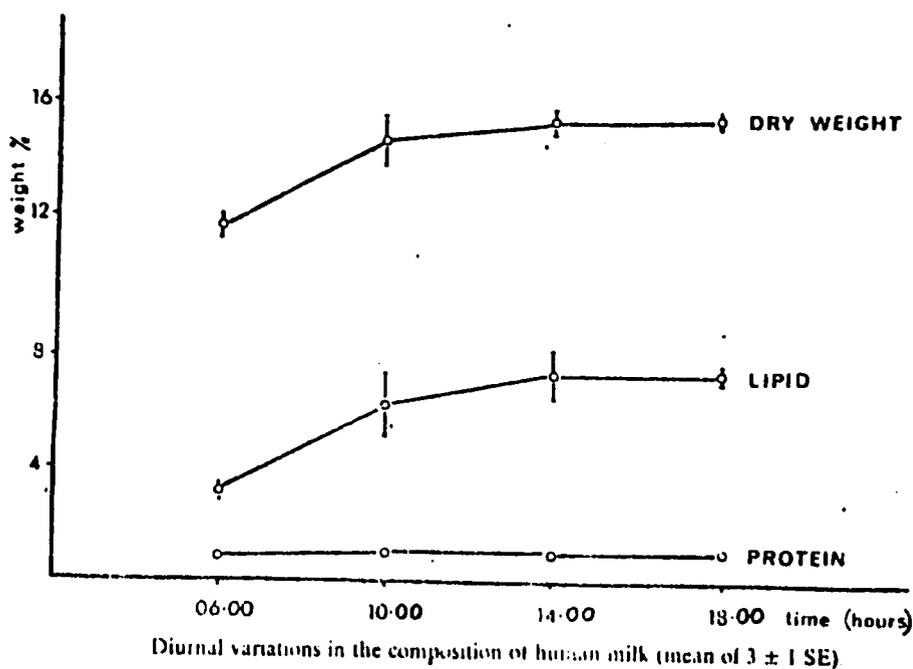


Table and Figure from Hall, "Uniformity of Human Milk" Amer. J. Clin. Nutr. Vol. 32, 1979.

HAMBRAEUS, L., "PROPRIETARY MILK VERSUS HUMAN BREAST MILK IN INFANT FEEDING," PEDIATR. CLIN. OF NORTH AMER., 24 (1): 17-36, 1977.

This is a thorough study comparing the composition of human breast milk, other mammalian milk and formula. Includes an excellent bibliography.

HAREFOUCHE, J.K. "THE IMPORTANCE OF BREAST-FEEDING," J. OF TROP. PEDIATR., 16:135-175, 1970.

Maternal nutrition does not greatly affect the protein and carbohydrate (lactose) concentrations of the milk, but it does decrease the volume of the milk, fat and other constituents.

HARRIS, S.G. AND HIGHLAND, J. H., "BIRTHRIGHT DENIED: THE RISKS AND BENEFITS OF BREAST-FEEDING," WASHINGTON, D.C.: ENVIRONMENTAL DEFENSE FUND, 1977.

Human breast milk can be contaminated with chlorinated hydrocarbons - chemicals from agriculture and industry. These chemicals, such as DDT dieldrin, heptachlor, and BHC have all been shown to cause cancer in host animals. In addition, they can produce chronic effects such as liver damage, nervous system disorders, enzyme induction, ferotoxicity, and reproductive difficulties. The authors suggest that if chemical residues in human milk greatly exceed the national average in a geographical area, women should nurse the baby for only a few days to give it the benefit of colostrum. The major dietary source of chlorinated hydrocarbons occur in foods of animal origin (meat, dairy products) and fish. High fat meats, drippings, and fresh water fish should be avoided if a woman is planning to breast-feed in a high risk area.

HERNELL, O., ET AL., "BREAST MILK COMPOSITION IN ETHIOPIAN AND SWEDISH MOTHERS, IV MILK LIPASES," AMER. J. CLIN. NUTR., 30: 508-511, 1977.

The (potential) activities of the two lipases in human milk were determined in breast milk samples collected from Ethiopian and Swedish mothers. The major lipase in human milk is dependent on bile salts for activity and probably participates in intestinal digestion of milk lipids in the newborn. The level of this lipase in the milk did not change with time after parturition, but differed between the groups so that it was higher in the privileged Ethiopian mothers than in

nonprivileged Ethiopian mothers, who in turn had a higher level than the Swedish mothers. The other lipase is a serum-stimulated lipase (lipoprotein lipase). The level of this lipase varied between samples from different mothers as well as between different samples from the same mother. It tended to be lower in samples obtained at 4 to 5 days after parturition (Swedish mothers) than in later samples. There were in this case no significant difference between non-privileged and privileged Ethiopian mothers or between them and Swedish mothers.

HO, P.C. ET. AL. "HUMAN COLOSTRAL CELLS; PHAGOCYTOSIS AND KILLING OF *E. COLI* AND *C. ALBICANS*," J. OF PEDIATR., 93:910-915, 1978.

Cells from human colostrum, collected from others within 48 hours of delivery, were examined for their capacity to phagocytose and kill *Escherichia coli* and *Candida albicans*. The phagocytic power of colostrum cells was comparable to that of blood leukocytes from the same individuals. In contrast, the capacity of colostrum cells to kill microorganisms was significantly less than that of blood leukocytes. Preincubation of blood leukocytes with colostrum supernatant did not reduce phagocytic indices, but reduced *E. coli* killing by 40% and *C. albicans* killing by 66%. The role of colostrum cells in protecting the neonate from infection is discussed in the light of these findings. (Author's abstract).

JELLIFFE, D.B., AND JELLIFFE, E.F.P. "THE VOLUME AND COMPOSITION OF HUMAN MILK IN POORLY NOURISHED COMMUNITIES; A REVIEW," AMER. J. OF CLIN. NUTR., 31:492-515, 1978.

This up-to-date, well-referenced article points out the problems of obtaining representative samples of breast milk on a 24 hour basis and the lack of data to correlate the degree of malnutrition with milk supply. The authors, however, state that unsupplemented milk is all that is required for the first 6 months in babies of well-nourished mothers. In malnourished mothers, maternal depletion is important. In these mothers, milk is often suboptimal in quantity and quality with lower values of fat (calories), water soluble Vitamin A and somewhat lower calories and protein than in well-nourished women. Supplementary feeding of the mother improves the volume and composition. Late lactation (e.g. 7 months to 2 yrs. or more) is insufficient by itself for the rising nutrient need (and declining stores) of the infant, but forms a valuable supplementary source of "complete" protein, and of fat, calcium and vitamins.

Approximate quantities of milk produced daily at different periods of lactation in some poorly nourished communities*

Country reference	1-6 months	6-12 months	12-24 months	24 months and above
India (15, 16)	600 ml	500 ml	350 ml	
India (Baroda) (116, 117)	600 (3 mo) (350-1100)			
	735 (3 mo) (540-1100)			
New Guinea (Chimbu) (142)	525 ml	525 ml	343 ml	343-142 ml
Biak Island (60)	427 ml	390-430 ml	127-338 ml	243 ml
New Guinea (14)	720 ml	660 ml	705 ml	488 ml
New Guinea (5)	400 ml	400 ml	400 ml	
Chimbu and Maprik				
New Guinea (5)	600 ml	600 ml	600 ml	
Baiyer River				
New Guinea (108)		350-480 ml	270-360 ml (12-18 mo) 200-210 ml (12-24 mo)	230-300 ml
Ajamaru				
Nubuai		310-410 ml	250-340 ml (12-18 mo) 150-210 ml (18-24 mo)	
Egypt (45)				
Healthy	922 ml			
Malnourished	733 ml			
Sri Lanka (30)	475 ml	495 ml	506 ml	
Nigeria (Benin) (81)	555 ml (2-3 mo)	590 ml (6-9 mo)	606 ml (13-18 mo)	
Uganda (122a)		660 ml (2-12 mo)		

* Results not strictly comparable as varying collection techniques and methods of sampling used.

Fat, lactose, protein, and calcium content of mature human milk from some well-nourished and poorly nourished communities*

Country (reference)	Fat	Lactose g/100 ml	Protein	Calcium mg/100 ml
<i>Well-Nourished</i>				
American (92)	4.5	6.8	1.1	34.0
British (87)	4.78	6.95	1.16	29.9
Australian (150)				28.6-30.7
British (29a)	4.2	7.4	1.3	
<i>Poorly-Nourished</i>				
Indian (17)	3.42	7.51	1.06	34.2
Bantu S. Africa (144)	3.90	7.10	1.35	28.7
Chimbu, New Guinea Highlands (142)	2.36	7.34	1.01	
New Hebrides (111)	3.8	5.0	1.40	25.8
Wuppertal, Germany (Immediately Post World War II) (42)	3.59		1.20	
Nauru (19)			1.60	
Ibadan, Nigeria (88 months) (62)			1.20 (0.59-1.79)	
New Guinea (Biak) (60)			0.83-0.9	
Alexandria, Egypt (45)				
Healthy	4.43	6.65	1.09	
Malnourished	4.01	6.48	0.93	
New Guinea (14)	2.3	6.48	0.93	
Sri Lanka (30)	2.8	6.8	1.5	
Brazil (21)				
High economic	3.9	6.8	1.3	20.8
Low economic	4.2	6.5	1.3	25.7
Pakistan (139)			1.2	
Tanzania (25)	Often below 2%			
Nigeria (Ibadan) (102)	4.05	7.67	1.22	

* Modified from Gopalan and Belavady (37), with added data.

Tables from Jelliffe and Jelliffe, "The Volume and Composition of Human Milk in Poorly Nourished Communities" Amer. J. of Clin. Nutr. Vol. 31, 1978.

JENSEN, R.G., ET. AL. "LIPIDS OF HUMAN MILK AND INFANT FORMULAS:
A REVIEW," AMER. J. CLIN. NUTR., 31:990-1016, 1978.

The amount of human milk ingested by the nursing infant is about 600 ml per day. The average lipid content of the mature milk ranges from 3.2 to 3.5% and the amount does not appear to be influenced by diet. About 98% of the lipid is triacylglycerol in which most of the secondary ester is palmitic acid, a unique structure possibly responsible for the relatively high absorbability of the fat. Smaller quantities of other lipids are present. Amounts of cholesterol reported, range from 200 to 546 mg per 100 g of lipid. While 167 fatty acids have been positively and tentatively identified as being present in human milk lipids, the major fatty acids are palmitic, stearic, oleic, and linoleic. The composition can be changed by diet, with linoleic acid contents of from 1.0 to 45.9% having been found. The "average" linoleic acid is about 10% and this amount is apparently adequate for the essential fatty acid requirements of the infant. The quantity of vitamin E also appears to be satisfactory. The hypothesis that a cholesterol challenge to the breast-fed infant would enable the adult to more efficiently metabolize the sterol does not seem to be supported by available evidence, primarily, because the cholesterol content of human milks varies so markedly; 26 to 52 mg per 8 ounces. The compositions of most infant formulas currently in use in the United States are presented for comparison and convenience and a few possible problems associated with their consumption are discussed.

LAUBER, E., AND REINHARDT, M. "STUDIES ON THE QUALITY
OF BREAST MILK DURING 23 MONTHS OF LACTATION IN A RURAL
COMMUNITY OF THE IVORY COAST," AMER. J. CLIN. NUTR.,
32:1159-1173, 1979.

Breast milk composition over 23 months of lactation was determined in 33 women from a rural community of the Ivory Coast. The mothers' diet consisted mainly of yam, plantain, and cassava and was low in fat and protein (10 and 15% of caloric intake, respectively). Mothers were told to feed the baby only from one breast throughout the night preceding the sampling. The entire content of the unused breast was measured the next morning. However, the large number of small samples suggests that several women had not followed the instruction to give only one breast during the night.

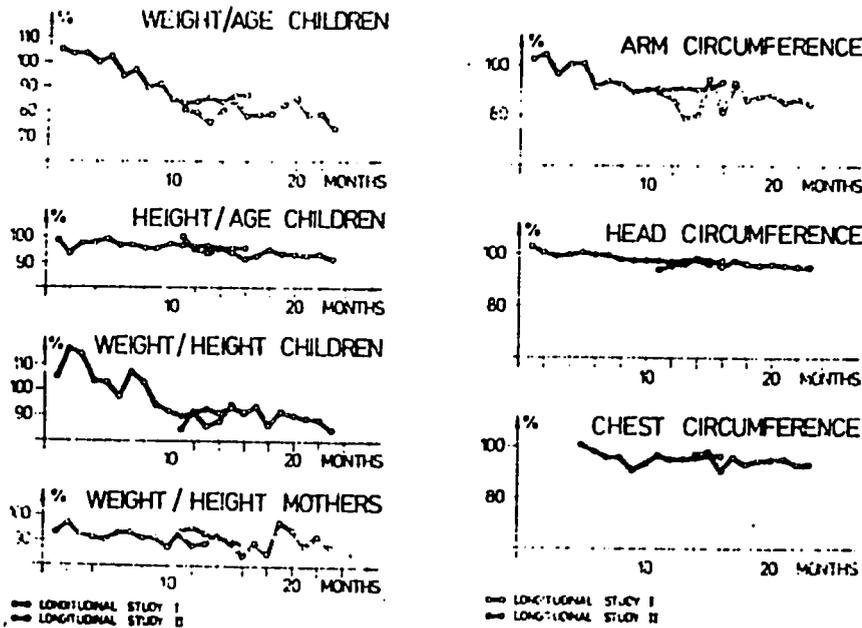
The results of the analysis of milk samples showed that total lipids, triglycerides, phospholipids and cholesterol remained consistent over 23 months of lactation. The proteins showed a significant decrease of about 30% over the first 7 months and remained constant afterwards. A rising trend of myristic acid and a falling trend of oleic acid were observed. Total lipids and polyunsaturated fatty acids were lower than the normal levels for Western countries.

Comparative composition of breast milk in Western and developing countries and in the Ivory Coast

Components	Western countries* (range)	Developing countries* (range)	Ivory Coast Present study (mean ± 1 SD)
Proteins (g/100 ml)	0.9-1.6	0.85-1.78	0.96 ± 0.11
Total lipids (g/100 ml)	3.2-5.2	2.3-4.1	3.07 ± 0.65
Triglycerides (g/100 ml)	3.8-4.7	2.2-4.0 ^c	2.05 ± 0.50
Phospholipids (mgP/100 ml)	1.05-4.0		1.11 ± 0.30
Cholesterol (mg/100 ml)	13-27		22.10 ± 5.10
Lactose (g/100 ml)	5.3-7.6	6.1-7.9	6.74 ± 1.04
Calories (kcal/100 ml)	65-75	53-68	61 ± 7
Iron (mg/100 ml)	0.02-0.36	0.08-0.13	0.06 ± 0.029
Copper (mg/100 ml)	0.02-0.05	0.056	0.023 ± 0.014
Zinc (mg/100 ml)	0.12-0.53	0.35	0.23 ± 0.11
Vitamin E (mg/100 ml)	0.14-0.94		0.36 ± 0.27

* Western countries, References 3, 12, 14, 16, 17, 19, 20, 29, 39-44. ^a Developing countries, References 1-5, 8-10, 44-53. ^c Calculated values as percentage of total lipids.

Weight for age and, to a lesser degree, arm circumference for age showed a gradual decline from around 5 months of age onward and leveled off after about 10 months of age. Weight for height began to decrease after 3 months of age although the curve fell below 100% of the Harvard Standard only after the 8th month.



Anthropometric measurements of infants from 1 to 23 months of age, percentage of Harvard standards.

Table and Figure from Lauber and Reinhardt "Studies on the Quality of Breast Milk during 23 Months of Lactation in a Rural Community of the Ivory Coast" Amer. J. Clin. Nutr. Vol 32, 1979.

LANTON, J.W.M. ET. AL. "INTERFERON SYNTHESIS BY HUMAN
COLOSTRAL LEUCOCYTES," ARCH. DIS. CHILD. 54:127-130,
1979.

The antiviral potential of human colostrum leucocytes was assessed by their capacity to produce interferon when stimulated by mitogens and inactivated Newcastle disease virus (NDV). Colostrum samples were obtained from 26 women, mainly Chinese, by manual expression into sterile plastic universal bottles. Eleven samples were prepartum and 15 were 2 to 5 days postpartum. Prepartum colostrum cells produced higher interferon levels than postpartum cells. Colostrum cells were less efficient producers than blood leucocytes. However, these results confirm that colostrum leucocytes can synthesize interferon under appropriate conditions and that their capacity to do so is comparable with that of blood leucocytes.

LUCAS, A. ET. AL. "PATTERN OF MILK FLOW IN BREAST-FED
INFANTS," THE LANCET, 2:57-58, 1979.

To determine the time course of milk flow from the mother to the infant on each breast, 122 six-day-old infants were test-weighted during breast-feeding. Cross-sectional data collection was used to avoid repeated interruptions during each feed. During a ten minute feed, 80-90% of the feed was taken from each breast by four minutes suckling. Preliminary studies suggested that the pattern is the same after a month of feeding.

MARANO, H. "BREAST-FEEDING - NEW EVIDENCE IT'S FAR MORE THAN NUTRITION," MED. WORLD NEWS, 20:62-78, 1979.

A review of current information and research in the areas of immunocompetence, nutrition and bonding is presented. New developments in immunocompetence include findings that a nursing mother in close contact with her infant can make antibodies on demand to combat pathogens that challenge her infant. These antibodies are transferred through her milk to the infant. Also, a factor that stimulates development of intestinal mucosa has been discovered.

In the area of nutrition, researchers believe that the abundant quantity of taurine in human milk may be important in regulating the intraluminal phase of bile-acid metabolism. The role of cholesterol has been investigated, it is now believed to play an anti-infective role in addition to its structural role. The question of whether or not premature infants should be given breast milk or formula is very controversial. Recent studies have shown that the protein content of milk in mothers of preterm infants was higher during the first month of lactation so that they may get sufficient protein for fast growth from their mother's milk.

MASUDA, Y. ET. AL. "TRANSFER OF POLYCHLORINATED BIPHENYLS FROM MOTHERS TO FOETUSES AND INFANTS," FD. COSMET. TOXICOL., 16:543-546, 1978.

