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2 Child Feedings in Less Developed Countries: Induced Breast Feeding in a Transitional Society

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I. Introduction

It is not easy to generalize regarding child feedings in developing countries, in view of the variation in degree of transition that they undergo. Child feeding practice is a part of the culture of each region and country, and relates to traditions, beliefs, and taboos that cannot possibly be covered in this chapter. Our experience is limited to observations on four cultural groups: Cakchiquel Indians in Guatemala, and Guaymi Amerindians, Caucasians and mestizos in Costa Rica.

Traditional features are those innate to a culture since prehistoric times. Transition implies a rapid change, occurring particularly in the last decades, which is transforming a traditional society to a modern or "Western" type. Traditional societies generally are rural and poor and subsist on primitive agriculture (Table 1). Typically, childbirth takes place at home with the mother kneeling or squatting; mother-infant interaction and successful breast feeding for 1–3 years is the norm; good childrearing practice is commonly observed [1]. In contrast, in transitional and modern societies there may be a tendency to dehumanize the delivery through institutional practices, among which the following are outstanding: inadequate relations between attendants and the delivering mother, separation of mother and infant after delivery, and interference with breast feeding by formula feeding during the first days of life. Furthermore, urbanization and the stress of modern life account for a substitution of the extended family by the nuclear family, ensuing loss of support to the young mother, and loss of maternal technology [2,3]. Col-

laterally, poverty and deprivation in urban centers may expose the family to economic strains, anxiety, and violence, all incompatible with breast feeding and optimal childrearing.

The three types of society illustrated in Table 1, as well as the intermediate stages, can be found in any country at any time. The number of persons observing a Western (industrialized, modern) type of life within a traditional society, however, is small, and few persons live traditionally within a modern society. The degree of transition is reflected in a general way in such health indicators as demographic growth, infant mortality, life expectancy at birth, and incidence of severe malnutrition [4] (Table 1).

II. Child Feeding in Traditional Societies

Breast feeding is virtually universal and practically exclusive during the first 4–6 months of life. Weaning follows a protracted course and generally lasts for 2–3 years in most traditional countries of the tropics and subtropics [1,5]. Although poverty and underdevelopment are typical features of such societies, marked differences in the level of health may be observed, a situation that in a few instances bears more on the particular natural habitat and degree of crowding than on other aspects of prevailing poverty and underdevelopment.

A. Guaymi Amerindians

These people represent one of the few populations that enjoy quite good health despite the marked poverty under which they live. They inhabit forests and jungles of Costa Rica on the border with Panama, quite isolated not only from other population groups but also among themselves, because of the long distances separating their dwellings [6]. Thus transmission of enteric viruses,

Table 1 Characteristics of Traditional, Transitional, and Modern Societies

	Traditional	In transition	Modern
Infant mortality	High	High or declining	Low
Fertility	High	Declining	Low
Childbirth	At home	In institutions, at home	In institutions
Low birth weight	> 15%	8–15%	< 8%
Breast feeding	Universal, prolonged	Declining, early weaning	Not common, early weaning[a]
Malnutrition	Kwashiorkor common	Marasmus common to rare	Marasmus rare

[a] Breast feeding is rising in some modern societies.

bacteria, and parasites among the Guaymi is more difficult than in crowded villages. Most infants are breast fed for more than 18 months, and supplementation begins after 6 months with rice and plantain. The adult village diet consists of rice, plantains, bananas, "chicha" (a beverage made of maize), and very small amounts of animal protein [6]. The diet of the Guaymi generally is more deficient than that of the Cakchiquel Indians of Guatemala, who suffer from a high rate of malnutrition [1]. Despite the very poor diet consumed, Guaymi infants enjoy relatively good nutrition and health [6,7]. Studies conducted by us during the last 2 years revealed a virtual absence of wasting (deficit of weight for height) among children (Fig. 1). Furthermore, intestinal infection among the Guaymi appears to be low. Surveys of rotaviruses (by ELISA) and intestinal

