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 AN ANALYSIS OF THE ECONOMIC VALUE
NURTURE OF BREASTFEEDING IN EL SALVADOR

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TABLE OF CONTENTS

LIST OF TABLES		iv
ACRONYMS		v
EXECUTIVE SUMMARY		vi
I. INTRODUCTION		1
II. COUNTRY BACKGROUND		1
Demographic, Economic and Health Sector Profile		1
Breastfeeding Situation		2
III. METHODS		3
IV. BENEFITS AND COSTS OF BREASTFEEDING PROMOTION		4
Current Scenario		4
Benefits		4
Costs		6
Alternative (Intervention) Scenario		7
Basis for the alternative scenario		7
Benefits		8
Costs		10
VI. OTHER SOURCES OF BENEFITS AND COSTS		12
Public Sector		13
Households		13
VII. CONCLUSIONS		14
Comparison of Current Versus Alternative Practices		14
Recommendations		14
Limitations of This Analysis		16
BIBLIOGRAPHY		17
ANNEX 1: METHODOLOGY USED TO CALCULATE EXCESS MORBIDITY AND MORTALITY ATTRIBUTABLE TO SUBOPTIMAL BREASTFEEDING		20
ANNEX 2: WORKSHEETS FOR CALCULATION OF COSTS AND BENEFITS		26
ANNEX 3: LIST OF KEY DATA AND INDICATORS FOR EL SALVADOR USED IN THE ANALYSIS		39
ANNEX 4: EXCESS MORBIDITY FROM DIARRHEA AND ACUTE RESPIRATORY INFECTIONS UNDER THREE LEVELS OF SUBOPTIMAL BREASTFEEDING/EL SALVADOR 1993		45
ANNEX 5: CALCULATION OF CURRENT BREASTFEEDING PROMOTION COSTS		47



ANNEX 6: CALCULATION OF INTERVENTION COSTS FOR THE ALTERNATIVE SCENARIO 49

ANNEX 7: CALCULATION OF HOUSEHOLD COSTS ATTRIBUTABLE TO CURRENT PREVALENCE OF SUBOPTIMAL BREASTFEEDING 53

LIST OF TABLES

TABLE 1: BASIC DEMOGRAPHIC AND ECONOMIC INDICATORS 2

TABLE 2: COVERAGE OF THE MAJOR HEALTH CARE PROVIDERS 2

TABLE 3: TOTAL ANNUAL BENEFITS TO THE PUBLIC SECTOR FROM CURRENT LEVELS OF BREASTFEEDING 5

TABLE 4: TOTAL ANNUAL COSTS TO THE PUBLIC SECTOR FOR CURRENT ACTIVITIES TO PROMOTE BREASTFEEDING 7

TABLE 5: PREVALENCE OF BREASTFEEDING: CURRENT VS. ALTERNATIVE SCENARIOS 8

TABLE 6: ADDITIONAL BENEFITS TO THE PUBLIC SECTOR PER YEAR FROM INCREASED LEVELS OF BREASTFEEDING UNDER ALTERNATIVE SCENARIO 9

TABLE 7: PROJECTED ANNUAL AND ADDITIONAL COSTS TO THE PUBLIC SECTOR FOR INCREASED ACTIVITIES TO PROMOTE BREASTFEEDING UNDER ALTERNATIVE SCENARIO 11

TABLE 8: NET BENEFITS TO THE PUBLIC SECTOR FROM THE PROMOTION OF BREASTFEEDING: COMPARISON OF CURRENT AND ALTERNATIVE SCENARIOS 12

TABLE 9: COMPARISON OF NET BENEFITS TO MSPAS AND ISSS FROM INCREASED PROMOTION OF BREASTFEEDING 12

TABLE 10: ADDITIONAL ACTIVITIES INVOLVING THE PUBLIC AND PRIVATE SECTORS TO INCREASE THE PREVALENCE OF OPTIMAL BREASTFEEDING 15



ACRONYMS

ANSAL	El Salvador Health Sector Assessment 1993/94 (English Acronym HSA)
ARI	Acute respiratory infection
BF	Breastfeeding
CALMA	Breastfeeding Support Center (Centro de Apoyo para la Lactancia Materna)
DHS	Demographic and Health Surveys
EBF	Exclusive breastfeeding
FESAL	Family Health Survey 1993
IDB	Inter-American Development Bank
IEC	Information, education and communication
IMR	Infant mortality rate
ISSS	Instituto Salvadoreño del Seguro Social
LOS	Length of stay
LRI	Lower respiratory infection
MCH	Maternal and child health
MSPAS	Ministry of Public Health and Social Assistance
PAHO	Pan American Health Organization
PHC	Primary health care
PROSAMI	Maternal Health/Child Survival Project
RR	Relative risk
TBA	Traditional birth attendant
URI	Upper respiratory infection
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHO	World Health Organization



EXECUTIVE SUMMARY

This report estimates the costs and savings associated with breastfeeding in El Salvador. Due to breastfeeding's substantial impact on reducing morbidity among infants from diarrhea and acute respiratory infection (ARI), it is estimated that currently there are some 251,000 fewer cases of diarrhea and 415,000 fewer cases of ARI in El Salvador each year than there would be if no infants were breastfed. Additionally, current levels of breastfeeding annually prevent over 2500 deaths from diarrhea and 300 deaths from ARI. The cost savings associated with the reductions in morbidity from diarrhea and ARI respectively are estimated at 3,977,000 colones (US \$456,000) and 7,321,000 colones (US \$840,000). Beyond these savings, breastfeeding yields important nutritional, psychosocial, immunological and other benefits to the infant population.

Breastfeeding also averts births. Many women do not use contraception during the first year postpartum, and breastfeeding helps protect against conception, especially during the first six months postpartum. The number of births averted by current levels of breastfeeding are estimated at 45,600. The cost savings from these prevented deliveries are 10,676,000 colones (US \$1,224,000) to the Ministry of Health and Social Assistance (MSPAS) and to the Social Security Institute (ISSS). Because of high rates of breastfeeding at MSPAS hospitals, MSPAS does not expend funds for infant formula, supplies and staff time necessary to provide breast milk substitutes. These savings are estimated at 2,514,000 colones (US \$288,000).

On the other hand, the public sector incurs costs to promote breastfeeding. The analysis estimates the current annual costs of MSPAS and ISSS activities to promote breastfeeding at 287,000 colones (US \$33,000), including staff time to provide counseling and receive training, materials, and education campaigns at the national and facility level. Thus, the current net benefits of breastfeeding promotion by the public sector (the estimated benefits minus the estimated costs) are 24,203,000 colones per year (US \$2,776,000).

In order to achieve a higher breastfeeding prevalence than the current one, the public sector could enhance promotion efforts. It is estimated that concerted efforts over three to five years could double the prevalence of exclusive breastfeeding among infants 0-5.9 months from the current estimated level of 15% to 30% within three to five years at an estimated additional cost of 786,000 colones (US \$90,000) (See attached table). These promotional efforts would result in 54,400 fewer cases of diarrhea, 73,000 fewer cases of ARI, and some 6,500 fewer births. The savings associated with the increases in breastfeeding are estimated at 6,229,000 colones (US \$714,000) for a net benefit of 5,442,000 colones (US \$624,000). This affords a benefit-to-cost ratio of 8.7, suggesting that every additional dollar invested in breastfeeding promotion returns nearly nine dollars in direct benefits for the public sector. Thus, the analysis shows that the Government of El Salvador could prevent substantial levels of ill health among infants, reduce births and save limited funds through investments in breastfeeding promotion.



**SUMMARY TABLE OF THE COSTS AND BENEFITS OF
BREASTFEEDING PROMOTION IN EL SALVADOR
CURRENT VERSUS INTERVENTION SCENARIO**

	CURRENT	INTERVENTION SCENARIO
Prevalence of exclusive breastfeeding among infants 0-5.9 months	15%	30%
Costs of breastfeeding promotion in colones:		Additional investment required beyond current levels:
Advocacy	68,268 (US \$7,829)	55,550 (US \$6,370)
Hospital-based	137,844 (US \$15,808)	127,676 (US \$14,642)
Community-based	80,705 (US \$9,255)	160,916 (US \$18,454)
IEC	<u>0</u>	<u>442,300 (US \$50,722)</u>
TOTAL	286,817 (US \$32,892)	786,442 (US \$90,188)
Benefits of breastfeeding promotion in colones:		Additional benefits beyond current level:
Morbidity averted	11,298,618 (US \$1,295,713)	2,143,611 (US \$245,827)
Births averted	<u>13,190,390 (US \$1,512,665)</u>	<u>4,085,325 (US \$468,501)</u>
TOTAL	24,489,008 (US \$2,808,378)	6,228,936 (US \$714,328)
Net benefits of additional investment in breastfeeding promotion:		5,442,494 colones (US\$ 624,140)
Benefit-to-cost ratio		\$8.70/\$1.00



I. INTRODUCTION

The purpose of this report is to provide policy makers with information that can contribute to their decision-making regarding investments in the promotion of breastfeeding among mothers in El Salvador. The report estimates the net benefits (benefits minus costs) of the current efforts in the promotion and practice of breastfeeding. In addition, the report calculates the net benefits of an alternative scenario of increased activities by the public sector to promote optimal infant feeding and improved breastfeeding practices.

The perspective adopted in this analysis is that the public sector in El Salvador can receive gains or economic benefits from promoting breastfeeding and that these benefits can be compared with the costs involved. By limiting the analysis to solely the economic gains and costs involved, the study attempts to inform the decision regarding further investments to promote breastfeeding in El Salvador by delineating the costs and benefits involved in achieving a higher level of breastfeeding among mothers. For the purposes of this report, it is assumed that the alternative scenario would imply that the prevalence of exclusive¹ breastfeeding would increase from a current estimated level of 15% among infants 0-5.9 months to one of 30% of infants 0-5.9 months.

This report presents first a description of the economic and demographic conditions in El Salvador, as well as an overview of current breastfeeding promotion activities in the country. The next section outlines the methods used to estimate the benefits and costs of breastfeeding to the primary public sector health institutions, followed by a section with the results for current and alternative scenarios. Section 5.0 compares the net benefits of each scenario, followed by a brief discussion of other sources of costs and benefits not included in the analysis. At the end, the report discusses conclusions and recommendations.

II. COUNTRY BACKGROUND

Demographic, Economic and Health Sector Profile

Table 1 presents basic demographic and economic indicators for El Salvador. Relative to other countries in the region, El Salvador shows low levels for most social indicators. The low per capita total health expenditure and per capita Ministry of Health expenditure are reflective of overall low social sector spending by the government in the past decade. Since 1989, however, the government has embarked on a radical economic reform program that emphasizes poverty alleviation and improved delivery of social services.

Though classified as a middle-income country, El Salvador suffers from a highly skewed income distribution, and in general, the health of young children is poor. Infant mortality remains high, particularly in rural areas. Leading causes of death among children under one year of age are diarrhea and acute respiratory infections, accounting for 19% and 16%, respectively, of all infant deaths. Malnutrition is widespread, with 6% of infants 0-5.9 months and 14% of children 12-23.9 months of age demonstrating low weight-for-age.

¹ Exclusive breastfeeding is defined as provision of only breast milk to the infant and no other liquids or solids, including water. The World Health Organization recommends exclusive breastfeeding as the best mode of infant feeding for the first 6 months of life and the introduction of other foods and non-milk liquids beginning at 6 months of age.

**TABLE 1: BASIC DEMOGRAPHIC AND ECONOMIC INDICATORS**

Total population	5,047,925	(1993/ANSAL)
Urban population	45 %	(1990/World Bank)
Crude Birth Rate	29.95	(1992/ANSAL)
Infant Mortality Rate	52/1000 live births	(1993/UNICEF)
GNP per capita	US \$1,080	(1991/World Bank)
Per capita health expenditures as % of GDP	3.71 %	(1992/ANSAL)
Per capita public sector health expenditures as % of GDP	0.9 %	(1989/World Bank)
Per capita Ministry of Health expenditures	US \$14.63	(1992/ANSAL)

The provision of health services in El Salvador is characterized by a diversity of providers, limited coverage by the major public sector institutions, and high reliance on private providers or self-care. As measured in a recent demand study and illustrated in Table 2, Ministry of Health facilities provide about 40% of all ambulatory services and 75% of hospital-based services. Only 51% of all births are attended by medical personnel.

TABLE 2: COVERAGE OF THE MAJOR HEALTH CARE PROVIDERS

<u>Ambulatory</u>	<u>Hospital</u>
39.8% Ministry of Health	75.5% Ministry of Health
12.7% Social Security	12.6% Social Security
45.2% Private (includes NGOs)	9.4% Private (includes NGOs)
2.3% Other	2.5% Other

Source: Cited in Pan American Health Organization (PAHO) 1994.

Breastfeeding Situation

The mean duration of breastfeeding in El Salvador is 15 months, indicating that breastfeeding is well accepted among Salvadoran mothers. However, the low rate of exclusive breastfeeding and the early introduction of complementary foods contribute to high rates of morbidity, mortality and malnutrition. While 91% of Salvadoran infants are breastfed at birth, only 15% of infants 0-5.9 months are breastfed exclusively, and only 6% are breastfed exclusively at 3-5 months of age.



Although the breastfeeding-related policies and norms of the Ministry of Public Health and Social Assistance (MSPAS) conform to those prescribed by the World Health Organization (WHO), there are only limited ongoing training and information/communication activities focused on breastfeeding promotion, with one important exception. Since 1992, the Ministry has been working actively with UNICEF to extend the "Baby Friendly Hospital Initiative" to most MSPAS facilities performing deliveries. Problems have been noted, however, in the current integration of breastfeeding messages into routine service delivery in health facilities.

Breastfeeding promotion has also been a key intervention in the child survival programs of 36 non-governmental organizations (NGOs). In contrast to MSPAS and the NGO community, the Salvadoran Institute of Social Security (ISSS) has not actively promoted breastfeeding as part of its maternal care and currently has no explicit policy with regard to the promotion of breastfeeding.

III. METHODS

The methodological approach used to calculate the benefits and costs of breastfeeding promotion for the public sector begins with an identification of the sources of benefits and costs that would be considered in the analysis. For the health sector, only the two main public providers of health care were considered: the Ministry of Public Health and Social Assistance and the Salvadoran Institute of Social Security.

The benefits from breastfeeding that apply to the public health sector can be summarized as follows. Breastfeeding prevents child morbidity, part of which is treated by MSPAS and ISSS; the public sector thus accrues savings due to not treating prevented cases. The child diseases considered for the purpose of this report are infant diarrhea and acute respiratory illness (ARI). Breastfeeding also prevents diarrhea and ARI mortality. However, due to the difficulties in ascribing monetary value to those deaths, the public sector analysis only considers the costs saved from the averted morbidity episodes. In addition, births are averted with breastfeeding, so the benefits to MSPAS and ISSS due to savings from prevented deliveries are included. The institutions also save in breast milk substitutes as well as the supplies and staff time necessary to provide breast milk substitutes.

On the other hand, MSPAS incurs costs to promote breastfeeding. The analysis estimates the current costs of MSPAS activities to promote breastfeeding, including staff time to provide counseling and receive training, materials and education campaigns at the national and facility level. The current net benefits of breastfeeding promotion by the public sector are then determined as the estimated benefits minus the estimated costs.

In order to illustrate the net benefits that may be associated with increased investment in activities to promote optimal breastfeeding, the analysis estimates the costs of increased activities by the public sector that could be expected to increase the prevalence of optimal breastfeeding in El Salvador.

The economic analysis drew upon but was not limited to the assumptions and formulas employed in *The Guide to Assessing the Economic Value of Breastfeeding: A Workbook for Policymakers* (Center to Prevent Childhood Malnutrition, 1991). Modifications were made following an analysis of the assumptions used to estimate excess morbidity, mortality and fertility attributable to sub-optimal breastfeeding practices in the original workbook². The number of diarrhea and ARI episodes and deaths attributable to suboptimal breastfeeding under the current and alternative scenarios was calculated using

² The team's recommendations for modifying the workbook are presented in a separate report entitled, "Application of the 'Guide to Assessing the Economic Value of Breastfeeding' in the Analysis of the Economic Value of Breastfeeding in El Salvador and Suggestions for Future Modifications to the Guide."



the approach described in Annex 1. This calculates morbidity and mortality as a function of the prevalence of exclusive and partial breastfeeding and the relative risks of diarrhea and ARI found in longitudinal studies among low-income populations in Lima, Peru (Brown, et al., 1989) and southern Brazil (Victora, et al., 1987). The approach used to estimate the number of births averted due to breastfeeding was based on the estimated changes to the length of the susceptible period for conception among mothers under the assumed prevalences of breastfeeding, holding constant the prevalence of contraception (see Annex 2 for the worksheets showing the calculations involved in determining births averted, as well as prevented cases of diarrhea and acute respiratory infections).

Information on current activities of MSPAS and ISSS and much of the unit cost data were obtained through interviews conducted by Dr. Carlos Melendez with MSPAS and ISSS officials during March and April 1994 as well as from several recent reports. Foremost among the latter were the Infant Feeding Assessment in El Salvador and the Maternal and Child Health Situation and Demand for Health Services reports prepared as part of the 1993-94 health sector assessment (ANSAL) and the 1993 National Family Health Survey (FESAL). The values of key indicators and other relevant data underlying the cost estimations are listed in Annex 3.

IV. BENEFITS AND COSTS OF BREASTFEEDING PROMOTION

Current Scenario

Benefits

Total annual economic benefits to the public sector from current levels of breastfeeding are summarized in Table 3 (calculations detailed in Annex 2) and discussed below.

Infant diarrhea cases prevented

To estimate the current benefits from prevented diarrhea morbidity, we calculated the number of cases prevented by comparing the number of infant diarrhea cases that currently occur in El Salvador with those estimated in the absence of breastfeeding. We then used this figure to determine the episodes that would be treated by MSPAS and ISSS, both as hospitalizations and ambulatory cases. Because ISSS currently does not provide pediatric care at the hospital level, it is assumed that all pediatric hospitalizations of ISSS affiliates occur at MSPAS facilities. The approximate cost of treatment per ambulatory case and hospital day in each institution was used to obtain estimates of the total costs prevented by each institution.

As shown in Annex 4, nearly 251,000 episodes of infant diarrhea are prevented annually due to the current level of optimal breastfeeding. This implies savings to MSPAS and ISSS attributable to prevented hospitalizations and ambulatory cases. By preventing diarrhea, we estimate that breastfeeding prevents 700 hospitalizations and 99,579 ambulatory cases per year at MSPAS facilities and 31,775 ambulatory cases at ISSS facilities. These savings in number of cases translate into 2,847,852 colones (US \$326,589) for MSPAS and 1,129,604 colones (US \$129,542) for ISSS, totalling benefits of 3,977,456 colones (US \$456,130) per year³.

³ Exchange rate at 8.72 colones/U.S. Dollar.

*Infant ARI cases prevented*

We followed a similar procedure to estimate the number of cases of infant ARI prevented due to breastfeeding. With the current prevalence of breastfeeding, we estimate that there are 414,776 cases of ARI prevented, of which 397,656 are upper respiratory infections (URI) and 17,120 lower respiratory infections (LRI). These figures translate into an estimated 923 hospitalizations and 164,664 ambulatory cases prevented annually which would have been treated by MSPAS. For ISSS, we estimate that there are 52,543 ambulatory cases prevented. These cases imply a total annual cost savings of 7,321,162 colones (US \$839,583) (5,453,240 colones [US \$625,372] for MSPAS and 1,867,922 colones [US \$214,211] for ISSS).

Births averted

The current number of births (1993) in El Salvador is 151,200 per year. We estimate that 45,556 additional births are averted each year because of breastfeeding. To determine the cost savings, we estimated the number of births that would be attended by MSPAS and ISSS (normally and by cesarean) and applied an estimated cost of deliveries in each institution. Based on these calculations, the total number of deliveries averted results in a total annual savings of 10,676,095 colones (US \$1,224,328), of which 7,278,661 (US \$834,709) correspond to MSPAS and 3,397,433 (US \$389,614) to ISSS.

Breast milk substitutes use averted

Since mothers delivering in MSPAS facilities breastfeed their babies during the length of their stay, the MSPAS does not incur the costs of purchasing breast milk substitutes. We estimated these savings by taking the number of births attended by MSPAS and estimating the number of breast milk substitute feedings that would be required if newborns were fed infant formula. This figure was obtained by calculating the number of deliveries and length of stay of the mothers according to an estimated proportion of cesarean and non-cesarean deliveries, and applying an estimated cost per feeding. The feeding cost included expenditures for breast milk substitutes and the bottle preparation and administration time required of MSPAS staff. The annual number of 56,862 deliveries by MSPAS translates into bottle feeding averted costs of 2,514,295 colones (US \$288,337) per year.

There are currently no savings to the ISSS due to averted use of breast milk substitutes, since breastfeeding by mothers is not promoted and 100% of newborns at ISSS are given breast milk substitutes during their entire or almost entire stay.

TABLE 3: TOTAL ANNUAL BENEFITS TO THE PUBLIC SECTOR FROM CURRENT LEVELS OF BREASTFEEDING

Source of Benefit	Total Annual Amount Colones (US Dollars)
Infant diarrhea cases prevented	3,977,456 (US \$456,130)
Infant ARI cases prevented	7,321,162 (US \$839,583)
Births averted (delivery costs)	10,676,095 (US \$1,224,328)
Breast milk substitutes use averted	2,514,295 (US \$288,337)
TOTAL	24,489,008 (US \$2,808,378)



Costs⁴

Public sector costs associated with breastfeeding promotion include four principal kinds of activities: lobbying or advocacy and monitoring health sector activities relevant to breastfeeding; hospital-based breastfeeding promotion; breastfeeding promotion at the primary care and community levels; and information, education and communication (IEC) activities. Specific costs incurred with each type of activity would include staff time, materials and supplies, and possibly space. The current total annual costs to the public sector by type of breastfeeding promotion activity are summarized in Table 4 and detailed in Annex 5.

Advocacy/monitoring

MSPAS has assigned national breastfeeding coordination responsibilities to three staff in its Maternal and Child Health (MCH) Department: one pediatrician (who works full-time on breastfeeding promotion), a part-time Technical Collaborator (20% time on breastfeeding promotion) and a nurse supervisor (30% time on breastfeeding promotion). The total annual salary cost for this personnel is 68,268 colones (US \$7,829). There are currently no staff at the regional and local levels with specific breastfeeding coordination or monitoring duties. No ISSS staff member spends any appreciable time on breastfeeding advocacy.

Hospital-based breastfeeding promotion

Breastfeeding education/counseling in MSPAS hospitals and health centers consists of a daily group talk given to mothers on breastfeeding and infant bathing. A similar practice occurs in the ISSS Primero de Mayo hospital. The annual cost of these daily talks is estimated at 105,850 colones (US \$12,139) for MSPAS and 2,920 colones (US \$335) for ISSS. (See Annex 5.)

In addition, MSPAS conducts routine training activities related to breastfeeding for hospital and health center staff. Because data on actual expenditures on breastfeeding-related training of hospital personnel were not available, the budgeted costs of training activities planned for 1994 were used to approximate typical expenditures. These training costs total 29,074 colones (US \$3,334). ISSS does not currently conduct breastfeeding-related training for its hospital personnel.

No other significant material or space costs were identified. Total costs of hospital-based breastfeeding promotion are thus estimated at 137,844 colones (US \$15,808), of which 134,924 (US \$15,473) correspond to MSPAS and 2,920 (US \$335) to ISSS.

Primary health care facility and community-based breastfeeding promotion

Breastfeeding is routinely promoted as part of MSPAS' maternal and child health activities (e.g., prenatal visits, well-baby check-ups, etc.). Providing breastfeeding messages during routine consultations is not assumed to add any appreciable cost to the consultation itself; therefore no primary health care personnel costs or other resources are associated with MSPAS' current breastfeeding promotion activities. The same assumption is made for ISSS ambulatory care facilities.

⁴ Subsequent discussions with MSAP officials indicate that current (as of September 1994) MSAP may actually be slightly higher than stated in this report. Rough estimates of salaries and time allocations were made, so these figures should be considered "ballpark" estimates. The pediatrician who is coordinator of breastfeeding activities has other responsibilities as well. The amount of time available for breastfeeding promotion varies, but is currently around 60%. Balancing this, additional time must be added for other employees who spend part of their time on breastfeeding promotion. A materials specialist currently spends about half time producing promotional materials. Five regional officials spend approximately 15% of their time promoting breastfeeding. The the balance is \$2,434 annually in current additional expenses. Calculations are shown in Annex 2.



MSPAS does conduct training activities specifically related to breastfeeding for primary health care (PHC) facility personnel and community health workers. Annual costs for training PHC facility staff in breastfeeding promotion are estimated at 79,080 colones (US \$9,069), based on 1994 training programs budgeted by the Maternal and Child Health Department of MSPAS. MSPAS also trains traditional birth attendants (TBAs) in breastfeeding promotion (3 hours on breastfeeding out of total of 120 hours). In 1993, five TBA training courses were held, for which a total of 1,625 colones (US \$186) are attributable as breastfeeding promotion costs. ISSS does not conduct breastfeeding training for its ambulatory care staff.

Information, education and communication

Since 1990, there have been no activities to promote breastfeeding through mass media funded by the public sector. Apparently, neither MSPAS nor ISSS routinely produces educational materials related to breastfeeding.⁵

Alternative (Intervention) Scenario

In order to achieve a higher breastfeeding prevalence than the current one, the public sector needs to consider investing in increased promotion efforts. This section focuses on an alternative scenario of increased interventions by MSPAS and ISSS to promote breastfeeding and presents estimates of the additional benefits and costs that would be incurred by the public health sector from making this investment.

TABLE 4: TOTAL ANNUAL COSTS TO THE PUBLIC SECTOR FOR CURRENT ACTIVITIES TO PROMOTE BREASTFEEDING

Source of Cost	Total Annual Amount Colones (US Dollars)
Advocacy/monitoring	68,268 (US \$7,829)
Hospital-based breastfeeding promotion	137,844 (US \$15,808)
PHC facility and community-based breastfeeding promotion	80,705 (US \$9,255)
Information, education and communication	0
TOTAL	286,817 (US \$32,892)

Basis for the alternative scenario

Table 5 compares the breastfeeding parameters for the alternative scenario with present breastfeeding practices. The basic assumption made is that the level of exclusive breastfeeding would double, increasing from the current prevalence of 15% among infants 0-5.9 months to 30%. This increase would imply additional benefits and costs from the current levels presented in section 4.1.

⁵ As of September 1994 the Ministry was producing some promotional materials with financing from international donors.



A prevalence of exclusive breastfeeding among infants 0-5.9 months of 30% was selected as a reasonably achievable goal for El Salvador for two reasons. First, the rate of initiation of breastfeeding in El Salvador is high (> 90%) and about two-thirds of all infants are breastfed through the first year of life, indicating an overall cultural climate favorable to breastfeeding, despite the early termination of exclusive breastfeeding. Second, several prospective intervention studies⁶ in other Latin American countries and settings comparable to El Salvador have demonstrated that there are a number of interventions that can increase the duration of exclusive breastfeeding, often in time frames as short as one year. Foremost among these interventions have been breastfeeding information, assistance and support received at the time of birth and in the post-partum period and community-based interventions such as mother support groups and home visiting by health promoters.

TABLE 5: PREVALENCE OF BREASTFEEDING: CURRENT VS. ALTERNATIVE SCENARIOS

BREASTFEEDING PRACTICE	CURRENT PREVALENCE		ALTERNATIVE SCENARIO	
	0-5.9 mos.	6-11.9 mos.	0-5.9 mos.	6-11.9 mos.
Exclusive breastfeeding	15%	--	30%	--
Partial breastfeeding	72%	72%	63%	85%
Not breastfeeding	13%	28%	7%	15%

The intervention scenario used in this analysis assumes a highly concerted effort on the part of public sector and non-governmental organizations in El Salvador to promote and effectively support exclusive breastfeeding in the first six months of life. The intervention will require a fundamental change in health personnel attitudes, knowledge and practices to ensure that all appropriate service delivery opportunities are effectively exploited to spur and reinforce optimal breastfeeding. While empirical data do not exist to prescribe a specific time line of activities for the proposed increases in breastfeeding prevalence to occur, we expect that a period of 3 to 5 years of coordinated and well publicized activities to elevate public and health personnel awareness will be needed to effect a significant increase in the prevalence and duration of exclusive breastfeeding in El Salvador. Successful intervention will require the coordinated action and participation of public and private sector service providers, training and academic institutions, non-governmental organizations, and professional associations.

Benefits

Table 6 summarizes the additional economic benefits that would accrue to the public sector annually under the alternative scenario of increased activities to promote breastfeeding.

⁶ The results of several studies were reviewed to justify the proposed increase in exclusive breastfeeding in El Salvador. In Chile (Burkhalter, B.R. and Marin, P.S., 1991), an intervention based on home visiting and a breastfeeding clinic resulted in a prevalence of EBF at 6 months of 74% in the intervention group versus 30% in the control. In Honduras (Canahuati, 1990), a clinic-based intervention resulted in a prevalence of EBF at 90 days postpartum of 23% in the intervention group versus 14% in the control. Also in Honduras (de Chavez, et al., 1992), the use of community-based breastfeeding counselors in rural areas resulted in a prevalence of EBF of 50% at 2 months and 21% at 6 months postpartum versus 20% and 12%, respectively, in the control group. In Brazil (Lutter, et al., 1994), a hospital-based intervention resulted in a prevalence of EBF at 3 months of 43% in the intervention group versus 20% in the control.

*Infant diarrhea cases prevented*

To determine the additional number of infant diarrhea episodes prevented by the increased prevalence of optimal breastfeeding, we took the difference between the number of estimated infant diarrhea cases that currently occur in El Salvador and the number estimated under the higher prevalence of optimal breastfeeding assumed for the intervention scenario. We then used this figure to determine the episodes that would be treated by MSPAS and ISSS, both as hospitalizations and ambulatory cases. We then used the approximate cost of treatment per ambulatory case and hospital day in each institution to obtain estimates of the additional costs that would be prevented by each institution under the intervention scenario.

TABLE 6: ADDITIONAL BENEFITS TO THE PUBLIC SECTOR PER YEAR FROM INCREASED LEVELS OF BREASTFEEDING UNDER ALTERNATIVE SCENARIO

Source of Benefit	Additional Annual Benefits Beyond Current Levels Colones (US Dollars)
Infant diarrhea cases prevented	862,581 (US \$98,920)
Infant ARI cases prevented	1,281,030 (US \$146,907)
Births averted (delivery)	2,392,958 (US \$274,442)
Breast milk substitutes use averted	1,692,367 (US \$194,079)
TOTAL	6,228,936 (US \$714,328)

If breastfeeding prevalence were to increase as assumed, 54,432 episodes of infant diarrhea would be prevented. This number of episodes translates to 152 additional hospitalizations prevented in MSPAS hospitals. Increased prevalence of optimal breastfeeding would also prevent 21,595 additional ambulatory cases for the MSPAS and 6,891 additional cases for the ISSS. These cases would represent savings of 617,606 colones (US \$70,826) for MSPAS and 244,974 colones (US \$28,093) for ISSS, totalling 862,581 colones (US \$98,920) per year.

Infant ARI cases prevented

We followed a similar procedure to estimate the additional number of cases of infant ARI (URI and LRI) due to increased breastfeeding. Under the alternative breastfeeding scenario, there would be 72,576 prevented cases of infant ARI (161 hospitalizations and 28,812 ambulatory cases prevented for MSPAS and 9,194 ambulatory cases for the ISSS). Avoiding treatment for these cases would translate into 954,188 colones (US \$109,425) for the MSPAS and 326,842 colones (US \$37,482) for ISSS, totalling 1,281,030 colones (US \$146,907) per year in savings for both public institutions.

Births averted

With a higher breastfeeding prevalence, there would be 10,211 births averted, in addition to those estimated as currently averted. These averted births represent 3,840 prevented deliveries for the MSPAS and 1,186 for the ISSS per year. The additional savings due to prevented deliveries total 2,392,958 colones (US \$274,422) per year (1,631,451 [US \$187,093] for MSPAS and 761,507 [US \$87,329] for ISSS).



Breast milk substitutes use averted

There would be no additional savings to MSPAS due to breast milk substitutes for newborns, since we have assumed that all newborns in MSPAS facilities are already breastfed and not receiving breast milk substitutes. To estimate the benefits of increasing breastfeeding in ISSS, we assumed that 80 percent of newborns would be breastfed exclusively in the hospital. We used the current number of births at ISSS and applied an approximate cost per bottle of formula and glucose used for the estimated postpartum hospital stay to calculate the savings to ISSS in averted breast milk substitutes. The total estimated benefits amount to 1,692,367 colones (US \$194,079) per year.

Costs

The activities proposed for MSPAS and ISSS to achieve the prevalence of optimal breastfeeding specified for the alternative scenario were based on information presented in the El Salvador Infant Feeding Assessment (December 1993) on current breastfeeding promotion activities and gaps and on suggestions from MSPAS authorities in interviews conducted for this study. The specific activities that have been costed are detailed in Annex 6 and discussed below by type of activity. The estimated costs are summarized in Table 7, both in terms of total annual costs and as additional costs above what MSPAS and ISSS are currently spending on breastfeeding promotion.

Total annual costs of the proposed activities are estimated at 1,037,890 colones (US \$119,024) for MSPAS and 35,369 colones (US \$4,056) for ISSS, for a total of 1,073,259 colones (US \$123,080). Additional costs to each institution for the implementation of the proposed activities (i.e., total costs minus current costs for breastfeeding promotion) total 786,442 colones (US \$90,188) (753,993 colones [US \$86,467] for MSPAS and 32,449 colones [US \$3,721] for ISSS). Section 5.0 compares these additional costs to the additional benefits obtained from increased breastfeeding to determine the net benefit from greater investments in breastfeeding promotion.

Advocacy/monitoring

In addition to the current national breastfeeding coordination staff in MSPAS, we assume that regional breastfeeding coordinators are also designated to advocate and promote breastfeeding in each of the five regions at both MSPAS and ISSS institutions. A specific monitoring and evaluation function is proposed for CALMA to aid MSPAS in monitoring progress toward achieving breastfeeding objectives. A national workshop to standardize breastfeeding-related norms and messages for community health promoters (including those working with NGOs) is also proposed, at a total annual cost to MSPAS of 123,818 colones (US \$14,199) or 55,550 colones (US \$6,370) above current expenditures.

Hospital-based breastfeeding promotion

Increased activities to facilitate hospital-based promotion of breastfeeding include doubling the amount of time currently spent by MSPAS and ISSS nurses providing breastfeeding education and counseling; training to extend the Baby Friendly Hospital Initiative to the remaining 4 MSPAS hospitals and the ISSS Primero de Mayo hospital; and designating a breastfeeding coordinator in each hospital and health center to coordinate and monitor breastfeeding promotion in the facility.⁷ The total cost of these activities is 265,520 colones (US \$30,450) (253,657 colones [US \$29,089] for MSPAS and 11,863 colones (US \$1,360] for ISSS). This represents 127,676 additional colones (US \$14,642) per year. Note that training costs are amortized over a three-year period, since we assume that such activities would not need to occur annually but rather every 3 years.

⁷In September 1994, 25 hospitals had breastfeeding committees.

*Primary health care facility and community-based breastfeeding promotion*

Improved breastfeeding promotion at the PHC and community levels is proposed to be accomplished through an extensive program of refresher training involving all MSPAS health units and posts, promoters, TBAs, and nutrition collaborators. Such training would be coordinated with training on other priority child survival interventions and would emphasize the importance of integrating breastfeeding promotion in all maternal and child health services. Because the vast majority of clinic-based opportunities for breastfeeding support and promotion occur during routine MCH consultations (e.g., prenatal care, immunizations, well baby check-ups, etc.), no additional PHC level staff time is costed for breastfeeding promotion activities other than time spent in training. The intervention package also includes MSPAS support for the creation and ongoing supervision of community-based mother support groups to promote effective breastfeeding practices. Training of pediatric and obstetric staff working in ISSS ambulatory facilities is also proposed. Most of the training costs are amortized over a three-year period. The total annual cost of the proposed activities is 241,621 colones (US \$27,709) (235,215 colones [US \$26,974] for MSPAS and 6,406 colones (US \$735) for ISSS). The additional cost of PHC and community-based breastfeeding promotion is 160,916 colones (US \$18,454) per year.

Information, education and communication

Because of the limited overall MSPAS expenditures on mass media activities and the lack of reasonable cost estimates, no new information, education and communication (IEC) activities using mass communication strategies are proposed for the alternative scenario. Instead, printing of educational and training materials on breastfeeding is proposed. Such materials are budgeted

TABLE 7: PROJECTED ANNUAL AND ADDITIONAL COSTS TO THE PUBLIC SECTOR FOR INCREASED ACTIVITIES TO PROMOTE BREASTFEEDING UNDER ALTERNATIVE SCENARIO

Source of Cost	Projected Annual Amount Colones (US Dollars)	Additional Annual Amount Beyond Current Levels Colones (US Dollars)
Advocacy/monitoring	123,818 (US \$14,199)	55,550 (US \$6,370)
Hospital-based breastfeeding promotion	265,520 (US \$30,450)	127,676 (US \$14,642)
PHC facility and community-based breastfeeding promotion	241,621 (US \$27,709)	160,916 (US \$18,454)
Information, education and communication	442,300 (US \$50,722)	442,300 (US \$50,722)
TOTAL	1,073,259 (US \$123,080)	786,442 (US \$90,188)

separately for hospitals, PHC facilities and community health workers and are proposed for both MSPAS and ISSS. The total cost (and also additional cost, since no IEC costs are included in the current scenario) of the expanded use of print materials is estimated at 442,300 colones (US \$50,722) per year (425,200 colones [US \$48,761] for MSPAS and 17,100 colones [US \$1,961] for ISSS).



V. NET BENEFITS OF BREASTFEEDING PROMOTION

The comparison of benefits and costs of breastfeeding promotion under both the current and alternative scenarios clearly supports the strongly positive net benefits of breastfeeding promotion in El Salvador (see Table 8). Because the current level of public sector spending to promote breastfeeding in El Salvador is low, a substantial additional net economic benefit (5,442,494 colones [US \$624,140]) can be obtained with only a moderate additional investment of 786,442 colones (US \$90,188). Indeed, because this analysis has only quantified certain benefits associated with optimal breastfeeding, the true net benefit of increased breastfeeding promotion in El Salvador is even higher.

TABLE 8: NET BENEFITS TO THE PUBLIC SECTOR FROM THE PROMOTION OF BREASTFEEDING: COMPARISON OF CURRENT AND ALTERNATIVE SCENARIOS

	Current	Additional under Alternative
Benefits	24,489,008 (US \$2,808,378)	6,228,936 (US \$714,328)
Costs	286,187 (US \$32,820)	786,442 (US \$90,188)
Net Benefits	24,202,821 (US \$2,775,558)	5,442,494 (US \$624,140)

The magnitude of the net benefit of increased breastfeeding promotion is high for both of the main public sector institutions examined. As shown in Table 9, the net benefits of breastfeeding promotion under the alternative scenario are particularly large for ISSS. If rooming-in and breastfeeding were promoted among the majority of women delivering under ISSS care, savings would be accrued from a substantial reduction in ISSS's current use of breast milk substitutes.

TABLE 9: COMPARISON OF NET BENEFITS TO MSPAS AND ISSS FROM INCREASED PROMOTION OF BREASTFEEDING

	MSPAS Additional under Alternative	ISSS Additional under Alternative
Benefits	3,203,245 (US \$367,344)	3,025,690 (US \$346,983)
Costs	753,993 (US \$86,467)	32,449 (US \$3,721)
Net Benefits	2,449,252 (US \$280,877)	2,993,241 (US \$343,262)

VI. OTHER SOURCES OF BENEFITS AND COSTS

This report has thus far been limited to quantifying the benefits and costs of breastfeeding that accrue to the public health sector--namely, to MSPAS and ISSS. In addition to these two institutions, the country of El Salvador as a whole receives benefits from appropriate breastfeeding and bears costs of suboptimal breastfeeding. These other sources of benefits and costs were omitted from the benefit/cost analysis



because they were felt to be less relevant to decision making about further investments in the promotion of breastfeeding practices by the public sector. They are briefly discussed in this section to highlight the fact that suboptimal breastfeeding has significant economic costs for El Salvador, particularly for low-income households.

Public Sector

Previous country studies of the economic value of breastfeeding have sought to quantify the benefits to the national economy of tax revenue generated from the local manufacture of breast milk substitutes as well as costs to the government of the use of scarce foreign exchange to import breast milk substitutes and the debt service related to the same. In both of these cases, however, it is also possible to argue that alternative imports would be made so that interest on the country's debt would still be as high as it could be without infant formula or milk imports, and that the domestic companies that stopped producing breast milk substitutes would find an alternative commodity to produce and employ workers, such that the overall public sector would suffer no great loss or benefit from these sources. For this reason, we conclude that it is difficult to identify unequivocal net economic benefits of optimal breastfeeding that accrue to the public sector beyond those described in section 5.0.

A more defensible position is that there are other sources of benefits and costs of breastfeeding that accrue to the public health sector that have been omitted from the analysis for lack of an empirical basis upon which to quantify them. For example, breastfeeding provides an infant with passive immunity from the mother, resulting in the prevention of additional infant morbidity cases beyond those estimated for diarrhea and acute respiratory infections. Evidence from studies in poor communities of the superior nutritional status of exclusively breastfed infants in the first six months of life as compared with bottlefed infants also suggests that breastfeeding yields savings to the public sector from averted costs of undernutrition. The fact that such benefits were not accounted for here suggests that the true net benefits to El Salvador's public sector of breastfeeding promotion are even higher than those estimated in this report.

Households

An important benefit of breastfeeding not included in the public sector analysis is represented by the resources that households not currently practicing optimal breastfeeding would save if they were to appropriately breastfeed.

We examined three principal sources of "costs" to Salvadoran households due to current levels of suboptimal breastfeeding: 1) the costs of breast milk substitutes used by non-breastfeeding and partially breastfeeding infants; 2) the costs of seeking medical treatment for the excess diarrhea and ARI episodes which result from suboptimal breastfeeding; and 3) the costs of infant deaths from diarrhea and lower respiratory infections attributable to suboptimal breastfeeding. Our analysis drew on a previous study of the household costs of artificial feeding in El Salvador carried out by UNICEF in 1991 and on the findings of the health care demand study carried out by USAID and REACH in 1989 as reported in the 1994 El Salvador Health Sector Assessment.

The first two sources of costs were calculated using the assumptions and approaches described in Annex 7. Based on an assumed average monthly consumption of breast milk substitutes by partially breastfed and non-breastfed infants of 5 lbs. and 10 lbs. respectively, we estimate that Salvadoran households spend some 78,269,100 colones (US \$8,975,814) each year on breast milk substitutes, or about 1767 colones (US \$203) per suboptimally breastfed infant. The per household figure is equal to 21% of the government-set minimum annual salary of 8460 colones (US \$970) for San Salvador, indicating that the use of breast-milk substitutes signifies a staggering expense for poor households.



Based on findings about the cost to households of seeking treatment by source of care (including the cost of the consultation itself, transportation costs and the costs of any medicines the family had to purchase) and the proportions of households seeking medical care for child illnesses, we estimate the total annual household expenditures for the excess diarrhea and ARI episodes currently attributable to suboptimal breastfeeding in El Salvador to be 5,266,233 colones (US \$603,926).

The final important cost to households, but one that is not readily quantifiable in economic terms, is the excess infant mortality resulting from suboptimal breastfeeding. As shown in Annex 4, we estimate that some 356 infant deaths (261 from diarrhea and 95 from lower respiratory infections) could be prevented each year by increasing the prevalence of exclusive breastfeeding in the first 6 months and partial breastfeeding through the first year of life.

VII. CONCLUSIONS

Comparison of Current Versus Alternative Practices

The benefits/cost analysis illustrates that a modest investment in breastfeeding promotion activities by MSPAS and ISSS will yield net benefits that accrue directly to the two institutions. The ratio of benefits to costs is 8.7 under the alternative scenario, showing that for every additional dollar invested in promotion of breastfeeding, the institutions would obtain nearly 9 dollars in benefits per year. This is a sizeable return to the investment made by the public health sector.

Results from breastfeeding promotion interventions conducted in other Latin American countries suggest that the proposed levels of increase in prevalence of exclusive breastfeeding among infants less than 6 months of age and of partial breastfeeding among infants older than 6 months of age, are feasible for El Salvador.

Decisions regarding further investments in the promotion of breastfeeding by the public sector of El Salvador should rest on other criteria in addition to the pure economic benefits to the public health institutions. This exercise has shown, however, that from the economic dimension of the issue alone, a favorable result would be obtained if additional investments were made in the promotion of breastfeeding by El Salvador's Ministry of Public Health and Social Security Institute.

Recommendations

- 1) **It is recommended that MSPAS and ISSS increase funding for activities that will increase the effectiveness of efforts by these public sector institutions to promote optimal breastfeeding practices among Salvadoran infants.**
- 2) **A proposed plan and budget for increased public sector funding of breastfeeding promotion should be prepared by knowledgeable MSPAS and ISSS officials.** While an attempt has been made in the above exercise to provide reasonable estimates of the costs of activities that would be needed to enhance breastfeeding promotion in El Salvador and increase the prevalence of optimal breastfeeding, these activities and costs were not defined by MSPAS or ISSS technical staff. Consequently, detailed plans and budgets for technical activities to promote breastfeeding should be developed by cognizant Salvadoran public sector officials.
- 3) **Such a plan should consider activities which go beyond the formal boundaries of the public health sector to include NGOs, academic institutions, private providers, etc.** While the benefit/cost analysis was limited to direct net benefits to the public sector, it is important to note for overall public policy purposes and donor investment decisions that activities involving NGOs,



advocacy groups, universities, and other training institutions have been shown in numerous country experiences to play an important role in stimulating optimal breastfeeding practices throughout the population. This is especially true in El Salvador, given the large number of NGOs providing health services to the population. Breastfeeding promotion activities that appear to have strong potential for positively affecting breastfeeding practices in El Salvador are shown in Table 10. These activities involve, but are not limited to, the public sector. They were suggested by the El Salvador Infant Feeding Assessment and by experiences elsewhere in Latin America.

TABLE 10: ADDITIONAL ACTIVITIES INVOLVING THE PUBLIC AND PRIVATE SECTORS TO INCREASE THE PREVALENCE OF OPTIMAL BREASTFEEDING

Area	Specific Activities
Advocacy/monitoring	Establish National Commission for the Support of Breastfeeding* (Commission established but inactive, Technical Committee active)
	Curriculum review and revision workshops for cognizant faculty of all schools of medicine and nursing in El Salvador to increase attention to promotion of appropriate breastfeeding practices*
	Organization of continuing education sessions on optimal breastfeeding practices and lactation management through Salvadoran medical associations
	Strengthen coordination with local non-governmental and regional/international technical resources (e.g., CALMA, INCAP) for planning, monitoring and evaluating activities*
	Provide support for CALMA in its advocacy activities beyond the health sector
Hospital-based breastfeeding promotion	Training to extend Baby Friendly Hospital Initiative to private hospitals* (planned)
	Annual coordination meetings to monitor progress in achieving goals of Baby Friendly Hospitals throughout El Salvador*
Health facility and community-based breastfeeding promotion	Retraining of 400 NGO promoters in revised breastfeeding norms and skills*(initiated by CALMA)
	Workshop among NGOs to develop monitoring and evaluation indicators which emphasize exclusive breastfeeding* (CALMA)
	Establish community-based mother support activities
Information, education and communication	Workshop involving MSPAS, NGOs, and ISSS on the design and validation of educational material (including print, radio, TV) for the promotion of breastfeeding*

* According to MSPAS officials, the activities indicated had been initiated as of September 1994.



Limitations of This Analysis

Estimates are by definition only as accurate as the assumptions upon which they are based. This report has tried to clearly document the assumptions and formulas used to calculate benefits and costs under the three scenarios examined (i.e., no breastfeeding, current level of breastfeeding, improved level of breastfeeding) so that changes made in key assumptions could be introduced and new results obtained fairly readily.

Key assumptions underlying the analysis that should be noted: i) The analysis assumes that current average costs can be applied to other cases to estimate their additional costs; ii) the calculations for averted morbidity, mortality and births assume that numerous other variables (e.g., morbidity/mortality rates for other causes, use of contraception) affecting these processes are held constant; iii) as noted above, the costs of the proposed additional activities to increase the prevalence of optimal breastfeeding were based on extrapolations of unit costs for existing activities and may not reflect actual marginal costs of new activities; and iv) similarly, the estimation of additional benefits assume that the sources of current benefits can be extrapolated.

Finally, readers should keep in mind that the numbers reported in the analysis are estimates intended to illustrate the magnitude of net benefits of breastfeeding promotion, not precise predictions of what the true costs and savings would be. As such, they are considered appropriate as an input into public sector and donor decision making in El Salvador but should obviously not be used for budgetary planning or program evaluation purposes.



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ANNEXES

- ANNEX 1: METHODOLOGY USED TO CALCULATE EXCESS MORBIDITY AND MORTALITY ATTRIBUTABLE TO SUBOPTIMAL BREASTFEEDING
- ANNEX 2: WORKSHEETS FOR CALCULATION OF COSTS AND BENEFITS
- ANNEX 3: LIST OF KEY DATA AND INDICATORS FOR EL SALVADOR USED IN THE ANALYSIS
- ANNEX 4: EXCESS MORBIDITY FROM DIARRHEA AND ACUTE RESPIRATORY INFECTIONS UNDER THREE LEVELS OF SUBOPTIMAL BREASTFEEDING/EL SALVADOR 1993
- ANNEX 5: CALCULATION OF CURRENT BREASTFEEDING PROMOTION COSTS
- ANNEX 6: CALCULATION OF INTERVENTION COSTS FOR THE ALTERNATIVE SCENARIO
- ANNEX 7: CALCULATION OF HOUSEHOLD COSTS ATTRIBUTABLE TO CURRENT PREVALENCE OF SUBOPTIMAL BREASTFEEDING



ANNEX 1: METHODOLOGY USED TO CALCULATE EXCESS MORBIDITY AND MORTALITY ATTRIBUTABLE TO SUBOPTIMAL BREASTFEEDING¹

FORMULAS FOR CALCULATING RELATIVE RISK AND ATTRIBUTABLE RISK

The formulas presented below were used to calculate 1) the relative risk of morbidity and mortality for diarrhea and acute respiratory infections (ARI), and 2) the excess morbidity and mortality attributed to sub-optimal breastfeeding practices. It is useful to bear in mind that whereas the total relative risk of illness (RR_{total}) is mainly a function of the prevalence of no breastfeeding and partial breastfeeding among sub-optimal breastfeeders, the risk attributable to poor breastfeeding practices also takes into account the percent of the population following the desired feeding behavior, as shown below:

- 1) **Relative risk (RR) of diarrheal/ARI morbidity or mortality:**

$$RR_{total} = \{ [PB_{0-5\ mo} * (RR_{pb, 0-5\ mo}) + NB_{0-5\ mo} * (RR_{nb, 0-5\ mo})] * PP_{0-5\ mo} \} + \{ RR_{nb, 6-11\ mo} * PP_{6-11\ mo} \}$$

where: pb=partial breastfeeding and nb=no breastfeeding

RR=relative risk of morbidity or mortality for the specific cause

$PB_{0-5\ mo}$ = % of non-exclusive breastfeeding population 0-5 mo. that is partially breastfeeding

$NB_{0-5\ mo}$ = % of non-exclusive breastfeeding population 0-5 mo. that is not breastfeeding

$PP_{0-5\ mo}$ = % of infant population < 6 months

$PP_{6-11\ mo}$ = % of infant population > 6 months

- 2) **Excess morbidity or mortality attributable to sub-optimal breastfeeding**

$$[(\% \text{ of infant population sub-optimally breastfeeding}) * (RR_{total} - 1)] / [(\% \text{ of infant population sub-optimally breastfeeding}) * (RR_{total} - 1)] + 1$$

The relative risks of diarrhea and ARI morbidity for partial breastfeeding infants and non-breastfeeding infants were taken from Brown *et al.*, 1989 and are as follows:

Diarrhea morbidity:

$$RR_{pb, 0-5\ mo} = 1.41$$

$$RR_{nb, 0-5\ mo} = 2.59$$

$$RR_{nb, 6-11\ mo} = 1.30$$

ARI morbidity:

$$RR_{pb, 0-5\ mo} = 1.40$$

$$RR_{nb, 0-5\ mo} = 2.68$$

$$RR_{nb, 6-11\ mo} = 1.00$$

The relative risks of diarrhea and ARI mortality for partial breastfeeding infants and non-breastfeeding infants were taken from Victora *et al.*, 1987 and are as follows:

Diarrhea morbidity:

$$RR_{pb, 0-5\ mo} = 3.00$$

$$RR_{nb, 0-5\ mo} = 18.0$$

$$RR_{nb, 6-11\ mo} = 3.00$$

ARI morbidity:

$$RR_{pb, 0-5\ mo} = 2.00$$

$$RR_{nb, 0-5\ mo} = 2.50$$

$$RR_{nb, 6-11\ mo} = 1.50$$

¹ Adapted from Piwoz, Ellen G., *The Validity and Reliability of Morbidity and Mortality Calculations on the Economic Value of Breastfeeding and their Application to El Salvador*, April 1994.



EXCESS MORBIDITY AND MORTALITY IN EL SALVADOR (CURRENT PREVALENCE OF EXCLUSIVE BREASTFEEDING)

The excess morbidity and mortality due to sub-optimal breastfeeding practices are calculated using data obtained in the 1988 and 1993 El Salvador Family Health Surveys and presented in the Infant Feeding Assessment in El Salvador (Betancourt *et al.*, 1993).

For these calculations, the following **data and assumptions** were used:

- 1) 19% of infant deaths are due to diarrhea and 16% of infant deaths are due to ARI (LRI).
- 2) IMR is 52/1000 and thus $> 7,860$ infants die each year ($IMR * \# \text{ live births} = 7,862$).
- 3) infants suffer 5.8 episodes of diarrhea per year (based on two-week recall prevalence of 30.5% and estimated average duration of 5 days), for a total of 876,960 diarrhea episodes.
- 4) infants spend an average of 29 days per year with diarrhea ($5.8 * 5 / 365 = 8\%$ of days).
- 5) infants suffer 8.9 episodes of ARI (URI+LRI) per year (based on two-week recall prevalence of 68.1% and estimated average duration of 14 days), for a total of 1,270,080 episodes of URI and 75,600 episodes of LRI.
 - of these 8.9 episodes, 8.4 episodes are URI and 0.5 episodes are LRI.
 - the division of URI and LRI episodes is based on data from longitudinal studies in Guatemala (reported in Mora, 1991).
 - average duration of ARI among exclusively breastfed infants < 6 months is 9.1 days, and among partially breastfed infants 6-11 months is 11.2 days.
 - average duration of ARI among all other infants is 14 days (see previous discussion).
- 6) infants spend an average of 125 days per year with ARI ($8.9 * 14 / 365 = 34\%$ of days).
- 7) among infants 0-5.9 months, 14.9% are exclusively breastfed, 71.8% are partially breastfed, and 13.3% are completely weaned.
 - therefore, 84.3% of non-exclusively breastfed infants are partially breastfed and 15.7% are completely weaned.
- 8) among infants 6-11.9 months, 72.4% are partially breastfed, and 27.6% are completely weaned.
- 9) among infants 0-11.9 months, 58.3% are sub-optimally breastfed.
- 10) 53.3% of infants are 0-5.9 months and 46.7% are 6-11.9 months.
- 11) there are 151,200 infants in El Salvador ($5,047,925$ population $* 0.2995$ crude birth rate), and all are at risk of diarrhea and ARI due to sub-optimal feeding practices.

It is important to stress that the results of the calculations presented below are **estimates** (not predictions) of the morbidity and mortality in Salvadoran infants that may be attributable to improper breastfeeding practices for the purpose of persuading policy makers of the need for and the potential benefits of



programs to improve breastfeeding practices. As estimates, percentages used and results obtained should be presented in rounded numbers, so that readers do not assume an element of precision (or prediction) that does not exist. The percentages used and the results obtained from this exercise are not rounded in this report, however, so that the persons reviewing this report can clearly see how each calculation is done and where each number comes from.

Excess Morbidity Episodes - Diarrhea

The excess diarrheal morbidity episodes due to sub-optimal feeding practices are calculated using the above data and the formulas.

1) **Relative risk for sub-optimally breastfed infants**

$$[0.843*(1.41) + 0.157*(2.59)]*0.533 + \{(1.20)*0.467\} = 1.46$$

Thus, sub-optimally breastfed infants are 0.46 times more likely to develop diarrhea than optimally breastfed infants in this population.

2) **Risk attributable to sub-optimal breastfeeding**

$$\{0.583*(1.46-1)\} / \{0.583*(1.46-1)\} + 1 = 0.2115$$

Thus, 21 % of all infant diarrhea episodes may be attributed to sub-optimal feeding practices.

This is equivalent to 1.22 episodes per infant per year (the average of 5.8 episodes per infant per year*0.2115).

3) **Excess morbidity episodes due to diarrhea**

Sub-optimal breastfeeding accounts for 184,464 episodes of diarrhea per year (1.22*151,200=184,464). Note that this assumes that all infants are at risk of diarrhea due to sub-optimal breastfeeding practices. If non-poor infants living in clean environments are not at risk, then excess episodes will be lower than this number (and can be approximated by multiplying 1.22 and the total population at risk).

Excess Morbidity Episodes - Respiratory Infections

1) **Relative risk for sub-optimally breastfed infants**

$$[0.843*(1.40) + 0.157*(2.68)]*0.533 + \{(1.00)*0.467\} = 1.32 \text{ for URI}$$

$$[0.843*(2.82) + 0.157*(3.64)]*0.533 + \{(1.55)*0.467\} = 2.30 \text{ for LRI}$$

Thus, sub-optimally breastfed infants are 0.32 times more likely to develop URI and 2.3 times more likely to develop LRI than optimally breastfed infants in this population.

2) **Risk attributable to sub-optimal breastfeeding**

$$\{0.583*(1.32-1)\} / \{0.583*(1.32-1)\} + 1 = 0.1572 \text{ for URI}$$

$$\{0.583*(2.30-1)\} / \{0.583*(2.30-1)\} + 1 = 0.4311 \text{ for LRI}$$



Thus, 16% of all infant URI episodes and 43% of all LRI episodes may be attributed to sub-optimal feeding practices.

This is equivalent to 1.3 episodes of URI (8.4×0.16) and 0.22 episodes of LRI (0.5×0.43) per infant per year.

3) **Excess morbidity (episodes) due to respiratory infection**

Sub-optimal breastfeeding accounts for 196,560 episodes of URI and 33,264 episodes of LRI per year.

Excess Mortality - Diarrhea

The excess diarrheal mortality due to sub-optimal feeding practices is calculated using the data listed for El Salvador, the relative risks determined in Victora, C.G., *et al.*, 1987, and the formulas outlined above.

1) **Relative risk for sub-optimally breastfed infants**

$$\{0.843 \times (3.00) + 0.157 \times (18.0)\} \times 0.533 + \{(3.00) \times 0.467\} = 4.26$$

Thus, sub-optimally breastfed infants are 4.3 times more likely to die from diarrhea than optimally breastfed infants in this population.

2) **Risk attributable to sub-optimal breastfeeding**

$$\{0.583 \times (4.26 - 1)\} / \{0.583 \times (4.26 - 1)\} + 1 = 0.6552$$

Thus, 66% of all infant diarrhea deaths may be attributed to sub-optimal feeding practices.

3) **Excess mortality due to diarrhea**

Sub-optimal breastfeeding accounts for 986 infant deaths per year ($7,860 \text{ deaths} \times 0.19 \text{ due to diarrhea} \times 0.66 \text{ due to sub-optimal breastfeeding} = 986$), or 12.5% of all infant deaths ($986/7860$).

Excess Mortality - Respiratory Infections

The excess lower respiratory infection mortality (LRI) due to sub-optimal feeding practices is shown below:

1) **Relative risk for sub-optimally breastfed infants**

$$\{0.843 \times (2.00) + 0.157 \times (2.50)\} \times 0.533 + \{(1.50) \times 0.467\} = 1.81$$

Thus, sub-optimally breastfed infants are 1.8 times more likely to die from lower respiratory infections than optimally breastfed infants in this population.

2) **Risk attributable to sub-optimal breastfeeding**

$$\{0.583 \times (1.81 - 1)\} / \{0.583 \times (1.81 - 1)\} + 1 = 0.3208$$

Thus, 32% of all infant respiratory deaths may be attributed to sub-optimal feeding practices.



3) **Excess mortality due to respiratory infection**

Sub-optimal breastfeeding accounts for 402 infant deaths per year due to respiratory infections ($7,860 * 0.16 * 0.32 = 402$), or 5.1% of all infant deaths.

Thus, approximately 18% of all infant deaths in El Salvador result from increased diarrhea (12.5%) and LRI (5.1%) that may be attributable to sub-optimal breastfeeding practices.

EXCESS MORBIDITY AND MORTALITY IN EL SALVADOR (ALTERNATIVE SCENARIO)

To estimate the morbidity and mortality effects of doubling the prevalence of exclusive breastfeeding among infants under 6 months of age (i.e., from 15% to 30%), the prevalences of partial breastfeeding and no breastfeeding that were projected under the intervention scenario were used to recalculate the relative risks and attributable risks for diarrhea and ARI morbidity and mortality. The calculations performed are shown on the attached spreadsheet (REL RISK.WK1).

CALCULATION OF ALTERNATIVE SCENARIO RELATIVE RISKS

FILE:RELRISK.WK1

Exclusive breastfeeding < 6 mos. = 30%

Partial breastfeeding < 6 mos. = 63%

Not breastfeeding < 6 mos. = 7%

(90% of non-excl BF < 6 mos)

(10% of non-excl BF < 6 mos)

Partial breastfeeding > 6 mos. = 85%

Not breastfeeding > 6 mos. = 15%

Relative Risk Excess Morbidity - Diarrhea

$$RR = (.90 \cdot 1.41 + .10 \cdot 2.59) \cdot .533 + (1.30 \cdot 0.467) = 1.421524$$

Risk attributable to suboptimal breastfeeding =

$$[.417 \cdot (1.4215 - 1)] / [.417 \cdot (1.4215 - 1) + 1] = 0.149497508$$

= 14.9% diarrhea morbidity attributable to suboptimal BF

Relative Risk Excess Morbidity - Upper Resp Inf

$$RR = (.90 \cdot 1.40 + .10 \cdot 2.68) \cdot .533 + (1.00 \cdot 0.467) = 1.281424$$

Risk attributable to suboptimal breastfeeding =

$$[.417 \cdot (1.2814 - 1)] / [.417 \cdot (1.2814 - 1) + 1] = 0.105028333$$

= 10.5% URI morbidity attributable to suboptimal BF

Relative Risk Excess Morbidity - Lower Resp Inf

$$RR = (.90 \cdot 2.82 + .10 \cdot 3.64) \cdot .533 + (1.55 \cdot 0.467) = 2.270616$$

Risk attributable to suboptimal breastfeeding =

$$[.417 \cdot (2.2706 - 1)] / [.417 \cdot (2.2706 - 1) + 1] = 0.346339808$$

= 34.6% LRI morbidity attributable to suboptimal BF

Relative Risk Excess Mortality - Diarrhea

$$RR = (.90 \cdot 3.00 + .10 \cdot 18.0) \cdot .533 + (3.00 \cdot 0.467) = 3.7995$$

Risk attributable to suboptimal breastfeeding =

$$[.417 \cdot (3.7995 - 1)] / [.417 \cdot (3.7995 - 1) + 1] = 0.538615889$$

= 53.9% diarrhea mortality attributable to suboptimal BF

Relative Risk Excess Mortality - Lower Resp Inf

$$RR = (.90 \cdot 2.00 + .10 \cdot 2.50) \cdot .533 + (1.50 \cdot 0.467) = 1.79315$$

Risk attributable to suboptimal breastfeeding =

$$[.417 \cdot (1.7931 - 1)] / [.417 \cdot (1.7931 - 1) + 1] = 0.248540412$$

= 24.9% LRI mortality attributable to suboptimal BF

Calculation of new cause-spec mortality under intervention

Diarrhea

$$0.892018779 \cdot 9.88 = 8.81314554 \quad 9.88 - 8.81 = 1.07$$

Lower respiratory infections

$$0.988950276 \cdot 8.32 = 8.228066298 \quad 8.32 - 8.23 = 0.09$$

New total # infant deaths

$$52 \text{ less} \quad 1.16 \text{ per } 1000 \quad \cdot 151,200 = 7687.008$$

**ANNEX 2: WORKSHEETS FOR CALCULATION OF COSTS AND BENEFITS****Calculations of Adjustments to Salary Costs for MSPAS Personnel**

	c	US\$
Subtract 40% time of breastfeeding coordinator, based on monthly salary of c40,800 (\$468)	- 19,584	- 2,246
Add 50% time materials specialist, based on monthly salary of c2,616 (\$300).	15,696	1,800
Add 15% time for each of 4 regional health officers, based on monthly salary of c3,488 (\$400).	25,114	2,880
TOTAL	c21,226	\$2,434

Salary figures in this report were calculated based on straight salary alone, and do not include fringe benefits, such as the "13th month" December bonus. This omission will be corrected in future calculations.

Current Scenario

FILE: NUTR1.WK1

A.1 Diarrhea cases prevented	250992	A.1	A1
MSPAS hospit. (1992)	2446	A.2	A2
MSPAS receives 88.1%* hospit.	0.881	A.3	A3
Total diarrhea hospit.	2776.390465	A.2/A.3	A4
ISSS receives 0%* hospit.	0	A.5	A5
ISSS hospit.	0	A.4*A5	A6
Total episodes diarrhea	876960	A.7	A7
Hospit./total episodes	0.003165926	A.4/A.7	A8
Ambul=1-(hospit/total episod)	0.996834074	1-A.8	A ^o
MSPAS receives 39.8% ambulat.	0.398	A.10	A10
ISSS receives 12.7% ambulat.	0.127	A.11	A11
Hospit. prevented	794.6220987	A.1*A.8	A12
Ambulat. prevented	250197.3779	A.1*A.9	A13
MSPAS hospit. prevented	700.062069	A.12*A.3	A14
ISSS hospit. prevented	0	A.12*A.5	A15
MSPAS ambulat. prevented	99578.5564	A13*A10	A16
ISSS ambulat. prevented	31775.06699	A13*A11	A17
% MSPAS hospit. in hospitals	0.7891	A18	A18
Average LOS days	3.6	A19	A19
% MSPAS hospit. in health ctrs.	0.2109	A20	A20
Cost of MOH hospit. day	215.219	A21	A21
Cost of MSPAS health ctr. day	56.366	A22	A22
Cost of ISSS hospit. day	409.62	A23	A23
Cost of MSPAS ambulat. case	24	A24	A24
Cost of ISSS ambulat. case	35.55	A25	A25
Days of MSPAS hospit. in hospit.	1 ^o 88.708323	A14*A18*A19	A26
Days of MSPAS hospit. in health ctrs.	531.5151252	A14*A20*A19	A27
Cost of MSPAS hospit	457967.1981	(A21*A26)+(A22*A27)	A28
Days of ISSS hospit	0	A15*A19	A29
Cost of ISSS hospit	0	A29*A23	A30
Cost of MSPAS ambulat	2389885.354	A16*A24	A31
Cost of ISSS ambulat	1129603.632	A17*A25	A32
Total Cost of prevented cases	3977456.183	A28+A30+A31+A32	A33

NOTES:

*Because ISSS currently offers no pediatric hospitalization services, assume all ISSS pediatric affiliates become MSPAS hospitalizations and that MSPAS share of ped. hosp is $75.5 + 12.6 = 88.1\%$.

Current Scenario

FILE: NURT2.WK1

B.1 ARI cases prevented	414776	A1=397656+17120	A1
MSPAS LRI hospit (1992)	2994	A2	A2
MSPAS receives 88.1%* hospit.	0.881	A3	A3
Total LRI hospit	3398.4109	A4=A2/A3	A4
ISSS receives 0%* LRI hospit.	0	A5	A5
ISSS hospit.	0	A6=A4*A5	A6
Total episodes of ARI	1345660	A7=151200*8.9	A7
Hospit. total episodes	0.00252542	A8=A4/A7	A8
Ambul=1-(hospit/total episod)	0.99747458	A9=1-A8	A9
MSPAS receives 39.8% ambulat.	0.398	A10	A10
ISSS receives 12.7% ambulat.	0.127	A11	A11
Hospit. prevented	1047.48475	A12=A1*A8	A12
Ambulat. prevented	413728.515	A13=A1*a9	A13
MSPAS hospit. prevented	922.834065	A14=A12*A3	A14
ISSS hospit. prevented	0	A15=A12*A5	A15
MSPAS ambulat. prevented	164663.949	A13*A10	A16
ISSS ambulat. prevented	52543.5214	A13*A11	A17
% MSPAS hospit. in hospitals	0.7682	A18	A18
Average LOS days	5.3	A19	A19
% MSPAS hospit. in health ctrs.	0.2317	A20	A20
Cost of MSPAS hospit. day	208.248	A21	A21
Cost of MSPAS health ctr. day	53.124	A22	A22
Cost of ISSS hospit. day	409.62	A23	A23
Cost of MSPAS ambulat. case	28	A24	A24
Cost of ISSS ambulat. case	35.55	A25	A25
Days of MSPAS hospit. in hospit.	3757.28198	A14*A18*A19	A26
Days of MSPAS hospit. in health ctrs.	1133.24946	A14*A20*A19	A27
Cost of MSPAS hospit	842649.202	(A21*A26)+(A22*A27)	A28
Days of ISSS hospit	0	A15*A19	A29
Cost of ISSS hospit	0	A29*A23	A30
Cost of MSPAS ambulat	4610590.57	A16*A24	A31
Cost of ISSS ambulat	1867922.19	A17*A25	A32
Total Cost of prevented cases	7321161.96	A28+A30+A31+A32	A33

NOTES:

- Because ISSS currently offers no pediatric hospitalization services, assume all ISSS pediatric affiliates get hospitalized at MSPAS and therefore that MSPAS share of pediatric hospitalizations = 88.1%.

C.1 Births Averted

EQUATION

$$TFR = C_m \cdot C_c \cdot C_{ppi} \cdot C_a \cdot C_s \cdot TF$$

1) C_m = Proportion Married2) $C_c = 1 - 1.08(u \cdot e)$ (u = Contraceptive prevalence rate; e = Aggregate Effectiveness)3) $C_{ppi} = 20 / (18.5 + ppi)$ 4) $C_a = TFR / (TFR + .4 \cdot (1 + u) \cdot TA)$ (TA = abortion rate, u = contraceptive prevalence rate)5) $C_s = (7.63 - .11 \cdot s) / 7.3$ (s = % sterile). We modify this formula to simplify the equation:

$$C_s = 1 - s$$

DATA NEEDED

1) Proportion Married 0.64

2) Contraceptive use and effectiveness

Column	A	B	C	D	E	F	
		Proportion of women using contra.	Proportion of contraceptors using each method (Formula)	(Value)	Use Effectiv	Aggregate Effectiveness (Form (Value)	
Users Fem sterilization		0.314	+++	.314/0.533	0.589	1	E*D 0.589 A3
Users Oral		0.087		.087/0.533	0.163	0.94	E*D 0.153 A4
Users Condoms		0.021		.021/0.533	0.039	0.83	E*D 0.032 A5
Users IUD		0.021		.021/0.533	0.039	0.97	E*D 0.038 A6
Users Injections		0.036		.036/0.533	0.068	0.98	E*D 0.067 A7
Users Rhythm		0.03		.03/0.533	0.056	0.83	E*D 0.046 A8
Users Withdrawal		0.02		.02/0.533	0.038	0.83	E*D 0.032 A9
Users Male sterilization		0.004		.004/0.533	0.008	1	E*D 0.008 A10
a) Contraceptive prevalence rate		0.533	(u)				
Non-users		0.467					
Total		1			1		

b) Aggregate use-effectiveness

Weighted a (e)

SUM (E*D)

0.965

3) Postpartum infecundability (ppi)

Months of pp infecund. w/out b-feed	1.5 mo.	1.5
Months of pp infecund. with current bf	7.5 mo.	7.5
Months of pp infecund. with alternative 25% inc. in duration of ppi	1.25*7.5=9.4 mo.	9.4

4) Abortion rate = 0

5) Sterility rate = .02

6) Current TFR = 3.85

+++ Varies slightly (.314 vs. .315 reported in FESAL, 1993)

CALCULATIONS

First solve for TF (total fecundity in absence of contraception or breastfeeding)

$$TFR = C_m * C_c * C_{ppi} * C_a * C_s * TF$$

Current Level of Breastfeeding

$$3.85 = .64 * (1 - 1.08(.533 * .965)) * (20/18.5 + 7.5) * 3.85 / (3.85 + 0) * 1 - (.02) * TF$$

$$\begin{aligned} 3.85 &= 0.64 & 0.445 & 0.769 & 1 & 0.98 & TF \\ 3.85 &= 0.21463098 & TF \\ TF &= 17.94 \end{aligned}$$

Projected with No BF

$$TFR = .64 * (1 - 1.08(.533 * .965)) * (20/18.5 + 1.5) * 3.85 / (3.85 + 0) * 1 - (.02) * TF$$

$$\begin{aligned} TFR &= 0.64 & 0.445 & 1 & 1 & 0.98 & 17.94 \\ TFR &= 5.01 \end{aligned}$$

Projected with Increased Breastfeeding and PPI

$$TFR = .64 * (1 - 1.08(.533 * .965)) * (20/18.5 + 9.4) * 3.85 / (3.85 + 0) * 1 - (.02)$$

$$\begin{aligned} TFR &= 0.64 & 0.4445 & 0.717 & 1 & 0.98 & 17.94 \\ TFR &= 3.59 \end{aligned}$$

Current births

TFR w/out b-feed	5.01	151200
TFR with current bf	3.85	151200
TFR with alternative bf	3.59	151200

Current number of births	151200			Ratio
Births without b-feed	151200	5.01/3.85	196756	1.3012987
Births with alternative	151200	3.59/3.85	140989	0.93246753

				% births averted
Current births averted	196756	151200	45556	30.13
Alternative births averted (diff)	196756	140989	55767	36.88

Alternative Scenario (Additional)

FILE: NUTR4.WK1

A.1 Diarrhea cases prevented	54432	A.1	A1
MSPAS hospit. (1992)	2446	A.2	A2
MSPAS receives 88.1%* hospit.	0.881	A.3	A3
Total diarrhea hospit.	2776.39047	A.2/A.3	A4
ISSS receives 0%* hospit.	0	A.5	A5
ISSS hospit.	0	A.4*A5	A6
Total episodes diarrhea	876960	A.7	A7
Hospit./total episodes	0.00316593	A.4/A.7	A8
Ambul=1-(hospit/total episod)	0.99683407	1-A.8	A9
MSPAS receives 39.8% ambulat.	0.398	A.10	A10
ISSS receives 12.7% ambulat.	0.127	A.11	A11
Hospit. prevented	172.327684	A.1*A.8	A12
Ambulat. prevented	54259.6723	A.1*A.9	A13
MSPAS hospit. prevented	151.82069	A.12*A.3	A14
ISSS hospit. prevented	0	A.12*A.5	A15
MSPAS ambulat. prevented	21595.3496	A13*A10	A16
ISSS ambulat. prevented	6890.97838	A13*A11	A17
% MSPAS hospit. in hospitals	0.7891	A18	A18
Average LOS days	3.6	A19	A19
% MSPAS hospit. in health ctrs.	0.2109	A20	A20
Cost of MSPAS hospit. day	215.219	A21	A21
Cost of MSPAS health ctr. day	56.366	A22	A22
Cost of ISSS hospit. day	409.62	A23	A23
Cost of MSPAS ambulat. case	24	A24	A24
Cost of ISSS ambulat. case	35.55	A25	A25
Days of MSPAS hospit. in hospit.	431.286142	A14*A18*A19	A26
Days of MSPAS hospit. in health ctrs.	115.26834	A14*A20*A19	A27
Cost of MSPAS hospit	99318.1875	(A21*A26)+(A22*A27)	A28
Days of ISSS hospit	0	A15*A19	A29
Cost of ISSS hospit	0	A29*A23	A30
Cost of MSPAS ambulat	518288.39	A16*A24	A31
Cost of ISSS ambulat	244974.282	A17*A25	A32
Total Cost of prevented cases	862580.859	A28+A30+A31+A32	A33

NOTES:

*Assume ISSS pediatric affiliates are hospitalized at MSPAS, giving MSPAS a total hospital share of 75.5 + 12.6 = 88.1%.

Alternative Scenario (Additional)

FILE: NURT5.WK1

B.1 ARI cases prevented	72576	$A1=66528+6048$	A1
MSPAS LRI hospit (1992)	2994	A2	A2
MSPAS receives 88.1%* hospit.	0.881	A3	A3
Total LRI hospit	3398.4109	$A4=A2/A3$	A4
ISSS receives 0%* hospit.	0	A5	A5
ISSS hospit.	0	$A6=A4*A5$	A6
Total episodes of ARI	1345680	$A7=151200*8.9$	A7
Hospit./total episodes	0.00252542	$A8=A4/A7$	A8
Ambul=1-(hospit/total episod)	0.99747458	$A9=1-A8$	A9
MSPAS receives 39.8% ambulat.	0.398	A10	A10
ISSS receives 12.7% ambulat.	0.127	A11	A11
Hospit. prevented	183.285082	$A12=A1*A8$	A12
Ambulat. prevented	72392.7149	$A13=A1*A9$	A13
MSPAS hospit. prevented	161.474157	$A14=A12*A3$	A14
ISSS hospit. prevented	0	$A15=A12*A5$	A15
MSPAS ambulat. prevented	28812.3005	$A13*A10$	A16
ISSS ambulat. prevented	9193.87479	$A13*A11$	A17
% MSPAS hospit. in hospitals	0.7682	A18	A18
Average LOS days	5.3	A19	A19
% MSPAS hospit. in health ctrs.	0.2317	A20	A20
Cost of MSPAS hospit. day	208.248	A21	A21
Cost of MSPAS health ctr. day	53.124	A22	A22
Cost of ISSS hospit. day	409.62	A23	A23
Cost of MSPAS ambulat. case	28	A24	A24
Cost of ISSS ambulat. case	35.55	A25	A25
Days of MSPAS hospit. in hospit.	657.435572	$A14*A18*A19$	A26
Days of MSPAS hospit. in health ctrs.	198.29188	$A14*A20*A19$	A27
Cost of MSPAS hospit	147443.701	$(A21*A26)+(A22*A27)$	A28
Days of ISSS hospit	0	$A15*A19$	A29
Cost of ISSS hospit	0	$A29*A23$	A30
Cost of MSPAS ambulat	806744.415	$A16*A24$	A31
Cost of ISSS ambulat	326842.249	$A17*A25$	A32
Total Cost of prevented cases	1281030.36	$A28+A30+A31+A32$	A33

NOTES:

*Assume that all ISSS pediatric affiliates are hospitalized at MSPAS, giving MSPAS overall pediatric hospital share of 75.5 + 12.6 + 88.1%.

Alternative Scenario – TOTAL

FILE: NURT6.WK1

A.1 Diarrhea cases prevented	305424	A1=435456-130032	A1
MSPAS hospit. (1992)	2446	A2	A2
MSPAS receives 88.1%* hospit.	0.881	A3	A3
Total diarrhea hospit.	2776.390465	A4=A2/A3	A4
ISSS receives 0%* hospit.	0	A5	A5
ISSS hospit.	0	A6=A4*A5	A6
Total episodes diarrhea	876960	A7	A7
Hospit./total episodes	0.003165926	A8=A4/A7	A8
Ambul=1-(hospit/total episod)	0.996834074	A9=1-A8	A9
MSPAS receives 39.8% ambulat.	0.398	A10	A10
ISSS receives 12.7% ambulat.	0.127	A11	A11
Hospit. prevented	966.9497828	A12=A1*A8	A12
Ambulat. prevented	304457.0502	A13=A1*A9	A13
MSPAS hospit. prevented	851.8827586	A14=A12*A3	A14
ISSS hospit. prevented	0	A15=A12*A5	A15
MSPAS ambulat. prevented	121173.906	A16=A13*A10	A16
ISSS ambulat. prevented	38666.04538	A17=A13*A11	A17
% MSPAS hospit. in hospitals	0.7891	A18	A18
Average LOS days	3.6	A19	A19
% MSPAS hospit. in health ctrs.	0.2109	A20	A20
Cost of MSPAS hospit. day	215.219	A21	A21
Cost of MSPAS health ctr. day	56.366	A22	A22
Cost of ISSS hospit. day	409.62	A23	A23
Cost of MSPAS ambulat. case	24	A24	A24
Cost of ISSS ambulat. case	35.55	A25	A25
Days of MSPAS hospit. in hospit.	2419.994465	A26=A14*A18*A19	A26
Days of MSPAS hospit. in health ctrs.	646.7834657	A27=A14*A20*A19	A27
Cost of MSPAS hospit	557285.3857	(A21*A26)+(A22*A27)	A28
Days of ISSS hospit	0	A29=A15*A19	A29
Cost of ISSS hospit	0	A30=A29*A23	A30
Cost of MSPAS ambulat	2908173.744	A31=A16*A24	A31
Cost of ISSS ambulat	1374577.913	A32=A17*A25	A32
Total Cost of prevented cases	4840037.043	A28+A30+A31+A32	A33

NOTES:

*Because ISSS currently offers no pediatric hospital services, assume all ISSS pediatric affiliates use MSPAS services, and consequently that MSPAS share of hospitalizations is 75.5+12.6=88.1%.

Alternative Scenario – TOTAL

FILE: NURT7.WK1

B.1 ARI cases prevented	487352	$A1=597240+48872-133056-25704$	A1
MSPAS LRI hospit (1992)	2994	A2	A2
MSPAS receives 88.1%* hospit.	0.881	A3	A3
Total LRI hospit	3398.410897	$A4=A2/A3$	A4
ISSS receives 0%* hospit.	0	A5	A5
ISSS hospit.	0	$A6=A4*A5$	A6
Total episodes of ARI	1345680	$A7=151200*8.9$	A7
Hospit./total episodes	0.002525423	$A8=A4/A7$	A8
Ambul=1-(hospit/total episod)	0.997474577	$A9=1-A8$	A9
MSPAS receives 39.8% ambulat.	0.398	A10	A10
ISSS receives 12.7% ambulat.	0.127	A11	A11
Hospit. prevented	1230.769832	$A12=A1*A8$	A12
Ambulat. prevented	486121.2302	$A13=A1*a9$	A13
MSPAS hospit. prevented	1084.308222	$A14=A12*A3$	A14
ISSS hospit. prevented	0	$A15=A12*A5$	A15
MSPAS ambulat. prevented	193476.2496	$A13*A10$	A16
ISSS ambulat. prevented	61737.39623	$A13*A11$	A17
% MSPAS hospit. in hospitals	0.7682	A18	A18
Average LOS days	5.3	A19	A19
% MSPAS hospit. in health ctrs.	0.2317	A20	A20
Cost of MSPAS hospit. day	208.248	A21	A21
Cost of MSPAS health ctr. day	53.124	A22	A22
Cost of ISSS hospit. day	409.62	A23	A23
Cost of MSPAS ambulat. case	28	A24	A24
Cost of ISSS ambulat. case	35.55	A25	A25
Days of MSPAS hospit. in hospit.	4414.717553	$A14*A18*A19$	A26
Days of MSPAS hospit. in health ctrs.	1331.54134	$A14*A20*A19$	A27
Cost of MSPAS hospit	990092.9031	$(A21*A26)+(A22*A27)$	A28
Days of ISSS hospit	0	$A15*A19$	A29
Cost of ISSS hospit	0	$A29*A23$	A30
Cost of MSPAS ambulat	5417334.989	$A16*A24$	A31
Cost of ISSS ambulat	2194764.436	$A17*A25$	A32
Total Cost of prevented cases	8602192.328	$A28+A30+A31+A32$	A33

NOTES:

*Because ISSS offers no pediatric hospital services, assume all ISSS pediatric affiliates are hospitalized at MSPAS and that MSPAS share of hospitalizations is this $75.5 + 12.6 = 88.1\%$.

A. DELIVERY

Current number of births	151200	A1
Births averted (current)	45556	A2
% births at MSPAS	0.37607143	56862/151200
% births at ISSS	0.11617725	0.11617725
Prevented cesareans at MSPAS	3255.1389	A5=A2*A3*.19
Prevented non-cesareans at MSPAS	13877.1711	A6=A2*A3*.81
Prevented cesareans at ISSS	1323.14269	A7=A2*A4*.25
Prevented non-cesar. at ISSS	3969.42806	A8=A2*A4*.75
Cost per cesarean delivery at MSPAS	1004	A9
Cost of non-c. delivery at MSPAS	289	A10
Cost of cesarean delivery at ISSS	1711.8	A11=380.4*4.5
Cost of non-c. at ISSS	285.3	A12=380.4*0.75
Total cost prevented at MSPAS	7278661.9	A13=(A5*A9)+(A6*A10)
Total cost prevented at ISSS	3397433.47	A14=(A7*A11)+(A8*A12)
Total cost prevented (current)	10676095.4	A15=A13+A14

B. BOTTLE FEEDING TO NEWBORNS

Cost of formula per bottle	3.75	A16=C\$30/8
Cost of nurse time per bottle	4.26041667	A17=C\$2045/160/3
ISSS:add glucose per bottle	0.91028571	A18=(180*12/14000)*5.90
Cost per bottle at MSPAS	8.01041667	A19=A16+A17
Cost per bottle at ISSS	8.92070238	A20=A16+A17+A18
Cost of feed per ces. at MSPAS	96.125	A21=A19*3*4
Cost of feed per non-ces. at MSPAS	32.0416667	A22=A19*1*4 A23
Cost of feed per ces. at ISSS	285.462476	A24=A20*8*4
Cost of feed per non-ces. at ISSS	53.5242143	A25=A20*1.5*4
Total MSPAS births	56862	A26=56862 births
Total MSPAS cesareans	10803.78	A27=A26*.19
Total MSPAS non-cesareans	46058.22	A28=A26*.81
Total MSPAS feeding savings	2514295.49	A29=(A27*A21)+(A28*AA22)

A. DELIVERY

Current number of births	151200	A1
Births Averted (Additional)	10211	A2
% births at MSPAS	0.376071429	$56862/151200$
% births at ISSS	0.116177249	0.116177249
Prevented cesareans at MSPAS	729.6124179	$A5=A2*A3*.19$
Prevented non-cesareans at MSPAS	3110.452939	$A6=A2*A3*.81$
Prevented cesareans at ISSS	296.5714716	$A7=A2*A4*.25$
Prevented non-cesar. at ISSS	889.7144147	$A8=A2*A4*.75$
Cost per cesarean delivery at MSPAS	1004	A9
Cost of non-c. delivery at MSPAS	289	A10
Cost of cesarean delivery at ISSS	1711.8	$A11=380.4*4.5$
Cost of non-ces. at ISSS	285.3	$A12=380.4*0.75$
Total cost prevented at MSPAS	1631451.767	$A13=(A5*A9)+(A6*A10)$
Total cost prevented at ISSS	761506.5675	$A14=(A7*A11)+(A8*A12)$
Total costs prevented (additional)	2392958.335	$A15=A13+A14$
B. BOTTLE FEEDING TO NEWBORNS		
Cost of formula per bottle	3.75	$A16=C\$30/8$
Cost of nurse time per bottle	4.260416667	$A17=C\$2045/160/3$
ISSS:add glucose per bottle	0.910285714	$A18=(180*12/140000)*5.90$
Cost per bottle at MSPAS	8.010416667	$A19=A16+A17$
Cost per bottle at ISSS	8.920702381	$A20=A16+A17+A18$
Cost of feed per ces. at MSPAS	96.125	$A21=A19*3*4$
Cost of feed per non-ces. at MSPAS	32.04166667	$A22=A19*8*0.5$
		A23
Cost of feed per ces. at ISSS	321.1452857	$A24=A20*8*4.5$
Cost of feed per non-ces. at ISSS	53.52421429	$A25=A20*8*.75$
Total MSPAS births	56862	$A26=56862$ births
Total MSPAS cesareans	10803.78	$A27=A26*.19$
Total MSPAS non-cesareans	46058.22	$A28=A26*.81$
Total MSPAS feeding savings	2514295.485	$A29=(A27*A21)+(A28*AA22)$
Total ISSS births	17565.9624	$A30=151200*.116177$
Total ISSS cesareans	4391.4906	$A31=A30*.25$
Total ISSS non-cesareans	13174.4718	$A32=A30*.75$
Total ISSS feeding savings (80% newborns breastfed)	1692367.804	$A33=.8((A31*A24)+(A32*A25))$

A. DELIVERY

Current number of births	151200	A1
Births Averted (Total)	55767	A2
% births at MSPAS	0.376071429	56862/151200
% births at ISSS	0.116177249	0.116177249
Prevented cesareans at MSPAS	3984.751318	$A5=A2*A3*.19$
Prevented non-cesareans at MSPAS	16987.62404	$A6=A2*A3*.81$
Prevented cesareans at ISSS	1619.714157	$A7=A2*A4*.25$
Prevented non-cesar. at ISSS	4859.14247	$A8=A2*A4*.75$
Cost per cesarean delivery at MSPAS	1004	A9
Cost of non-ces. delivery at MSPAS	289	A10
Cost of cesarean delivery at ISSS	1711.8	$A11=380*4.5$
Cost of non-ces. at ISSS	285.3	$A12=380.4*0.75$
Total cost prevented at MSPAS	8910113.67	$A13=(A5*A9)+(A6*A10)$
Total cost prevented at ISSS	4158940.04	$A14=(A7*A11)+(A8*A12)$
Total cost prevented (altern.-total)	13069053.71	$A15=A13+A14$

B. BOTTLE FEEDING TO NEWBORNS

Cost of formula per bottle	3.75	$A16=C\$30/8$
Cost of nurse time per bottle	4.260416667	$A17=C\$2045/160/3$
ISSS:add glucose per bottle	0.910285714	$A18=(180*12/14000)*5.90$
Cost per bottle at MSPAS	8.010416667	$A19=A16+A17$
Cost per bottle at ISSS	8.920702381	$A20=A16+A17+A18$
Cost of feed per ces. at MSPAS	96.125	$A21=A19*3*4$
Cost of feed per non-ces. at MSPAS	32.04166667	$A22=A19*1*4$
		A23
Cost of feed per ces. at ISSS	285.4624762	$A24=A20*8*4$
Cost of feed per non-ces. at ISSS	53.52421429	$A25=A20*1.5*4$
Total MSPAS births (no change)	56862	$A26=56862$ births
Total MSPAS cesareans	10803.78	$A27=A26*.19$
Total MSPAS non-cesareans	46058.22	$A28=A26*.81$
Total MSPAS feeding savings	2514295.485	$A29=(A27*A21)+(A28*AA22)$
Total ISSS births	17565.9624	$A30=151200*.116177$
Total ISSS cesareans	4391.4906	$A31=A30*.25$
Total ISSS non-cesareans	13174.4718	$A32=A30*.75$
Total ISSS feeding savings (80% newborns breastfed)	1567007.226	$A33=.8((A31*A24)+(A32*A25))$

Alternative Scenario

FILE: NURT11.WK1

Activities to Promote Breastfeeding
(Costs in annual colones)

1. Hospital-based

Counseling mothers MSPAS hospitals	211700	A1=105850*2
Training to 4 MSPAS hospitals	17333.3333	A2=52000/3
Coordinator for MSPAS	24624	A3=19*2160/20*12
Counseling mothers ISSS hospital	5840	A4=2920*2
Training to ISSS Io. de Mayo	4333.33333	A5=13000/3
Coordinator for ISSS	1690	A6
(Sub-total MSPAS)	253657.333	A7=A1+A2+A3
(Sub-total ISSS)	11863.3333	A8=A4+A5+A6
(SUB-TOTAL)	265520.067	A9=A7+A8

2. Health facility and Community-based

Training MSPAS regional coordinators	1433	A10=4299/3
Refresher training/MSPAS units	20392.3333	A11=61177/3
Refresher training/Promoters	58476.6667	A12=175430/3
Refresher training/TBAs	44526.6667	A13=133580/3
Refresher training/Nutr Coll	13666.6667	A14=41000/3
Support group training	60240	A15=12240+42000+6000
Support group supervision	36480	A16=152*20*12
Training ISSS clinic staff	6406	A17=(495*38)+408/3
(Sub-total MSPAS)	235215.333	A18=A(10+11+12+13+14+15+16)
(Sub-total ISSS)	6406	A19=A17
(SUB-TOTAL)	241621.333	A20=A18+A19

3. Information, education, and communication

Printing materials for MSPAS	425200	A21
Printing materials for ISSS	17100	A22
(SUB-TOTAL)	442300	A23=A21+A22

4. Advocacy

National coordination (MSPAS)	68268	A24
Five regional coordinators	18000	A25
National workshop	7550	A26=22650/3
Monitoring/evaluation	30000	A27
(SUB-TOTAL)	123818	A28=A24+A25+A26+A27
SUB-TOTAL MSPAS	1037890.67	A30=A7+A18+A21+A28
SUB-TOTAL ISSS	35369.3333	A31=A8+A19+A22
TOTAL	1073259.4	A32=A9+A20+A23+A28

NOTES:

Assumes 1993 exchange rate (8.72 colones=1 US\$).

The cost of certain activities which are assumed to occur only every 3 years are amortized by dividing total cost by 3.



ANNEX 3: LIST OF KEY DATA AND INDICATORS FOR EL SALVADOR USED IN THE ANALYSIS

DATA/INDICATOR	SOURCE*
<u>Morbidity/mortality</u>	
% infant deaths from diarrhea: 19%	FESAL
% infant deaths from ARI: 16.3% (100% of ARI deaths assumed to be lower respiratory infections)	FESAL
# infant diarrhea hospitalizations at MSPAS in 1992: 2446	MSPAS, Sistema de Información Gerencial
% infant diarrhea cases receiving hospitalization at MSPAS: $2446/876,960 = 0.28\%$	
# infant LRI hospitalizations at MSPAS in 1992: 2994	MSPAS, Sistema de Información Gerencial
% infant LRI cases receiving hospitalization at MSPAS: $2994/75,600 = 3.96\%$	
Ave. cost MSPAS treatment per diarrhea episode (cost to MSPAS): 25 colones	Carlos Melendez, interview with pediatricians in MCH Dept./MSPAS
Ave. cost MSPAS treatment per ARI episode (cost to MSPAS): 30 colones	Carlos Melendez, interview with pediatricians in MCH Dept./MSPAS
Ave. cost per MSPAS hospital bed day for infant diarrhea: 215 colones	UNICEF
Ave. cost per MSPAS health center bed day for infant diarrhea: 56 colones	UNICEF
Ave. length of stay for infant diarrhea: 3.6 days	UNICEF

* Source abbreviations: ANSAL = El Salvador Health Sector Assessment 1993/94; FESAL = Family Health Survey (DHS) 1993; Infant Feeding Assessment in El Salvador; UNICEF = report by Julio Ramos Chorro 1992.



DATA/INDICATOR	SOURCE*
Ave. cost per MSPAS hospital bed day for infant LRI: 208 colones	UNICEF
Ave. cost per MSPAS health center bed day for infant diarrhea: 53 colones	UNICEF
Ave. length of stay for infant diarrhea: 5.3 days	UNICEF
Ave. cost per ISSS ambulatory consultation: 35.55 colones	1990 ISSS statistics, cited by Jack Fiedler in personal communication
Ave. cost per ISSS hospital bed day: 409.62 colones internal medicine 380.4 colones obstetrics	1990 ISSS statistics, cited by Jack Fiedler in personal communication
Total ave. cost to family of seeking care at MSPAS hospital: 52.29 colones	ANSAL, Demand for Health Services
Total ave. cost to family of seeking care at MSPAS health post: 25.27 colones	ANSAL, Demand for Health Services
Total ave. cost to family of seeking care at ISSS facility: 21.20 colones	ANSAL, Demand for Health Services
Breastfeeding practices	
Not breastfeeding at 0-2.9 months: 9.9%	Infant Feeding Assessment in El Salvador, 1993, Original source: FESAL
Exclusive BF at 0-2.9 months: 23.4%	Infant Feeding Assessment in El Salvador, 1993, Original source: FESAL
Exclusive BF at 3-5.9 months: 5.6%	Infant Feeding Assessment in El Salvador, 1993, Original source: FESAL
Partial BF at 9-11.9 mos.: 65.2%	FESAL
Exclusive BF at 0-5.9 mos.: 14.9%	Ellen Piwoz, calculated from Table 10 in Infant Feeding Assessment in El Salvador, 1993

* Source abbreviations: ANSAL = El Salvador Health Sector Assessment 1993/94; FESAL = Family Health Survey (DHS) 1993; