

INTRODUCTION

Breastfeeding is believed to provide substantive advantages to both the mother and the infant. The mother's choice to breastfeed is most likely based upon the family's knowledge of breastfeeding and their perception of the environment in which the infant will be fed. Certain barriers at home, work, or school, or in the health care delivery system or the community can negatively influence both a woman's decision to breastfeed and her breastfeeding experience. The promotion of breastfeeding, a national priority, can be achieved through changing community views.

Knowledge and acceptance of breastfeeding by the general public are influenced by not only the media but also cultural and ethnic background, community attitudes, family patterns, and formal education. The community attitude to be fostered is that breastfeeding is a normal part of everyday life. A positive attitude toward breastfeeding must be promoted in future parents; public officials and employers must be encouraged to remove barriers to breastfeeding; the health care system must review its policies and procedures to insure that they facilitate breastfeeding; multi-media approaches to specific target audiences must be developed; the education of health professionals on the physiology of lactation and the management of breastfeeding for optimal infant health must be enhanced.

Excellent models of support in initiation and continuation of breastfeeding exist. These models need to be shared for application in a variety of settings. To assess the current status of breastfeeding in the United States and to develop strategies to facilitate breastfeeding, Dr. Koop convened the Third Surgeon General's Workshop at the University of Rochester, June 11-12, 1984. The Workshop on Breastfeeding and Human Lactation brought together from a wide range of disciplines and settings health professionals who serve different ethnic and cultural groups throughout the nation. One hundred invited participants included representatives of professional and lay organizations, local, state and federal governments, industry, and volunteer groups.

Speakers at the opening session discussed the physiology and process of human lactation, the composition of human milk, trends in breastfeeding, socio-anthropologic factors, and successful approaches for promoting breastfeeding. The roles of the lay volunteer and of the media in the promotion of breastfeeding were highlighted. Participants convened in work groups to consider key issues such as the decision to breastfeed, socio-cultural influences and determinants of infant feeding practices, support services for mothers who breastfeed, roles and responsibilities of the health care system in promoting breastfeeding, vocational

supports and barriers to breastfeeding, educating health professionals and the public about breastfeeding, and research needs related to breastfeeding and human lactation. Excerpts from presentations and recommendations of the work groups are included in this Report.

Presenting the findings and recommendations of the Workshop to the Surgeon General, Workshop Chairperson Ruth Lawrence, M.D., synthesized the deliberations of the participants in her summary. The Surgeon General accepted the report, commented on the general topics, and stated that this Report of the Workshop would be prepared for widespread dissemination.

KEYNOTE ADDRESS

C. Everett Koop, M.D., Sc.D.

Surgeon General and Deputy Assistant Secretary for Health

In 1978 the World Health Organization set for itself a goal of health for all by the year 2000. Now this is a tall order, and many of the lesser developed countries—those with limited resources—will have trouble in meeting that goal. Other countries, with help from some of the more developed countries in the western world, will succeed in at least improving health for all in their countries by the year 2000 only to see those gains slip as support is subsequently withdrawn.

The United States is a signatory to "health for all" by the year 2000, but we in this country had previously set ourselves a series of objectives to be realized not by the year 2000, but by 1990. These are largely contained in a publication called *Healthy People*, the Surgeon General's Report on Health Promotion and Disease Prevention. This volume was subsequently supplemented by *Objectives for the Nation*. Among the national objectives for the United States by the year 1990 is the topic of this Workshop. This objective states: "The proportion of women who breastfeed their babies at hospital discharge should be increased to 75%, and the percentage of those still breastfeeding at 6 months of age should be increased to 35%." In 1978, when this objective was chosen, the proportion was 45% at hospital discharge and 21% at 6 months of age. Historically the federal government has not been idle in the promotion of breastfeeding. During the years 1946-47 Dr. Katherine Bain of the Children's Bureau conducted the first nationwide survey on the incidence of breastfeeding in hospitals in the United States. This report was published in *Pediatrics* in September 1948.

A symposium on human lactation was held at George Washington University in October 1976 and was co-sponsored by the Public Health Service, the March of Dimes, and George Washington University. The proceedings of that symposium were widely disseminated in public health circles. In 1978, an annotated bibliography on breastfeeding, supported by the Public Health Service, was published by the National Academy of Sciences. Then in 1983, a nationwide video-teleconference on improving nutrition of mothers and babies was co-sponsored by the Department of Health and Human Services and the United States Department of Agriculture. "Breastfeeding and Human Lactation" was one of two major topics presented during this 3-hour program viewed at 125 sites coast-to-coast. The program presented an update of new research findings with special emphasis on practical application. Edited videotapes of the teleconference are now being disseminated. The Public Health

Service has not been idle in current activities. Breastfeeding promotion is one of the thrusts of the Healthy Mothers/Healthy Babies Coalition. A breastfeeding kit for professionals is now being produced in collaboration with several professional organizations, voluntary associations, the Department of Health and Human Services, and the United States Department of Agriculture. The National Natality Survey of the National Center for Health Statistics provides an ongoing surveillance and reporting mechanism on educational factors associated with breastfeeding.

But let us return for a moment to objectives for the nation. The current roles of the federal government in promoting breastfeeding to meet the already mentioned 1990 national objective include the following:

- establishing and promulgating policy;
- offering professional consultation and technical assistance to providers;
- supporting professional training;
- conducting research;
- implementing service delivery; and
- sponsoring public education.

Let me highlight some of these points. In reference to policy on nutrition, the guidelines and policies issued by recognized professional organizations such as the American Academy of Pediatrics, the American College of Obstetricians and Gynecologists, the American Academy of Family Physicians, the National Academy of Sciences, and the Association of State and Territorial Health Officials are used by the Public Health Service in formulating policies and recommendations in maternal and child nutrition.

Professional consultation and technical assistance on maternal nutrition, lactation, and infant nutrition are made available through guidance materials and technical references developed in concert with professional organizations. For example, recommendations on breastfeeding and other information on infant feeding are addressed in the *Pediatric Nutrition Handbook* published by the American Academy of Pediatrics with the support of the Division of Maternal and Child Health. An example of a more recently developed technical reference is *Guide to Breastfeeding the Infant with PKU*.

Another federal role is the support of professional training. Breastfeeding is included in the curriculum of graduate training programs in public health nutrition and in the maternal and child health curriculum for physicians, nurses, social workers, and other health-care providers. For example, over the last 10 years, 200 public health nutritionists have received Title V/Maternal and Child Health support, and 107 nutritionists have received National Health Service Corps scholarships for training leading to a master's degree.