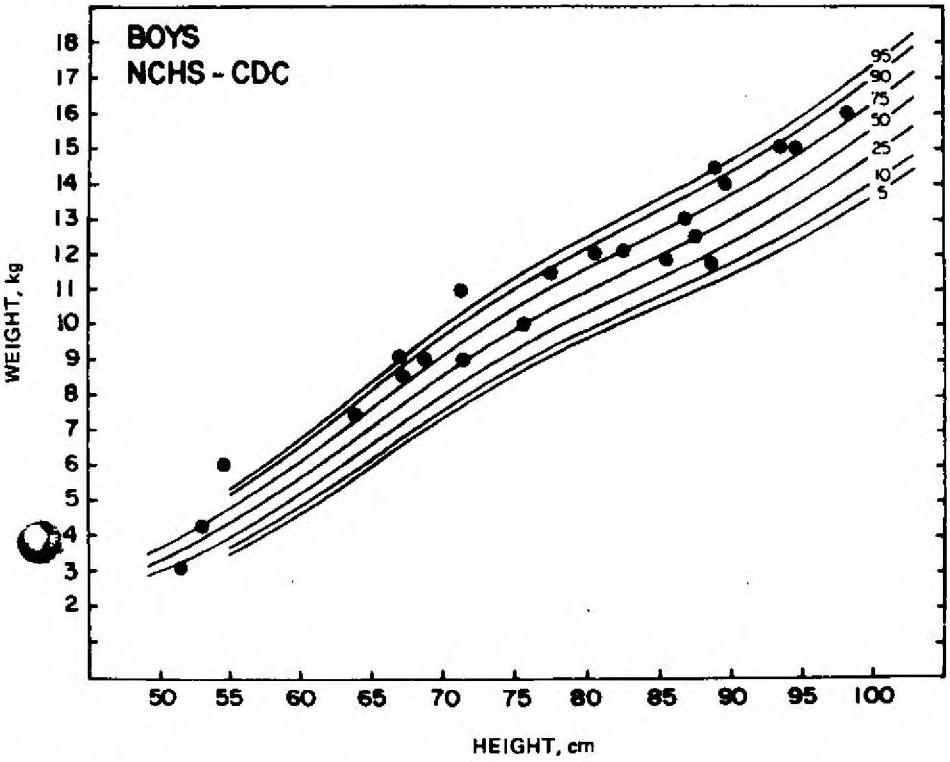

Figure 1 Weight-for-height of 22 Guaymi boys of Limoncito, Costa Rica. Children virtually represent the universe of preschool children. All but one have an adequate weight-for-height; at least two were overweight; most are above the 50th percentile of the curves of the National Center for Health Statistics-Center for Disease Control. A similar situation applied to the girls.

parasites (in trichrome-stained feces and Stoll egg counts) conducted in 1979 and 1980 turned out negative for rotaviruses and showed a low prevalence of intestinal parasites (unpublished results).

However, most children develop progressive stunting, which is then very marked among adults. In analogy with other observations [8], the growth potential of the Guaymi probably is better than that observed in the population studied. But since the Guaymi appear to enjoy good health, we postulate that the deficit in height reflects a "progressive physiologic stunting" resulting from subtle nutrient deficiencies that curtail linear growth while maintaining the appropriate weight for height at most times. This could be possible because diarrheal disease and other malnourishing infections [3,9] are not so prevalent in the settlement; thus the lack of interaction between infection and the nutritional status precludes acute weight loss and wastage. Evidently, our observations on the Guaymi provide additional support for the proposition that infection, particularly diarrhea, is a main contributor to weight loss, wastage, and severe malnutrition in the community [3,9–11].

B. Cakchiquel Indians

Today few traditional societies live as do the Guaymi. The usual pattern is to crowd in poor villages and towns of insufficient size, creating considerable sanitation and nutritional problems. A typical traditional crowded village, Santa María Cauqué, was prospectively studied for 9 years [1,3,10]. In this village, as elsewhere in rural Guatemala, women regard nursing as a natural function, a situation aided by the few cattle in the village, and a minimal influence of urbanization and education [1]. About one-half of mothers feed their infants—aided by a piece of cloth—small amounts of sweetened water and certain infusions. The origin of this custom is unknown; observations elsewhere indicate that in many cultures it is customary to administer beverages and foods, perhaps with a magic value, to newborns [12]. The remarkable health of neonates in poor villages attests to the potent anti-infectious properties of breast milk [5,13], since fecal contamination at the time of feeding is common.

