

# Breast-feeding and the Nutritional Status of Nursing Children in Chile<sup>1</sup>

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*The work reported here sought to describe the feeding patterns of Chilean children up to 18 months old and their relation to nutritional status. To this end, a survey was conducted in 1993 of 9 330 Chilean children under 18 months old who were receiving care through the National Health Service System—which provides care for 75% of all children under age 6. The children, whose mothers or caretakers were interviewed, constituted 94% of a sample selected at random from 102 of the 320 urban health clinics located throughout the country.*

*The interview served to identify the type of feeding (exclusive breast-feeding, breast-feeding plus bottle-feeding, breast-feeding plus solid food, exclusive bottle-feeding, or bottle-feeding plus solid food) and to determine the nutritional status of the participants in terms of standards used by the United States National Center for Health Statistics and the World Health Organization. Children were deemed at risk of malnutrition if they had z scores on the weight-for-age distribution between 1.0 and 2.0 standard deviations below the US/WHO standard and as actually malnourished if they had z scores of over 2.0 standard deviations below the standard.*

*The survey found exclusive breast-feeding prevalences of 86.5%, 66.7%, and 25.3% among infants 1, 3, and 6 months old. Some 12.1% of the participants were found to have a weight-for-age deficiency, 30.7% exhibited a height-for-age deficiency, and 35.7% were found to be overweight. The prevalence of weight-for-age and height-for-age deficiencies were found to be considerably higher among bottle-fed children than among breast-fed children. In general, the results demonstrated the benefits of exclusive breast-feeding through the first 6 months of life, the need to complement exclusive breast-feeding with solid food after that time, and the superior nutritional status of breast-fed children within the age groups studied.*

**I**n Chile, as in many countries, a notable decline was previously observed in the prevalence of breast-feeding. Indeed, at the start of the 1980s the percentage of children exclusively breast-fed through the first 6

months of life did not exceed 5%. Even though this percentage later rose in response to an education campaign conducted by the Ministry of Health (1–3), current breast-feeding prevalences still do not approach levels called for by national goals—which state that 80% of all children should be exclusively breast-fed through the first 4 months of life and that 35% should be partially breast-fed through the first 12 months of life (4).

Numerous factors have influenced this reduction in traditional breast-feeding—including rural-to-urban migration, development of milk substitutes, incorporation of women into the labor market, aggressive marketing of breast milk substitutes, the inadequate treatment of breast-feeding in

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education programs for health professionals, and use of anthropometric standards that failed to reflect the normal pattern of growth for breast-fed children. Equally important was the underestimation of breast milk's contribution by health professionals and their adherence to feeding guidelines that discouraged exclusive breast-feeding (5-7).

The advantages of breast-feeding from the nutritional, immunologic, and psychosocial standpoint are well documented. The negative effects of shortened breast-feeding on growth and infant health are particularly evident in poor communities—because bottle-feeding entails a greater risk of infection, a smaller supply of nutrients, and association with an increased prevalence of malnutrition (8-11).

Although they have not evolved in a continuous manner, since the 1980s a number of activities have been carried out in Chile to promote breast-feeding. These have included creation of the National Commission on Breast-feeding (*Comisión Nacional de Lactancia Materna*) in which representatives of academic groups, scientific societies, the Ministry of Health, and nongovernmental organizations have all participated; development of a "hospital friends of the child" (*hospitales amigos del niño*) initiative; dissemination and application of a code governing the marketing of milk substitutes; and training of health teams in up-to-date breast-feeding concepts.

One aim of the National Commission on Breast-Feeding was to develop an initial estimate of the prevalence of breast-feeding and to follow trends in that prevalence through future interventions. To derive the initial estimate, in September 1993 a national survey was conducted of the infant population receiving health care in Ministry of Health facilities. This article describes that survey and uses its data to examine the breast-feeding patterns of Chile's infant population and also the relationship between breast-feeding and nutritional status.

## MATERIALS AND METHODS

The researchers designed a prevalence survey that took as its reference population all children under 18 months old who were receiving health care in urban primary health care facilities supervised by the Ministry of Health. In all, the ministry was operating 26 regional health services distributed throughout the country that were providing health care to approximately 1 230 000 children under 6 years old, or 75% of the total population in that age group.

