

## SOME EPIDEMIOLOGICAL ASPECTS OF MATERNAL BREAST-FEEDING IN A POPULATION ENTITLED TO SOCIAL WELFARE SERVICES IN MEXICO<sup>1</sup>

Arturo Magaña Cárdenas,<sup>2</sup> Luz María Padilla González,<sup>3</sup> Javier E. García de Alba,<sup>4</sup> Rogelio Troyo San Román,<sup>5</sup> and Ariel Delgado Becerra<sup>6</sup>

*A survey of breast-feeding practices was conducted among 632 obstetric patients with access to social welfare services in Guadalajara, Mexico. The results indicate a decline in the extent and duration of breast-feeding since 1959, and suggest that within the group studied education, higher income, urban living, and access to social welfare services (milk donations) tended to encourage early weaning.*

### Introduction

Marked changes have been noted in recent decades in infant feeding patterns, the most significant being a progressive decline in the prevalence and duration of breast-feeding. Although this decline was first observed in the more highly developed countries (1,2,3), recent data suggest that the trend toward early weaning is spreading rapidly to the less-developed countries as well (4,5,6).

Early weaning has serious consequences. Since the turn of the century, various studies of how infant morbidity and mortality relate to diet have demonstrated that human milk is more beneficial than formulas prepared with cow's milk (7,8,9,10). Not only do formula-fed babies have a higher incidence of gastroenteritis, respiratory infections, and otitis media, but their infections tend to persist

longer and their rate of mortality is higher. Early weaning has also been related to a higher incidence of allergies and eczema in infants (11), delayed neonatal tetany (12), enamel hypoplasia (13), hyperosmolarity (14, 15), hyperaminoacidemias (16,17,18), food allergies (19), and infantile and probably subsequent obesity (20). The limited data available for Mexico do not permit the full extent of the problem to be known. Like data from other developing countries, however, they do indicate a trend toward early weaning.

The study reported here had two major purposes: to provide a retrospective look at changes in patterns of infant feeding in Mexico over the past 20 years, and to examine some socioeconomic and cultural factors that could affect the incidence and duration of breast-feeding—including education, employment, income, and rural versus urban environments.

### Materials and Methods

The research was conducted at the obstetric service of the Mexican Social Security Institute's Clinic 45 in the city of Guadalajara, Mexico, from 1 January to 15 October 1978. A questionnaire was drawn up to provide the basis for interviews, each of which was conducted by one of the authors. In the course of

<sup>1</sup>Also published in Spanish in the *Boletín de la Oficina Sanitaria Panamericana* 90(3):218-228, 1981.

<sup>2</sup>Pediatrician, Mexican Social Security Institute, Jalisco State, Mexico.

<sup>3</sup>Medical Doctor, Coordinated Public Health Services of the State of Jalisco.

<sup>4</sup>Medical Adviser, Mexican Social Security Institute, Jalisco.

<sup>5</sup>Engineering Adviser, Mexican Social Security Institute, Jalisco.

<sup>6</sup>Statistician, Mexican Social Security Institute, Jalisco.

the interview, detailed information was requested concerning the diets of all children (except the newborn) during lactation and about a number of other variables considered relevant to breast-feeding patterns. In all, 632 recent maternity patients were interviewed, and the data collected were based on their direct oral responses to the questions asked.

For purposes of data compilation, a card was prepared with spaces for reporting details about the parents' educational background, occupation, and family income, as well as each listed child's place of birth, type of social welfare coverage, duration (in months) of breast-feeding, and age (in months) when formula-feeding began. The end product was a compilation of information on the 632 mothers and 2,130 of their children.

In order to evaluate these data, the 2,130 children were divided into five age groups—including those born before 1959, in 1959-1964, in 1965-1970, in 1971-1976, and in 1977—the divisions being made so that each group contained at least 100 children. The feeding patterns of each subgroup were then assessed and were examined for correlations with the child's urban or rural birthplace, the mother's education and occupation, social welfare coverage, and family income. Appropriate tests were made to determine whether differences observed between the subgroups were statistically meaningful.