As in all of these endeavors, research and study form the basis for policy and practice. In government, the National Institutes of Health plays a major role in breastfeeding research efforts. A revival of interest in the composition of human milk and the special functions of its many components has been stimulated by the necessity of devising proper nutrient therapy for premature, growth-retarded, and immunologically

compromised babies. The National Institute of Child Health and Human Development has stimulated studies of immunologic and nutrient composition, as well as perhaps undefined components and possible contaminants of colostrum and human milk obtained from mothers delivering babies at various gestational ages. In addition, in response to the recommendations from workshops held by the Division of Maternal and Child Health, in both 1975 and 1976, the National Institute of Child Health and Human Development is supporting applied studies of human milk-banking in order to develop techniques of collecting, storing, and distributing human milk and colostrum for use in clinical situations. Currently techniques are being developed to combat viral contamination without destroying immunologically active cells or denaturing proteins that possess antimicrobial activities. The eventual isolation of special immunologic and nutrient components of human milk which could assist in the care of premature and growth-retarded babies will be the hoped-for outcome of such research. As a matter of fact, a workshop was held in September 1982 on human-milk banking in order to provide further stimulation for this expanding research. The report will be available this summer. The National Institute of Allergy and Infectious Diseases is studying the role of breastmilk as a defense against enteric infections. The National Institute of Environmental Health Sciences is conducting a longitudinal study of 900 children in North Carolina to see if childhood morbidity is attributable to DDT and PCBs in breastmilk.

In response to the controversy over the International Code of Marketing of Breastmilk Substitutes, two task forces were established by the Assistant Secretary for Health in November 1981. A Public Health Service Task Force on the assessment of scientific evidence relating to problems of infant feeding, both in domestic and international context, was chaired by the then-Director of the Centers for Disease Control, Dr. William Foege. These findings will be published as a supplement to *Pediatrics* in October 1984. I chaired the other task force on domestic activities, and the findings have been incorporated into a report that I made to the World Health Assembly last month in Geneva.

Education, perhaps the most important aspect of all, should not really be left until the last. Educational materials on nutrition for use in counseling parents and other caregivers of children in community health education programs have been developed by the Public Health Service. Maternal and Child Health funds are frequently used by the states to disseminate educational materials. An example of this is *Breastfeeding*, a publication developed in 1979 and aimed at parents-to-be and new parents. Other federal agencies such as the United States Department of Agriculture, voluntary groups such as La Leche League, and practitioners as well as parents had the opportunity to review the material in draft and make suggestions. Thus, the publication is as practical and useful as

possible. To date, over 60,000 copies of the publication have been distributed nationwide.

Now you might wonder why we are having this Surgeon General's Workshop on Breastfeeding and Human Lactation. Although the number of breastfed infants has grown in recent years, the increase has not been as great in the highest risk groups. The number of women who start to breastfeed has increased, but many of them do not continue breastfeeding beyond the first few weeks of their infant's life. We know that breastfeeding gives babies complete nutrition plus immunologic benefits to launch them on a healthy life. Breastfeeding also provides its particular benefits at a low cost. We must therefore identify and reduce those barriers which keep women from initiating or continuing to breastfeed their infants. And it is now time to consider what needs to be done. You have already heard a little bit of why we chose the University of Rochester, but let me expand on that. The University of Rochester School of Medicine and Dentistry was selected because of its active and unique efforts in the support of breastfeeding. Along with the School of Arts and Sciences and the School of Nursing, the School of Medicine and Dentistry has developed a cluster for the interdisciplinary study of the physiologic, psychologic, sociologic, and anthropologic aspects of human lactation. Dr. Ruth Lawrence, Associate Professor of Pediatrics and of Obstetrics and Gynecology, is the workshop chairperson and a nationally recognized authority on breastfeeding. She is the author of the primary text on the subject entitled *Breastfeeding: A Guide for the Medical Profession*. The University of Rochester has a strong Obstetrics and Gynecology Department whose chairman is Dr. Henry Thiede. He is co-chairperson of this workshop. Dr. Thiede, in his prior position as the Chairman of OB/GYN at the University of Mississippi, was instrumental in the creation of the certified nurse/midwifery training program.

Now, let us turn our attention to what will be going on here for the next two days. The luncheon speaker today will highlight the role of the lay volunteer in the mother-to-mother program of the La Leche League. On Tuesday, Bob Bazell, Health and Science Correspondent for NBC, will discuss the use of media in promoting breastfeeding. Speakers this morning will give us an update on the state of the art and the state of science on the physiology of breastfeeding, the unique values of human milk, current trends, and cultural factors related to breastfeeding. This introduction will provide background for the discussions to follow in the work groups. Models of successful approaches will also be presented this morning, in order that they become part of our knowledge base. This afternoon and continuing through tomorrow morning, participants will convene in 8 work groups to consider and make recommendations on key issues, such as:

- the decision to breastfeed;
- sociocultural influences and determinants of infant feeding practices;
- support services needed for initiation and continuation of breastfeeding;
- roles and responsibilities of the health-care system in promoting breastfeeding;
- overcoming barriers to breastfeeding in the world of work;
- educating health professionals and the public about breastfeeding; and
- research needs in breastfeeding and human lactation.

My charge to the participants of this Workshop is to report the following: which efforts have been successful, which need better application, what else do we need to know, and what of the above will better promote breastfeeding among high-risk groups in order to realize greater benefits? Now this charge, as I stated earlier, is a tall order, but I know that you will do this, I know that you will do it well, and I will be here tomorrow afternoon to receive your report.

Thank you very much.

EXCERPTS FROM PRESENTATIONS

HUMAN LACTATION AS A PHYSIOLOGIC PROCESS

Ruth A. Lawrence, M.D.

Lactation is the physiologic completion of the reproductive cycle. The breast, the body, and the psyche are prepared for lactation during pregnancy. The newborn infant is prepared to suckle at the breast at birth.

Growth of the mammary gland is a gradual process that starts during puberty under the influence of the sex steroids. The embryonic buds which developed initially in the fetus and have been quiescent since birth are stimulated by estrogen to proliferate and to become multilayered. Buds and papillae are formed. The lobuloalveolar development and ductal proliferation depend on the intact pituitary gland.

There are three major stages of activity: 1) mammogenesis—mammary growth, which begins embryonically and culminates during pregnancy, 2) lactogenesis—the initiation of milk secretion, which begins in pregnancy and increases at delivery, 3) galactopoeisis—maintenance of established lactation, which begins a few days postpartum and continues as long as there is stimulus.

The embryonic breast begins its preparation at puberty when the hypophyseal-ovarian-uterine cycle is established. Fifteen to 20 primitive ducts arborize extensively and form a compound tubuloalveolar gland. A relatively inactive stage continues through adult life until pregnancy initiates the proliferative stage. Spectacular ductal growth begins in response to luteal and placental hormones. There is true hyperplasia, but in an orderly fashion, as one alveolus does not overrun another. (Figure 1)

The hormones—placental lactogen, prolactin, and chorionic gonadotropin—contribute to the acceleration of growth. At this stage one can observe the complex interaction of the many hormones that function in the development of both the fetus and the breasts during pregnancy. Estrogen stimulates ductular sprouting, and progesterone stimulates lobular formation. There is a delicate balance of prolactin inhibiting factor in the hypothalamus and prolactin production in the adenohypophysis as the presecretory phase progresses in the second trimester to a secretory phase. In this phase, material resembling colostrum is seen in the alveoli stimulated by placental lactogen.

A mother delivering a preivable infant at 16-weeks gestation will secrete colostrum. As early as 24 weeks, lipid droplets can be seen in the

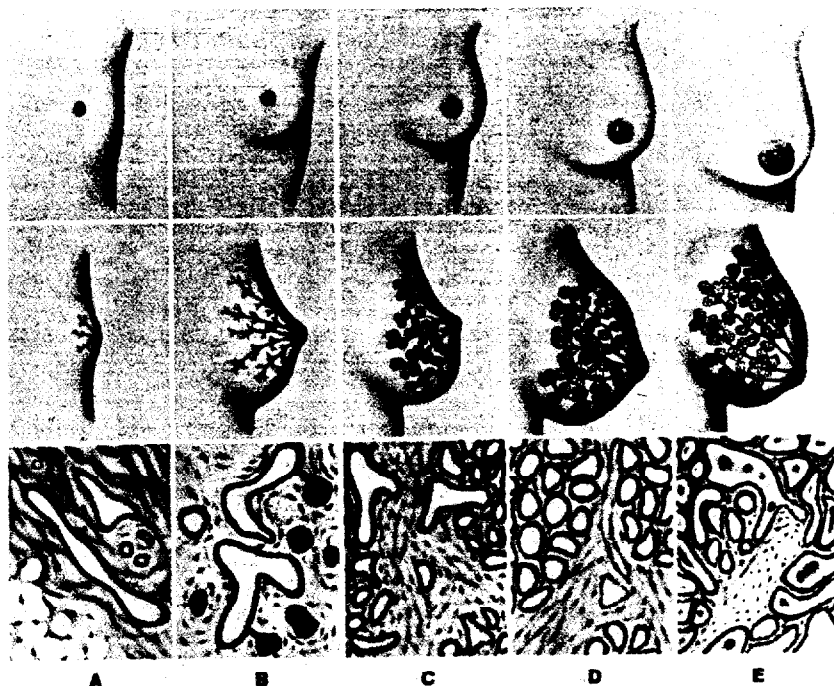


Figure 1. Female breast from infancy to lactation with corresponding cross section and duct structure. A, B, and C, Gradual development of well-differentiated ductular and peripheral lobular-alveolar system. D, Ductular sprouting and intensified peripheral lobular-alveolar development in pregnancy. Glandular luminal cells begin actively synthesizing milk fat and proteins near term; only small amounts are released into lumen. E, With postpartum withdrawal of luteal and placental sex steroids and placental lactogen, prolactin is able to induce full secretory activity of alveolar cells and release of milk into alveoli and smaller ducts.

alveolar cells. The composition of the secretion is fairly consistent from 16-17 weeks right up to the time of delivery.

With the delivery of the placenta, the source of hormones is lost abruptly and the plasma levels begin to fall. Placental lactogen is gone within hours, progesterone within 2-3 days, estrogen reaches basal levels within 5-6 days, but prolactin levels depend upon the amount of suckling. In the non-nursing mother, prolactin drops to prepregnant levels in about 14 days. Observation of nursing mothers with retained placenta indicates that lactation is suppressed until the placental fragments are removed. This suppression is similar to the lack of milk secretion seen in mothers experiencing an intrauterine death. Evidence strongly suggests that it is loss of the placental progesterone with the decline in plasma progesterone which triggers galactogenesis, or milk production.

The necessity for adequate levels of prolactin for lactation to begin in humans has been demonstrated. The exact role of prolactin in ade-

quate milk production, however, continues under investigation. In the first week postpartum, the high levels of prolactin are only slightly augmented by nursing. In the second stage, from 2 weeks to 2 months, baseline levels of prolactin are 2-3 times normal, and increase to 10-20 times normal with suckling. The third phase begins at about 3 months and lasts to weaning. Prolactin levels are almost normal, and no rise is seen with suckling, even though milk production continues.

The role of other hormones such as insulin and thyroxine in mammogenesis, lactogenesis, and galactogenesis is well established, but the definition of their roles does not have universal agreement. The breast does not function in isolation, but in synchrony and balance with the maternal endocrine system.

The process of milk synthesis is complex. There is a marked alteration of the maternal metabolism with a redistribution of the blood supply and an increased demand for nutrients. The mammary blood flow, cardiac output, and milk secretion are suckling-dependent. These changes in turn trigger the hypothalamus to release prolactin to act on the mammary cells. Milk is iso-osmolar with plasma in all species. Although milks of different species vary tremendously, each is physiologic for the growth demands of that species.

The biosynthesis of milk involves a cellular site where the metabolic processes occur. Milk is secreted by apocrine and merocrine mechanisms. Protein and fat are synthesized *de novo*; lactose is synthesized from glucose; ions and water diffuse across the membrane so that primary alveolar milk is diluted to plasma isotonicity by water extracted from extracellular fluid.

While the glands prepare for full lactation, other structures of the breast prepare as well. The areolae increase in prominence with the development and activity of the glands of Morgagni which provide a secretion to lubricate and protect the nipple and areolae during suckling. Some of the zealous rituals recommended to mothers during pregnancy (such as scrubbing, buffing, and stretching these tissues) actually interfere with nature's process.