Blood, milk, adipose tissue and other tissues of mothers, fetuses and infants were collected at delivery, stillbirth or lactation, and analyzed for polychlorinated biphenyls (PCBs). The PCB levels in the maternal blood were significantly higher than those in the corresponding cord blood at delivery, but lower than those in the corresponding infants' blood. A positive but weak correlation was observed between the PCB levels of maternal and cord blood. However, there was no significant correlation between the PCB levels of maternal and infant blood. The PCB levels in the adipose tissue, liver, and adrenals of the fetus were much lower than the corresponding values for the adult. These findings suggest that the transfer of PCBs via the milk is much more significant than is placental transfer and that there may be a placental barrier against PCBs.

Concentration of PCBs in maternal milk and blood and in infants' blood

Source	No. of samples	PCB levels (ppbt)	
		Mean \pm SEM	Range
Maternal milk			
In fat only	52	350 \pm 25	30-870
Total milk	52	13 \pm 1.2	1-36
Maternal blood			
Mothers of 2-3-month-old infants	15	1.8 \pm 0.67	0.7-3.4
Mothers of 4-12-month-old infants	27	1.3 \pm 0.64	0.5-3.1
Total	56	1.4 \pm 0.08	0.5-3.4
Infant blood			
2-3-month-old	15	2.4 \pm 0.22*	0.9-3.9
4-12-month-old	27	2.5 \pm 0.24**	0.7-6.2
Total	42	2.5 \pm 0.17**	0.7-6.2

*b = 10°.

Values marked with an asterisk differ significantly from those of the maternal blood (*P < 0.05).

**P < 0.001)

McENERY, G., AND CHATTOPADHYAY, B. "HUMAN MILK BANK IN A DISTRICT GENERAL HOSPITAL," BRIT. MED. J., 2:794-796, 1978.

A human milk bank was organized in the special care baby unit of a district general hospital. The staff of the unit and members of a voluntary organization helped to contact donors and arrange collection of milk samples. Over two years 2,093 samples of expressed breast milk were collected from 187 donors and examined bacteriologically. Of these samples, 1,171 (56%) grew no bacteria. If the organism count exceeded $2.5 \times 10^6/1$ but was less than $1 \times 10^9/1$ samples were subjected to mild heat treatment. If the count exceeded $1 \times 10^9/1$ the milk was not fed to babies. Sixty-five babies received milk from the bank during the second year. Although these infants were vulnerable, mortality and morbidity were not adversely affected by the banked milk they received.

The cost of establishing and running a human milk bank need not be high. Extensive resources such as extra staff and laboratory and transport facilities were not needed. Enthusiastic co-operation and good will between hospital staff, voluntary helpers, and donors contributed greatly to the success of the scheme. (Author's abstract)

MURRAY, J. AND MURRAY, A. "BREAST MILK AND WEIGHTS OF NIGERIAN MOTHERS AND THEIR INFANTS," AMER. J. CLIN. NUTR., 32:737, 1979 (LETTER).

The authors were able to follow the weights of Nigerian mothers and their infants (they were exclusively breast-fed for at least 6 months) during the Sahel drought and famine of 1974. Although undernourished, these mothers were able to provide enough breast milk for normal growth of their infants to 6 months of age without detriment to their health.

	Mean maternal weight (kg)		Mean infant weight (kg)	
	Term	6 mo postpartum	Birth	6 mo
Famine (Ref 1)	59.15 n=69	50.30 n=49	3.123 n=69	6.426 n=49
Nonfamine (Ref. 2) ^a	64.90 n=130		3.119 n=8070	
Percentiles USA (Ref. 3)			25th	25th
Yoruba (Ref 4)			75th	

^a Fulani and Kanouri in grasslands of Eastern Niger
^b For Cameroun grasslands

NELLIES, M.J. ET. AL. "EFFECTS OF VARYING MATERNAL DIETARY FATTY ACIDS IN LACTATING WOMEN AND THEIR INFANTS," AMER. J. OF CLIN. NUTR., 32:299-303, 1979.

This report evaluates the effects of variation of maternal dietary polyunsaturated and saturated fats on maternal plasma and milk, and, subsequently, on infant plasma fatty acids. Fourteen mothers were equilibrated on a diet for 30 days and then divided into two test groups -- one fed a low polyunsaturated high saturated fat and high cholesterol diet and the other the opposite (high polyunsaturate, low cholesterol). After 4 weeks on one diet the mothers were crossed over to the other diet for another four weeks. On the polyunsaturate-rich diet, milk 18:2 was doubled while the saturated fats were reduced. The fatty acid composition of milk on the saturate-rich diet was similar to that on the ad libitum diet. Close and significant relationships were observed for some maternal milk and infant plasma fatty acids, especially linoleate and oleate. It is concluded that by partaking of a polyunsaturate-rich diet, the mother can provide polyunsaturate-rich breast milk and significantly increase the polyunsaturated levels in her infant.

OLSZYNA-MARZYS, A.E. "CONTAMINANTS IN HUMAN MILK," ACTA PAEDIATR. SCAND., 5:571-576, 1978.

There is a paucity of information regarding excretion of contaminants in human milk, due to experimental difficulties and until recently a general lack of interest. Because of the high fat content of milk and as its acidity is higher than that of plasma, nearly all liposoluble and basic agents consumed by the mother will be excreted in the milk. Distinction must be made between, on the one hand drugs and social toxicants such as smoking and alcohol, whose intake can be stopped or limited during pregnancy and lactation, and ecological toxicants present in a polluted environment to which the mother is exposed. Cases have occurred of heavy prenatal and postnatal intoxication of infants with hexachlorobenzene in Turkey and methylmercury in Iraq due to consumption of fungicide-treated seed wheat by pregnant and lactating mothers. Recent attention has been concentrated on contamination of milk with organochlorine compounds such as DDT and PCB's, that are found in many parts of the world. The heaviest contamination with DDT has been found in Guatemala, resulting in suckling infants consuming many times the Acceptable Daily Intake of this compound proposed by WHO, with unknown future effects.

MAXIMA AND MINIMA OF DDT CONTENT OF HUMAN MILK BY COUNTRY

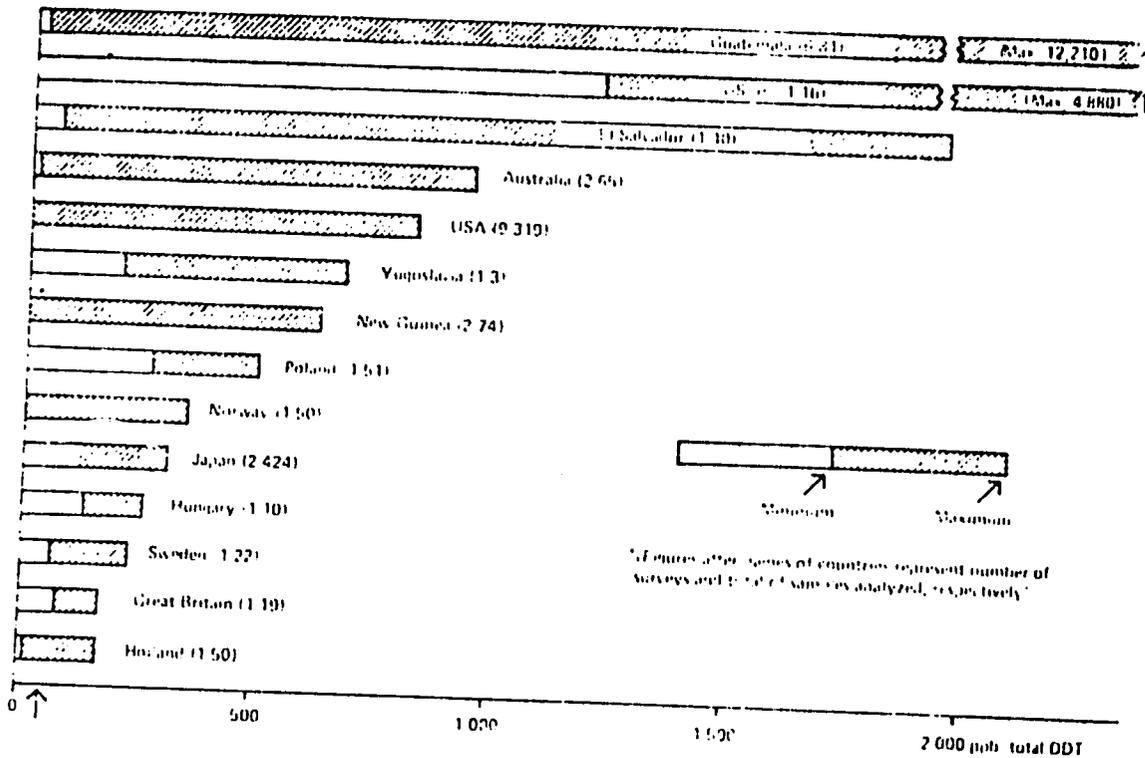


Table from Olszyna-Marzys, "Contaminants in Human Milk" Acta Paediatr. Scand. Vol. 5, 1978.

PAXSON, C.L., AND CRESS, C.C., "SURVIVAL OF HUMAN MILK LEUKOCYTES," J. OF PEDIATR., 94: 61-62, 1979.

This study was conducted to determine which factors may affect survival and viability of the leukocytes of human milk. Sixty milk samples were obtained from lactating mothers during the first post-partum week and from the initial 5-minute portion of a 20-minute feeding time. Alterations in solution pH and in environmental temperature had profound effects on the survival and viability of leukocytes.

No difference in phagocytosis ability was noted between cells collected in plastic versus glass containers. The only detrimental effect of glass containers was the adherence of white cells to the container's walls. (Alterations in osmolality and protein concentration produced no changes in survival or phagocytosis).

PICCIANO, M. AND DEERING, R. "THE INFLUENCE OF FEEDING REGIMENS ON IRON STATUS DURING INFANCY," (IN PRESS), 1979.

Iron status of 96 apparently healthy, full term infants was assessed during the first year of life. Four groups on the following regimens were studied: (I) human milk as a sole milk source for at least 3 months, (II) an iron-fortified formula (14 mg/qt) for 4 months, (III) an iron fortified formula for 12 months, and (IV) the same formula without added iron for 4 months. At ages 1, 2, 3, 6, 9 and 12 months, 5-day dietary assessments were performed. Hematologic determinations were made on blood samples collected at ages 3, 6, 9, and 12 months. Throughout the study, mean hemoglobin and hematocrit levels were not significantly different among groups. At 6 months, Groups I and III had significantly higher mean serum iron concentrations than Group IV and higher mean percentage saturation of transferrin than Groups II and IV. These differences in serum iron and transferrin saturation were not apparent at 9 and 12 months. Level of dietary iron was not related to any parameter of iron status. These data suggest that supplemental iron in early infancy does not provide a nutritional advantage in late infancy when maternal iron supply is exhausted. Data also confirm previous findings that breast-feeding and the extensive use of an iron-fortified formula are associated with satisfactory biochemical indicators of iron status. However, the iron status of this population of infants seen in private practice was remarkably good. The use of both iron-fortified formula and cereals results in exceedingly high dietary iron intakes, a matter to view with concern.

PITTARD, W.B. "BREAST MILK IMMUNOLOGY - A FRONTIER IN INFANT NUTRITION," AMER. J. DIS. CHILD., 133:83-87, 1979.

The discussion in this review article concentrates specifically on the immunoprotective components of human milk. Emphasis is placed on the biosynthesis and function of milk immunoglobulins.

The majority of the cells in human milk are macrophages and immunocompetent B- and T- lymphocytes. Neutrophils have also been found in early lactation and epithelial cells are sometimes found, possibly from the skin of the nipple. Another consistent observation is that colostrum has a higher cellular content than mature milk.

Additional study is needed to provide further understanding of the interactions between breast milk and the recipient newborns' GI tract. Other areas which require clarification include the influence of milk lymphocytes on the newborns' developing humoral and cellular immune systems and their specific mode of action. The functional roles of the milk neutrophil and of the milk epithelial cell need further investigation.

RASSIN, D.K. ET. AL. "TAURINE AND OTHER FREE AMINO ACIDS
IN MILK OF MAN AND OTHER MAMMALS," EARLY HUM. DEV.,
2:1-13, 1978.

Taurine is the second most abundant amino acid in the milk of man and may be important during the crucial early stages of brain development. This investigation was conducted to determine the levels of taurine and other free amino acids in milk from man and other species and to study changes in their content throughout lactation. The concentration of free amino acids in mature human milk was lower than during the first week of lactation. In comparison to cow's milk, human milk had a larger pool of free amino acids. The milk of each species has a characteristic free amino acid pattern which may be an indication of the relative nutritional importance of these compounds during early postnatal development.

ROBERTS, S.A., AND SEVERA, M. "BACTERIAL GROWTH IN RAW
AND PASTEURIZED HUMAN MILK," BRIT. MED. J., 2:1196, 1978.

Bacterial growth was determined after inoculation with either E. coli or S. aureus in samples of filtered and unfiltered raw breast milk and pasteurized breast milk to determine the effectiveness of their anti-microbial properties. Filtered raw milk inhibited bacterial growth to the same degree as unfiltered milk despite the absence of manophages and neutrophils. This emphasizes the importance of non-cellular antibacterial constituents in raw milk.

The authors conclude that unheated breast milk (compared to pasteurized breast milk) has bacterial growth inhibitory properties which may protect the neonatal gut against harmful bacterial colonization. Therefore, it is essential that careful and hygienic methods of milk collection be stressed in conjunction with bacteriological monitoring.

The breast milk of vegans contained higher proportions of linoleic acid and its long-chain derivatives and lower levels of long-chain derivatives of α -linolenic acid. The most marked differences were in the proportions of linoleic and docosahexenoic acids. No major differences were noted in the fatty-acid composition of breast milk lipids between the start, middle, and end of a feed.

ROBINSON, J.E. ET. AL. "PHAGOCYTOSIS AND KILLING OF BACTERIA AND YEAST BY HUMAN MILK CELLS AFTER OPSONIZATION IN AQUEOUS PHASE OF MILK," BRIT. MED. J., 1:1443-1445, 1978.

Macrophages and neutrophils from human milk phagocytose and kill staphylococcus aureus and E. coli. They also phagocytose candida albicans. The authors conclude that the phagocytosis and killing of bacteria by milk cells may contribute to the lower incidence of infection among breast-fed rather than artificially fed babies.

SANDERS, T.A.B. ET. AL. "STUDIES OF VEGANS: THE FATTY ACID COMPOSITION OF PLASMA CHOLINE PHOSPHOGLYCERIDES, ERYTHROCYTES, ADIPOSE TISSUE, AND BREAST MILK, AND SOME INDICATORS OF SUSCEPTIBILITY TO ISCHEMIC HEART DISEASE IN VEGANS AND OMNIVORE CONTROLS," THE AMER. J. CLIN. NUTR., 31:805-813, 1978.

Ten mothers, four vegans and six omnivores and their infants were studied to determine the fatty acid composition of breast milk in each group of mothers. The vegan mothers had been on the diet for an average of 7 years (range 3 to 12 years). All the infants were exclusively breast-fed for a minimum of 3 months. Breast milk samples were obtained at the start of morning feeds in 20 ml quantities between the second and sixth months postpartum. Smaller samples, about 2 ml, were also obtained in the middle and end of the feed from the same breast.

SIIMES, M.A. AND HALLMAN, N. "A PERSPECTIVE ON HUMAN MILK BANKING, 1978," J. OF PEDIATR., 94:173-174, 1979.

Some practical aspects of human milk banking have been practiced at the Helsinki Children's Hospital and are described here. The main question asked about milk banking and discussed here involves the treatment of human milk in order to preserve the beneficial factors thought to increase the infant's resistance to infection. The ideal method for preserving milk antibodies is to freeze milk, a second choice is to use brief heating not exceeding 65° C. Questions which remain unresolved and require further study include the following aspects: optimal conditions of freezing or heating (including maximum allowable duration of storage), and temporary use of various medications by donors.

SIIMES, M.A. ET. AL. "BREAST MILK IRON - A DECLINING CONCENTRATION DURING THE COURSE OF LACTATION, ACTA PEDIATR SCAND., 68:29-31, 1979.

Prior studies indicate a declining concentration of iron in breast milk since the 1950's. No study indicated the period of the stage of lactation. This study in Helsinki, Finland, analyzed the iron concentration of milk over the duration of breast-feeding. Breast milk was collected bi-weekly and, later, monthly at the beginning and end of each feeding over a twenty-four hour period. Twenty-seven mothers were in the study. The median iron concentration declined from 0.6 to 0.3 mg/l during thirty weeks of breast-feeding. Consequently, in that stored iron and the concentration of hemoglobin reach low levels in infants at the age of six months (when the concentration of iron in breast milk is at its lowest), there may be a need of iron supplementation in some infants breast-fed for prolonged periods.

TAITZ, L.S. "SOLUTE AND CALORIC LOADING IN YOUNG INFANTS:
SHORT-TERM AND LONG-TERM EFFECTS," ARCH. DIS. CHILD.,
53:797-800, 1978.

Although breast milk and cow's milk have approximately the same caloric composition, breast milk contains a low level of salt and solutes. Breast milk averages about 7 mmol sodium per litre and cow's milk contains 26 mmol sodium per litre. However, as solids are introduced in the breast-fed infant's diet, this difference is not as great due to the levels of salt in the solids.

There are several physiological reasons for the low solute load of breast milk. First, sodium retention capacity matures more slowly than glomerular filtration rate and does not attain adult levels until into the second year. Therefore, there is a tendency for sodium retention to occur throughout infancy and despite the fact that babies can be induced to concentrate urine to very high osmolalities. As a result, babies fed cow's milk formula are more likely to develop hypernatremia than breast-fed babies.

Control of milk intake is determined by the infant's degree of physical activity, metabolism, and gastric capacity. Osmolar/water imbalance leading to thirst can lead to excess intake of calories. Of utmost importance is the feeders attitude, which can significantly influence his/her intake. The effects of early weight gain and its long-term effects are also discussed.

UNDERWOOD, A. AND HEPNER, R. "PROTEIN, LIPID, AND FATTY
ACIDS OF HUMAN MILK FROM PAKISTANI WOMEN DURING PRO-
LONGED PERIODS OF LACTATION," AMER. J. OF CLIN. NUTR.,
23(4):400-407, 1970.

The study was undertaken to assess protein, lipid, and fatty acid patterns of breast milk obtained from Pakistani women at intervals of up to two years. Protein levels, after six weeks postpartum, stabilized at about 1.2 grams/100 ml. and changed little thereafter. Lipids varied extensively, with a trend toward higher concentrations from six months onward. Fatty acid patterns showed no statistically significant changes. During the second year of lactation, a trend toward an increased percentage of total fatty acids as myristic acid rather than palmitic or oleic acid was observed. The patterns of fatty acids in milk lipids were intermediate between those of adipose tissue and dietary fat and seemed to be due to the high dietary intake of palmitic acid.