## Results

Table 1 shows the occupations of the study children's fathers. It may be seen that most of the fathers were members of the active workforce. Furthermore, as indicated in Table 2, 93 per cent of the families surveyed reported monthly incomes equalling or exceeding the minimum wage. In contrast, as Table 3 shows, only 83 (13.1 per cent) of the mothers interviewed said they had paid employment. Regarding education, 45 per cent of the mothers interviewed said they had attended school for six years or more, and 90 per cent

**Table 1. Occupations of the study children's fathers.**

Occupation	No.	%
Laborer	238	37.7
Artisan	156	24.7
White-collar worker	86	13.6
Bricklayer	56	8.9
Technician	42	6.6
Professional	14	2.2
Farmer	12	1.9
Businessman	11	1.7
Unknown	17	2.7
Total	632	100.0

**Table 2. Study families' monthly income, in pesos.**

Monthly family income (in pesos)	No. of families	%
Unknown	43	6.8
≤ 2,000 (below minimum wage)	1	0.2
2,001-4,000 (at or above minimum wage)	277	43.8
4,001-6,000	172	27.2
6,001-10,000	91	14.4
> 10,000	48	7.6
Total	632	100.0

**Table 3. Occupations of the study children's mothers.**

Occupation	No.	%
Housewife	548	86.7
Work outside the home	83	13.1
Unknown	1	0.2
Total	632	100.0

**Table 4. Education of the study children's mothers.**

Educational level	No. of mothers	%
Unknown	1	0.2
No schooling	62	9.8
Some primary education	287	45.4
Completed primary school (grades 1-8)	209	33.1
Secondary education (grades 9-11)	54	8.5
University education	19	3.0
Total	632	100.0

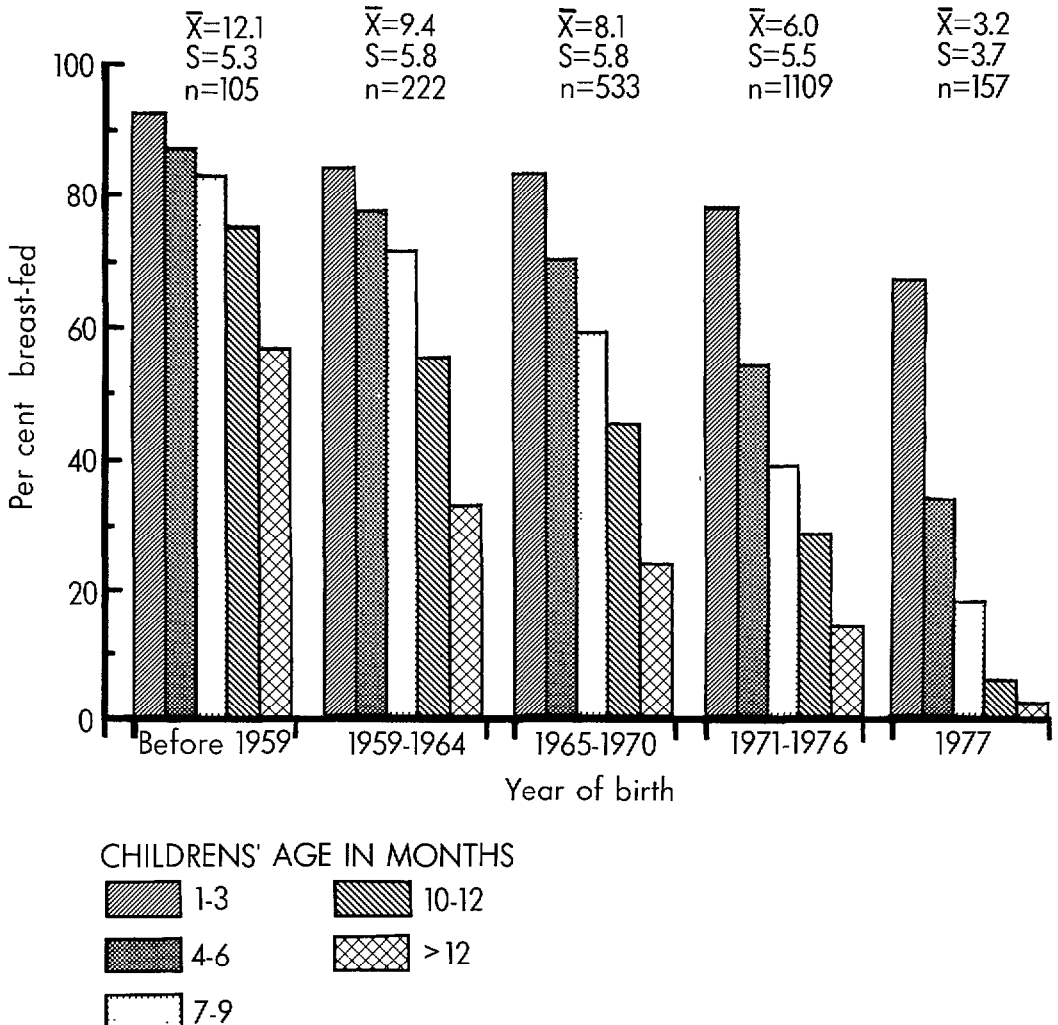
said they had received some primary schooling.