In Santa María Cauqué, approximately one-half of mothers lactate during part of pregnancy, and 10% through delivery with continuation of nursing of the newborn. About a third of women not lactating during gestation gave colostrum to their infants, while the remaining nursed only when their milk matured; thus colostrum was not given to all village infants [1]. However, infants of women not lactating at the time of delivery generally were nursed by other women, generally relatives, from birth and for the few days required for maturation of maternal milk. At night, nursing was by the mother favored by the custom of sleeping with the baby. Women with small infants were preferred as foster mothers because of the local belief that their milk was better.

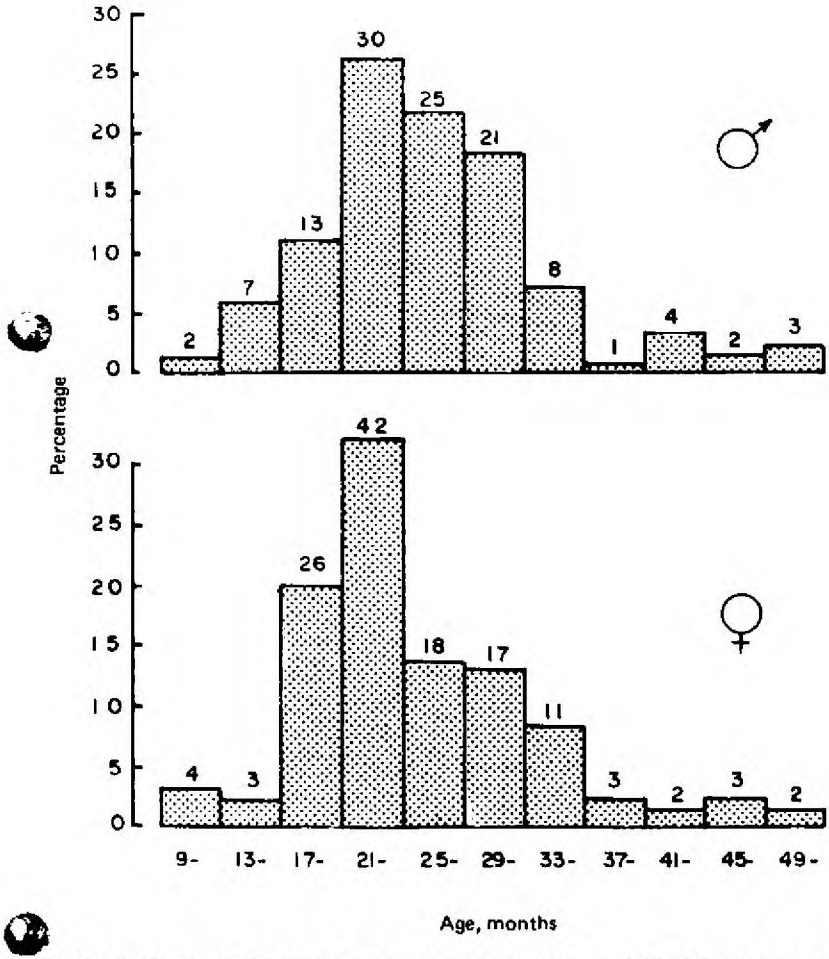

Figure 2 Percent distribution of weaning age, by sex, 247 children from Santa María Cauqué, observed prospectively from birth until complete weaning, 1964–1972. Figures above bars are number of cases.