Approximately 85% of the total Chilean population lives in urban areas and has a fairly homogeneous ethnic makeup. The vast bulk of the children in the reference population belonged to families whose incomes placed them in one of the four lowest quintiles. However, the health care coverage provided for the poorest quintile (the 20% with the lowest income) approached 100%. The average level of schooling of mothers seen at the health centers was eight years, although this percentage varied from one region to another (12).

To calculate the desired size of the study sample, the researchers estimated the prevalence of exclusive breast-feeding through 6 months of age at 25%—based on partial information from a number of health centers. They also allowed for a 95% level of confidence, an estimating error of 2.5% for each age group (0-2, 3-5, 6-8, 9-11, and  $\geq 12$  months), 10% nonresponse or incomplete response to the survey, and a design effect of 1.5. Based on these data and calculations, the desired sample size was 9 912 (13).

Subsequently, a sample size proportional to the number of children under age 2 receiving medical checkups at the health services was calculated for each service. Three to five urban clinics pertaining to each service were then selected, priority being given to those conducting the greatest number of checkups with an eye to completing the survey in less than 10 days. In all, 102 clin-

ics were included in the survey, which accounted for 32% of the total number of urban clinics operating in the country.

The survey was administered by health workers at each facility (nurses, nutritionists, etc.), following pre-established guidelines. The survey included all children who were seen at the centers during the study period (approximately one week in September 1993) for growth monitoring or because of illness until the pre-established sample size was reached.

A card was used to record the following data: the subject's date of birth, date of the consultation, weight, height, sex, and type of feeding. Information about feeding was obtained from the child's mother or caretaker by means of a survey instrument (14). Using this instrument, specific information was collected with regard to the child's consumption of the following foods during the preceding 24-hour period: breast milk, milk formula, water, juices or other liquids, soft foods (pap), and solid foods. Weight and height measurements were taken under standardized conditions in accordance with the international norms adopted by the Ministry of Health (15). With regard to breast and formula feeding, the following categories were established: exclusive breast-feeding, breast-feeding plus solid foods, breast-feeding plus formula, exclusive formula feeding, and formula feeding plus solid foods.

By comparing the anthropometric data obtained with standards employed by the United States National Center for Health Statistics and WHO, weight-for-age, weight-for-height, and height-for-age ratios were calculated (16). In classifying nutritional status, the researchers defined children with *z* scores of  $-1.0$  and  $-2.0$  on the weight-for-age distribution as being at risk of undernourishment, while children receiving *z* scores of less than  $-2.0$  were considered undernourished. Similarly, all children with *z* scores between  $1.0$  and  $2.0$  on the weight-for-height distribution were

classified as overweight, while all those with *z* scores greater than  $2.0$  were classified as obese.

The prevalences of nutritional deficiency and excess weight were compared in groups of study children who received the type of feeding considered optimal versus those who received various other types of feeding—a comparison yielding nutritional deficiency (or excess weight) prevalence ratios. Exclusive breast-feeding was considered optimal for subjects under 6 months old, while breast-feeding supplemented with solid food was considered optimal for children 6 through 18 months old.

ANTHRO and STAT Plus software programs were used to analyze the data. In order to compare proportions, the chi-square test was applied with a level of statistical significance of 5%.

## RESULTS

In connection with this study, the researchers conducted a total of 9 330 interviews with 94% of the mothers or caretakers of children included in the sample. To judge by the proportions of regular health checkups performed for children of different ages (see Table 1), children under 6 months old were over-represented in the sample, accounting for 46% of the total.

Table 1 shows the percentage distribution of the 9 330 survey children whose mothers or caretakers were interviewed, by month of age and type of feeding. The prevalence of exclusive breast-feeding was relatively high up to 4 months of age (being 59.4% at 3.0–3.9 months) but then dropped off rapidly, declining to 1.6% in the seventh month. However, 83%, 59%, and 31% of the children 3, 6, and 12 months old, respectively, were still receiving some breast milk. The data also indicated that solid foods had been added to the diets of 15%, 38%, and 60% of the respective children 4, 5, and 6 months of age who had once been exclusively breast-fed.