A statistically significant ( $P < 0.001$ ) negative correlation was found between the average duration of breast-feeding (in months) and year of birth, as shown in Figure 1. The data thus appear to show a trend toward reduced breast-feeding.

Another statistically significant ( $P < 0.001$ )

negative correlation was found between duration of breast-feeding and family income. Table 5 shows how long mothers in four different family income groups breast-fed their children, and Figure 2 compares feeding patterns for children of different ages in two different family income groups. (No food except milk was considered in compiling the Figure 2 data.) In general, these data show that breast-

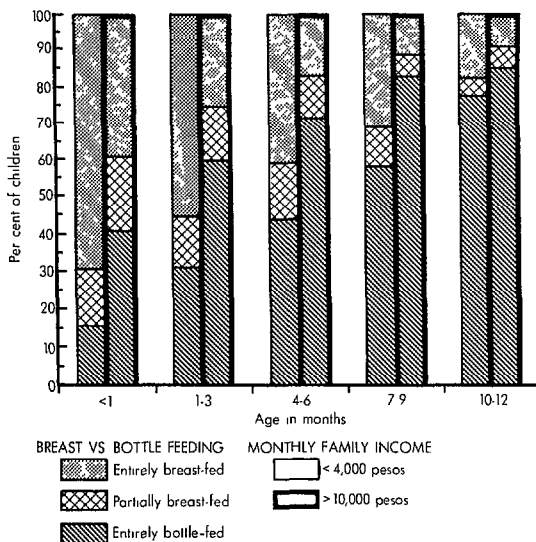
**Figure 1.** Duration of breast-feeding among five cohorts of children born in different years (before 1959 or in 1959-1964, 1965-1970, 1971-1976, or 1977). Within each cohort, the bars show the percentages of children breast-fed at 1-3, 4-6, 7-9, 10-12, and over 12 months postpartum. The figures above the bars show the average duration of breast-feeding ( $\bar{X}$ ) and the standard deviation ( $S$ ) for each cohort, as well as the number of children ( $n$ ) in the cohort.



**Table 5. Duration of breast-feeding among children from families with different monthly incomes.**

Duration of breast-feeding (in months)	Monthly family income, in pesos									
	2,001-4,000		4,001-6,000		6,001-10,000		> 10,000		Total	
	No. of children	%	No. of children	%	No. of children	%	No. of children	%	No. of children	%
< 1	157	15.6	113	20.0	58	24.1	59	40.4	432	20.3
1 - 3	156	15.5	125	22.0	71	29.6	28	19.2	411	19.3
4 - 6	129	12.8	83	15.0	33	13.8	17	11.6	269	12.6
7 - 9	143	14.2	57	10.0	22	9.2	17	11.6	252	11.8
10 - 12	198	19.6	82	14.0	30	12.5	3	2.1	341	16.0
> 12	225	22.3	108	19.0	26	10.8	22	15.1	425	20.0
Total	1,008	100.0	568	100.0	240	100.0	146	100.0	2,130	100.0

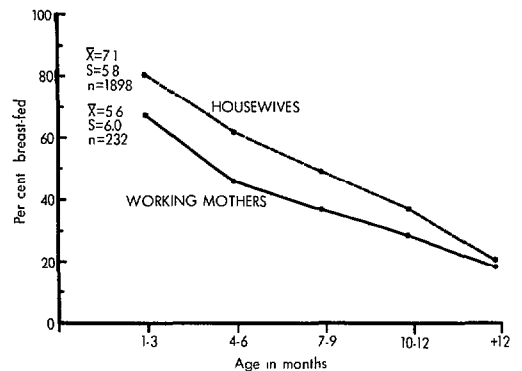
**Figure 2. Breast-feeding versus formula-feeding of milk to infants of various ages in low-income and high-income families, showing a general tendency toward less breast-feeding of the infants from high-income families.**