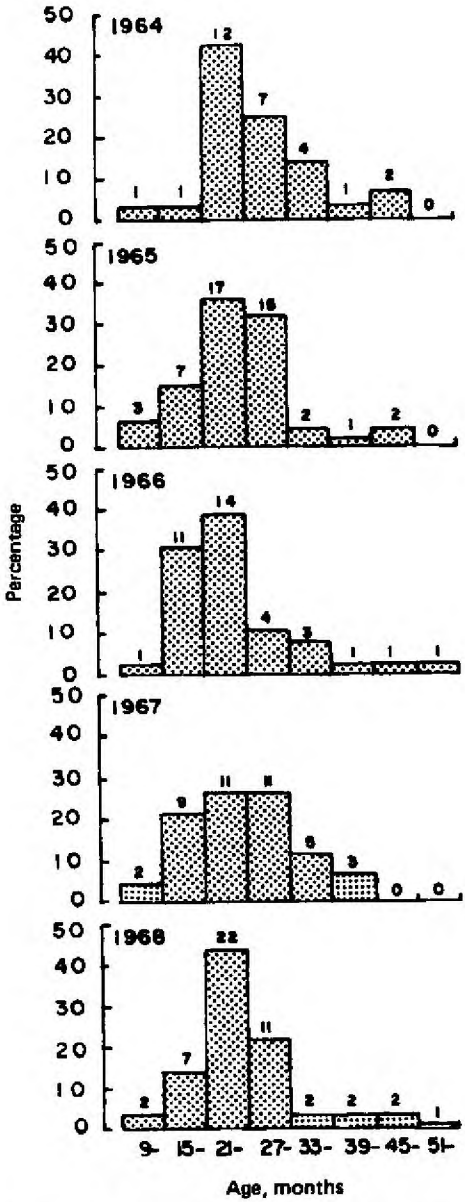

Figure 3 Percent distribution of weaning age, by year of birth of cohort, Santa María Cauqué, 1964–1972. Figures above bars are number of cases. Note a slight decrease in length of breast feeding for cohorts of 1966 and 1968.

There are many cultural beliefs regarding administration of foods other than breast milk to infants in the neonatal period [5,14,15]. However, exclusive breast feeding is established by the first week of life in most cultures; breast feeding continues for at least 15 months or longer in traditional societies. The introduction of supplemental foods (from 3 to 5 months onward) obeys traditions passed on through generations by experienced village women, and is modified by cultural influences from the outside.

Observation in the village of Santa María Cauqué showed an interdependence between growth and age of weaning, in that infants growing faster tended to wean earlier, whereas those growing slowly were weaned at a later date [1,16]. The association suggests biological and cultural interrelations between the two phenomena that account for different times of weaning. Figure 2 shows the distribution of weaning age (complete separation from the breast) in the village, illustrating the prolonged nursing period and the bell-shaped distribution of breast feeding. The pattern also applies to other traditional societies where breast feeding is prolonged. No changes in onset of weaning were noted over a period of 8 years of observation (Fig. 3), except for a slight shortening of weaning age in two of the yearly cohorts. This exemplifies the deeply rooted cultural traits in the community. The analysis of causes of weaning in Santa María Cauqué [1] showed that they were very similar to those of other cultures and ecosystems of Meso America [17,18]. However, when weaning age was analyzed by cause, the resulting histograms were very similar to each other, which suggests that the real causes for weaning are other than those stated by the mother; they bear on the child's growth velocity, the nutritional and emotional state of the mother, and extraneous cultural influences on the traditional life. The main cause of weaning was a new pregnancy.

III. Child Feeding in Transitional Societies

A marked decline in breast feeding occurs as the society undergoes a transition to modern ways of life. Factors contributing to the decline in breast feeding are migration to urban centers, and mother-infant separation and other negative practices in hospitals and clinics. Results from a survey carried out in a Costa Rican slum showed that most women believed that breast feeding was the best food for infants; however, a significant proportion had failed to nurse [21]. Surveys conducted in Latin American countries revealed a low prevalence of breast feeding in some nations, particularly in urban areas (Table 2). As will be shown later, a significant proportion of failures to nurse and of very early weanings is of iatrogenic origin, especially in connection with the use of drugs in childbirth, separation of mother and infant, and feeding of milk formula during hospitalization [5,23] (Table 3).

Table 2 Percent of Women Nursing Last Child, Latin America, 1976-1979

	Urban	Rural
Honduras, Orient	97	96
Peru	87	95
Colombia	88	92
Panama	70	88
Nicaragua	72	85
Honduras, North	72	84
Costa Rica	60	76

Source: Refs. 17, 19-23.

Table 3 Factors Accounting for the Decline of Breast Feeding in Developing Nations

Mother-infant separation in hospital
Analgesia and anesthesia in childbirth
Migration from rural areas to urban centers
Inappropriate participation of women in work
Use of hormonal contraceptives
Promotion of milk formulas and commercial weaning foods
Promotion of an erotic symbolism of the breasts

IV. Volume of Milk Secreted by Village Women

The belief that breast milk is not sufficient by 4–6 months of age is inspired by the observation of faltering growth of some village children, particularly when the protective anti-infectious effect of breast milk is fading away [5,13] and because some infants are not completely satisfied with the milk secreted by their mothers. In India, Africa, and Latin America rural women consume fewer calories than do their European counterparts, and produce from 150 to 300 ml less milk per day than the World Health Organization recommended volume [5,24–26]. It has been proposed that by 6 months of life, infants consuming 450–600 ml of breast milk must receive supplements to satisfy growth demands [27]. However, this statement needs more validation. The composition of human milk is not significantly altered under conditions of poverty, but the volume decreases when calorie intake is restricted [5,24–27].

Observations in a poor rural area of Costa Rica (Puriscal) showed that milk intake by exclusively breast-fed infants was significantly greater than that of

Table 4 Consumption of Human Milk by Infants 0–5 Months Old, Puriscal, Costa Rica, 1978

Number	Age	Suckings per day	Duration of suckings (min/day)	Consumption (ml/day)
Breast-fed				
Range	2 days–14 weeks	6–13	20–130	206–1043
Mean	5 weeks	9	90	638
With supplements				
Range	6 days–26 weeks	3–10	21–175	73–756
Mean	11 weeks	6	66	396

Source: Modified from Ref. 26.

infants of the same age who were receiving supplements (Table 4). The upper limit of intake was also significantly higher for breast-fed infants. An important consideration is that even with calorie intake below the recommendation, mothers secreted enough milk to nurse for several months, with attainment of adequate child nutrition and health as evidenced in normal ratios of weight-for-age, weight-for-height, and height-for-age [26]. In fact, all exclusively breast-fed infants grew above the 25th percentile of the National Center for Health Statistics–Center for Disease Control (NCHS-CDC) growth charts, despite the fact that their calorie intakes were about 80% of the recommendation (Table 5). This provides further evidence that the official recommendation overestimates the needs of rural children. Furthermore, it is apparent that the lower rates of infection observed in Puriscal [23] contribute to the good infant nutrition observed. In another ecological setting, Santa María Cauqué, where infants consume similar volumes of breast milk [25] and where the nutrient value of supplements is comparable [1,28], malnutrition is very prevalent, apparently induced by the exceedingly high rates of infectious disease prevailing in that community [1,9,10,23,28].

V. Nutrient Intake of Village Infants and Young Children

Supplementation of breast milk usually begins around 6 months of life in many traditional societies. In Costa Rica, a nation in transition, weaning foods are introduced 1–2 months earlier than in traditional societies. Furthermore, most children are weaned in the first year, in contrast with the 2–3 years characteristic of traditional cultures. This seems influenced by Westernization, increasing urbanization, anxiety stress, and other associated factors.

Table 5 Energy Consumption by Exclusively Breast-Fed Rural Infants, Puriscal

Number of child	Age (months)	Weight (kg)[a]	Requirement (kcal)[b]	Human milk consumption		
				Volume per day (ml)	Estimated energy (kcal)[c]	Percent of requirement
8	1.5	5.16	558	657	460	82
10	1.5	4.60	512	608	425	83
12	2.5	5.79	590	711	498	84
15	3.2	6.06	612	492	345	56
16	3.2	6.97	686	789	562	84

[a] All infants were above the 25th percentile of the NCHS-CDC growth curves.
[b] After Ref. 27: 82 kcal/kg per day (maintenance) + 5 kcal/g (weight gain).
[c] Assuming 70 kcal/dl human milk.
Source: Modified from Ref. 26.

Supplements given to children in developing nations consist of fluids, gruels, and solid foods commonly available in the area [1,5,12,18,24]. Commercial weaning foods are being introduced with sustained emphasis in developing nations [5], and are getting to be well known by women of countries in transition [5,12,22,29].