WATERLOW, J. C., "OBSERVATIONS ON THE PROTEIN AND ENERGY REQUIREMENTS OF PRE-SCHOOL CHILDREN." A PAPER PRESENTED AT THE NATIONAL INSTITUTE OF NUTRITION, DIAMOND JUBILEE, OCT. 1978.

This paper reviews the protein-nitrogen and energy requirements of infants under six months of age and whether they can be adequately met by breast milk. The conclusions stated are that after two months of age, breast milk is likely to be inadequate. The evidence cited in the paper from past studies of several researchers can be interpreted otherwise. The studies cited do not differentiate between exclusive breast-feeding and mixed breast- and bottle-feeding. A major conclusion seems to be that the nutritional need of infants varies a great deal, and that mother's milk, on the average, can meet the energy and nitrogen needs of the child up to the age of six months. When infections enter the picture, the child's nutrient requirement may change to such an extent that breast milk cannot meet them if this requirement is measured by desired weight gain at the age of six months.

Intakes of breast milk by infants 2-5 months old in some developing countries

Author	Country	I n f a n t s		
		Age, months	Number	Mean volume of milk ml/day
Gopalan (1958)	India	2-4	14	501
Somesvara Rao et al (1959)	India	3	18	640
Devadas et al (1977)	India	3	8	564
Devadas et al (1978)	India			
low income		3	21	665
high income		3	9	563
Hanafy et al (1972)	Egypt			
healthy mothers		2-5	14	932
malnourished mothers		2-5	13	945
Chavez et al (1975)	Mexico	2-4	17	557
Van Steenbergen et al (1971)	Kenya	2-3	12	619

WELSH, J.K., AND MAY, J.T. "ANTI-INFECTIVE PROPERTIES OF BREAST MILK," J. PEDIATR., 94(1):1-9, 1979.

This thorough review describes the wide range of factors in breast milk which are active against bacteria and viruses. These factors are generally absent or present in lesser quantities in cow's milk and synthetic formulas. It concludes that, although it is difficult to attach a precise clinical significance to each factor, it appears evident that the sum of these factors are at least partially responsible for the differences in both morbidity and mortality between breast-fed and non breast-fed infants.

WILLIAMSON, S. ET. AL. "ORGANISATION OF BANK OF RAW AND PASTEURISED HUMAN MILK FOR NEONATAL INTENSIVE CARE," BRIT. MED. J., 1:393-396, 1978.

In 1976 a human-milk bank was established at King's College Hospital to serve the neonatal intensive care unit. The bank is staffed by two part-time nurses who interview prospective donors, organize collections, prepare samples for bacteriological screening, and process the milk. On average 25 litres a month may be collected from about 15 donors, of which at least two-thirds is free enough of bacteria to be fed raw (unheated) to sick and low-birth-weight infants. Most of the remainder may be used after holder pasteurization. (Author's abstract).

YOLKEN, R.H., ET AL., "SECRETORY ANTIBODY DIRECTED AGAINST ROTAVIRUS IN HUMAN MILK - MEASUREMENT BY MEANS OF ENZYME-LINKED IMMUNOSORBENT ASSAY," J. OF PEDIATR., 93: 916-921, 1978.

The levels of antibody to human rotavirus in human colostrum and milk from 35 mothers were investigated. The women came from Santa Maria Cauque, a Mayan Indian village in the rural highlands of Guatemala. When possible, colostrum was collected shortly after delivery; milk specimens were obtained at 1, 2, 3, 4, 8, 12, and 16 weeks after delivery. In addition, 32 colostrum specimens were examined from women living in San Jose, Costa Rica, and 12 colostrum specimens from women living in the Washington, D.C. area. Anti-rotavirus SC1gA was detected in 18 colostrum specimens and 89 of the 95 milk specimens in the Guatemalan women. All of the Costa Rican and American women had anti-rotavirus SC1gA. However, rotavirus antigen was not found in any colostrum or milk specimen.

COMPOSITION OF HUMAN BREAST MILK

- ABE, H. R., "History of the First German Collecting Point for Women's Milk." Aerzliche Jugendkunde, 67 (5): 392-396, Dec. 1976.
- ADLY, D. P., "Infant Feeding. A Current View." Br. Med. J., 1268-1271, 1976.
- ADDY, H.A., "The Breast-feeding of Twins: An Exploratory Study." J. Trop. Pediatr. Environ. Child Hlth., 21: 231, 1975.
- BAILEY, K. V., "Quality and Composition of Breast Milk in Some New Guinean Populations." J. Trop. Pediatr., 1965.
- BAKKEM, C., "Insecticides in Human Breast Milk." Acta Paediatr. Scan. (65): 535, 1976.
- BALDWIN, D., "The All-Natural Diet Isn't." Environ. Action, Dec. 1977.
- BOURGES, H., et al., "Effect of Dietary Supplements on Nutrient Content of Milk from Mothers in Rural Mexico." Quebec: Proceedings of the Western Hemisphere Nutrition Congress, 1977.
- CALKINS, E. J., et al., "Mineral Intakes of Breast-fed Infants." Quebec: Proceedings of the Western Hemisphere Nutrition Congress, 1977.
- CARLSON, B., "Echerichia Coli O Antibody Content in Milk from Healthy Swedish Mothers and Mothers from a Very Low Socio-economic Group of a Developing Country." Acta Paediatr. Scan., 65: 417-423, 1976.
- CLEMENT, E., "Study on the Composition of Casein from Individual Human Milks." Biomedicine, 25 (8): 303-306, Sept. 30, 1976.
- COMMITTEE ON ENVIRONMENTAL HAZARDS, "PCB's in Breast Milk." Pediatr., 62: 407, 1978.
- "The Composition of Nature of Human Milk. Report of a Working Party of the Committee on Medical Aspects of Food Policy." Reports on Health and Social Subjects (London), 12 (1-11): 1-47, 1977.

COMPOSITION OF HUMAN BREAST MILK

- COULSON, D. M., et al., "Hematocrit Levels in Breast-fed American Babies." Clin. Pediatr., 16 (7): 649-651, July 1977.
- DAUNCEY, M. J., "The Absorption and Retention of Magnesium, Zinc, Copper by Low Birth Weight Infants Fed Pasturized Human Breast Milk." Pediatr. Research, II: 997-1000, 1977.
- DAVIES, D. P., "Adequacy of Expressed Breast Milk for Early Growth of Preterm Infants." Arch. Dis. Child., 52: 296-301, 1977.
- DIGIACONO, R., "Relationship of Calorie, Protein and Fat Consumption to Fetal, Neonatal and Infant Mortality." Nutr. Reports Internat. 17 (1) January 1978.
- EDITORIAL, "Iron Absorption from Breast Milk or Cow's Milk." Nutr. Reviews.
- EDITORIAL, "Vitamin D in Human Milk." Med. J. of Austr., 1 (11): 256, March 12, 1977.
- EGLI, G. E., "The Influence of the Number of Breast-feedings on Milk Production." Pediatr., 27: 314-317, 1961.
- EMERY, W., et al., "Effects of Sampling and Dietary Fat on Gross and Fatty Acid Composition of Human Milk." Nutr. Reports Internat., 17 (1), Jan. 1978.
- FAIRNEY, A., "Vitamin D and Human Lactation." Lancet, 2 (8041): 739-743, Oct. 8, 1977.
- FORD, J. E., "Influence of the Heat Treatment of Human Milk on Some of Its Protective Constituents." The J. of Pediatr., 90 (1): 29-35, Jan. 1977.
- GAVLL, G., "Protein Nutrition in the Pre-Term Infant." Acta Pediat. Belg., 31: 3-8, 1978.

COMPOSITION OF HUMAN BREAST MILK

- GEBRE-MEDHIN, M., et al., "Breast Milk Composition on Ethiopian and Swedish Mothers. I. Vitamin A. and B-Carotene." Amer. J. of Clin. Nutr., 29: 441-451, April 1976.
- GOPALAN, C., "Studies on Lactation in Poor Indian Communities." J. Trop. Pediatr., 4: 87-97, 1958.
- GOPALAN, C., "Effect of Protein Supplementation and Some So-Called Galactogens on Lactation of Poor Indian Women." Indian J. of Med. Research, 46 (2): 317-331, 1958.
- GYORGY, P., "The Uniqueness of Human Milk: Biochemical Aspects." Amer. J. of Clin. Nutr., 24: 770, 1971.
- HYTTEN, F. E., "Clinical and Chemical Studies in Human Lactation." Br. Med. J., 2: 175-182, 1954.
- JAGADUSAN, V., et al., "C₃ in Human Milk." Acta Paediatrica Scand., 67: 237-238, 1978.
- JANSSON, L., et al., "Vitamin E Requirements of Preterm Infants," Acta Paediatrica Scand., 67: 459-463, 1978.
- JELLIFFE, A. B., et al., "Unsupplemented Human Milk and the Nutrition of the Exterogestate Fetus," Proceedings IXth International Nutrition Congress, Mexico City, 2: 77, 1972.
- JELLIFFE, D. B., et al., "The Volume and Composition of Human Milk in Poorly Nourished Communities: A Review." Amer. J. of Clin. Nutr., 31: 492-515, March 1978.
- JOHNSON, P. E., et al., "Zinc Availability in Human Breast Milk, Infant Formulas and Cow's Milk" Amer. J. of Clin. Nutr., 31: 416-421, 1978.
- KADER, M. M. A., et al., "Clinical Biochemical and Experimental Studies on Lactation." Amer. J. of Obstet. and Gynecology, 105 (6): 978-985, 1969.
- KARMAKAR, M. G., "Studies on Human Lactation." Indian J. of Med. Research, 47: 344-351, 1959.

COMPOSITION OF HUMAN BREAST MILK

KOYAMA, K., et al., "PCB in Human Milk, Blood and Food." Environmental Mutagen Information Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1976.

KROGER, M., "General Environmental Contaminants Occurring in Milk." Lactation, Vol. 3, Editors: B.L. Lanon and V.R. Smith, Academic Press, N.Y., 1974.

LAMM, S.H., et al., "Lead Content of Milks Fed to Infants 1971-1972." Pediatr., 53 (2): 137-141, 1974.

LAZAREV, S., "Composition of Human Milk of Mother of Infants with Excessive Weights." Pediatr., (1): 60-61, 1976.

LONNERDAL, B., et al., "Breast Milk Composition in Ethiopian and Swedish Mothers. II. Lactose, Nitrogen and Protein Contents." The Amer. J. of Clin. Nutr., 29: 1134-1141, 1976.

LONNERDAL, B., et al., "A Longitudinal Study of the Protein Content of Human Milk from Well-nourished Swedish Mothers." Second European Nutrition Conference, Munich, 1976. Nutrition Metabolism, 21 (1): 106-109, 1977.

McMILLAN, J., et al., "Iron Sufficiency in Breast-fed infants and the Availability of Iron from Human Milk." Pediatr., 58 (5), November 1976.

MARTINEZ, C., et al., "Nutrition and Development in Infants of Poor Rural Areas." Nutr. Reports Internat., 4 (3): 139-149, Sept. 1971.

MELLANDER, D., et al., "Breast-feeding and Artificial Feeding: A Clinical, Serological and Biochemical Study in 402 Infants, with a Survey of the Literature, The Norrbotten Study." Acta Paediatrica Sca., 11 (suppl): 114-118, 1958.

MORRISON, S. D., "Human Milk: Yield, Proximate Principles and Inorganic Constituents." Aberdeen Scotland, Commonwealth Agriculture Bureau Technical Comm., (18), 1952.

COMPOSITION OF HUMAN BREAST MILK

- NASSI, L., "Zinc Metabolism. Note VI Distribution of Zinc in Various protein Fractions of Powdered Milk. Comparison with Human and Cow's Milk." Minerva Pediatr., 28 (12-13): 707-715, April 7, 1976.
- NASSI, L., et al., "Zinc, Metabolism, 4 Electrophoretic Study of Lactalbumin and B-Lactoglobulins in Colostrum and Milk of Women and Cows." Minerva Pediatr., 28 (2): 547-448, 1976.
- OLIVECRONA, T., "Are the Lipases in Human Milk Important for Fat Digestion in the New Born?" Lipid Absorption: Biochemical and Clinical Aspects, pp. 315-320, Edited by K. Rommel and R. Bohmen, University Park Press, Baltimore, Maryland, 1976.
- OLLE, H., et al., "Breast Milk Composition in Ethiopian and Swedish Mothers. IV Milk Lipases." J. of Clin. Nutr., 30: 508-511, 1977.
- PETER, M. B., "Nursing Mothers and Environmental Contaminants." EPA Journal, pp. 9-11, Nove.-Dec. 1978.
- PCB's in Mother's Milk. Department of Health, Education and Welfare, Public Health Service, Bethesda, Maryland, September 23, 1976.
- PICCIANO, M., et al., "Copper, Iron and Zinc Contents of Mature Human Milk." Amer. J. of Clin. Nutr., 29: 242-254, 1976.
- POTTER, J., et al., "The Effects of Dietary Fatty Acids and Cholesterol Plasma Cholesterol of Breast-fed Infants." Amer. J. of Clin. Nutr., 29: 54-60, 1976.
- RAMEREZ, M. J., "The Diet of Children of Low Birth Weight." Boletin Medico de Hospital Infantil, 34: 185-203, Feb. 1977.
- SANGUANSERMSRI, J., et al., "Polyamines in Human and Cow's Milk." Amer. J. of Clin. Nutr., 27 (8): 859-865, 1974.
- SCHULTE-LOBBERT, F. J., "Determination of Cadmium in Human Milk During Lactation." Archives Toxicology, 37 (2): 155-157, June 18, 1977.

COMPOSITION OF HUMAN BREAST MILK

SOSNOUSKII, V., et al., "Contents of Individual Components of Lipid Metabolism in Breast Milk at Different Stages of Lactation." Voprosy Okhrany Materinstva i Detstva, 19 (7): 52-54, 1974.

SVANVERG, U., "Breast Milk Composition in Ethiopian and Swedish Mothers III. Amino Acids and Other Nitrogenous Substances." The Amer. J. of Clin. Nutr., 30: 499-507, April 1977.

THOMAS, A. M., et al., "Nutritional Aspects of Human Lactation." Bull. Wld. Hlth. Organ., 52: 163-176, 1975.

VAUGHAN, L. A., et al., "Trace Elements in Human Milk." Quebec: Proceedings of the Western Hemisphere Nutrition Congress, 1977.

WASTI, S.M.K., "Miscalculations in the Adequacy of Breast Milk Feeding to Gross Malnutrition of Infants." Proceedings of the Symposium on Nutritional Deficiencies and Their Remedies, pp. 89-92. Punjab University, Lahore, Pakistan, 1974.

WIDDOWSON, E., et al., "Comparison of Dried Milk Preparations for Babies on Sale in Seven European Countries. 1. Protein, Fat, Carbohydrate, and Inorganic Constituents." Arch. Dis. Child., 49 (11): 867-873, 1974.

WIDDOWSON, E., "Nutrition and Lactation." Current Concepts in Nutrition, 5: 67-75, 1977.

WILES, D. H., et al. "Chlorpromazine Levels in Plasma and Milk of Nursing Mothers." Br. J. Clin. Pharma., 5: 272-273, 1978.

V. IMPACT OF FEEDING PRACTICES ON
MORBIDITY AND MORTALITY

V. IMPACT OF FEEDING PRACTICES ON MORBIDITY AND MORTALITY

AYKROYD, W.R. "NUTRITION AND MORTALITY IN INFANCY AND EARLY CHILDHOOD: PAST AND PRESENT RELATIONSHIPS," AMER. J. OF CLIN. NUTR., 24:480-486, 1971.

This paper reviews data on how past trends in mortality in early childhood can throw light on the problem and solutions for protein-calorie malnutrition (PCM). In England and other affluent countries the infant mortality rate has greatly decreased during the last 60 years. "Diarrhea and enteritis" were among the important recorded causes of death in the 19th century. A study by George Newman in "Infant Mortality, a Social Problem," (1906) showed that "hand fed" infants had a lower chance of survival than breast-fed infants; the mortality rate being three times higher than for breast-fed infants. A number of other studies on infant and child mortality between 1841 and 1961, in the developed and developing countries, suggest that PCM can be eliminated in a few decades by the establishment of adequate maternal and child health services and a rising standard of living.

BAUZA, C. ET. AL. "PREVENTION OF REPEATED EPISODES OF GASTROENTERITIS IN THE WEANED CHILD BY RE-ESTABLISHING BREAST-FEEDING," (IN SPANISH) COURRIER, 29:1-6, 1979.

In developing countries early weaning may be accompanied by serious risks for the infant. There are data which prove that repeated sucking on the nipple and the areola may stimulate secretion by non-secreting breast tissue, or increase inadequate secretion. In some cases medication has been used to stimulate lactation. Re-lactation has been achieved in a variety of circumstances: in adoptive mothers (USA); in the prevention of marasmus (Uganda); in refugee camps (Bangladesh). Authors have reported their first results, obtained in a hospital ward setting, when mother and sick infant are hospitalized together. The method is based on the mother's strong motivation, on the family group, on the health team, caloric supplements for the mother, self demand breast-feeding of the infant, progressive reduction of the cow's milk feeding and the use of chlorpromazine as a galactagogue.

BEHAR, M. "THE ROLE OF FEEDING AND NUTRITION IN THE PATHOGENY AND PREVENTION OF DIARRHEIC PROCESSES," PAHO BULL., XI:1-9, 1975.

Breast-feeding is the single most effective protection against environmental factors which promote diarrheic processes. The widespread introduction of artificial feeding has resulted in a greater frequency and severity of diarrheic episodes among bottle-fed babies than among breast fed ones.

Early introduction of weaning foods (fashionable in so many countries) should not be recommended if environmental sanitation is low. Breast-feeding alone for the first three months of life should definitely be encouraged, followed by a sound weaning diet. While diarrhea precipitates and aggravates malnutrition, the course of diarrheic processes is affected by feeding practices. Diarrhea was the major cause of death in the combined total of all child population samples examined by the Pan American Health Organization.

BORGOLTZ, P.A. AND LATHAM, M.C., "EFFECTS OF ARTIFICIAL FEEDING ON NUTRITIONAL STATUS OF THE INFANT POPULATION OF LIMA, PERU." ABSTRACTED IN AMER. J. CLIN. NUTR., 32:948, 1979.

The objective of this study was to evaluate the magnitude of infant malnutrition associated with artificial feeding in Peru. Infant data from the National Nutrition Survey (1975-76), drawn on a representative sample of the population were analyzed for the capital, Lima. The infants 3 to 23 months of age were divided in a breast-fed group (n=83; mean age = 11.8 ± 5.7) and an artificially fed group (n=87; mean age = 11.8 ± 5.8), according to whether they breast-fed at least 6 months, or were still breast-fed if less than 6 months old. As indicated by the Survey, using sex-specific "Boston" standards, 30% or 96,000 Lima infants were classified as malnourished. The median weaning age was 4 months. Differences in nutritional status between the 2 groups were significant ($p=.05$). During the first year of life the age-independent relative risk of malnutrition ($\leq 95\%$ height/age norm) was found to be 4.4 times higher for artificially fed babies ($p=.05$), corresponding to an attributable risk of 63%. Using multivariate probit analysis, the probability of malnutrition, after controlling for several factors including age, income and sanitary conditions was shown to be very significantly influenced by artificial feeding. Interactions with lack of water, electricity, kerosene stove, mothers' illiteracy had the expected strong positive effects. The results suggest that the majority of infant malnutrition in Lima, especially severe malnutrition, is indeed associated with early weaning from the breast. Serious considerations to policies protecting and promoting adequate breast-feeding practices are warranted.

BODE, H.H., ET. AL. "MITIGATION OF CRETINISM BY BREAST-
FEEDING," PEDIATRICS, 62(1):13-16, 1978.

An athyrotic infant had hypothyroidism at 1 year of age. He had grown at an above-average velocity until age 10 months when breast-feeding was discontinued, yet his bone age remained that of a newborn. These observations suggested that breast-feeding had attenuated hypothyroidism by providing significant quantities of thyroid hormones in the milk. To test this hypothesis, thyroxine (T_4), 3,5,3'- triiodothyronine (T_3) and 3,3',5'- triiodothyronine (reverse T_3) were measured in breast milk samples collected serially from three months to before 4 months after delivery. Mean breast milk T_4 content fell from 1.4 to 0.7 ug/dl within 48 hours after delivery, while T_3 content rose from 136 to 286 ng/dl. Reverse T_3 content remained unchanged. The shift in the T_4/T_3 ratio after delivery was observed in samples of all five donors; the highest postpartum T_4 level was 1.1 ug/dl and the highest postpartum T_3 level was 405 ng/dl. It is concluded that breast-feeding may deliver sufficient thyroid hormones to the athyrotic infant to mitigate severe hypothyroidism and to prevent impaired neurological development.

BROWN, R.D., "WEANING FOODS IN DEVELOPING COUNTRIES,"
WASHINGTON, D.C.: FOOD AND NUTRITION BOARD OF THE
NATIONAL ACADEMY OF SCIENCES, 1977, PUBLISHED IN THE
J. OF CLIN. NUTR., 3 (11): 2066-2072.

The weaning period is that phase from complete breast-feeding until the infant is entirely on an adult diet. Ideally weaning should not start earlier than about six months and should not be completed before age 2-3 years. The weaning is a very vulnerable point in an infant's development. While still growing extremely rapidly, the infant has just about run out of most maternal protective antibodies. At this time the infant is started on foods that may be unfamiliar, difficult to digest and spicy. At the same time the child is exposed to bacteria, viruses, parasites and insects. The author examines in detail each of these risks in typical Third World settings. In conclusion, Brown evaluates low cost weaning foods which are presently manufactured in developing countries today.

CHIEN, S.T. "PNEUMONIA AND DIARRHOEAS: KILLERS OF TODDLERS
IN DEVELOPING COUNTRIES," TROP. AND GEO. MED., 27:103-
108, 1975.

The records of 811 toddlers (aged 1-4 years) who were admitted to the University Hospital in Malaysia (during 1971) were examined for pneumonia or diarrhea. One third of these children were suffering from varying degrees of protein-calorie malnutrition. They tended to come from poorer homes and to have a larger number of siblings born in rapid succession. They were also more likely to be fed with sweetened condensed milk (after having been breast-fed for a median duration of 3.8 months). The author emphasized the importance in the approach to the management of children with infection and malnutrition. He states that it must be at the family level, taking into account socio-economic factors. Hospitals in developing countries should, along with their curative function, be involved in the prevention of diseases, namely: promotion of health through health education (promotion of breast-feeding), specific protection by immunization of children in hospitals, and early detection and management of malnutrition.

CHANDRA, R. K., "NUTRITIONAL DEFICIENCY AND SUSCEPTIBILITY TO INFECTION." BULL. WLD. HLTH. ORGAN., 57
(2): 167-177, 1979.

Undernutrition and infection, together or separately, are major contributors to morbidity and mortality world-wide particularly in underprivileged young children. Deficiencies in the required nutrition components increases the susceptibility to infection. This review analyzes the epidemiological and clinical evidence pointing to this increase, the effects of nutritional deficiencies and infection on the immune response, the implications of the findings for public health workers in reference to immunization.

It proposes intervention strategies which include breast-feeding substantiated by studies done in Canada and India comparing the effects of breast-feeding and formula-feeding on several conditions:

CLARKE, T. ET. AL. "HYPERNATREMIC DEHYDRATION RESULTING FROM INADEQUATE BREAST-FEEDING," PEDIATR., 63:931-932, 1979.

A 2-week old infant developed severe hypernatremic dehydration after having been totally breast-fed during this time. However, the mother was breast-feeding three times a day for 15 to 20 minutes each time and stated that the infant was a poor feeder and would rather sleep than eat. On physical examination, the infant was lethargic and emaciated in appearance. After laboratory studies were carried out, it was estimated that the infant had suffered a 20 to 25% loss of fluid since birth. Subsequent interviews with the mother revealed complicating factors such as financial problems, ambivalence about the pregnancy, and difficulty in keeping the baby satisfied.

Breast-feeding was continued following discharge from the hospital, but infant formula supplements were offered after each feeding. The follow up examination showed that the infant's serum sodium level was normal.

COOK, R. "THE FINANCIAL COST OF MALNUTRITION IN THE COMMONWEALTH CARIBBEAN," J. OF TROP. PEDIATR., 14(2): 52-54, 1968.

The expense of preventive programs should be viewed in relation to the heavy financial losses caused by malnutrition. If programs are planned carefully, and if they are evaluated to see that they give a significant degree of improvement for expenditure then a great deal could be spent on combating malnutrition before it approached the present costs of malnutrition. Seven islands are compared in terms of their health budgets, their per capita health expenditures, and occupancy of hospital beds and pediatric beds. From this and other information, estimates are made of the approximate costs of malnutrition and gastroenteritis.

CRUICKSHANK, J.G. "NEONATAL WARDS, MILK AND STAPHYLOCOCCI," CENTR. AFR. J. MED., 24:25-28, 1978.

The purpose of this study was to examine the extent of significant contamination in freshly expressed breast milk using staphylococci as a marker, and to investigate the epidemiology of this organism in an African neonatal unit. The results showed that a high proportion of mothers became colonized with the locally dominant staphylococcus soon after they entered the unit. However, very few contaminated their expressed milk in the pooled milks to a detectable degree. Therefore, when the milk is used within an hour or so of expression, the contaminants will be in such small numbers that they will have little opportunity to multiply to sufficient levels to produce toxin.

CUNNINGHAM, A.S., "MORBIDITY IN BREAST-FED AND ARTIFICIALLY FED INFANTS," J. OF PEDIATR., 90(5):726-729, 1977.

One-half of the healthy newborn infants at a rural center were initially breast-fed; the proportion declined to 4% by one year of age. Breast-feeding was associated with significantly less illness during the first year, especially if continued beyond 4½ months of age. Breast-feeding was associated with a higher level of parental education and, by inference, higher socio-economic status. The health advantage of breast-feeding was still evident after controlling for parental educational status. In better educated families the difference in significant illness between infants who were artificially fed and those who were breast-fed for prolonged periods of time was two to threefold.

Significant episodes of illness according to feeding mode at time of onset of illness*

Illness	Breast† (2,047 patient- weeks)	Artificial‡ (10,209 patient- weeks)	χ² test
Otitis media	3.4 (10)	6.3 (64)	p < 0.10
Acute lower respiratory illness	0.34 (1)	5.5 (56)	p < 0.001
Significant vomiting or diarrhea	2.0 (6)	4.9 (50)	p < 0.05
Hospital admissions‡	0.34 (1)	2.9 (30)	p < 0.02
Total episodes of illness‡	5.8 (17)	16.8 (172)	p < 0.001

*Does not include one apparent crib death in a 2-week old, bottle-fed infant.

†Episodes per 1,000 patient-weeks (number of episodes).

‡Includes hospital admissions for *H. influenzae* meningitis, pyloric stenosis, urticaria, or unexplained fever, all in bottle-fed infants, the only breast-fed infant hospitalized proved to have roseola.

DOUGLAS, J.W.B., "THE EXTENT OF BREAST-FEEDING IN GREAT BRITAIN IN 1946, WITH SPECIAL REFERENCE TO THE HEALTH SURVIVAL OF CHILDREN," THE BRITISH EMPIRE, 57:335-361, 1950.

Difference between the mortality of bottle-fed and breast-fed infants were insignificant. However, serious gastrointestinal infections were more frequent among bottle babies (primarily of extreme birth weight). They also were more prone than breast-fed infants to lower respiratory tract infections during the first nine months. Immunity to measles developed in breast-fed infants in the early months which lasted throughout the 2nd year.

DUGDALE, A.E., "THE EFFECT OF THE TYPE OF FEEDING ON WEIGHT GAIN AND ILLNESSES IN INFANTS." BR. J. NUTR., 26: 423, 1971.

This study of 250 Malay and Chinese infants in MCH clinics in Kuala Lumpur, Malaysia, indicates that those that were breast-fed had slightly greater weight gains during the first ten weeks of age than those who were bottle-fed. Breast or bottle-feeding indicated no detectable difference for those between 10-20 weeks. After 20 weeks the artificially fed babies gained considerably more weight. Respiratory and alimentary illnesses which were recorded showed no measurable difference between the two methods of feeding. There were significantly more illnesses among the Malay infants and low-income families. For infants of poor and ignorant families breast milk may be a matter of life and death, but for wealthy and educated families the type of infant feeding is a matter of convenience.

ELLESTAD-SAYED, J. ET. AL. "BREAST-FEEDING PROTECTS AGAINST INFECTION IN INDIAN INFANTS," CANAD. MED. ASSOC. J., 120:295-298, 1979.

A retrospective study was undertaken at two isolated Manitoba Indian communities to determine whether the type of infant feeding was related to infection during the first year of life. Of 158 infants 28 were fully breast-fed, 58 initially breast-fed and then changed to bottle-feeding and 72 fully bottle-fed. Fully bottle-fed infants were hospitalized with infectious diseases 10 times more often and spent 10 times more days in hospital during the first year of life than fully breast-fed infants. Diagnoses were mainly lower respiratory tract infection and gastroenteritis. Gastroenteritis

occurred in only one breast-fed infant. Preast-feeding was strongly protective against severe infection requiring hospital admission and also against minor infection. The protective effect, which lasted even after breast-feeding was discontinued, was independent of family size, overcrowding in the home, family income and education of the parents. Measures to achieve breast-feeding for virtually all infants, particularly in northern communities, should be given high priority.

Table I - Hospitalization of 158 infants for infection during first year of life

Variable	Type of feeding		
	Group A (breast only) (n = 28)	Group B (breast, then bottle) (n = 58)	Group C (bottle only) (n = 72)
Total no. of hospital admissions	3	33	70
Mean no. of hospital admissions per child*	0.1	0.6	1.0
Total no. of days in hospital	25	252	676
Mean no. of days in hospital per child†	0.9	4.4	9.4

*Means of all groups significantly different; P at least < 0.05.
†Mean of group C significantly different from means of other two groups; P < 0.01.

Table II Hospitalization for infection per breast- or bottle-feeding year

Variable	Type of feeding	
	Breast	Bottle
Total no. of feeding years	48	107
Total no. of hospital admissions	13	93
Mean no. of hospital admissions per feeding year*	0.27	0.8
Total no. of days in hospital	120	833
Mean no. of days in hospital per feeding year†	2.5	7.8
Diagnosis		
Lower respiratory tract infection	9	63
Gastroenteritis	1	23
Upper respiratory tract infection	0	7
Otitis media	0	5
Other	3	8

*Means significantly different; $\chi^2 = 52.12$; P < 0.001.
†Means significantly different; $\chi^2 = 148.19$; P < 0.001.

Tables from Ellestad-Sayed et. al. "Breast-Feeding Protects Against Infection in Indian Infants" Canad. Med. Assoc. J. Vol. 120, 1979.

FISHER, Q. ET. AL. "JAUNDICE AND BREAST-FEEDING AMONG ALASKAN ESKIMO NEWBORNS," AMER. J. DIS. CHILD., 114: 859-861, 1978.

A pattern of jaundice and neonatal feeding practices has been observed in Alaskan Yupik Eskimo newborns. This study describes the clinical history and offers a partial explanation. Sixty-eight breast-fed and 27 bottle-fed infants were included in the study. Cord or capillary blood specimens were obtained from the infants for the first five days after birth. Bilirubin concentrations were determined. Breast milk and maternal urine and serum were obtained and examined for bilirubin glucuronyl transferase. Although both groups of infants experienced high bilirubin levels, the breast-fed had higher concentrations of bilirubin than the bottle-fed. A marked capacity to inhibit hepatic glucuronyl transferase was observed in breast milk.

FRANTZ, K.B. ET. AL. "MANAGEMENT OF THE SLOW-GAINING BREAST-FED BABY," J. OF HUMAN NUTURING, 3(4):288-308, 1978.

Breast-feeding in the United States has increased from 25% in 1971 to 45% in 1977. In view of this increased prevalence and citations of the desirability of breast-feeding, this article cites means of examining whether slow weight-gain in the breast-fed child is due to some behavioral or physiological problem and of deciding whether it is acceptable or not. Means of correcting problems are also suggested.

FRENCH, J.G. "RELATIONSHIP OF MORBIDITY TO THE FEEDING PATTERNS OF NAVAJO CHILDREN FROM BIRTH THROUGH TWENTY-FOUR MONTHS," AMER. J. OF CLIN. NUTR., 20(5): 375-385, 1967.

Study of 139 Navajo infants from birth to 24 months of age. Economic factors may play an important role in influencing the use of formula. Bottle-fed infants had a significantly higher incidence of diarrhea from birth through 12 months than breast-fed babies. The incidence of hospital experience of the bottle-fed was significantly higher than that of the breast fed for the first nine months of life.

GERRARD, J.W. "ALLERGY IN BREAST-FED BABIES TO INGREDIENTS IN BREAST MILK," ANNALS OF ALLERGY, 42(2):69-72, 1979.

Food antigens ingested by the mother may be absorbed by the mother and enter her breast milk. Some infants may be allergic to these. Case histories of eighteen (18) infants are cited here in which the infants were found to be allergic to food antigens. The criteria for allergy were normally placed on history, food avoidance, and challenge.

In two instances where both prick and RAST tests were carried out to cow's milk, both were strongly positive. The foods to which the babies were sensitive were cow's milk (16), oranges (2), and egg, apple, banana, coffee, strawberry, and tomato (1 each). The author concludes that these findings do not detract from the value of breast milk but simply confirms what many nursing mothers have observed -- ingested foods may upset the baby.

GHAJ, O.P. "FEEDING HABITS IN RELATION TO DIARRHOEA AND MALNUTRITION," INDIAN PEDIATR., 12:72, 1975.

A study of infant feeding patterns in urban, semi-urban and rural areas around Delhi showed that by the age of one year, 36.8 percent of urban, 4.5 percent of the semi-urban, and 2.1 percent of rural children were completely weaned from the breast. Solid foods were introduced before 9 months of age in 24.5 percent of the urban, and in 13.6 percent of the rural children. A large number of diarrheal spells were found in rural infants from 3 to 5 months old who were partially weaned than in those who were strictly breast-fed. In urban areas, early weaning did not increase the incidence of diarrhea, probably because of sanitary weaning practices and better hygiene.

GORDON, J.E. "DIARRHEAL DISEASE OF EARLY CHILDHOOD - WORLDWIDE SCOPE OF THE PROBLEM," ANNALS NEW YORK ACAD. OF SCI., 176:9-15, 1975.

Community control of endemic diarrheal disease on a group basis is prevalent. The incidence of diarrheal disease has dropped significantly in industrialized countries, but the aggregation of newborn infants in hospital nurseries and the practice of artificial feeding have resulted in epidemics of neonatal diarrhea in spite of high-grade environmental sanitation and good nutrition.

GRULEE, C.G. ET. AL. "BREAST AND ARTIFICIAL FEEDING:
 INFLUENCE ON MORBIDITY AND MORTALITY OF TWENTY THOUSAND
 INFANTS," J. OF THE AMER. MED. ASSOC., 103(10): 735-738,
 1934.

20,061 infants from birth to 9 months were studied during the years 1924-1929. Forty-eight and a half percent were totally breast-fed, 43.0% were partially breast-fed, and 8.5% were artificially fed. The total morbidity of the breast-fed group was 37.4%, and of the artificially fed group 63.6%. The average mortality of the infants per year was 1.1%. Of this mortality, 6.7% were in the breast-fed group, 27.2% were in the partially breast-fed group, and 66.1% among the artificially fed.

Infections and mortality in infants in the U.S.A. in 1934

	Percentage incidence of infection			
	Total infection	Respiratory	Diarthoea	Percentage deaths
Entirely breast-fed 9749 (48%)	37	28	5	7
Partially breast-fed 8005 (43%)	54	34	15	27
Artificially fed 1707 (8.5%)	64	39	16	66

GUNN, R., "CHOLERA IN BAHRAIN; BOTTLE-FEEDING AS A RISK FACTOR IN INFANT CHOLERA" 28TH ANNUAL EPIDEMIC INTELLIGENCE SERVICE CONF., CENTER FOR DISEASE CONTROL, ATLANTA, 1979.