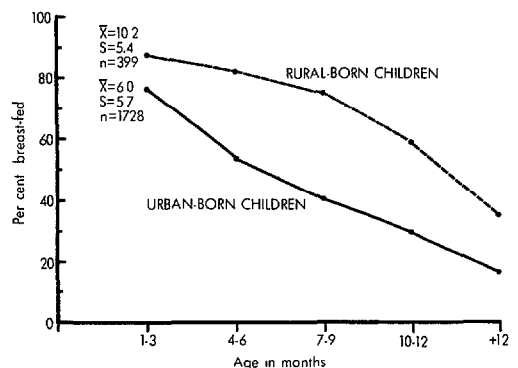
feeding of more than 6 months' duration tended to decline as family income rose, and that in each age group the proportion of breast-fed infants was lower among high-income families.

The observed relationship between duration of breast-feeding in months and the mother's occupation is shown in Figure 3. A statistically significant difference ( $P < 0.001$ ) was observed between the average length of time that housewives and women with paying jobs breast-fed their infants. One of every

**Figure 3. Percentages of children breast-fed at different ages (in months) by housewives as compared to working mothers. The figures to the left of each curve show the average duration of breast-feeding ( $\bar{X}$ ), the standard deviation in each group of children ( $S$ ), and the number of children in each group ( $n$ ).**



**Figure 4. Percentages of children breast-fed at different ages (in months), by rural versus urban birthplaces. The figures to the left of each curve show the average duration of breast-feeding ( $\bar{X}$ ), the standard deviation for rural-born and urban-born children ( $S$ ), and the number of children in each group ( $n$ ).**



three working mothers said she had not breast-fed her child.

Figure 4 shows the association observed between duration of breast-feeding and the child's place of birth. In this regard, a statistically significant ( $P < 0.001$ ) correlation was found between the average length of breast-feeding (in months) and rural (as compared to urban) birthplaces.

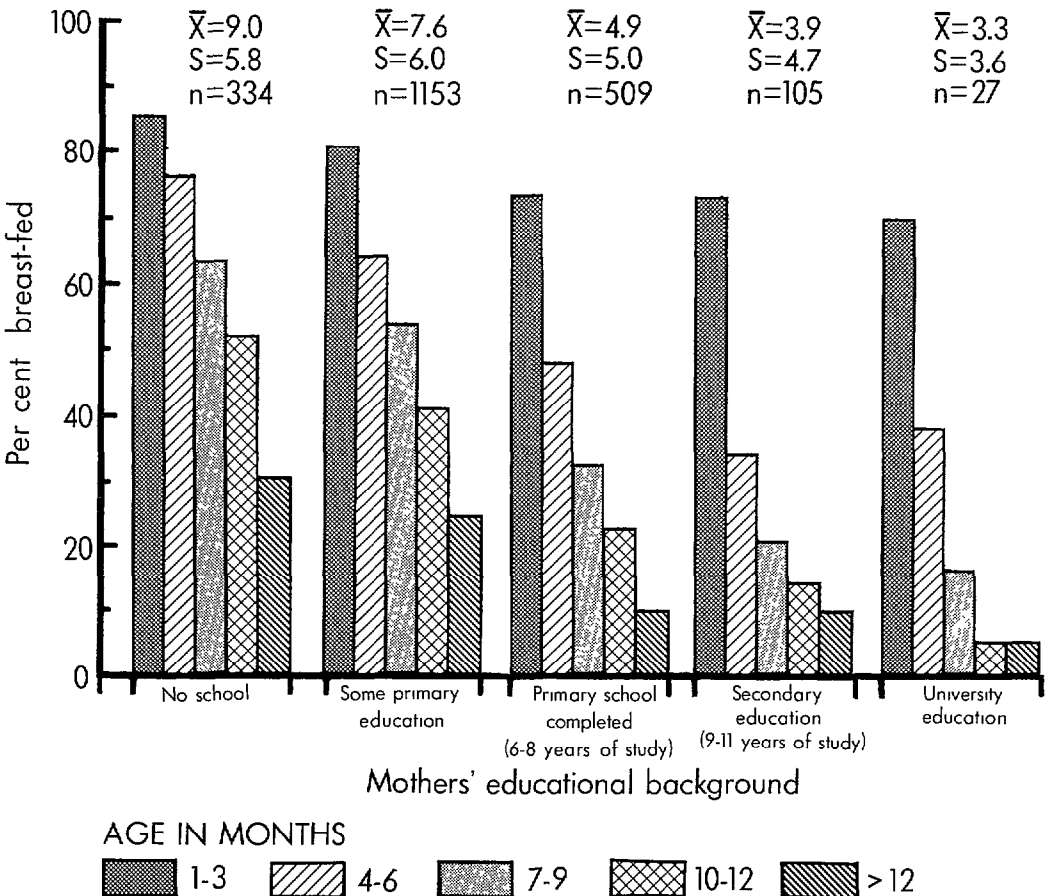
With regard to the relationship between duration of breast-feeding in months and maternal education (Figure 5), a statistically significant difference emerged between the two evaluated groups ( $P < 0.001$ ) and also between the two variables involved ( $P < 0.01$ ).