Measurement of the nutrients in supplements to breast milk in Santa María Cauqué revealed their low value [1,9,16]. However, a recent investigation of the volume of milk secreted by the Mayan Indian women of that village [25] conclusively indicates their good complementing capacity. In fact, with this new evidence, there should not be a marked dietary deficiency in the food intake of infants and young children in Santa María Cauqué, as previously stated, if children remain at the breast for at least 18 months [1]. Since malnutrition is prevalent, it must result from the wasting effect of infectious diseases.

The situation could be disastrous for children living under poverty and deprivation if weaning occurs in the first months of life. When sanitary conditions are improved, as seems to be the case of nations that have emphasized the model of social development instead of the model of economic and industrial development, the apparently deficient diets may not be that bad, and children could enjoy good nutrition and health. In a typical rural area of Costa Rica, prospective dietary studies revealed that the calorie and protein consumption of children 1–3 years old is only 70–90% of the recommendation (Table 6). However, children were growing normally when their weights and heights were compared with the NCHS-CDC growth curves. It should be emphasized that sanitary facilities, safe water supply, and primary health care services are available to this population. The present data strongly indicate the convenience of

Table 6 Energy and Protein Consumption (Means + S.D.), Rural School Children, Puriscal, Costa Rica

	Age (yr)	
Consumption/day	1–3	4–7
Energy (kcal)	1137 ± 133	1330 ± 225
Protein (g)	35.6 ± 7.3	39.2 ± 9.0
Iron (mg)	8.0 ± 0.6	10.4 ± 9.0
Retinol (μg)	340 ± 24	399 ± 86
Percent adequacy		
Energy	83	72
Protein	132	115
Iron	80	104
Retinol	160	133

Source: Modified from Ref. 30.

maintaining breast feeding for at least 6 months, and prolonging breast feeding beyond this age in countries where deficient diets and infection prevail. Under conditions of poverty, women secrete enough milk to assure optimum infant growth and health for at least 3–6 months [13,23,29,31]. Therefore, food supplements considered deficient in the past should not be that insufficient if the sanitary environment is improved. Furthermore, if children continue at the breast during the second year of life, the nutrient value of the supplement is boosted.

VI. Promotion of Breast Feeding in a Society in Transition

The decline in breast feeding in many developing nations is a matter of concern [5,22]. Early weaning is associated with severe infantile malnutrition, child abuse, abandonment, and premature death [5,32,33]. With a background of 20–40% rate of failure to nurse in rural Costa Rica (Table 2) it was postulated that mother-infant separation after childbirth was the main cause of premature weaning. To test this hypothesis, an intervention was made in the San Juan de Dios Hospital, Costa Rica, in 1979. More than 80% of births from a large rural area, Puriscal, occur at this hospital. About 8000 infants are delivered each year in this hospital, and of these, about 600 are from Puriscal. The intervention consisted in that newborns are given to the mother in the delivery room for early induction of breast feeding; often, newborns are given clothed and skin-to-skin contact is not adequate. Furthermore, infants born at night remain separated from the mother for several hours, until a neonatologist examines them; however, newborns go to their mothers thereafter. Most Puriscal women donate colostrum for high-risk neonates (Fig. 4). Colostrum is extracted with Egnel breast pumps, which stimulate milk secretion, may aid in the formation of nipples, and have a reassuring effect on women who may feel unable to secrete milk. The program has been very successful: mothers transfer breast feeding technology to newcomers; the hospital environment has improved and a relaxing and optimistic atmosphere prevails. Mothers and infants leave the hospital 24–48 hr after delivery to return to the about 160 localities of Puriscal, where they are visited within 8 days of hospital discharge. One year after the study began, the cohort had 625 infants. All mother-infant pairs were similarly stimulated in the hospital, but those of the rural dispersed districts Candelarita, Grifo Alto, and Barbacoas (subcohort I) were studied more closely by a physician and health nurses through monthly consultations. Visits included a survey of physical growth, breast feeding, food intake, and morbidity. Mother-infant pairs of four other districts, equally rural and dispersed (subcohort II), were visited monthly to collect data on breast feeding and physical growth. Information was collected by the staff of the Ministry of Health, coordinated by us. Mother-infant pairs of the central district of Puriscal (subcohort III), a rural

Figure 4 A woman extracts colostrum with a mechanical breast pump. Pumps mainly are for extraction of colostrum for high-risk neonates.

dispersed and concentrated population, attended the health services of the locality; theoretically, this population had better access to health resources of the region and the capital city. Standard forms and procedures were used to collect data in all districts.