During pregnancy, the body stores nutrients that are intended for the manufacturing of milk in the postpartum period. Eight to 10 pounds of added weight (neither fetus, placenta, uterus, or fluid) are carefully stored for future nutrient and energy needs. The body stores reflect the cumulative dietary intake of pre-pregnancy and pregnancy coupled with the short-term dietary variation to ensure daily sources of both macro- and micronutrients. Thus the daily nourishment provided through the milk is consistent and balanced. Temporary deficiencies of diet are compensated by body stores.

Lactation also influences the return to pre-pregnant state for the mother. Getting back "in shape" is facilitated by utilizing the extra weight of pregnancy for milk production. Thus, breastfeeding women return to baseline weight more quickly.

The direct effect of the oxytocin released on stimulus of suckling not only contracts the myoepithelial cells for milk ejection but also contracts the uterus for faster physiologic involution and increased tone.

In most anticipated normal pregnancies, a woman finds that the hormonal milieu triggers latent maternal instincts leading to anticipation of holding the infant closely to the breast and providing continued nourishment. Parenthood potentially provides the opportunity for psychologic growth from the egocentricity of adolescence to an adult self-concept in which the mother cares for and nourishes this new being.

The mind, however, is not controlled by body function alone. Many societal, community, family, and individual forces influence attitudes and feelings about breastfeeding. If a woman rejects her own mother as a model, other life experiences prevail. There are other psychodynamic issues and social trends that may lead to negative decisions about breastfeeding.

In the meanwhile, the fetus is simultaneously undergoing development. The infant is prepared to suckle shortly after birth. The newborn already has been making sucking motions in utero. Part of the balance of the amount of amniotic fluid depends upon the fetus sucking and swallowing fluid in utero. Until birth, the infant has not had to synchronize this action with breathing, but as Tizzard showed in England some years

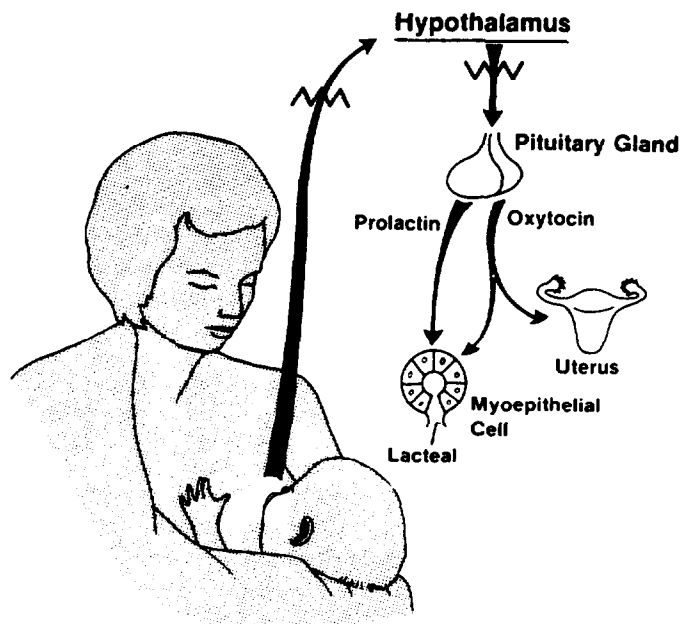


Figure 2. Diagrammatical outline of ejection reflex arc. When infant suckles breast, he stimulates mechanoreceptors in nipple and areola that send stimulus along nerve pathways to hypothalamus, which stimulates the posterior pituitary to release oxytocin. It is carried via bloodstream to breast and uterus. Oxytocin stimulates myoepithelial cells in breast to contract and eject milk from alveolus. Prolactin is responsible for milk production in alveolus. It is secreted by anterior pituitary gland in response to suckling. Stress such as pain and anxiety can inhibit let-down reflex. The sight or cry of infant can stimulate it.

Figures by permission of C. V. Mosby Company.

ago, suckling at the breast is compatible with continuous breathing compared to the suck-swallow-breathe pattern of the infant while bottle feeding. The infant also has a rooting reflex that helps him turn to grasp the nipple. The normal newborn infant adapts to breastfeeding readily.

When the infant grasps the nipple and areola, the sucking stimulates the nerve fibers in the nipple and these, in turn, stimulate the afferent nerve fibers via the spinal cord to the mesencephalon and the hypothalamus in the maternal brain and trigger the pituitary to release two hormones—prolactin and oxytocin. (Figure 2) The prolactin stimulates the synthesis and secretion of milk itself. The oxytocin rapidly causes the ejection of milk from alveoli and smaller ducts into larger lactiferous ducts and sinuses by stimulating the myoepithelial cells to contract. The myoepithelial cells (or basket cells) are wrapped about the ducts, and when they contract, milk is ejected. Milk ejection involves both neural and endocrine stimulation and response. A neural afferent pathway and an endocrine efferent pathway are required, but this stimulus is triggered predominantly by touch and not by pressure of a full milk gland. This response may be inhibited by pain or stress.

Breastfeeding is not a reflex; it is a learned process. In our present culture, many women have never witnessed an infant at the breast. When a woman is called upon to nurse her own infant, much of her success depends on a learning process. Successful lactation depends on proper information. As increased numbers of women breastfeed, we need more knowledge to help those who have difficulty in lactating. Another physiologic effect of lactation—important, though it receives little notice—is the suppression of ovulation and of menses. There is a temporal difference in the return of menses and ovulation among women who fully lactate, who partially lactate, and who have either discontinued breastfeeding or never began. The nonlactating woman ovulates within 4–6 weeks of delivery; the lactating woman does not ovulate for 4 months or more. This effect plays a role in general population statistics.

Finally, as we look at all the physiologic processes, the interaction of the breast with the mother's other bodily functions, we see that breastfeeding is an art—one based on the science of lactation. We need to continue our explorations, for as Aristotle would have it: "There is a reason behind all these things in nature."

THE UNIQUE VALUES OF HUMAN MILK

Cutberto Garza, M.D., Ph.D.