**Table 1.** Percentage distribution of the 9 330 children surveyed, by age group and type of feeding. Chile, 1993.

Age (months)	Cases (No.)	Type of feeding				
		Breast-feeding	Breast-feeding plus solid food	Breast-feeding plus formula*	Formula	Formula plus solid food
0.0-0.9	786	86.5	1.0	9.8	2.0	0.6
1.0-1.9	683	77.0	0.4	17.1	5.1	0.3
2.0-2.9	879	66.7	0.7	20.6	10.6	1.5
3.0-3.9	606	59.4	1.2	22.8	13.4	3.3
4.0-4.9	836	43.2	7.4	23.8	13.2	12.4
5.0-5.9	501	25.3	15.8	25.5	6.0	27.3
6.0-6.9	768	12.8	19.5	26.6	2.5	38.7
7.0-7.9	425	1.6	16.7	31.5	1.4	48.7
8.0-8.9	436	1.8	15.4	28.9	0.7	53.2
9.0-9.9	513	0.6	11.1	28.1	1.2	58.9
10.0-10.9	365	0.5	9.6	30.1	0.5	59.2
11.0-11.9	507	0.8	6.7	28.0	0.6	63.9
12.0-12.9	471	0.2	2.8	28.0	0.8	68.2
13.0-13.9	208	0.0	1.9	21.2	0.5	76.4
14.0-14.9	206	0.0	3.9	18.9	0.5	76.7
15.0-15.9	398	0.5	3.5	18.1	0.8	77.1
16.0-16.9	169	1.2	3.6	13.6	0.6	81.1
17.0-17.9	166	0.0	3.0	11.4	0.0	85.5
18.0-18.9	407	0.7	2.0	10.1	0.0	87.2
Total	9 330					

\* With or without solid food.

In the bottle-fed group the introduction of solid foods occurred earlier, with 48%, 82%, and 94% of those in the respective 4, 5, and 6 month groups receiving solid food. The high percentages of bottle-fed children over 6 months old who were receiving solid food (see Table 1) are also very noteworthy.

Data indicating the study children's nutritional status are shown in Table 2. The highest percentages of children with clear deficiency ( $z < -2$  SD) were deficient with respect to the height-for-age indicator, the percentage deficient increasing progressively with age. Regarding weight-for-age, the percentage with clear deficiency ( $z < -2$  SD) was low in the first 6 months but increased markedly in the second 6 months of life.

In contrast, the weight-for-height data revealed a distribution shifted to the right

of the normal curve, with very low percentages showing any deficiency but with substantial percentages showing excess weight. The effect of age appeared less significant than it was in the case of the other two indicators, because the percentages of children with deficient or excessive weight-for-height showed little variation by age group.

Table 3 shows how prevalences of deficient weight-for-age ( $z < -1$  SD) among the study subjects were related to types of nutrition, by age group. In children under 6 months old the level of deficiency was significantly higher among those who were given a combination of breast milk and formula than it was among those who were exclusively breast-fed ( $P < 0.01$ ). However, among children 6 to 8 months old who were exclusively breast-fed and had never re-

**Table 2.** Distribution of the 9 330 survey children, grouped into five age categories, in terms of deficient or excessive weight-for-age, height-for-age, and weight-for-height. Deficiency in all three cases was defined as more than 1 standard deviation (SD) below the 50th percentile (P50) of the appropriate US/WHO standard, while excess in the case of weight-for-height was defined as more than 1 standard deviation above the 50th percentile. The *P* values below compare the differences in nutritional status distribution by age group.