To evaluate the risk associated with different feeding practices in relation to clinical cholera in infants, a matched-pair study of 42 infant cases and their controls was done during an outbreak of *Vibrio cholerae* biotype El Tor in Bahrain in August-October 1978. Significantly more case infants than controls were principally (>50%) bottle-fed than were principally breast-fed during the week before onset of illness ($p < .001$, estimated relative risk=9.0); the association was greater in the 0- to 6-month age group ($p < .01$, estimated relative risk=11.0) than in the 7- to 11-month age group ($p = .07$, estimated risk=7.0). Although the difference is not statistically significant, more case infants than controls were exclusively bottle-fed than were exclusively breast-fed ($p = .07$, estimated relative risk=7.0). Only 3 mothers of case infants and 5 of control infants had evidence of cholera infection (symptomatic or asymptomatic), and geometric mean serum vibriocidal antibody titers were similar for the 2 groups of mothers, which suggests that maternal infection did not affect the risk of the infants' having clinical cholera. These data support the contention that cholera should be added to the list of enteric diseases that occur significantly less frequently in breast-fed infants than in bottle-fed infants. (Author's abstract)

HANSON, L. "ESCH. COLI INFECTIONS IN CHILDHOOD, SIGNIFICANCE OF BACTERIAL VIRULENCE AND IMMUNE DEFENSE," ARCH. DIS. CHILD., 51:737-743, 1976.

The *Esch. coli* in the gut constitute a reservoir of potential pathogens in the infant and child. Human breast milk confers immunity against *Esch. coli* infections which are provided by secretory IgA antibodies. Consequently, breast-feeding may be of special significance until the baby has built up its own local immune defense, preventing the microorganisms from attaching to and invading the intestinal mucous membranes.

HIGGINBOTTOM, M.C. ET. AL. "A SYNDROME OF METHYLMALONIC ACIDURIA, HOMOCYSTINURIA, MEGALOBlastic ANEMIA, AND NEUROLOGIC ABNORMALITIES IN A VITAMIN B₁₂ DEFICIENT BREAST-FED INFANT OF A STRICT VEGETARIAN," THE NEW ENGL. J. MED., 209:317-323, 1978.

A six month-old male infant was admitted to the University of California Medical Center, San Diego, in a coma. He had been born at term, weighing 3 kg, the first child of an apparently healthy 26 year old vegetarian. The mother had not eaten any animal products for eight years and had taken no supplemental vitamins. She had breast-fed her infant exclusively and his development was normal up to 4 months of age. At four months of age his development began to regress, as manifested by loss of head control, decreased vocalization and lethargy.

The rapid reversal of biochemical abnormalities and clinical improvement in this infant after treatment with vitamin B₁₂ indicate that the metabolic, hematologic and neurologic abnormalities were all the consequence of an inadequate vitamin B₁₂ intake.

INGRAM, V. ET. AL. "DIARRHEA IN CHILDREN OF WEST PAKISTAN: OCCURRENCE OF BACTERIAL AND PARASITIC AGENTS," J. TROP. MED. HYG., 15:743-750, 1966.

Bacterial and parasitic agents were studied in 655 children under two years of age with diarrhea and a comparison was made with 468 age-matched controls without diarrhea. Most diarrhea cases were severely ill with dehydration and fever. Almost three-fourths showed evidence of malnutrition and half showed various degrees of marasmus and kwashiorkor. Dietary histories revealed that 88% of babies up to six months of age with diarrhea were receiving inadequate artificial feeding. Only 30% of control babies of the same age were receiving feeding other than breast milk. Enteropathogenic *E. coli* was found 2.5 times as much in diarrhea cases as in controls and most frequently in the age groups from birth to 6 months and from 13 to 18 months.

JACKSON, A.A., AND GOLDEN, M.H.N. "THE HUMAN RUMEN," THE LANCET, 2:764-767, 1978.

Children who are fed cow's milk tend to develop a rumen (due to the bacterial fermentation) which may lead to chronic diarrhea and malnutrition. The close association between the start of a diet based on cow's milk and the onset of diarrhea is evident. The diarrhea is usually caused by either lactose intolerance, milk-protein allergy, or a bacterial or viral infection. Often the diarrhea is cured when human milk is given.

JAKOBSSON, I. AND LINDBERG, T. "COW'S MILK AS A CAUSE OF INFANTILE COLIC IN BREAST-FED INFANTS," THE LANCET, 2:437-439, 1978.

Eighteen mothers of 19 breast-fed infants with infantile colic were put on a diet free of cow's-milk protein. The colic disappeared promptly from 13; in 12, it reappeared on at least two further indirect challenges (in the form of a diet containing cow's milk to the mother). Most infants became symptom-free at age 2 and 4 months; at 4 months, only 4 reacted with colic when the mother took cow's milk. Five infants were directly challenged with cow's milk; 4 reacted promptly with colic. Other signs of intolerance to cow's milk protein developed in 3 infants during weaning. The treatment of infantile colic in breast-fed infants by a diet free of cow's milk for the mother appears worthwhile.

JANSEN, A.A.J., "MALNUTRITION AND CHILD FEEDING PRACTICES IN WESTERN SAMOA," ENVIRON. CHILD. HLTH., 23: 293-306, 1977.

Anthropometric information on children in urban and rural areas of Western Samoa is reported along with interview data on infant and toddler feeding practices and maternal health. Reasons for weaning and bottle-feeding are given for the more urban (Apia) and rural (Savai's) areas. The information on breast-feeding practices is based on very small samples (39-94) but is quite interesting. Fifty-eight percent of the mothers in Apia and 28% in Savai weaned because of the child's age and development. The women in Apia more often weaned because of physical complaints or pregnancy. Information on food taboos, birth-spacing, birth-weight and perinatal mortality is also included in this report.

KARDJATI, S. ET. AL. "FEEDING PRACTICES, NUTRITIONAL STATUS AND MORTALITY IN PRE-SCHOOL CHILDREN IN RURAL EAST JAVA, INDONESIA," TROP. GEOGR. MED., 30:559-371, 1978.

Child feeding practices, nutritional status of pre-school children and child mortality are reported in this survey.

Age specific mortality, according to age at death was about 21% in the perinatal and 16% in the neonatal period; from 1-11 months (inclusive) it was 31%, from 1-5 years 19% and 8% until 12 years of age.

In rural areas surveyed, breast-feeding is commonly practiced for a prolonged period, sometimes up to 25-47 months after birth.* However, exclusive breast feeding is seldom practiced and supplementary food is introduced around the first week after the infant's birth. This supplementary feeding is usually not able to maintain adequate growth after the first 6 months. Malnutrition (according to weight-for-age standards) was diagnosed in 1% of the 0-5 months olds, 4% of the 6-11 month olds, and in 10% of the 1-3 year olds.

* 9% of pregnant women still nursed their youngest child.

KUMAR, S.P. AND SASKS, L.M., "HYPONATREMIA IN VERY LOW BIRTHWEIGHT INFANTS AND HUMAN MILK FEEDINGS," CLINICAL NOTES, 93(6):1026-1027, 1978.

Two case histories of premature infants who developed low sodium concentration while fed human milk are reported. The infant girls were born during the 26th and 27th weeks of pregnancy, weighing 960 and 1080 grams, respectively. Within 6 weeks after birth following hyaline membrane disease one infant suddenly failed to gain weight and the other developed apneic spells. Serum sodium levels were found to be low (122 and 110 meq/l). The inclusion of 6 meq/kg/day sodium quickly caused the serum sodium concentrations to return to normal. Normal growth ensued. The authors conclude that, in that low birth-weight infants cannot adequately conserve urinary sodium, 4-8 meq/kg/day supplements may be needed.

LARGUIA, A.M. ET. AL. "FRESH HUMAN COLOSTRUM FOR THE PREVENTION OF E. COLI DIARRHEA -- A CLINICAL EXPERIENCE," J. TROP. PEDIATR. ENV. CHILD. HLTH., 23:289-290, 1977.

An epidemic of diarrhea due to enteropathogenic E. coli was discovered in Sarda hospital in Buenos Aires. Weekly stool cultures of premature infants yielded pathogenic E. coli in 19.8 percent of the patient population. Such measures as closing the nursery to new admissions, reinforcement of hand washing, keeping babies in cohorts, use of oral colymycin and bacteriological surveillance of personnel did not stop the epidemic. Control was established after donated fresh colostrum, kept in refrigeration above freezing, was administered. E. coli continued to be recovered in stool cultures, but diarrhea was greatly reduced, and deaths were reduced from five in 1971, 12 in 1972, to zero in 1973.

LARSEN, S.A., AND HOMER, D.R. "RELATION OF BREAST VERSUS BOTTLE FEEDING TO HOSPITALIZATION FOR GASTROENTERITIS IN A MIDDLE-CLASS U.S. POPULATION," J. PEDIATR., 92: 417-418, 1978.

One-hundred seven infants under 12 months of age admitted to the Kaiser-Permanente Medical Center with acute gastroenteritis were compared to a larger "normal" population of children discharged from the nursery for frequency of breast-feeding. Forty of the 107 infants were under 6 months of age, 35 were born in the hospital nursery. (Only one of the 107 infants admitted with acute gastroenteritis was being breast-fed at time of admission). Although about one-third of the bottle-fed infants had started breast-feeding at birth, all had switched to the bottle at least one month prior to hospitalization.

Breast-feeding vs. bottle-feeding in 35 infants under 6 months of age hospitalized for gastroenteritis between January 1, 1973, and December 31, 1975

<i>Age group (mo)</i>	<i>No. bottle-fed at time of admission</i>	<i>No. breast-fed at time of admission</i>	<i>Estimated % of total population breast-feeding at end of age period</i>
0-1	1	0	39
1-2	4	1	31
2-3	6	0	30
3-4	7	0	26
4-5	4	0	21
5-6	12	0	17
	<u>34</u>	<u>1</u>	

LECHTIG, A. AND KLEIN, R.E. "EFFECT OF FOOD SUPPLEMENTATION DURING PREGNANCY AND LACTATION ON INFANT MORTALITY, MORBIDITY, AND PHYSICAL GROWTH." CONF. ON "EFFECTS OF MATERNAL NUTRITION ON INFANT HEALTH: IMPLICATIONS FOR ACTIONS," PANAJACHEL, GUATEMALA, 12-16 MARCH, 1979.

This study was conducted in four Guatemalen villages over a six year period. Two received high protein-energy liquid supplements, two received a low (non) protein-energy beverage. Medical care was provided in all villages. Conclusions reached from

this study indicate that nutritional supplementation of lactating women has more effect during the first six months; the effect on the child is more important during the last six months of the first year. Nearly all babies were breast-fed, but this was not considered in this study. Other conclusions reached are that there was a decrease in infant mortality from pre-study of 135 per thousand after both medical services and nutritional supplementation. There was a decrease in the proportion of low birth-weight and a lower proportion of children with physical growth retardation regardless of kind of supplement. Food supplementation did not decrease duration of diarrhea during the first year of life.

MACLEAN, W.C. AND AHN, C.H. "GROWTH OF THE EXCLUSIVELY BREAST-FED INFANT," AMER. J. CLIN. NUTR., 1979, (IN PRESS).

To investigate the length of time that human milk alone would be adequate for the physical growth of the infant, ninety-six infants of mothers in La Leche League International from the Washington, D.C. - Baltimore area were studied. They had exclusively breast-fed their infants for at least six months within the past two years.

The average duration of exclusive breast-feeding was seven months; three infants were fed solely human milk through twelve months or more. The weight and length curves of these infants during the period of exclusive breast-feeding remained above the 50th percentile of the NCHS population through at least the sixth month, and above the 25th percentile through the ninth or tenth month of life. There was no significant difference between weight and length curves of infants who had been exclusively breast-fed six months or less and those of infants who had been exclusively breast-fed longer than six months. Of the other characteristics investigated, birth-order, infant's vitamin/mineral supplementation, parents' level of education and reported reasons for starting solids were significantly different between the two groups.

The results of this study indicate that most infants breast-fed by healthy mothers do not need supplementation during the major part of their first year of life in order to grow adequately. These findings have practical implications for the developing countries, where solids and milk-formulas are often given to three to six month old infants, more often than not, to the detriment of their health and nutritional state. Supplementation of the mother's diet in conjunction with prolonged exclusive breast-feeding might be a better way of sustaining growth of infants in these environments.

MATA, L.J. ET. AL. "BREAST-FEEDING, WEANING AND THE
DIARRHOEAL SYNDROME IN A GUATEMALAN INDIAN VILLAGE,"
ACUTE DIARRHEA IN CHILDHOOD. A CIBA FOUNDATION SYMPOSIUM
42:311-330, 1976.

This paper deals with the relationship of diarrhoeal disease with nutrition and health which was observed in a long-term prospective study in the highland Guatemalan Indian village of Santa Maria Cauque. Children were observed from birth to preschool age in their natural setting. Observations refer to the relationship between child feeding and diarrhea, weight loss, reduced intake and impaired physical growth.

The study placed an emphasis on home visits to obtain observations and to minimize gatherings at the clinic which could favour iatrogenic contamination and dissemination of community infections.

During the period of exclusive breast-feeding (two to four months in the village) infants were quite resistant to intestinal infection by enteric bacteria and protozoa. The child's intestine was relatively free of shigella and protozoa for weeks or months providing that maternal milk was the sole or main food received. However, after the introduction of weaning foods, the child became more susceptible to intestinal bacterial infection. The protracted weaning consisted of progressive administration of foods of low biological value given under deficient sanitary conditions.

Infectious diseases, especially diarrhea, were found to be associated with pronounced reductions in the already deficient calorie intake. These diseases were common during the first 6 to 18 months of life. The consequences of the malnutrition-infection interaction resulted in a marked stunting of growth which was evident from examination of the growth curves of village children. By contrast, the duration of breast-feeding was strongly associated with growth in the linear segment of the growth curve. The data indicate that infection is one of the leading factors associated with reduced calorie (and protein) intakes during the critical period of onset of malnutrition and mortality in childhood. By preventing infection, particularly diarrhea, the food intake, nutrition and growth of children could be significantly improved.

NWUGA, V., "EFFECT OF SEVERE KWASHIORKOR ON INTELLECTUAL
DEVELOPMENT AMONG NIGERIAN CHILDREN." THE AMER. J. OF
CLIN. NUTR., 30: 1423-1430, 1977.

What is the consequence on intellectual ability of severe malnutrition? This study follows up children at age 9 and 10 who had earlier been admitted to a hospital in Ibadan for kwashiorkor. This group was compared using psychological tests with siblings, upper class children and rural children who also suffered from kwashiorkor. Results showed that the test group performed poorly on intellectual tests when compared with siblings and upper class children. Male children seemed more affected than female children.

PARKER, R.L., ET AL., "THE NARANGWAL EXPERIMENT ON INTER-ACTIONS OF NUTRITION AND INFECTIONS: III. MEASUREMENT OF SERVICES AND COSTS AND THEIR RELATION TO OUTCOME." INDIA MED. J., 1978.

This paper reports on 5 years of field research undertaken in 26 villages in Punjab, India with a population of about 25,000 people. Funded by numerous Indian and international agencies, and using a staff of 200, the Narangwal experiment was an important investigation on the cost-effectiveness of low cost health delivery in rural areas.

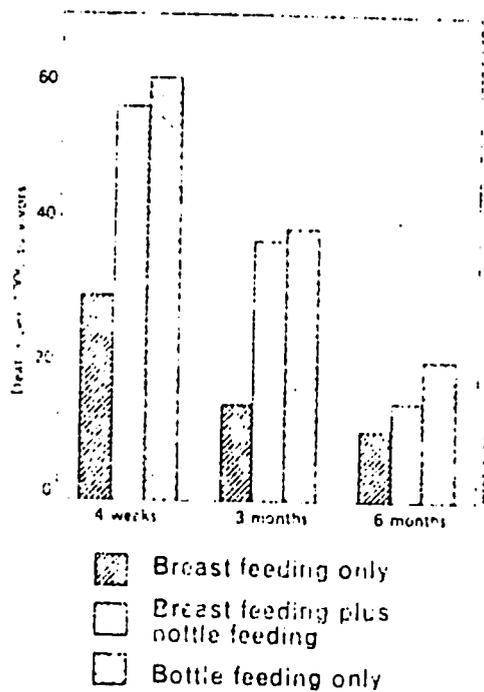
Sample findings reported in this paper include comparisons of the cost of different programs relative to each death averted. The researchers found that prenatal child care (averting still births) was the most economical intervention ranging in cost from Rs. 570 to RS. 1010 for each perinatal death averted. Still births were less expensive to prevent than infant deaths while the latter were one-seventh as expensive to prevent as child deaths.

PAYNE, P.R. "SAFE PROTEIN-CALORIE RATIOS IN DIETS, THE RELATIVE IMPORTANCE OF PROTEIN AND ENERGY INTAKE AS CAUSAL FACTORS IN MALNUTRITION," AMER. J. OF CLIN. NUTR., 28:281-286, 1975.

Assessing minimum protein and minimum energy requirements is complicated by individual variation and the fact that protein and energy requirements are not independent of each other. Two methods of relating protein to energy requirements are examined. The adequate "safe" level of protein to energy ratio in the diets of 2 to 3 year olds is close to 5%. Since most varieties of cereal grains appear to provide utilizable protein levels close to this amount, this supports the view that primary protein deficiency is unlikely to be the main factor causing protein-energy malnutrition in communities where cereals are the cheapest source of energy.

PLANK, S.J. AND MILANESI, M.L. "INFANT FEEDING AND INFANT MORTALITY IN RURAL CHILE," BULL. WLD. HTH. ORGAN., 48: 203-210, 1973.

The mortality pattern found in Chile appears to be determined by social rather than biological factors in the high parity, late weaning group of mothers. Postnatal deaths were significantly more frequent (relative risk of 3 to 1) among infants who were bottle fed in the first three months than those who were exclusively breast-fed during that time. Mixed feeders of bottle and breast had no advantage, and deaths occurred only after breast-feeding stopped. The average age for introducing any food other than milk was six months, fewer than 41% of the infants were given additional foods any earlier. Mortality rate was affected by family income, environmental factors (standards of sanitation) and medical reinforcement. Differential rates are attributable to bottle feeding and neglect of supplementary foods.



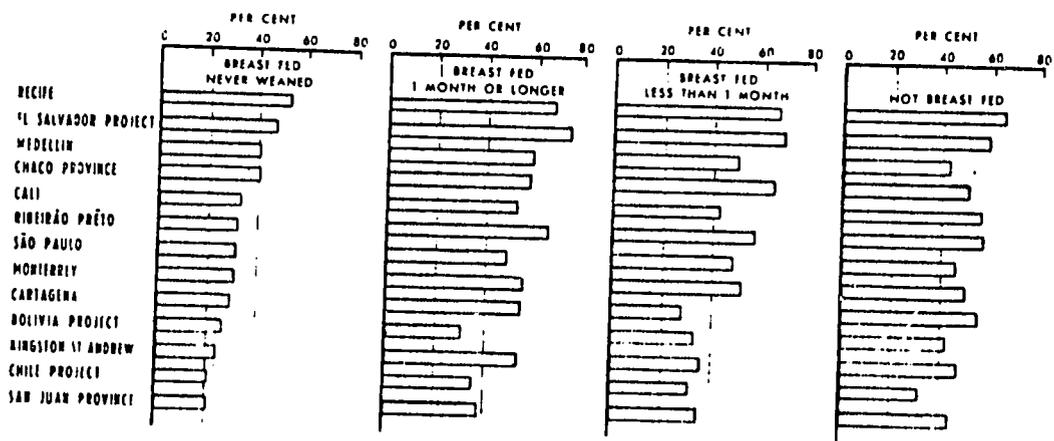
Data from PLANK, S. J. & MILANESI, M. L.
 Infant feeding and infant mortality in Chile.
Bulletin of the World Health Organization, 48: 203-220 (1973).

Mortality rate in the first year of life among infants surviving at 4 weeks, at 3 months and 6 months by type of feeding.

PUFFER, R.R. AND SERRANO, C.V. "BREAST-FEEDING, IN PATTERNS OF MORTALITY IN CHILDHOOD: REPORT OF THE INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD," WASHINGTON, D.C.: PAHO, 1973 (SCIENTIFIC PUBLICATION No. 262) PP. 257-271.

The relationship of breast-feeding to infant mortality in 13 Latin American communities was studied. Data revealed a widespread lack of breast-feeding and its early termination due to increased use of artificial feeding in hospitals and intensive promotion in the public sector. The lack of breast-feeding, or artificial feeding without nutritional supplements appears to be related to infant deaths due to diarrheal disease or nutritional deficiency. The proportion of infants aged one month to five months who died was substantially higher in all 13 regions among infants never breast-fed than among breast-fed infants who had not been weaned.

Percentage of Infants Dying at 28 Days-5 Months of Age from Diarrheal Disease According to Breast Feeding in 13 Latin American Projects.



RAKMONO, B. ET. AL. "INFANTILE DIARRHOEA IN A POPULATION OF LOW SOCIO-ECONOMIC GROUP," SOUTHEAST ASIAN J. TROP. MED. PUB. HLTH., 2:249-255, 1971.

A group of 48 full-term babies (ranging in weight from 2,700-3,500 grams) in a crowded slum area of Djakarta were followed up from birth to the age of one year. Twenty-four infants were breast-fed for the entire year; 21 infants received breast milk for intervals ranging from several days to nine months. The mothers were advised to provide supplementary food as early as three months. The nutritional status of the 49 infants who reached the age of one year was as follows: 22 were of normal weight and 13 were in the first degree of malnutrition. A local milk product, which consisted of skimmed milk enriched with vitamins, was given to 17 of the underweight infants as early as age three days and as late as the last month of the first year of age.

A total of 109 diarrheal episodes were recorded in the year studied. The average number of diarrheal episodes per infant per 100 weeks of observation was 4.9, with each episode lasting from one up to 16 days. There were eight deaths in infants ranging from 3.5 months to 9.5 months of age. Seven of these were related with a diarrheal episode. Six were related to malnutrition. It was concluded that the treatment and supplementary milk given were not adequate enough to reduce the infant mortality as long as the poor environmental conditions prevailed.

RICHARDSON, F.H., "UNIVERSALIZING BREAST-FEEDING IN A COMMUNITY," J. OF THE AMER. MED. ASSOC., 85(9): 668-671, 1975.

Data showed conclusively that there is more sickness among children who have not been breast-fed. The infant mortality dropped markedly when mothers were on a demonstration program that had nursing staff and physicians trained and interested in the techniques of breast-feeding and promoted breast-feeding.

ROBINSON, M. "INFANT MORBIDITY AND MORTALITY," THE LANCET, 1:788-794, 1951.

3,266 infants were studied to determine causes of mortality and morbidity. The diversity in infant-mortality evident in different parts of England was found to depend on: (1) the proportion of large families; (2) the proportion of breast versus bottle-fed infants; (3) the number of ill infants who received prompt medical attention; and (4) the incidence of communicable diseases in the school and adult population. The risk of infection increased as the size of the family increased. Breast-feeding reduced both the morbidity and the mortality rates, especially the latter.

Relation between feeding and mortality and morbidity in Liverpool, England

	Number of infants	Mortality, per 1000	Morbidity, per 1000	Case-mortality per cent
Breast-fed	971	10.2	223.4	4.6
Partly bottle-fed	1441	25.7	464.2	5.5
Bottle-fed	854	57.3	573.7	10.0
Total	3266	29.3	421.3	6.9

SCHOUB, B.D. ET. AL. "THE ROLE OF BREAST-FEEDING IN THE PREVENTION OF ROTAVIRUS INFECTION," J. MED. MICROBIOL., 11:25-31, 1977.

Breast-fed infants are less susceptible to gastroenteritis than bottle-fed infants. Antibodies against rotavirus, the major pathogen of infantile gastroenteritis, were sought in human sera, colostrum and milk specimens by immunofluorescence. An experimental murine-rotavirus model was established by infecting the second litters of dams 4 weeks after infecting their first litters. Antibodies were absent from human and murine colostrum and milk specimens despite being present in virtually all sera, and the second mouse litters were as susceptible as the first. The inability of rotavirus to infect adult human beings and mice may prevent the formation of gut-derived antibody-secreting lymphocytes in milk, and thus prevent transmission of passive immunity. The association of bottle-feeding with rotavirus gastroenteritis appears to be the result of increased opportunity for spread of infection rather than of the absence of specific protective antibody.

SIMMON, A. ET. AL. "S-IGA CHOLERA TOXIN AND ROTAVIRUS ANTIBODY IN HUMAN COLOSTRUM," ACTA PAEDIATR. SCAND., 68:161-164, 1979.

This report describes a semi-quantitative assay of anti-cholera toxin S-IgA antibody in 43 colostrum samples by means of an enzyme-linked immunosorbent assay (ELISA) as an alternative to neutralization techniques. Additional evidence is presented to confirm that colostrum from Costa Rican women contain significant levels of anti-rotavirus antibody. Rotavirus antibody persisted to detectable levels throughout 24 months of lactation.

SURJONO, D., ET AL., "BACTERIAL CONTAMINATION AND DILUTION OF MILK IN INFANT FEEDING BOTTLES." MEDICAL FACULTY GADJARA MADA UNIVERSITY, YOGYAKARTA, INDONESIA, 1978. (UNPUBLISHED PAPER).

While the value of breast-feeding has been well established, much less systematic research exist on problems of bottle-feeding. This study, planned as a fore-runner to more detailed investigations, showed a high level of bacterial contamination and incorrect dilution, so that "the danger of bottle-feeding, even among the better-off group in this society is immediately apparent."

Fifty-one of 53 infants were aged 1-18 months, 2 were two years old. One-half of the group was being partially breast-fed. Twenty-five had suffered diarrhea in the past month. Few mothers mixed the formulas correctly even though the group was highly educated by Indonesian standards. Of 52 milk samples of ordinary formula use, one third were less than 50% of proper strength. Only one-half were within 20% of the recommended concentration according to the commercial table. 80% of the mothers had over 6 years of schooling. This is a very highly educated group by Indonesian standards, yet only 1 in 4 mixed the milk to proper dilution.

Three-fourths of the group had bacterial densities in excess of 10,000 per ml., and 10% exceeded 1 million per ml.

Stated reason for use of feeding bottle

Insufficient Breast milk	14
Mother out of house	12
Breast milk never came	8
Mother ill	5
Child was hospitalized	4
Mother deceased	3
Other	7

WALKER, A.R.P. "INFANT FEEDING PRACTICES IN SOUTH AFRICA,"
S. AFR. J., 54:820-822, 1978.

Within the last half century, there has been a very marked drop in frequency and duration of breast-feeding among South African Whites, Blacks, Indians and Coloureds. Bottle-feeding, compared with breast-feeding, is associated with the increased morbidity and mortality, especially from gastroenteritis and respiratory infections. Reasons for the decline in breast-feeding (both nutritional and non-nutritional) are discussed briefly, as well as attempts made at remedial measures. The author feels that an urgent statement with maximum publicity should be made by pediatricians. It should provide guidance to be given at hospital, clinic and home on the benefits of breast-feeding, the correct preparation of commendable bottle-feeds, and also the appropriate time for introduction of solid foods.

APPROXIMATE FREQUENCY AND DURATION OF
 BREAST FEEDING IN SOUTH AFRICAN ETHNIC
 POPULATIONS

Population	% including partial feeding	% breast feeding at 4 months*
Whites		
USA (1920) ¹	90	
UK (1974) ¹	28	8
Belgrade ¹	90	70
Johannesburg ⁴	50	25
Cape Town ¹		5 (6 wks)
Coloureds		
Johannesburg	90	50
Cape Town ¹		10
Indians		
India ¹	90	90 (1 - 2 yrs)
UK ¹		5 (6 wks)
Johannesburg	90	50
Blacks		
Rural ¹	90 - 100	80 - 90
Urban		
Johannesburg ⁴	90 - 100	80 - 90
Durban ¹		50

* This proportion includes mothers whose babies are exclusively or partially breast fed

WHITEHEAD, R.C. "PROTEIN AND ENERGY REQUIREMENTS OF YOUNG CHILDREN LIVING IN THE DEVELOPING COUNTRIES TO ALLOW FOR CATCH-UP GROWTH AFTER INFECTIONS," AMER. J. OF CLIN. NUTR., 30:1545-1547, 1977.

Children who have lost weight because of infection or other illnesses need to produce catch-up growth after the illness is over. This catch-up growth can be rapid but requires a higher minimum protein intake relative to energy intake than does normal growth. The normal rate of growth of a 7 kilogram child is about 10 grams a day, but in a nutritional rehabilitation center, rates up to 7 times this value were encountered. Growth is not a steady process. When nutrients (relative to energy content of food) are not sufficient, the child will take longer to grow.

WHORWELL, P.J. ET. AL. "BOTTLE FEEDING, EARLY GASTROENTERITIS AND INFLAMMATORY BOWEL DISEASE," BRIT. MED. J., 1:382, 1979.

This study examined the pattern of breast-feeding in 57 patients with Crohn's disease, 51 patients with ulcerative colitis and 51 controls. A questionnaire was administered with information relating to infant feeding practices and history of gastroenteritis in the first six months of life. Breast-feeding was considered to have ceased when any other food was started.

The results showed that 29.9% of patients with ulcerative colitis compared with 11.8% of controls had never been breast-fed. No such differences were noted in the Crohn's disease group. There was a significant difference in a history of early gastroenteritis in patients with Crohn's disease - 10.5% as compared with .9% in controls, independent of bottle feeding.

WYON, J.B. AND GORDON, J.E. THE KHANNA STUDY, CAMBRIDGE, MASSACHUSETTS; THE HARVARD UNIVERSITY PRESS, 1971.

Mortality in infancy and early childhood in a longitudinal study of 11 villages in the Khanna region of rural Punjab India was analyzed. The method of infant feeding as well as the infant's age at the time of addition to solid food were recorded. The neonatal mortality rate was 75/1000 live births. Virtually all infants who died in the first few months of life did not receive breast milk.

This review, which has extensive historical references, attempts to answer three questions: Does maternal nutrition affect lactation; does lactation affect infant survival; do maternal nutrition and lactation affect fertility?

On the first, Wray states from previously published studies by Bailey, Gopalen, Rao, Underwood, etc. that the quality of breast milk is affected only when the diet of the mother is grossly inadequate. The quantity of milk produced decreased with maternal dietary inadequacy, sometimes as much as 40-50%. He also concludes that the daily volume of breast milk determines the timing of growth faltering that occurs in solely breast-fed infants. Because there are millions of women who fall in this category of very low dietary intake, the effects of better maternal nutrition on whole populations should be a serious issue, especially when breast-feeding is the only economically feasible option.

Wray infers from the literature that in modern times, there is little difference in morbidity rates of infants breast- or bottle-fed. The death rate from infectious diseases among bottle-fed babies is significantly higher. The reason is due to nutritionally deficient feeds.

Wray discusses the historical and clinical studies which show that lactation does affect ovulation, prolonging amenorrhea about 12 months longer in lactating women than in non-lactating women. Clinical studies by Van Bolen indicate that the major inhibitor of ovulation is the sucking process regardless of nutrition level. There are so many factors which shorten duration of lactation that no conclusive statement can be made of the effect of improvement of maternal nutrition on duration of lactation.

Womens' reasons for discontinuing breast-feeding in the first year of life, as reported in three countries: India, Jamaica, Colombia.

Reasons	Per cent reporting		
	India	Jamaica	Colombia
Milk stopped	29.1	43	34.8
New pregnancy	46.8	--	21.1
Maternal illness or death	19.6	9	7.4
Working	--	13	4.2
Advertising	--	14	--
Miscellaneous	4.5	10	4.5

ZEITHIN, M. ET. AL, "BREAST-FEEDING AND NUTRITIONAL
STATUS IN DEPRESSED URBAN AREAS OF GREATER MANILA,
PHILIPPINES," ECOLOGY OF FOOD AND NUTR., 7:103-113,
1978.

The aim of this paper was to examine the significance of breast-feeding within the context of other determinants of nutritional status in the poorest urban areas of Manila, Philippines. In a sample of 513 six to forty-eight month old children, bottle-feeding was not a statistically significant cause of malnutrition. However, marasmic infants were weaned from the breast earlier than nutritionally normal infants. Among six to twelve-month-old infants, mean weight for age of those bottle-fed or weaned by two months was slightly greater than for those still breast-fed, although both groups were severely malnourished.

IMPACT OF FEEDING PRACTICES ON MORBIDITY AND MORTALITY

- BEAVER, M. W., "Population, Infant Mortality and Milk." Pop. Studies, 2: 243-254, 1973.
- BRAUN, O., "The Protective Effect of Human Milk Against Infections and its Potential Causes." Kinische Paediatric, 133 (4): 297-310, July 1976.
- BULLEN, J. J., "Iron-Binding Proteins and Other Facts in Milk Responsible for Resistance to Escherichia Coli." Ciba Foundation Symposium, 42 (1): 49-69, 1976.
- CANTRELLE, P. and LERIDON, H., "Breast-feeding, Mortality in Childhood and Fertility in a Rural Zone of Senega." Pop. Studies 25: 505-533, 1971.
- EDITORIAL, "Breast-feeding: the Immunological Argument." Br. Med. J., May 13, 1970.
- EDITORIAL, "Mothers in Poverty: Breast-feeding and the Maternal Struggle for Infant Survival." The Lactation Review, 2 (3), 1977.
- GENERAL PRACTITIONER FORUM. "The Influence of Breast-feeding on Incidence of Infectious Illness During the First Year of Life." Practitioner, 208: 356-362, 1972.
- GOTHEFORS, L., "Symposium on Breast-feeding: Host Resistance Factors." J. Trop. Pediatr., 21 (5): 260-263, Oct. 1975.
- GRIFFITHS, E., "Bacteriostatic Effect of Human Milk and Bovine Colostrum on Escherichia Coli: Importance of Bicarbonate." Infective Immunology, 15 (2): 396-401, Feb. 1977.
- HABICHT, J.P., "Relationships of Birthweight, Maternal Nutrition and Infant Mortality." Nutr. Reports Internat., 7 (5), May 1973.

IMPACT OF FEEDING PRACTICES ON MORBIDITY AND MORTALITY

KANAANEH, H., "Relationship of Bottle Feeding to Malnutrition and Gastroenteritis in a Pre-Industrial Setting." J. Trop. Pediatr. Environ. Child Hlth., 18: 302-306, 1972.

KNODEL, J., "Two and a Half Centuries of Demographic History in a Bavarian Village." Pop. Studies, 24: 109-131, 1967.

MARKWELL, L., "Infant Feeding and Infant Mortality in Rural Chile." Bull. Wrld. Hlth. Organ., 48: 302-210, 1973.

MATA, L.J., KRONMEL, R. A., URRUTIA, J.J., and GARCIA, B., "Effect and Infection of Food Intake and the Nutritional State: Perspective as Viewed from the Village." Amer. J. Clin. Nutr., 30: 1215-1227, 1977.

ROSA, F. W. and TURSHER, M., "Fetal Nutrition." Bull. Wrld. Hlth. Organ., 43: 785-795, 1970.

ROWE, J., et al., "Nutritional Hypophosphatemic Rickets in a Premature Infant Fed Breast Milk." New England J. of Med., 300: 293-296, 1979.

SCHAEFER, O., "Otitis Media and Bottle Feeding." Canad. J. of Pub. Hlth., 62: 478-489, 1971.

SCHIMSHAW, N.S., "Effect of Infection on Nutrient Requirements." The Amer. J. of Clin. Nutr., 30: 1536-1544, Sept. 1977.

SPIKANTIA, S.G., and SIVAPRASAD, J., "Anaemia and Immune Response." The Lancet, 1 (7973): 1307-1309, June 19, 1976.

TONK, G., "Relation of Diet to Variation of Dental Caries." J. Amer. Dental Assoc., 20: 396-403, 1965.

VAHLQUIST, B., "The Transfer of Antibodies from Mother to Offspring." Advances in Pediatrics, S.Z. Levine (ed), Year Book Medical Publishers, Chicago, 10: 305, 1958.

WHEATLY, D., "Incidence and Treatment of Infantile Gastroenteritis in General Practice." Arch. Dis. Child., 53: 53-57, 1968.

VI. BREAST-FEEDING AND REPRODUCTION

VI. BREAST-FEEDING AND REPRODUCTION

ANON. "LACTATION, FERTILITY AND THE WORKING WOMAN,"
(WORKING CONFERENCE) TROP. PED. ENVIRON. CHILD HLTH.,
:3-11, 1979.

The purpose of the Conference was to suggest ways and means of enabling the working mother to combine her two roles - those of a mother and a productive worker - with the support of necessary legislation and social measures.

The recommendations included the recognition of the dual role of women, in that they have the right to work outside the home and bear children as well. Some of the measures suggested included a minimum of three months maternity leave, the development of social support services suited to and beneficial for both mother and child in different societies, and the provision of suitable facilities for the working woman to breast-feed her child. The cost of any measures instituted should be the responsibility of the society or community as a whole, and not fall on the employers or the working mothers. Prolonged breast-feeding was considered to be a more effective method of fertility regulation worldwide than the use of other forms of contraception. However, it was decided that advice on preventing unwanted pregnancies and the provision of suitable forms of contraception should be part of the supportive measures available to the breast-feeding, working woman.