Introduction

Recommendations of human milk as the ideal nutrient source for term infants are common. These endorsements and the growing clinical interest in its use have prompted a remarkable increase in studies of human milk. The results of such investigations have underscored the dual roles played by its constituents: 1) the classic role that is associated with most nutrients, i.e., the provision of enzymatic cofactors or substrates for energy or structural components and 2) a more complex role that is the performance of functions complementing the developing abilities of maturing infants. For example, proteins provide amino acids for growth, but they occur in the form of polypeptides that aid in digestion, host defense, and other functions. Lipids provide a major source of energy, but some also have antiviral properties that may impart protection to the developing infant. In addition, this nutrient class provides fat-soluble vitamins and essential fatty acids that are important structural membrane components, especially in the nervous system. Carbohydrates provide a significant portion of the energy in milk and also enhance mineral absorption, i.e., calcium; modulate the growth of bacteria, i.e., bifidus factor; and possibly act to prevent the attachment of selected bacteria to retropharyngeal and other epithelial cells found in respiratory and gastrointestinal surfaces exposed to environmental pathogens.

Milk Intake of Breastfed Infants

The unique pattern of constituents in human milk and the feeding practices inherent to breastfeeding appear to result in distinctive levels of milk intake between breast- and formula-fed infants. Recent data indicate that the intake of breastfed infants reaches a plateau at approximately 733 g/day through the first 4 months of lactation. Therefore, on a body weight basis, the energy intake falls from approximately 110 to 70 kcal/kg by the fourth month. These intakes are substantially below those of formula-fed infants and below levels currently recommended for this age group by the National Research Council.

Despite these differences between recommended amounts and observed intakes, exclusively breastfed infants appear to grow well. Nevertheless, the possibility that human milk may become limiting by the fourth month for most infants has been suggested. Current measurements of the intakes of infants whose diets are supplemented ad libitum with solids, however, do not support this view. Results of these recent studies indicate that when the diet of the exclusively breastfed infant is complemented with solid foods, intakes remain at approximately 70 kcal/kg, and infants continue to grow well.

These findings raise interesting points for discussion. They suggest that a child's energy intake is dependent upon the mode of feeding. It is not clear if the differences in intake between formula- and breastfed infants represent a more active "gate-keeping" role by mothers of formula-fed infants or represent sound physiologic responses to different nutrient sources. Formula-fed infants may require "more" food to attain approximately the same endpoint as their human-milk-fed counterparts. Human milk is a highly complex mixture with a nutrient balance that may promote a level of metabolic efficiency unattainable by the formula-fed infant. Yet, if we compare present estimates of the quantities of energy required for growth and maintenance by the 4-month-old infant, it appears that the exclusively breastfed infant would have no energy available for activity. Are the metabolic economies recruited to achieve the apparent high level of efficiency in the breastfed infant accomplished by more conservative uses of energy for growth and maintenance, or are these efficiencies accomplished by a significant curtailment in activity? Are the same levels of efficiency possible under hostile environments? If the energy consumed by bottle-fed infants represents a true excess, are there any positive or negative short-term or long-term consequences? These observations pose questions of significance to the general health of all infants.

Functional Components: An Example—Secretory IgA

The issues raised by the differences between energy and protein intakes of formula- and human-milk-fed infants are interrelated with the *in vivo* roles of milk components with demonstrated functional potentials. Of these components, those with protective functions have been examined most actively. Secretory IgA (SIgA) is the predominant immunoglobulin in human milk and is thought to represent one of its key protective agents.

Specific SIgA antibodies are found against a wide array of bacterial and viral organisms. This protein has the ability to adhere to mucosal surfaces and prevent the subsequent attachment, and possibly the invasion, of specific infectious agents. Significant data exist indicating that the appearance of these specific antibodies in milk is a response to environmental challenges. Specific antibodies have been observed in the first few weeks of lactation and are known to persist through 2 years of lactation. Observations made during weaning suggest that these antibodies persist through the period of decreased suckling stimulation.

The presence in human milk of SIgA antibodies which act against potential pathogens in the maternal environment provides for "environmentally specific" milk. The mechanism by which these antibodies, directed against gastrointestinal and respiratory pathogens, appear in human milk has been difficult to identify. In contrast to the gastrointestinal and respiratory tracts, where such SIgA is abundant, direct contact with such antigens is unlikely to occur in breast tissue. Experimental data suggest that immune cells travel from gastrointestinal and respiratory-associated immune tissues to multiple mucosal surfaces, in-

cluding breast tissue, and thereby effect the same specific immunity to all mucosal surfaces. During lactation, the "homing" of these cells to the breast appears to be activated by hormonal profiles which exist only in lactating women. The concept of a gastrointestinal-respiratory-mammary immune circulation provides an explanation of the means by which antigen stimulation at distant sites results in the local production of specific SIgA antibodies in milk.

This is one example of a protein with a great degree of specificity. There are other proteins that have more general, potentially protective functions. It is important to emphasize that carbohydrates and fats also have functions which may contribute to the high level of metabolic efficiency apparently characteristic of the breastfed infant.

Significance of Functional Components

Although the potential roles of specific antibodies, nonspecific immunologic factors, and other functional components may be extrapolated from laboratory studies, a definitive demonstration of their significance in free-living populations has been much more problematic. For example, differences in morbidity between bottle- and breastfed infants often are difficult to interpret because of confounding environmental and demographic variables. Factors such as the degree of preventable contamination of artificial formulas, the number of caretakers with whom the child has contact, the behavioral characteristics of the caretaker—including sanitation practices and other mothering skills, the number of potential disease-carrying contacts, etc.—are difficult to control unless appropriate data are collected and sufficiently large numbers of subjects are recruited. Research designs must account for the "unidirectional" flow of infants from one feeding category to another. A breastfed infant may become exclusively bottle-fed for many reasons. An exclusively bottle-fed infant, however, is unlikely to become exclusively breastfed. Although most studies that compare morbidity among children fed human milk or synthetic formula have not controlled adequately for all of the confounding factors, most studies from developed and developing countries have reported significantly fewer illnesses in breastfed infants. A few have found no differences, but there are no reports of increased morbidity among the human-milk-fed groups. Differences in morbidity between feeding groups have been demonstrated more consistently, however, in developing countries than in developed countries. Whereas available data are not conclusive, they generally support the theory that human milk provides components that complement a developing immune system in the infant. Although it is not known whether these complementary components participate in the improved development of active immunoprotective abilities, they may serve as substitutes until the infant matures sufficiently to mount an active immune response. Whether or not the protective effects of human milk components are made real or potential by environmental conditions, such benefits are available only if the infant is breastfed.