Anthropometric parameters and age groups (in months)	% survey children in each category			
	<-2 SD	>-2 SD, <-1 SD	P50 ±1 SD	>+1 SD
<i>Weight-for-age:</i>				
0-2	0.6	6.5	74.2	18.7
3-5	0.7	4.9	71.3	23.1
6-8	1.4	10.8	67.7	20.1
9-11	2.8	13.7	66.3	17.2
12-18	2.8	17.9	64.0	15.3
(χ <sup>2</sup> ; <i>P</i> < 0.001)				
<i>Height-for-age:</i>				
0-2	4.1	20.7	69.7	5.5
3-5	5.5	22.3	66.5	5.7
6-8	7.0	22.9	65.3	4.8
9-11	6.5	26.1	62.1	5.3
12-18	10.1	29.8	56.6	3.5
(χ <sup>2</sup> ; <i>P</i> < 0.001)				
<i>Weight-for-height:</i>				
0-2	0.5	2.3	63.7	33.5
3-5	0.1	1.0	54.1	44.8
6-8	0.1	2.2	60.5	37.2
9-11	0.1	4.6	61.4	33.9
12-18	0.1	4.8	65.5	29.6
(χ <sup>2</sup> ; NS)				

ceived solid foods, the prevalence of weight-for-age deficiency was higher than it was among children who had received both breast milk and solid foods.

Table 4 shows the same sort of data relating to height-for-age. As may be seen, breast-feeding in the first 6 months of life tended to protect against height-for-age deficiency, the risk of such deficiency being 1.6 to 1.8 times higher among children who were exclusively bottle-fed than among those who were exclusively breast-fed.

Finally, Table 5 shows the same sort of data relating to weight-for-height. Excess weight-for-height was found to occur with

relatively greater frequency among the study children over 3 months old who were exclusively breast-fed.

## DISCUSSION AND CONCLUSIONS

The advantages of breast-feeding are well documented, particularly with regard to infectious diseases, nutritional status, mother-child bonding, birth spacing, and infant mortality (17-19). Despite this, breast-feeding prevalences throughout the world remain low.

On the positive side, a number of stud-

**Table 3.** Prevalence ratios of weight-for-age deficiency (<-1 standard deviation) in different groups of study subjects, by age group and type of feeding. For each age group the *P* value was obtained by comparing the "ideally fed" benchmark group (in italics) with the others. NS = not significant.

Age (months)	Breast-feeding	Breast-feeding plus solid food	Breast-feeding plus formula*	Formula	Formula plus solid food	<i>P</i>
0-2	<i>1.0*</i>		1.3	2.0	2.2	<0.01
3-5	<i>1.0</i>	1.0	3.1	5.0	2.7	<0.001
6-8	1.5	<i>1.0</i>	1.2	2.5	1.5	<0.01
9-11		<i>1.0</i>	1.6		1.3	NS
12-18		<i>1.0</i>	1.9		2.1	NS

\* With or without solid food.

**Table 4.** Prevalence ratios of height-for-age deficiency (<-1 standard deviation) in different groups of study subjects, by age group and type of feeding. For each age group the *P* value was obtained by comparing the "ideally fed" benchmark group (in italics) with the others. NS = not significant.

Age (months)	Breast-feeding	Breast-feeding plus solid food	Breast-feeding plus formula*	Formula	Formula plus solid food	<i>P</i>
0-2	<i>1.0*</i>		1.4	1.8	1.7	<0.001
3-5	<i>1.0</i>	1.2	1.2	1.6	1.2	<0.01
6-8	1.2	<i>1.0</i>	1.0	1.2	1.0	NS
9-11		<i>1.0</i>	1.2		0.9	<0.05
12-18		<i>1.0</i>	1.3		1.4	NS

\* With or without solid food.

**Table 5.** Prevalence ratios of excessive weight-for-height (>1 standard deviation) in different groups of study subjects, by age group and type of feeding. For each age group the *P* value was obtained by comparing the "ideally fed" benchmark group (in italics) with the others. NS = not significant.

Age (months)	Breast-feeding	Breast-feeding plus solid food	Breast-feeding plus formula*	Formula	Formula plus solid food	<i>P</i>
0-2	<i>1.0*</i>		1.0	1.2		NS
3-5	<i>1.0</i>	0.8	0.8	0.7	0.7	<0.001
6-8	1.4	<i>1.0</i>	0.6	0.6	0.6	<0.001
9-11		<i>1.0</i>	0.7		0.8	<0.05
12-18		<i>1.0</i>	0.7		0.6	<0.01

\* With or without solid food.

ies have shown it possible to modify breast-feeding practices over the short term through appropriate health team management and training (20–23). Indeed, one community intervention program of this nature succeeded in raising the prevalence of exclusive breast-feeding for infants 6 months old to over 80% (21).