AYANGADE, S.O. "BIRTH INTERVAL STUDY IN A CULTURALLY STABLE
URBAN POPULATION," INT. J. GYNAECOL. OBSTET., 15:497-
500, 1978.

Five-hundred Nigerian women were interviewed within 2 days of delivery to examine indigenous birth spacing among the urban and rural population of the township. The crude birth interval was between 30 and 40 months due primarily to cultural attitudes towards lactation and sexual abstinence. Over 75% breast-fed their babies for more than 12 months, but less than 10% had practiced contraception using any modern methods.

The average Nigerian woman has a long reproductive period which often begins at age 16 and continues until she is 42. However, it is not socially acceptable for both a daughter and her mother to nurse an infant at the same time.

BUCHANAN, R. "BREAST-FEEDING - AID TO INFANT HEALTH AND FERTILITY CONTROL," POP. REPORTS, SERIES J, No. 4, 1975.

The numerous advantages of breast-feeding are listed with particular emphasis on the contraceptive effect which serves as a major mechanism for fertility control in developing countries with high birth rates. A thorough section on lactation and fertility is presented, along with contraceptive methods during lactation and a review of family planning program issues. Other topics covered include the physiology of lactation, techniques and requirements of breast-feeding, benefits of breast-feeding and incidence and duration of breast-feeding.

DELGADO, M. ET. AL. "NUTRITION, LACTATION AND POSTPARTUM AMENORRHEA," AMER. J. CLIN. NUTR., 31:322-327, 1977.

The authors indicate that the longer the duration of lactation, the more prolonged the period of postpartum amenorrhea (absence of menstruation). This effect can average nine months beyond the usual in populations not breast-feeding at all. Poor nutrition and prolonged lactation lengthen the period of amenorrhea and decrease fertility. Improved nutrition could mean higher fertility. However, this effect should be offset by a higher proportion of children surviving and the anti-fertility effect of longer lactation which improved nutrition permits.

Dow, T.E. "BREAST-FEEDING AND ABSTINENCE AMONG THE YORUBA," STUDIES IN FAM. PLAN., 8:208-214, 1977.

This paper considers the implications of present and prospective breast-feeding and abstinence patterns among the Yoruba for family planning practice and policy. Data are drawn from four surveys conducted in Nigeria between 1973 and 1975. Women living in rural areas and those in richer and poorer residential sections of the city of Ibadan were interviewed in the first survey. Responses indicated mean durations of breast-feeding of 22 months in rural and poorer urban communities and 9 months in richer urban communities. An inverse relationship between duration of breast-feeding and level of education and a direct relationship between age and duration of breast-feeding were observed in the first survey.

FRISCH, R.E. "POPULATION, FOOD INTAKE, AND FERTILITY,"
SCIENCE, 199: 22-30, 1978.

In an historical analysis of data from mid-Nineteenth Century England, Frisch examines the hypothesis that poor nutrition and hard living conditions may explain the relatively small size of the completed family of lower socio-economic classes in England during the mid-1800's. A shorter and less efficient reproductive span (for example, later menses and earlier menopause in women) could account for the smaller families. Quoting medical texts from the 1880's, Frisch found frequent references such as "she's too thin to get pregnant" or "she's too thin to menstruate regularly". If undernourished human beings are less fecund than well nourished populations, this can be regarded as an ecological adaptation to reduced food supplies. The historical data do not rule out the possibility that contraception (such as coitus interruptus) explains the lower fertility of the lower classes in Britain in the mid-1800's.

GEISSLER, C; ET. AL. "LACTATION AND PREGNANCY IN IRAN
II. DIET AND NUTRITIONAL STATUS," AMER. J. CLIN. NUTR.,
31:341-354, 1978.

Dietary intake in the third month postpartum and nutritional status during pregnancy close to term were assessed in urban Iranian women of low and middle socio-economic status in a population where failed lactation is a serious problem. Dietary intake was assessed by the 24-hour recall. The middle class ate more animal products, fruit and vegetables. Both groups had a nutrient intake of less than 80% of FAO recommendation of energy, Vitamin B, folacin, calcium, iron and zinc. Significant differences were found in hemoglobin, hematocrit and total serum protein. Adequacy of lactation correlated well with postpartum weight and percent of standard weight for height in the low socio-economic group.

GEISSLER, C. ET. AL. "LACTATION AND PREGNANCY IN IRAN
III. HORMONAL FACTORS," AMER. J. CLIN. NUTR., 32:1097-
1111, 1979.

The serum levels of placental lactogen, growth hormone, cortisol, and thyroid hormones were measured in two groups of pregnant women from low and low-middle socioeconomic areas of Teheran. The purpose was to examine the relationship of these hormones to adequacy of lactation and to nutritional and socioeconomic status in urban Iranian women. The hormones were measured two weeks before the expected delivery and 3 months after delivery. Significant differences were found in the biochemical parameters between socioeconomic groups. Hemoglobin and serum albumin values were lower and all the globulin fractions (except α_2 globulin during pregnancy), growth hormone and

cortisol were higher in the low than the middle socioeconomic group, both during pregnancy and postpartum. The levels of growth hormone and cortisol were significantly lower in subjects with adequate lactation than inadequate or ceased lactation. No correlations were found between nutritional status and lactation adequacy or free thyroxine values. These results show that growth hormone and cortisol play a role in stress and malnutrition and there is some evidence of a reciprocal relationship between growth hormone and prolactin. Consequently, these hormones may be a link in the chain between the urban environment, malnutrition and lactation failure.

GROSS, B.A. AND EASTMAN, C.J. "PROLACTIN SECRETION DURING PROLONGED LACTATIONAL AMENORRHEA," AUST. N.Z. J. OBSTET. GYNAEC., 19:95-99, 1979.

Basal serum prolactin levels were elevated up to 66 weeks postpartum in lactating amenorrhoeic women. The serum prolactin level in fully breast-feeding women was significantly higher than in women who were partially breast-feeding. The mean basal serum prolactin level in menstruating, lactating women was significantly higher than the mean level in women who had weaned and had normal menstrual cycles. The rise in prolactin due to suckling was seen up to 66 weeks postpartum. The marked variability and lack of reproducibility of individual suckling responses may obscure the importance of prolactin secretion in the postpartum period. Nevertheless, this study confirms that prolactin secretion is increased in women with prolonged lactational amenorrhoea. (Author's abstract).

KAMAL, I. ET. AL. "CLINICAL, BIOCHEMICAL, AND EXPERIMENTAL STUDIES ON LACTATION," AMER. J. OF OBSTET. AND GYNECOLOGY, 105(3):314-323, 1969.

A study of 29 lactating mothers was conducted. The average age for weaning was 15.1 months, and for breast milk supplementation, 6 months. Maternal age and age at weaning are positively correlated, the older the mother, the longer the lactation. More than one-third of the mothers had their first menses within the first 3 months of delivery; after 9 months, two-thirds of the lactating mothers were menstruating, and by the end of the 15th month, 87% were menstruating. More than half of the mothers became pregnant during lactation (half during the first year after delivery), even during lactation amenorrhoea. Lactation is far from being a satisfactory method of birth control.

KNODEL, J. "BREAST-FEEDING AND POPULATION GROWTH,"
SCIENCE, 198:1111-1115, 1977.

Abandonment of breast-feeding in parts of the world where contraception is not in common use may mean both higher birthrates and, especially among the poor, higher infant death rates. In this article estimates of the magnitude of these effects are made.

MCNEILLY, A.S. "EFFECTS OF LACTATION ON FERTILITY,"
BRIT. MED. BULL., 35:151-154, 1978.

This paper reviews present knowledge of mechanisms influencing the maintenance of infertility associated with lactation, including the hormonal control of lactation, and the status of the hypothalamopituitary gonadal axis during the period of lactational amenorrhoea. The relationship between lactation and lactational amenorrhoea is related to the endocrine consequences of the continued application of the sucking stimulus rather than to the milk secretion process. In communities where breast-feeding is supplemented relatively early and the intensity of breast-feeding is reduced, the birth interval is reduced to under three years. This results in an increase in the number of children born in the reproductive lifespan of women and a consequent increase in population growth.

PREMA, K. ET. AL. "LACTATION AND FERTILITY," AMER. J. OF CLIN. NUTR., 32:1298-1303, 1979.

A study of 1079 urban hospital attending women was undertaken to evaluate their breast-feeding practices. Prolonged (mean duration of lactation 19.8 months) and successful lactation (failure of lactation occurred in only 3.5%) was common among this group. But a trend toward shorter duration of breast-feeding was found among the educationally and economically better off segment. There was very good correlation between mean duration of lactation, lactation amenorrhoea, and interpregnancy interval. Therefore, it is possible that decrease in duration of lactation might result in shorter interpregnancy interval. The duration of lactation appeared to be "fixed" for each individual irrespective of age and parity. This in turn resulted in "fixed" duration of lactational amenorrhoea and interpregnancy interval under conditions of unhindered lactation and uncontrolled fertility. Conception during lactational amenorrhoea was low (7.7%) but once periods were reestablished, lactation offered very little protection against conception.

"REPRODUCTIVE PERFORMANCE OF POOR INDIAN WOMEN ON A LOW PLANE OF NUTRITION," TROP. AND GEOG. MED., 23:117-125, 1971.

Weight gains in pregnancy in the women studied averaged 6.5 Kg though dietary intakes did not increase significantly. Even during lactation when calorie needs are greatest, dietary intakes were not commensurate with the levels of milk produced (average 700 ml. per day). Data suggested increasing birth weight with increasing parity. Nutritional deficiencies during pregnancy need to be further studied to determine critical levels needed to prevent higher incidence of stillbirths, miscarriages, low placental weights and low birth-weights among the poor.

ROSA, F., "BREAST-FEEDING: A MOTIVE FOR FAMILY PLANNING," PEOPLE, 3(1): 10-13, 1976.

Breast-feeding provides a degree of protection against pregnancy and is important for infant nutrition and survival. Reviewing 86 anthropological studies, Rosa found 20 societies which observed taboos on intercourse up to one year after delivery of a child. Sixty societies observed a taboo for more than one year. Because of the desire to avoid pregnancy during breast-feeding, this is a highly desirable time to introduce contraceptives. An estimated 35 million couple years of protection from conception are provided annually by breast-feeding in developing countries, a figure larger than the number of couple years of protection provided by all family planning programs put together.

THOMSON, A.M. ET. AL. "LACTATION AND REPRODUCTION," BULL. WLD. HLTH. ORGAN., 52:337-349, 1975.

This article is a review of the literature on the effect of lactation on fertility and the effect of contraception on lactation. Comparing data from several countries, they conclude that for the individual, lactation would be an unreliable contraceptive, but that sustained lactation does reduce fertility in populations. The literature on the effect of contraceptives on lactation is inadequate, however. There is some consensus that estrogen in birth control pills may have an adverse effect on lactation but progestins alone do not.

TYSON, J., "MECHANISMS OF PUERPERAL LACTATION," MED. CLIN. OF NORTH AMER., 61 (2): 153-163, 1977.

The extent of the prolactin peak is proportional to both the length of the nursing interval and the intensity of the stimulus (sucking). Secretion of prolactin is greater when both nipples are stimulated simultaneously. Secretion of prolactin seems to be moderated by changes in hypothalamic dopamine turnover - excess dopamine is inhibitory while depletion of dopamine is followed by release of prolactin. Sucking will produce depletion of dopamine stores. Milk composition varies with the time of day, duration of the feeding, and completeness of breast emptying. The child-spacing effect of lactation appears to be declining in developing countries with a decline in breast-feeding and socio-cultural changes such as urbanization. This trend is ominous as it means increased fertility in already poor countries.

WINIKOFF, B. "NUTRITION, POPULATION AND HEALTH: SOME IMPLICATIONS FOR POLICY," SCIENCE, 200:895-902, 1978.

The advantages of breast-feeding over bottle-feeding in both developed and developing countries are reviewed. Breast-feeding has become a point of intersecting interest between nutrition and population experts because of its physiological relation both to child health and to fertility. The decline in breast-feeding and possible explanations for this trend are examined. The author states that breast-feeding appears to be on the increase in societies where women's options to work outside the home have expanded significantly. Sections on child survival and policy regarding health and nutrition (with emphasis on breast-feeding) are also included.

BREAST-FEEDING AND REPRODUCTION

- BERMAN, J.M., HANSON, K., and HELLMAN, I.L., "Effect of Breast-feeding on Postpartum Menstruation, Ovulation and Pregnancy in Alaskan Eskimos," Amer. J. Obstet. and Gynecology, 114 (4): 524-534, Oct. 15, 1972.
- BISWAS, S., "A Study of Amenorrhea After Child Birth and Its Relationship to Lactation Period." Indian J. Pub. Hlth., 7 (1): 9-14, Jan. 1963.
- BLEEK, W., "Spacing of Children, Sexual Abstinence and Breast-feeding in Rural Ghana." Soc. Science and Medicine, 10 (5): 225-230, 1976.
- BONTE, M., ZKINGENEYE, E., GASHAKAMBA, M., MBARUTSO, E. and NOLENS, M., "The Influence of the Socio-Economic Level on the Conception Rate During Lactation." Internat. J. of Fertility, 19: 97-102, 1974.
- CONNELL, E. B., "Lactation." Paper read at Workshop on Risks, Benefits and Controversies in Fertility Control, Arlington, Virginia, March 13, 1977.
- DELGADO, H., LECHTIG, M., BRINEMAN, E., and KLEIN, R., "Nutrition, Lactation and Postpartum Amenorrhea." The Amer. J. of Clin. Nutr., 31: 322-327, Feb. 1978.
- DELVOYE, P. and DE MAEGD, M., "The Influence of the Frequency of Nursing and of Previous Lactation Experience on Serum Prolactin in Lactating Mothers." J. of Biosocial Science, 9: 447-451, 1977.
- DELVOYE, P., et al., "Serum Prolactin, Gonadotropins, and Estradiol in Menstruating and Amenorrheic Mothers during Two years' Lactation." Amer. J. Obstet. and Gynecology, 130: 635-639, 1978.
- GREENBLATT, R. B., "Conception and Contraception in the Lactating Mother." Medical Aspects of Human Sexuality, 9: 117-119, 122, June 1975.

BREAST-FEEDING AND REPRODUCTION

- HEFNAWI, F., FAWZI, G., and BADRAOUI, M., "Effect of Some Pro-gestational Steroids on Lactation in Egyptian Women." J. of Biosocial Science, 8 (1): 45-48, Jan. 1976.
- HINGORANI, V. and UMA BAI, G. R., "Lactation and Lactational Amenor-rhea with Postpartum IUCD Insertions." J. of Reproduction and Fertility, 23: 513-515, 1970.
- IBRAHIM, A. and EL-TAWIL, N.Z., "The Effect of a New Low-Dosage Oral Contraceptive Pill on Lactation." Internal Surgery, 49 (6) 561-565, June 1968.
- JAIN, A.K., and SUN, T. H., "Inter-Relationship Between Socio-Demographic Factors, Lactation and Postpartum Amenorrhoea." Demography India, 1 (1): 255-271, Oct. 1972.
- JELLIFFE, D. B., and JELLIFFE, E. F. P., "Lactation, Conception, and the Nutrition of the Nursing Mother and Child." J. of Pediatr., 81 (4): 829-833, Oct. 1972.
- KAUR, P., MARWAH, S. M., GUPTA, V. H., and MURTHY, N.S., "Correlation of Amenorrhoea with Age, Parity and Lactation." J. of Family Welfare, 23 (2): 40-44, Dec. 1976.
- KIPPLEY, K., and KIPPLEY, F., "The Relevation Between Breast-feeding and Amenorrhoea: Report of a Survey." Environ. Child Hlth. pp. 239-245, Oct. 1977.
- MAYER, G., "Undernutrition, Prolonged Lactation and Female Infertility." J. Trop. Pediatr. and Afr. Child Hlth., 12: 58-59, Dec. 1966.
- MOSELY, W. H., ed., Nutrition and Human Reproduction. Plenum Press, New York, 1978.
- PEREZ, A., VELVA, P., MASNICK, G. S., and POTTER, R. G., "First Ovulation After Childbirth: The Effect of Breast-feeding." Amer. J. Obstet. and Gynecology, 114 (3): 1041-1047, Dec. 15, 1972.

VII. INFANT FORMULA AND WEANING FOODS

VII. INFANT FORMULA AND WEANING FOODS

BADER, M. "BREAST-FEEDING: THE ROLE OF MULTINATIONAL CORPORATIONS IN LATIN AMERICA," INTERNATIONAL J. HLTH. SCI., 6(4):609-626, 1976.

The shift of multinational corporations which manufacture infant formula from markets in industrial countries to markets in developing countries has serious public health consequences due to the high cost of formula and the scarcity of hygienic facilities essential to the sterile preparation of bottle formula. Bader outlines the economic and birth control advantages of breast-feeding. Current efforts to regulate multinational advertising of infant formula are reviewed and recommendations of actions which the health professions and Third World governments may adopt to combat this problem are made.

BROWN, J., "FINDING THE CAUSES OF PROTEIN-CALORIE MALNUTRITION IN A COMMUNITY, PART III," ENVIRON. CHILD. HLTH., 25: 254-261, 1977.

Food is plentiful in Balupe, Zaire households, so the causes of existing malnutrition are not in food procurement or in agriculture or food purchasing. Instead it is the use of available foods and the methods of feeding young children which are faulty. Six problems at Balupe are: (1) early weaning, (2) short interval between pregnancies leading to early weaning, (3) diet of bulky carbohydrate food with little protein, (4) use of thick porridges and other foods difficult to digest, (5) custom of giving only small portions of protein food to young children, and (6) prolonged absence of mothers leading to preventing regular weaning.

COX, J.W. "EFFECT OF SUPPLEMENTARY FEEDING ON INFANT GROWTH IN AN ABORIGINAL FAMILY," J. BIOSOC. SCI., 10:429-436, 1978.

The weight charts for the six infants of a 20 year old Aboriginal woman are examined. They all show satisfactory growth while being exclusively breast-fed, yet all demonstrate growth failure following the introduction of supplementary feeding. The double benefits of optimal infant growth and delay in the next conception derived from exclusive breast-feeding indicate its desirability for women in these circumstances. The problems associated with supplementary feeding and the non-utilization of family planning methods are demonstrated in the low maternal age at first pregnancy, the lack of adequate family spacing during the mother's teenage years, excessive family size and the impaired growth rate of the children. (Author's abstract).