The rate of breast feeding was higher in the first month of life in all subcohorts compared to rural Costa Rica 1 year earlier (Fig. 5), probably as a result of rooming-in. Furthermore, mothers of subcohort I nursed more frequently and longer than did mothers of the other subcohorts, apparently reflecting the added motivation induced by our health personnel through monthly visits (Fig. 6). The rate of breast feeding was similar for subcohorts II and III, but even these exhibited significantly higher rates than those of rural Costa Rica 1 year earlier.

To determine if the changes observed in Puriscal were dependent on the promotion of breast feeding that the Social Security System and the Ministry of Health initiated a few years earlier, a prevalence survey was conducted in rural dispersed localities of Moravia and Santo Domingo (Paracito, Santa Rosa, San Gerónimo). Women of this region deliver at the Calderon Guardia Hospital, where separation of mothers and infants and administration of formula to babies

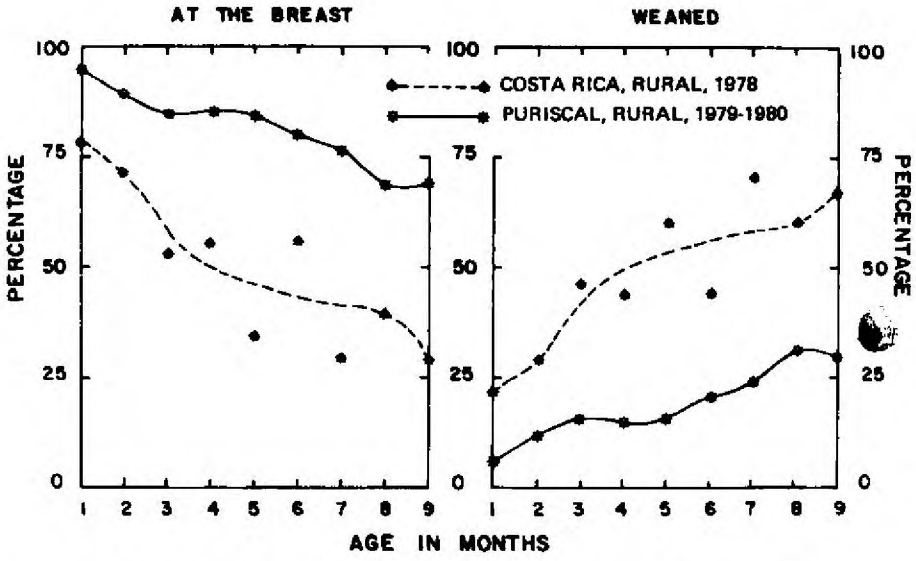

Figure 5 Left: Prevalence of breast feeding in a sample of rural dispersed population of Costa Rica in 1978, and in rural dispersed population of three districts (subcohort I) of Puriscal, Costa Rica, 1979–1980. Mothers and infants of subcohort I were exposed to rooming-in (see the text) at the San Juan de Dios Hospital. Right: Prevalence of weaning. The curves are the inverse of those at the left. (From Ref. 23.)

are the norm. Duration of hospitalization was similar to that observed in the San Juan de Dios Hospital. The results of the survey showed a decrease in breast feeding in these localities of the same magnitude as that found in rural Costa Rica 1 year earlier (Fig. 6). Furthermore, the decline in breast feeding with age was very rapid in this population, since by 9 months of age most children had been weaned.

Other positive effects of the rooming-in and postnatal stimulation in the San Juan de Dios Hospital were a dramatic reduction in child abandonment (M. E. Rodriguez, L. Mata, unpublished data), a decrease in the rate of diarrheal disease [23], and a marked reduction in neonatal mortality (M. E. Rodriguez, L. Mata, unpublished data). The effect of rooming-in on maternal behavior had been demonstrated experimentally in modern and traditional societies [34,35] and had been evaluated at the community level in industrial nations [5,36,37].