The study reported here found higher prevalences of exclusive breast-feeding than had been observed by prior studies in Chile, which had reported prevalences below or around 5% for infants 6 months old (1, 2, 17, 20). A number of factors could account for this. The Ministry of Health, as well as other Chilean public and private organizations, has made efforts to train health teams and mothers through campaigns that have included messages designed to stress the advantages of natural feeding, reinforce breast-feeding techniques, and teach practical ways to address the problems encountered during breast-feeding. In so doing, they have changed health team attitudes toward this practice.

Also, breast-feeding clinics have been established in primary health care centers. These clinics facilitate access to required medical care, clear up doubts that mothers may have about breast-feeding, and help the latter to resolve their own health problems as well as those of their children.

In addition, a children's hospital (*hospitales amigos del niño*) initiative has reinforced health education during pregnancy and the immediate postpartum period, and has modernized health career study programs.

Beyond that, efforts have been made to ensure application of a breast milk substitute marketing code, which has limited advertising for these products in health facilities and among the general population.

All of these actions have encouraged reassessment of breast-feeding and have led to marked changes in feeding guidelines that at one point went so far as to discredit exclusive breast-feeding.

As this study has shown, the prevalence

of weight-for-age deficiency was low (see Table 2), the overall prevalence of malnutrition (defined as  $z < -2$  SD) suggested by this indicator for infant subjects being less than 2%. While this finding tends to affirm the good nutritional status of Chile's infant population, it contrasts with considerably higher prevalences of deficient height-for-age found among all the age groups studied.

It is difficult to explain the manifest inconsistency in the behavior of these two indicators, which could derive from genetic factors, environmental factors, or some combination of the two. At present the specialists are split, with geneticists tending to stress the importance of genetic factors and nutritionists pointing to environmental causes. The distinction has practical significance, since whatever explanation is accepted will ultimately influence the interventions implemented to improve the infant population's nutritional status.

In general, it seems clear that exclusive breast-feeding constitutes the best feeding method during an infant's initial months of life. Hence, the growth patterns observed in healthy breast-fed children could become a new reference standard. Data from the present study indicate that infants under 6 months old who were fed only breast milk exceeded weight-for-age and weight-for-height standards set by the United States National Center for Health Statistics and the World Health Organization by 0.37 standard deviations and 0.87 standard deviations, respectively. In contrast, height-for-age data from these same study subjects indicated they were 0.42 standard deviations below the NCHS/WHO standard, suggesting that at least among infants under 6 months old, genetic factors could explain differences between weight and height.

One advantage of breast-feeding is that breast-fed infants tend to follow superior growth curves—because of breast milk's nutritional value and the protection it confers against infections. In interpreting weight curves, it must be remembered that

the benchmark patterns are inadequate because they were obtained with children fed primarily with breast milk substitutes. Even so, the results of the present study show that the risk of developing a weight-for-age deficiency was substantially higher among non-breast-fed children receiving formula, solid food, or both—thus reaffirming the findings reported in the literature on this subject (17–25).

In this study, infants up to 6 months old who were fed breast milk plus solid food achieved a higher weight-for-age than those receiving breast milk plus formula, formula alone, or formula plus solid food. The results also show that exclusive breast-feeding tends to prevent deficient height in this age group, although that protection is less evident than the protection against deficient weight.

Unlike the results reported by other studies (26, 27), our study found that higher percentages of children receiving only breast milk or breast milk and solid food showed excess weight and obesity beginning in the sixth month of life. This finding, which could be explained partly by excessive amounts of complementary foods being given, does not justify interrupting breast-feeding. Rather, it calls for modifying the diet by reducing its energy content while providing adequate food volume.

The advantages of breast-feeding shown by this study, including the protection it affords against respiratory and gastrointestinal diseases (28), reaffirm the need to continue to pursue systematic national breast-feeding promotion activities. Overall, there is good reason to expect that such activities stand to improve the infant population's living conditions and that taken together they constitute one of the most cost-effective interventions that can be carried out in the area of primary health care.

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