GOODALL, J. "MALNUTRITION AND THE FAMILY: DEPRIVATION IN KWASHIORKOR," J. PROC. NUTR. SOC., 38:17-27, 1979.

The majority of East African babies are breast-fed but none of the fifty children with kwashiorkor in this study was receiving any breast-feeds at all. Weaning had taken place abruptly in the children with kwashiorkor due either to the mother's pregnancy, return to work, or because no mother was present. Children with kwashiorkor were less likely to be living with both parents than was the control group. By law, a child in East Africa belongs to the father. Consequently, if a nursing mother runs away from her husband, she may abruptly stop breast-feeding and leave the child with the father.

GREINER, T. REGULATION AND EDUCATION: STRATEGIES FOR SOLVING THE BOTTLE FEEDING PROBLEM, CORNELL INTERNATIONAL NUTRITION MONOGRAPH SERIES NUMBER 4, 1977.

This 78 page monograph is the source of information on the promotional activities of infant formula manufacturers in developing countries. The monograph includes sample advertisements of formula and pictures of billboards from developing countries. Greiner outlines techniques which companies use to promote formula among the health professions, including hosting medical conferences and providing equipment and samples to hospitals.

The monograph includes an extensive bibliography and presents findings from a study of "baby books" published by industry for educating new mothers in child care. Due to a lack of resources for publications, these books are often used in Third World hospitals. Content analysis of the books show many more positive references to bottle-feeding than breast-feeding. When breast-feeding is discussed in the baby books, "problem areas" are focused upon.

COST OF BOTTLE FEEDING RELATIVE TO WAGES

	<u>Approx. Monthly Wage</u>	<u>Cost of Milk Formula</u>	<u>Required Marginal Propensity to Spend on milk</u>	<u>Percent of Wage</u>
Tanzania ¹ (1964) (Latham)	132 Shs.	68 Shs.	0.51	51%
Kenya ¹ (1976) (Lathan)	150 Shs.	88 Shs.	0.58	58%
India ¹ (1976) (Reutlinger and Selowsky)	120 Rs.	91.5 Rs.	0.76	76%

¹Tanzania and Kenya data based on cost of manufactured powdered formula. India data on cow's milk.

HEARINGS ON THE MARKETING AND PROMOTION OF INFANT FORMULA
IN DEVELOPING COUNTRIES BEFORE THE SUBCOMMITTEE ON
HEALTH AND SCIENTIFIC RESEARCH OF THE UNITED STATES
SENATE, WASHINGTON, D.C., MAY 23, 1978.

The printed record of these hearings, chaired by Senator Edward Kennedy, represents a compact survey of the range of opinion regarding the abuse of infant formula. The fifteen witnesses before the subcommittee included medical personnel with first-hand experience with "commerciogenic" malnutrition in developing countries; international health experts; and representatives of four infant food manufacturers. Dr. Clavano of the Philippines and Dr. Carballo of the World Health Organization each presented the results of previously unpublished studies on infant feeding practices, and both stated that the practice of rooming-in seems to be associated with the initiation of breast-feeding. Dr. Jelliffe introduced a can of puppy formula which carried a warning that the formula should not be used during the first days of a puppy's life because of the value of colostrum (first milk) in protecting puppies against infection. Dr. Jelliffe wondered if humans fed formula from birth are not "second-class puppies."

The World Health Collaborative Study found the lowest percentage of breast-feeding mothers in the Philippines and in Guatemala. In the Philippines, one-third of mothers from economically advantaged homes never breast-fed; whereas, in Sweden the percentage was 3% and in Hungary 7%. In Guatemala 23% of women of economically advantaged background had never breast-fed and 9% of the urban poor. The practice of providing free samples is relatively common in the Philippines. It was significant that 41% of rural poor who had delivered in the Philippines had been given free milk samples. In Guatemala the social group most exposed to this practice was the urban poor.

Post, J.E., THE INFANT FORMULA INDUSTRY: STRATEGY, STRUCTURE, AND PERFORMANCE, PAPER FROM THE SCHOOL OF MANAGEMENT, BOSTON UNIVERSITY, AUGUST 1977.

This paper reviews the history of the manufacture of infant formula in the United States and outlines marketing strategies of infant formula companies for domestic sales and overseas distribution. The most important distinction determining market strategy is whether the companies are food processors or pharmaceutical manufacturers. Food companies tend to advertise directly to consumers whereas pharmaceutical companies promote their products through doctors and in hospitals. Direct advertising to consumers of infant formula has come under heavy fire by critics of the infant formula industry. Thus, criticism has centered more on the marketing practices of food companies than pharmaceutical companies which sell infant formula. Post notes that infant formula companies differ in their reaction to criticism of their marketing practices ranging from denial on the one hand, to adaptive change. European and Japanese infant formula companies are also discussed.

RAO, A.R. "HUMAN BREAST MILK AS COMMERCIAL INFANT FOOD," J. TROP. PEDIATR., 23:280-288, 1977.

The author proposes that placing a commercial value on breast milk in media will promote greater interest in lactation especially among the poor. Satisfactory lactation is possible in poor, undernourished women; however, improved nutrition, hormones and drugs can promote adequate breast milk. Some mothers may be able to spare extra milk for other infants who have to be artificially fed. Milk donors may be paid partly with food supplements for themselves and their own babies and partly with cash. According to La Leche League International, a total of 22 breast milk banks were operating as of November 1976 in the following countries - Brazil, Canada, Denmark, England, France and the U.S.A.

PEDDY, S.K. AND GURNEY, M.J. "FAMILY FOOD AND NUTRITION. A MANUAL OF PRIORITIES FOR THE EASTERN MEDITERRANEAN REGION. MESSAGES TO MOTHERS," WHO/UNICEF PUBLICATION, EM/NUT/76, APRIL 1977.

This manual contains straightforward information about breast-feeding in a question-answer format. Explanations are brief and to the point and discuss the importance of breast-feeding. Some of the aspects covered include nutrition during pregnancy and lactation, preparation for breast-feeding, supplementary feeding and weaning. Foods which are staples in the Eastern Mediterranean region are used as examples to show what combinations can be offered as nutritious weaning foods.

This document should be used in conjunction with the parallel text entitled, "Guidelines for Frontline Workers," which explains in more detail the rationale behind the messages for mothers.

ROWLAND, M.G.M., ET. AL. "BACTERIAL CONTAMINATION IN TRADITIONAL GAMBIAN WEANING FOODS," THE LANCET, 1:136-138, 1978.

Commercial milk preparations are virtually unknown in rural, West African villages, yet infantile diarrhea is common and affects the growth and general health of the infant. In the village of Keneba, The Gambia, the custom is to breast-feed the infant for the first 18 months with introduction of weaning foods (as a supplement) after three months. Traditional weaning foods were tested at regular intervals after cooking and in different seasons for *E. coli*, *B. cereus*, *Staph. aureus*, *Cl. welchii* and *Salmonella*; the total viable count was also made. At three months of age and above, the body-weight of the infants fell behind the internationally accepted standard, intake of breast milk fell and traditional gruels were used to supplement the diet. Diarrheal disease started at three months and was common by six months, although seasonal variation had an effect on the exact prevalence. Supplementary gruels given were frequently heavily contaminated with potentially pathogenic microorganisms. Cooking water was also highly contaminated. The practice of cooking a large amount of food at one session, keeping the leftovers for eight hours after preparation and storing the foods at ambient temperatures is the major reason for the high level of contaminated weaning foods which cause weaning diarrhea.

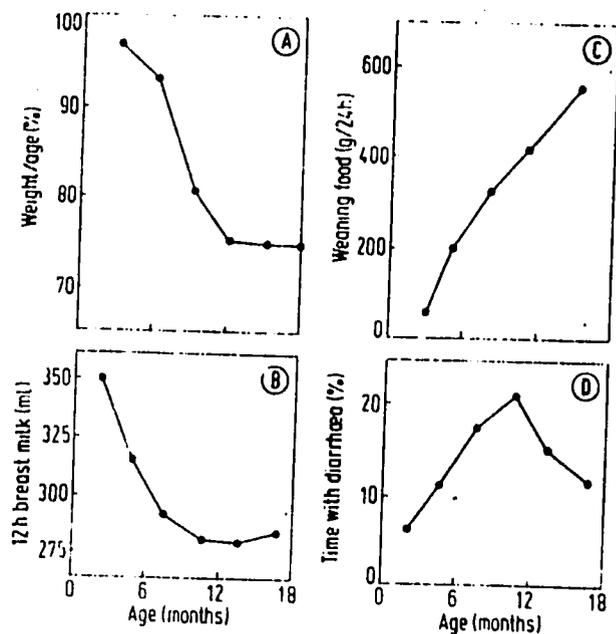


Fig. A—Percentage expected weight of village children by age (1422 data points).
 Fig. B—Breast milk consumed between 6.30 a.m. and 6.30 p.m. (417 data points).
 Fig. C—Traditional weaning food consumed (1681 data points).
 Fig. D—Percentage of each month the average child is ill with diarrhea (772 data points).

SAARINEN, U. "NEED FOR IRON SUPPLEMENTATION IN INFANTS ON PROLONGED BREAST-FEEDING," J. OF PEDIATR., 93:177-180, 1978.

This was a longitudinal study in which 56 infants on prolonged breast-feeding were compared to 29 infants receiving cow's milk formula (prepared at home) and to 47 infants receiving a proprietary infant formula to determine iron status in each of these groups. Iron status was measured by blood counts and indices, serum iron, transferrin saturation, and serum ferritin values.

Breast milk was superior to cow's milk in all of the iron measures used. While breast milk alone is sufficient to meet iron needs during the first 6 months of life, supplemental iron should be considered after 6 months of age. Reasons for iron supplementation include a decrease in the iron concentration in breast milk during the course of lactation, a decrease in the quantity of breast milk ingested due to the introduction of solid foods in the infant's diet, and a possible modification in the unusually high bioavailability of breast milk iron due to the addition of solid foods.

SWEDISH PEDIATRIC ASSOCIATION, "A SWEDISH CODE OF ETHICS FOR MARKETING OF INFANT FOODS," ACTA PAEDIATR. SCAN., 66:129-132, 1977.

This editorial reviews the general decline in breast-feeding worldwide and notes the unfortunate recurrence of artificial feeding where even the basic requirements for safe formula feeding are not met. Codes of ethics for selling infant foods have been developed by the International Council of Infant Foods and the International Pediatric Association has urged member countries to introduce appropriate advertising codes and legislation as necessary.

The Swedish code, released by Swedish pediatricians in 1975, recommends that its medical personnel screen all infant food advertisements for accuracy, that advertisements not be aimed at the public, that all printed menus indicate that only breast-feeding should be given as the main component of meals for children under four months of age, and that free distribution of infant foods as a method of promotion not occur.

INFANT FORMULA AND WEANING FOODS

- ANDERSON, M., Care Preschool Nutrition Project, CARE, New York, 1977.
- ANDERSON, T. A., "Commercial Infant Foods: Content and Compositor," Pediatr. Clin. of North Amer., 24 (1): 34-47, Feb., 1977.
- BAER, E. C., "Infant Feeding and Nutrition Policy in Columbia: Preliminary Field Findings." School of Management, Boston University, Boston, 1977.
- BERG, ALAN, "The Crisis in Infant Feeding." Chapter VII in The Nutrition Factor, The Brookings Institution, Washington, D.C. 1973.
- BROZEK, J., "Abstracts International Conference on Behavioral Effects of Energy and Protein Deficits." Department of Psychology and Center for Health Sciences, Lehigh University, Bethlehem, Pennsylvania, 17: Dec. 1977.
- CARTER, O. L. Supplementary Foods in Relation to Nutrition, Caribbean Food and Nutrition Institute Library, Diploma in Community Nutrition Thesis No. 9, 1969.
- COTTINGHAM J., "The Baby Food Controversy: Three years Later." Ideas and Action, publication of Action for Development, Food and Agriculture Organization, Rome, 1977.
- DWYER, J. T., "The Demise of Breast-Feeding ... Sales, Sloth, or Society." in Priorities in Child Nutrition in the Developing Countries ed. J. Mayer, United Nations Economic and Social Council, E/ICEF/L1328, Vol. 2: 331, 368, 1975.
- EDDY, T. P., "An Error of Medicine? Kwashiorkor and the Protein Gap." Tropical Doctor, 7: 28-32, Jan. 1977.
- EDITORIAL, "The Infant Food Industry." Lancet: No. 8076: 1240-1241, June 10, 1978.
- FRIED, R., "One Hundred Years of Infant Feeding." Clin. Pediatr., 16 (3): 215-218, Mar. 1977.
- FORD, J., PORTER, JR., SCOTT, K., "Comparison of Dried Milk Preparations for Babies on Sale in Seven European Countries for Folic Acid, Vitamin B., Thiamin, Riboflavin, and Vitamin E." Arc. Dis. Child., 49 (1): 874-877, 1977.
- GARSON, B., "Modern Marketing Killed This Baby." Mother Jones, :p. 33-34, 3940, 60-62, December, 1977.

INFANT FORMULA AND WEANING FOODS

GORDON, J. E., CHITKARA, I. D., and WYON, J. B., "Weaning Diarrhea." J. of Pediatr., 15: 76-98, 1969.

GREINER, T., "The Promotion of Bottle Feeding by Multinational Corporations: How Advertising and the Health Professionals have Contributed." Cornell International Nutrition Monograph Series 2, Ithica, N.Y., 1975.

GURNEY, J. M., "The Problems of Feeding the Weaning Age Group: An Overview of Available Solutions." Cajanus, 12: 43-51, 1979.

HAMBRAEUS, L., "Proprietary Milk Versus Human Breast Milk In Infant Feeding." Pediatr. Clin. of North Amer., 24 (1), 1977,

HUSSAIN, A. W., "Protein Problems in Bangladesh." Nutr. Reviews, 35 (4), April, 1977.

INDUSTRY STATEMENT, "International Council of Infant Food Industries: Its Aims and Progress." Lancet: (8076): 1250-1252, June 10, 1978.

International Council of Infant Food Industries, "Infant Feeding in the Less Developed Countries: An Industry Viewpoint." PAG Bull. 7 (3-4): 62-65, 1977.

LAPIDO, P. and MORRIS, P., "Child Feeding and Toddler Mortality in West Nigeria." J. of Nutr. Educat., 6 (1): 17-20, Jan. - Mar., 1974.

LATHAM, L., LATHAM, M. and BASTA, S., "The Nutritional and Economic Implications of Ascaris Infection in Kenya." World Bank Working Paper No. 271, World Bank, Washington, D.C., 1977.

LEVINSON, F. JAMES, The Morinda Experience: An Economic Analysis of the Determinants of Malnutrition Among Young Children in Rural India, Ph.D. Dissertation, Cornell University, 1972.

MACLEAN, G. D., "An Appraisal of the Concepts of Infant Feeding and Their Application in Practice." J. of Advanced Nursing, 2: 111-126, 1977.

MARGULIES, L., "A Critical Essay on the Role of Promotion in Bottle Feeding." PAG Bull., 7 (3-4): 73-83, 1977.

MCLAREN, D., "A Fresh Look at Protein-Calorie Malnutrition." The Lancet, 2 (7461): 485-488, Aug. 29, 1966.

MATA, L. J., The Children of Santa Cauque: A Prospective Field Study of Health and Growth, MIT University Press, Cambridge, Mass., 1977.

INFANT FORMULA AND WEANING FOODS

- MORGAN, J., "Feeding Practices and Food Intake of Children Under Two Years of Age." Proceedings of the Nutrition Society, 35: 474, May 1977.
- ORK, E., "The Contribution of New Food Mixtures to the Relief of Malnutrition." Food and Nutr., 3: 2-10, 1977.
- PAIGE, D., CORDANO, A., and HUANG, S., "Nutritional Supplementation of Disadvantaged Elementary School Children." Pediatr. for the Clinician, 58 (5), Nov., 1976.
- PAN AMERICAN HEALTH ORGANIZATION, "Guidelines to Young Child Feeding in the Contemporary Caribbean." PAHO Science Pub., (217), 1970.
- PELLET, P., "The Role of Food Mixtures in Combating Childhood Malnutrition." Malnutrition in the Community, Edited by Donald McLaren, Wiley, New York, 1976.
- Population Reference Bureau. "Third World Use of Infant Formula Stirs Widening Controversy." Intercom, 6: 1, 4-7, 1979.
- POST, J. E., "Marketing and Society: The Great Infant Formula Controversy." Draft, School of Management, Boston University, July, 1976.
- REUTLINGER, S. and SELOWSKY, M., Malnutrition and Poverty: Magnitude and Policy Options. Johns Hopkins University Press, Baltimore, Maryland, 1976.
- ROBSON, J. R., Malnutrition: Its Causation and Control, Gordon and Branch, New York, 1972.
- SCRIMSHAW, N. W., "Through a Glass Darkly." Nutr. Today, 13 (1): 14-20, Jan.-Feb., 1978.
- SINHA, D., "Definitions and Overview of the Problems of Feeding the Weaning Age Group." Cajanus, 12: 24-25, 1979.
- WADE, N., "Bottle Feeding: Adverse Effects of Western Technology." Science, 184: 45-48, April 5, 1974.
- WATERLOW, J. C. "Evolution of Kwashiorkor and Marasmus." The Lancet, 2 (7882): 712-713, Sept. 21, 1974.
- WATERLOW, J. C., "Some Aspects of Childhood Malnutrition As a Public Health Problem." Br. Med. J., II: 88, Oct. 1976.

INFANT FORMULA AND WEANING FOODS

WENNEN, VAN DER MAY, "The Decline of Breast-Feeding in Nigeria." Trop. Geo. Med., 21: 92, 1969.

WHITEHEAD, R. G., "Some Quantative Considerations of Importance to the Improvement of the Nutritional Status of Rural Children." Proceedings of Royal Society of London, 199: 49-60, 1977.

WILLIAMS, C., "Milk and Murder." Address Delivered to the Rotary Club of Singapore (memeo), 1939.

WINICK, M., "Nutrition Growth and Development." Modern Problems Pediatrics, 14: 48-56, 1976.

WORLD BANK, Village Water Supply. World Bank Paper, Washington, D.C., March 1976.

YARBROUGH, C., et al., "Length and Weight in Rural Guatemalan Ladino Children: Birth to Seven Years of Age." Am. J. of Physical Anthropology, 42 (3): 439-488, 1975.