Conclusion

Knowledge of the apparent differences between the ad libitum intakes of breast- and formula-fed infants, changes in the composition of human milk as lactation progresses, and responses of immunologic factors in human milk which effect environmentally specific protection contribute to the consensus that feeding human milk to infants is beneficial. The implementation of this consensus requires the identification of barriers that impede successful lactation. The consensus that recommends human milk also poses a significant opportunity to private and public health services to aid in the implementation of a practice which promotes health and fosters greater individual responsibility for health.

TRENDS IN BREASTFEEDING IN THE UNITED STATES

Gilbert A. Martinez, M.B.A.

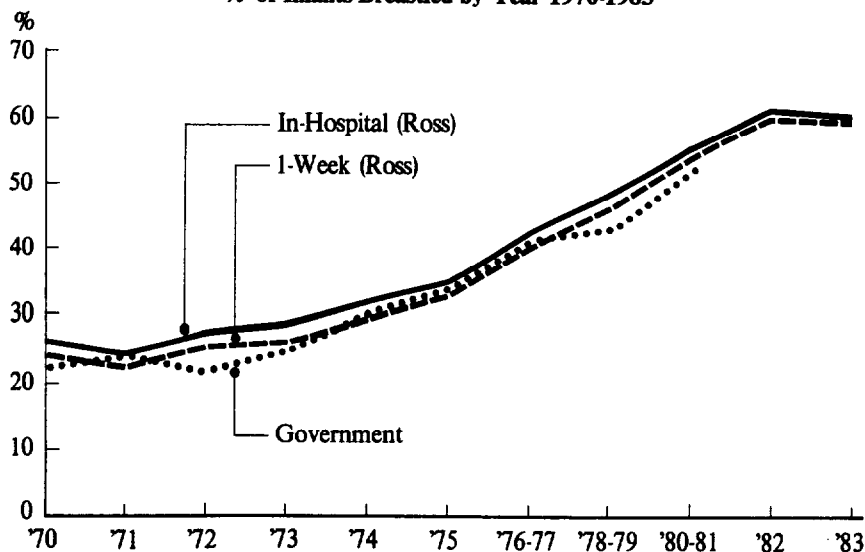
In 1971 the incidence of breastfeeding declined to its lowest level—25%. Since then, breastfeeding has increased to 61.9% in 1982 and has declined marginally to 61.4% in 1983. (Figure 1)

The duration of breastfeeding similarly declined in 1971 to its lowest level of 9% of women who breastfed 3 months or longer. Since then, breastfeeding for at least 3 months has increased to 40% of women giving birth in 1983.

Between 1978 and 1983 breastfeeding increased from 47% to 61% nationally, with substantial variation among socio-demographic groups. The highest incidence of breastfeeding occurs among well-educated, relatively affluent, somewhat older women living in the Western part of the country. Conversely, the lowest proportion of women breastfeeding is among mothers under 20 years of age, grade-school educated, lower income, black, and living in the East South Central part of the country—Kentucky, Tennessee, Alabama, and Mississippi. (Figure 2; Table 1)

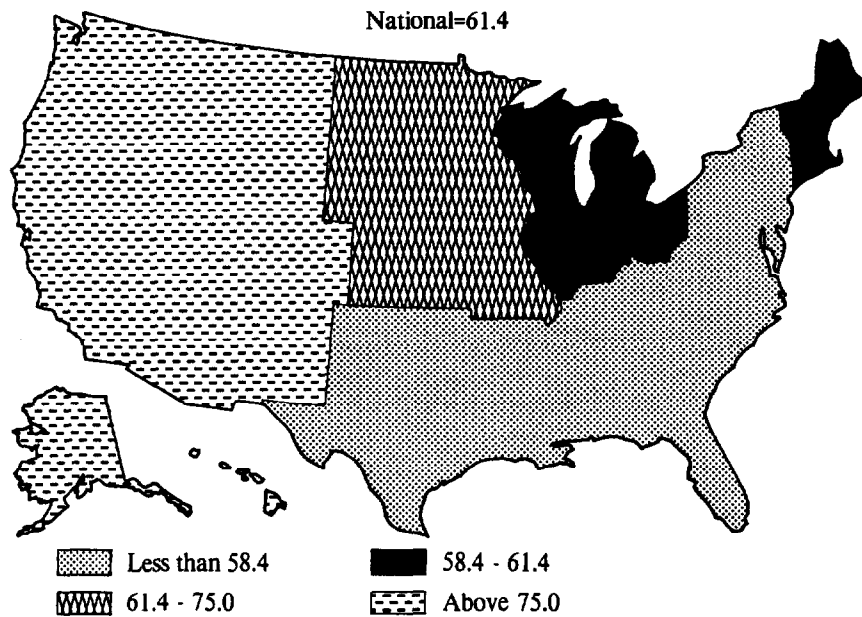
The proportion of women breastfeeding their infants at 5 and 6 months of age increased from about 20% in 1978 to 27% in 1983. The

FIGURE 1- Incidence of Breastfeeding U.S.A.
% of Infants Breastfed by Year 1970-1983



Sources: Ross Laboratories National Mothers Survey
National Survey Family Growth, NCHS

FIGURE 2- 1983 Incidence of Breastfeeding by U.S. Census Regions



Source: Ross Laboratories National Mothers Survey

same differences by socioeconomic groups previously mentioned prevail at 5 and 6 months of age.

The most rapid percentage increases in the incidence of breastfeeding between 1978 and 1983 occurred among women with the least education, employed full-time, multiparous, and in the West South Central area—Arkansas, Louisiana, Oklahoma, and Texas. The least rapid percentage growth occurred among mothers under 20 years of age, the well-educated, the unemployed, and those with lower incomes.

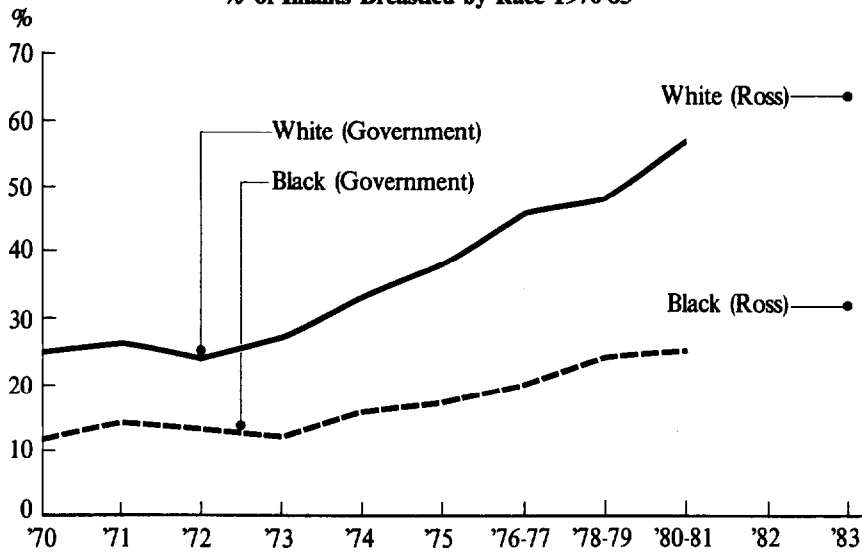
The proportion of black women who breastfed their infants in 1978 is unavailable. Hendershot reported 17% of black women breastfed their infants in 1975. For the 2-year period of 1978–1979, 24% of black infants were breastfed. In 1983 that figure had increased to 32%. (Figure 3)

The proportion of black women who breastfed their infants in 1983 for 3 months or more was 20%, and was less than half of the 42% of white women who breastfed for 3 months or more.

Among black women, as among the whole country, the lowest incidence of breastfeeding occurs among young, less educated, low-income women, and, as is true among all women, the highest incidence of breastfeeding occurs among those Blacks with the most education and income. (Table 2)

The proportion (54%) of Hispanic women who breastfed their infants in 1983 is less than the national rate.

**FIGURE 3- Incidence of Breastfeeding U.S.A.
% of Infants Breastfed by Race 1970-83**



Sources: Ross Laboratories National Mothers Survey
National Survey Family Growth, NCHS

TABLE 1- Breastfeeding by Demographics: 1983

Rank	Characteristic	Percent breastfed ¹	Percent of all births ^{2,3}
1	College	78	33
2	Pacific.....	78	16
3	Mountain	77	6
4	>\$25,000 income.....	71	32
5	30 to 34 years of age.....	67	16
6	25 to 29 years of age.....	65	31
7	Primiparous.....	65	43
8	\$15,000 to \$24,999 income.....	64	26
9	White	64	80
10	West North Central.....	63	8
11	Not Employed	62	65
12	New England.....	61	5
13	\$10,000 to \$14,999 income.....	61	15
	National.....	61	
14	Employed.....	60	35
15	35+ years of age.....	60	5
16	East North Central.....	59	18
17	Multiparous.....	58	57
18	West South Central.....	58	13
19	20 to 24 years of age.....	57	33

Rank	Characteristic	Percent breastfed ¹	Percent of all births ^{2,3}
20	South Atlantic.....	57	15
21	Hispanic.....	54	15
22	High School Education.....	54	63
23	Middle Atlantic.....	52	13
24	East South Central.....	49	7
25	<5 lbs. 8 oz. birthweight.....	46	7
26	<\$10,000 income.....	44	26
27	<20 years of age.....	43	15
28	Grade School Education.....	41	4
29	Black.....	32	16

Sources:

¹ Ross Laboratories' Mothers' Survey.

² Advance Report of Final Natality Statistics, 1981.

³ Population Characteristics, Series P20, No. 386, April 1984 (women 18-44 years of age).

TABLE 2- Breastfeeding by Demographics among Blacks: 1983

Rank	Characteristic	Percent breastfed ¹	Percent of black births ^{2,3}	Percent of all births ^{2,3}
1	Pacific.....	61	9	16
2	Mountain.....	60	1	6
3	>\$25,000 income.....	56	13	32
4	College.....	55	22	33
5	New England.....	54	2	5
6	\$15,000 to \$24,999 income.....	45	18	26
7	Employed.....	41	33	35
8	35+ years of age.....	41	4	5
9	West North Central.....	38	3	8
10	30 to 34 years of age.....	38	11	16
11	25 to 29 years of age.....	38	24	31
12	Primiparous.....	38	40	43
13	East North Central.....	36	17	18
14	Middle Atlantic.....	33	15	13
	National.....	32		
15	\$10,000 to \$14,999 income.....	31	13	15
16	West South Central.....	31	14	13
17	20 to 24 years of age.....	30	35	33
18	Multiparous.....	29	61	57
19	<5 lbs. 8 oz. birthweight.....	28	13	7
20	South Atlantic.....	27	28	15
21	Not Employed.....	27	67	65
22	Grade School Education.....	27	5	4
23	High School Education.....	23	73	63
24	<\$10,000 income.....	20	55	26
25	East South Central.....	20	11	7
26	<20 years of age.....	15	25	15

Sources:

¹ Ross Laboratories' Mothers' Survey.

² Advance Report of Final Natality Statistics, 1981.

³ Population Characteristics, Series P20, No. 386, April 1984 (women 18 to 44 years of age).

The decision to breastfeed is made by well over half the women prior to pregnancy. In 1981, 55% of breastfeeding women had made that decision before becoming pregnant and, in 1984, that number had increased to 63%. An additional 14% of breastfeeders made the decision during their first trimester, and, by the time of delivery, 98% of breastfeeding women had made their decision. In two prospective studies asking women what they intended to feed their infants and subsequently contacting them after the infant was born, 96% had implemented their prenatal decision to breastfeed.

In summary, both the incidence and duration of breastfeeding increased significantly among all segments of society from 1971 to 1982. These gains did not continue in 1983, with the incidence dipping slightly from 61.9% of mothers in 1982 to 61.4% in 1983. The figure remains a function of socio-demographic variables: older, well-educated, relatively affluent women living in the Western United States are more likely to breastfeed; younger, less well-educated, black women in the East South Central United States have the lowest incidence of breastfeeding. Continued gains will need to come from this latter group. Since the decision to breastfeed is made by more than half of women before pregnancy, three groups—the black, the young, and the poorly educated—need to be reached early if they are to be influenced to breastfeed.

THE CULTURAL CONTEXT OF BREASTFEEDING IN THE UNITED STATES

Susan C.M. Scrimshaw, Ph.D.

Breastfeeding, Ethnicity, and Socioeconomic Status

Research on breastfeeding in the U.S. reflects two biases frequently found in medical and public health literature. First, ethnicity, and sometimes even socioeconomic status are not even mentioned in many reports. Second, reports mentioning ethnicity and socioeconomic status often focus on incidence without discussing correlates such as attitudes, reasons for the observed behaviors, and the influence of sociocultural background.

The ethnic groups frequently discussed in the U.S.—Asians, Blacks, Latinos, and Native Americans—are each in fact a complex set of distinct “sub-groups,” with varying degrees of acculturation and levels of socioeconomic status. For example, Latinos include major subgroupings of Cubans, Puerto Ricans, Mexicans, and Mexican Americans with smaller numbers of Dominicans, Salvadorans, Guatemalans, and many more people from Central and South America and the Caribbean. Some Latinos, especially from the Caribbean and circum-Caribbean areas, are Black and reflect influences of African cultures. While few studies make comparisons between subcultures in relation to breastfeeding, important differences exist. For example, in her report on feeding practices among Anglos, Cubans, and Puerto Ricans in Dade County, Florida, Bryant reports that most Puerto Ricans think breastfeeding is better for babies, but almost half the Cuban women think bottle feeding is better.

Blacks, frequently thought of as one culture in this country, not only divide into obvious groups like Haitians and Panamanian Blacks, but vary in terms of parts of the country and rural or urban residence. A rural southern Black and an urban western Black are as different from each other as their White counterparts from the same region. Individuals in each subcultural group are proud of their heritage; they resent being lumped with others they perceive as dissimilar. Unfortunately, most of the literature that does discuss breastfeeding and ethnicity does not make these subcultural distinctions.

Many of these variations are reduced when socioeconomic and educational statuses are considered. Baranowski et al. showed bimodal educational relationships to breastfeeding in a tri-ethnic population. Both the least and the most educated were more likely to breastfeed. Middle- and upper-class women are now more likely to breastfeed, although research comparing middle- and upper-class women with lower-class women *within* ethnic minority groups is conspicuous by its absence. Studies such as Baranowski's which compared *low* socioeconomic status Anglo-Americans, Black Americans, and Mexican Americans show significant differences between ethnic groups. It should be noted that Baranowski et al. do not distinguish between Mexicans and Mexican Americans, although

they report that some of their Mexican American sample were interviewed in English and some in Spanish.

Higher educational attainment is also correlated with breastfeeding. Again, the effect of education *within* ethnic groups and subgroups has not been adequately documented.

Frequency and Duration of Breastfeeding by Ethnicity

The data on frequency and duration of breastfeeding by ethnicity vary greatly by region and by ethnic group. There is relatively little information on Asian populations, and even less on Native American populations. Breastfeeding in all populations declined from the beginning of this century until the early 1970s, and Blacks may have experienced the greatest decline. Prior to 1960, the majority of Blacks and Latinos breastfed their first babies, and nursed longer than Whites.

The trend began to reverse in the early 1970s, but this change appears to be occurring more quickly in White than in Latino, Asian, or Black populations. Current figures for Latinos on breastfeeding at discharge from the hospital range from 18% in Upper New York State to 60% in Northern California and 74% in Southern California. Asians are poorly represented in the literature, but Samuels reports that 67% of the Asians in her Northern California HMO population were breastfeeding at hospital discharge. The proportion of Blacks breastfeeding at hospital discharge ranges from 20% in Hartford to 26% in Chicago and 52% in Northern California. These discrepancies illustrate regional and perhaps also rural/urban variations, but probably reflect subcultural and socioeconomic variations as well.

An example of probable variations according to socioeconomic status is that the Blacks studied by Samuels were participants in a Kaiser HMO as an employment benefit. Their socioeconomic status is probably higher than that of the inner-city Blacks studied by Mohrer. The 74% figure for Latinos in Southern California is from our project, which looked at a population of 518 women, 96% Mexican in origin, 4% Mexican in descent. The relatively recent Mexican origin of most of these women probably accounts for the very high rate, and illustrates the importance of being able to distinguish between subcultures.

Duration of breastfeeding also varies, but drops off sharply after the first two or three months. According to Martinez and Nalezienski, in 1978 47% of *all* U.S. women were breastfeeding at hospital discharge, 35% were breastfeeding at two months postpartum, and 20% were breastfeeding at six months postpartum. In one of the two Southern California hospitals we studied, 86% of the Latinos (primarily Mexican) planned to breastfeed as of their in-hospital postpartum interview, but by the six-week postpartum visit, only 43% were still breastfeeding. On the other hand, a greater proportion of Whites breastfed and did so longer.

Barriers to Breastfeeding

UNDERLYING FACTORS

Few of the underlying factors associated with bottle-feeding rather than breastfeeding can be directly related to ethnicity, but relate instead to socioeconomic status or are reported by women in all ethnic groups. Cultural values, however, are likely to influence how these factors are interpreted by women. These factors include: general perceptions of the value of breastfeeding (mostly positive), the baby's father's feelings, embarrassment at the exposure of the breasts, concerns about interference with sexuality, questions about mother's temperament and suitability for breastfeeding, anxieties about the mother's ability to produce high quality and sufficient milk, perception of bottles as convenient, perception of breastfeeding as old-fashioned, concerns about breastfeeding ruining the figure, and work intentions.

In addition to socioeconomic and educational status, marital status provides another underlying factor. Several studies show that married women are more likely to breastfeed. The proportion of married women giving birth varies by ethnicity, as do socioeconomic status and educational level.

One factor identified by Bryant is the husband's role. She found that husbands were more often against breastfeeding in the Cuban and Puerto Rican families she studied, and that Anglo husbands varied from being very supportive to indifferent and sometimes negative. The husbands in both Latino groups were concerned about exposure of the breasts, interference with sexual activity, and the perceived "old-fashioned" nature of breastfeeding. This finding may appear to contradict the previously mentioned finding that married women are more likely to breastfeed, but other factors such as the need to work and social isolation may influence single women.

One perception often found in Latino populations is that of "bad milk" due to maternal stress or tendency to have a temper. Mexicans, Hondurans, Puerto Ricans, and Cubans have all described concern that maternal anger and stress would produce bad milk, which would make the baby sick. This concern was cited as a reason not to initiate lactation.

Another interethnic difference identified by Baranowski is the role of the support person. The male partner was the most important breastfeeding support person for the Anglo woman, the woman's mother was most important to Latinos, and a close friend was most important to Blacks. In this study, it was asserted that the woman's mother actually had a negative effect on Anglo women.

Despite these interethnic differences, one major underlying obstacle to breastfeeding in all groups is the woman's need to work postpartum. While many women never even initiate breastfeeding because of postpartum work plans, others simply stop sooner in order to return to work. In our sample of 518 Mexican women, significantly fewer women planned to breastfeed if they intended to return to work soon. The proportion breastfeeding increased with a later return to work. The highest propor-