Finally, a statistically significant ( $P < 0.001$ ) negative correlation was found between duration of breast-feeding in months and the family's access to social welfare services at the time the child was born (Figure 6). That is, mothers without access to these services tended, on the average, to breast-feed their children longer than those with it.

**Discussion and Conclusions**

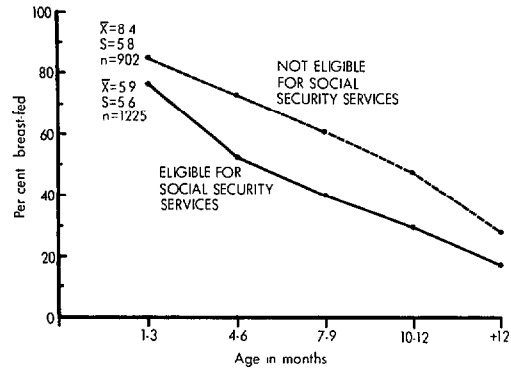
In view of the many underprivileged people, marked cultural differences, and pronounced economic inequalities that still exist in Mexico, our conclusions must logically be

Figure 5. Duration of breast-feeding among five groups of children born to mothers with different educational backgrounds. Within each group, the bars show the percentages of children breast-fed at 1-3, 4-6, 7-9, 10-12, and over 12 months postpartum. The figures above the bars show the average duration of breast-feeding ( $\bar{X}$ ) and the standard deviation (S) for each group, as well as the number of children (n) in the group.



**Figure 6. Percentages of children breast-fed at different ages (in months) among families with access (lower curve) and without access (upper curve) to social security services at the time of delivery.**

The figures to the left of each curve show the average duration of breast-feeding ( $\bar{X}$ ), the standard deviation in each group of children (S), and the number of children in each group (n).



limited to the universe from which the sample was selected. Thus, it is important to note that the population selected was enjoying the benefits of a social security institution that serves most of the country's actively productive workers (see Tables 1 and 2).

It is also true that the length of time elapsed between some of the study children's birth-dates and the interview could conceivably have influenced the reliability of some of the data. Nevertheless, childbirth is a memorable event in a woman's life, and breast-feeding is easily remembered, so there seems no basis for questioning the overall accuracy of the figures. Moreover, as will be seen, our results concur with those of other studies made in Mexico.

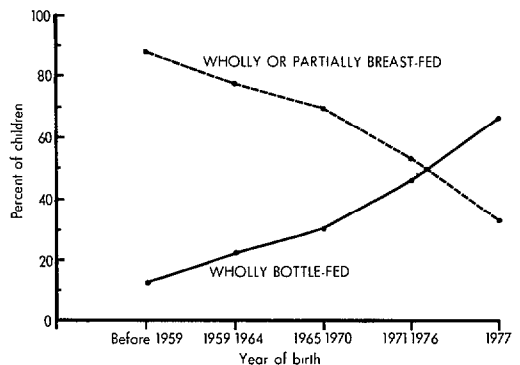
The subject of early weaning has been widely discussed in the literature as a more or less generalized and regular trend (1, 2, 3, 4, 5, 6, 21, 22, 23, 29, 30, 32). It involves first the elite classes of society and then, progressively, diverse segments of the general urban and suburban population. At present, as a rule, breast-feeding tends to be limited to less affluent urban populations, rural dwellers, and indigenous groups.

This, at least, appears to be the case in

Mexico. Our study documents a clear and progressive decline in breast-feeding, together with increasingly early formula-feeding (see Figure 7). It also indicates that, in the group studied, the risk of early weaning was greater for children born in urban areas than for those with rural backgrounds. Other studies conducted in Mexico point to the same phenomena, in varying degrees, throughout the country. Sanjur and Cravioto (23) conducted a longitudinal study in Tlaltizapan, Morelos (a town of 6,000 people in the semitropical farming area of Zacatepec) and found that only 9 per cent of all infants were being breast-fed at 6 months of age; this provided a dramatic contrast to the findings of an earlier 1960 study made in the same place by Navarrete et al. (24), which indicated that 91 per cent of the children were still nursing at that age.

Regarding breast-feeding in urban and indigenous populations, a study by Vega (25) published in 1977 found that 55.1 per cent of the infants born to the lower classes in the Federal District were still being breast-fed at 6 months of age; also in 1977, Mariscal (26) reported that 60.5 per cent of the children in suburban areas of Mexico City continued to be breast-fed after the eighth month. However, a study of indigenous groups in the Chiapas highlands published by Pérez (27) in 1975 found that hardly any of the children studied were weaned before their first birth-

**Figure 7. Percentages of children born at different times who were exclusively formula-fed or at least partially breast-fed at 4 months of age, by birth date.**



day, and that 33 per cent of them were still nursing at age 2.

As previously noted, our study also found that the level of family income, the mother's occupation and education, and the use of social security facilities at the time of the baby's birth all played a significant part in the average duration of breast-feeding.

These data indicate that in our group the opportunity to obtain formula, whether supplied by a social security agency or purchased (where family income permitted), had an adverse effect on the duration of breast-feeding. We found a negative association between breast-feeding and the family's position on the income scale, as well as a greater risk of early weaning among the group with social security coverage. Although the hospital's influence on this group has yet to be spelled out, as a rule hospitals exert a negative influence (28, 29, 23); that is, feeding routines for the newborn are scheduled to suit the convenience of the administrative staff, which favors the use of formula rather than breast-feeding, and we know that mothers tend to adopt the nontraditional practices observed during their stay in the maternity ward. Evans (30), Gallegos (6), Brown (31), and Manckeberg (36) have also noted that the availability of a substitute has an adverse effect on breast-feeding.

The role of other factors that initially appear to be important is less certain. Such factors as the mother's outside employment and maternal schooling may have a greater or lesser effect on certain groups, depending upon the net impact of that factor vis-a-vis complex interactions of other variables. Jobs outside the home do not appear to play a determining role, because fewer than one mother out of every four with nursing-age infants work in Latin America.

In Chile, Herrera (32) has reported that work outside the home had an adverse effect on breast-feeding. On the other hand, Marin (33) has asserted that there is no relationship between outside employment and breast-feeding in Chile.

Hirschman (34) found no significant dif-

ference in the index of breast-feeding among working and nonworking mothers in the United States, whereas we did find such a significant difference in the duration of breast-feeding in our group. However, even working mothers in our group nursed their infants an average of 5.6 months, a length of time which is considered adequate.

With regard to maternal education and breast-feeding, the discrepancies between different studies are sharper. Hirschman has reported an interesting correlation between breast-feeding and educational level. That is, the highest indexes of breast-feeding found in his study were attained by women who had not gone beyond the sixth grade, closely followed by those with 16 or more years of school. Those with intermediate levels of education ranked lowest. As noted, our own study found a negative correlation between the level of education and the duration of breast-feeding. Sanjur (23) has likewise reported that the probability of early weaning increases in direct proportion to the mother's years of schooling. On the other hand, Herrera (32) and Marin (33) failed to find any correlation between early weaning and education. This provides grounds for speculating that there could conceivably be four stages involved in the relationship between education and breast-feeding, these being (1) no relationship (cultures of more and less educated mothers homogeneous); (2) a negative relationship (nonindustrial cultures of more and less educated mothers different); (3) a curvilinear relationship (industrial cultures of more and less educated mothers different); and (4) no relationship (industrial cultures of more and less educated mothers homogeneous).