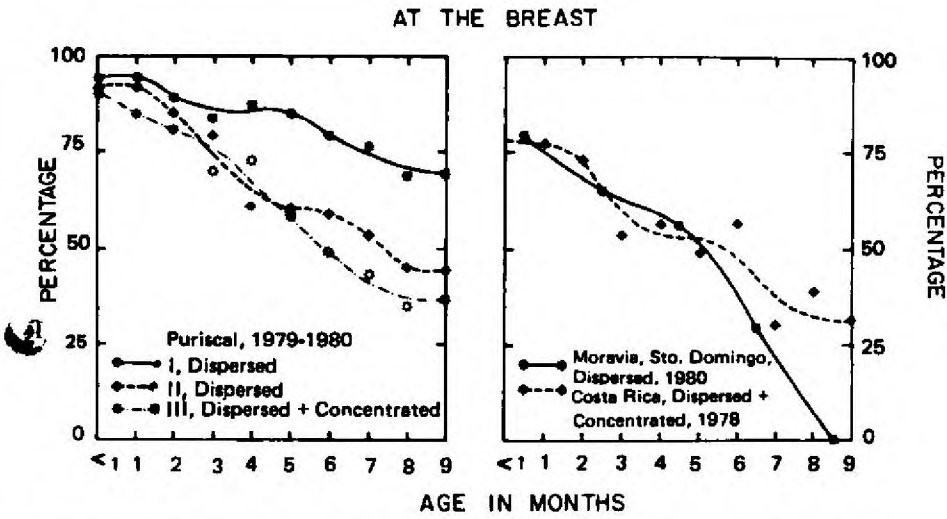

Figure 6 Left: Prevalence of breast feeding in three subcohorts of infants from the rural dispersed population of Puriscal, Costa Rica. The subcohorts were equally exposed to rooming-in. Women of subcohort I were further stimulated by monthly visits by INISA field personnel who monitored the status of breast feeding. Women of subcohort II were not subjected to stimulation by INISA's personnel, but were visited monthly by auxiliary health personnel from the Ministry of Health. Subcohort III, of rural dispersed and concentrated population, had greater exposure to urban influences than did subcohorts I and II; subcohort III had more access to health services than did subcohort II. Right: Prevalence survey of breast feeding in a representative sample of the rural population of Costa Rica in 1978, and in rural dispersed localities of Moravia and Santo Domingo in 1979–1980. This population did not enjoy rooming-in. Otherwise, it is similar in many other aspects to that of Puriscal. (From Ref. 23.)

VII. Summary

Breast feeding is the best promoter of growth and health of infants in traditional and transitional societies. Supplementation with semisolid and solid foods is generally required after 3–6 months in most developing countries. Supplements given to infants and young children in developing countries have been presumed to have a low nutrient value. Although this is true in many instances, continued breast feeding provides an excellent way to assure that the dietary deficiency of

supplements is corrected. Intakes of older infants and young children are nutritionally poor, but they could be sufficient if children stay at the breast for at least 18–24 months. This statement is supported by studies in Costa Rica which showed that nutrient intakes usually are 70–80% of the World Health Organization recommendation. Children with such intakes, however, grow well during infancy and early childhood, provided that they are relatively protected from infection. If infection is endemic, as is the situation of poor traditional and crowded societies, similar levels of food consumption will not prevent chronic malnutrition, due to the wasting and debilitating effect of infectious diseases.

Malnutrition and high mortality are prevalent in deprived societies in transition, especially in large urban centers, among infants weaned prematurely. It is then important to reverse the trend in declining breast feeding, for which several measures have been proposed. The hypothesis that mother-infant separation after delivery is one important cause of early weaning was tested by means of an intervention in a leading hospital of Costa Rica. Rooming-in resulted in almost universal nursing during the first month of life, and in a sustained high incidence of breast feeding up to 9 months of age. The result was related to the rooming-in implemented in the hospital and to an added postpartum stimulation by health personnel contacting the mothers at monthly intervals. In addition to the increase in breast feeding, there were lower rates of diarrhea, child abandonment, and neonatal mortality.

This investigation shows the importance of changing hospital norms to generalize rooming-in. Other measures should address other hospital practices and the negative effects of commercial promotion of milk formulas and weaning foods.

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