The discrepancies between the various studies are easily explained if one considers that infant feeding patterns are part of an overall sociocultural fabric involving many complex interrelationships. As a result, it is not surprising that the factors involved should vary from one country to another and even from one group to another within the same country.

We can therefore conclude, in accord with our own research and the literature, that no single factor can explain the observed differences in breast-feeding patterns or those patterns' historical trends. Consequently, the results obtained are strictly valid only for the group studied, and cannot be used as a basis for easy generalization. A great deal more knowledge about early weaning is therefore needed, and research in this area remains a high-priority task.

Specific matters that remain to be clarified include the length of time breast-feeding is continued in different populations and different population groups; the reasons for early weaning by different mothers and different populations; and relationships between breast-feeding and the psychological and emotional ties of the mother and her child. All this information is needed to provide a basis for viable programs capable of stemming and reversing the trend toward early weaning.

Among other things, the decline in breast-

feeding has implications that can affect national development planning. According to Jelliffe (35), the following considerations warrant particular attention: How much do substitutes for human milk cost the family, the community, and—in the final analysis—the nation? Where should such substitutes be produced, or should they be imported in the future from a protein-deficient world? And what effect might production of substitutes have on the nation's balance of payments, on economic and technological dependence, and—in the last analysis—on the possibilities for establishing other development projects?

As for the trend's more immediate public health implications, these are very clear. That is, breast-feeding has proven superior to bottle-feeding in the developing countries, where it can have a determining influence upon survival in early childhood. Therefore, it is hard to underestimate the importance of learning more about the background factors that influence this trend.

### SUMMARY

A survey was conducted to assess the breast-feeding practices of a group of 632 women selected by the obstetric service of the Mexican Social Security Institute at Guadalajara, Mexico. The specific purposes of this research were to determine whether there had been changes in breast-feeding patterns over time, and to examine the possible effects upon breast-feeding of such socioeconomic and cultural factors as maternal education, maternal occupation, place of birth, family income, and access to social welfare services.

Most of the women came from economically active population sectors, and most of their families

had incomes equalling or exceeding the minimum wage. Overall, 45 per cent of the mothers had received at least six years of primary education.

A progressive decline was documented in the prevalence and duration of breast-feeding over time. Significant correlations were also observed between breast-feeding and the other factors considered. For the population studied, the results suggest that the risk of early weaning was greater among children born in urban areas, those whose mothers had access to social welfare services, those born into higher-income families, and those whose mothers had a higher level of education.

### REFERENCES

(1) Sjolín, S. Present trends in breast feeding. *Current Medical Research and Opinion* Vol. 4 (Suppl. 1):17-22, 1976.

(2) Jelliffe, D. B. *Infant Nutrition in the Subtropics and Tropics*. WHO Monograph Series, No. 29. World Health Organization, Geneva, 1968.



- (3) Fomon, J. S. *Nutrición infantil* (second edition). Nueva Editorial Interamericana, Mexico City, 1976.
- (4) Laurenti, R. Resultados e ações apontadas pe la investigação interamericana de mortalidade na infância no Brasil. *Bol Of Sanit Panam* 82(4):344, 1977.
- (5) Jelliffe, D. B., and E. F. Jelliffe. Human milk, nutrition, and the world resource crisis. *Science* 188:557, 1975.
- (6) Gallegos, H., S. Iturra, C. Barros, et al. Estudio del estado nutritivo y de las condiciones de vida de la población infantil de la comuna de Puataendo: Efecto del programa de atención médica y de distribución de leche del Servicio Nacional de Salud. *Rev Chil Pediatr* 41:556, 1970.
- (7) Goldman, A. S., and C. W. Smith. Host resistance factors in human milk. *J Pediatr* 82:1082, 1973.
- (8) Mata, L., and R. G. Wyatt. The uniqueness of human milk: Host resistance to infection. *Am J Clin Nutr* 24:976, 1971.
- (9) Cunningham, A. S. Morbidity in breast-fed and artificially fed infants. *J Pediatr* 90:726, 1977.
- (10) Gerrard, J. W. Breast-feeding: Second thoughts. *Pediatrics* 54:757, 1974.
- (11) Applebaum, R. M. The modern management of successful breast feeding. *Pediat Clin North Am* 17:203, 1970.
- (12) Tsang, R. C., E. F. Donovan, and J. J. Steichen. Calcium physiology and pathology in the neonate. *Pediatr Clin North Am* 23(4):611, 1976.
- (13) Stemmler, G. J. Dental defects associated with neonatal symptomatic hypocalcaemia. *Arch Dis Child* 48:217, 1973.
- (14) Davis, D. P. Plasma osmolality and feeding practices of healthy infants in the first three months of life. *Br Med J* 2:340, 1973.
- (15) Taitz, L. S., and H. D. Byers. High calorie-osmolar feeding and hypertonic dehydration. *Arch Dis Child* 47:257, 1972.
- (16) Menkes, J. H., D. W. Welcher, H. S. Levi, et al. Relationship of elevated blood tyrosine to the ultimate intellectual performance of premature infants. *Pediatrics* 49:218, 1972.
- (17) Gaull, G. E., D. K. Rassin, N. C. Rähä, et al. Milk protein quantity and quality in low-birth-weight infants: III. Effects on sulfur amino acids in plasma and urine. *J Pediatr* 90:348, 1977.
- (18) Mamunes, P., P. E. Prince, N. H. Thornton, et al. Intellectual deficits after transient tyrosinemia in the term neonate. *Pediatrics* 57:675, 1976.
- (19) Lebenthal, E. Cow's milk protein allergy. *Pediatr Clin North Am* 22(4):827, 1975.
- (20) Taitz, L. Obesity in pediatric practice: Infantile obesity. *Pediatr Clin North Am* 24(1):107, 1977.
- (21) Solein de González, N. L. Breast feeding, weaning and acculturation. *J Pediatr* 62:577, 1963.
- (22) Jelliffe, D. B., and E. F. Jelliffe. Lactation, conception and the nutrition of the nursing mother and child. *J Pediatr* 81:829, 1972.
- (23) Sanjur, D. M., J. Cravioto, L. Rosales, et al. Infant feeding and weaning practices in a rural preindustrial setting. *Acta Paediatr Scand (Suppl.)* 200: Suppl 200:1 +, 1970.
- (24) Pérez Navarrete, J. L. Operación Zacatepec V. *Bol Med Hosp Infant Mex* 17:283, 1960.
- (25) Vega Franco, L., T. Toca, and F. Torres Muñoz. Alimentación al seno en las clases populares de la ciudad de México. *Salud Pública Mex* 19(2):227, 1977.
- (26) Mariscal Abascal, C., J. Sori, L. Rey, O. Bautista, and M. Fiscal. Estudio sobre la lactancia materna en un área suburbana. *Bol Med Hosp Infant Mex* 34(4):777, 1977.
- (27) Pérez Hidalgo, C., M. Fernández, J. Ramírez, et al. La situación nutricional de la población rural de los altos de Chiapas. *Salud Pública Mex* 17:235, 1975.
- (28) Jelliffe, D. B., and E. F. Jelliffe. Editorial: Doulas, confidence, and the science of lactation. *J Pediatr* 84:462, 1974.
- (29) Wade, N. Bottle feeding: Adverse effects of a western technology. *Science* 188:557, 1975.
- (30) Evans, N., I. R. Walpole, M. U. Qureshi, et al. Lack of breast feeding and early weaning in infants of Asian immigrants to Wolverhampton. *Arch Dis Child* 51:608, 1976.
- (31) Brown, R. E. Breast feeding in modern times. *Am J Clin Nutr* 26:556, 1973.
- (32) Herrera, L. P. Alimentación natural: Estudio en 56 madres de un sector de bajo nivel socioeconómico en la ciudad de Valdivia en 1970. *Rev Chil Pediatr* 42:706, 1971.
- (33) Marin, S. P. Lactancia natural: Desafío en la enfermedad, desnutrición y mortalidad infantil. *Rev Chil Pediatr* 45:259, 1974.
- (34) Hirschman, C., and J. A. Sweet. Social background and breast feeding among American mothers. *Soc Biol* 21:39, 1974.
- (35) Jelliffe, D. B. Introducción. In *El valor incomparable de la leche materna*. PAHO Scientific Publication 250. Pan American Health Organization, Washington, D.C., 1972.
- (36) Manckeberg, F. Factors Conditioning Malnutrition in Latin America: Malnutrition as a Problem Ecology. Karger, New York, 1970, p. 23.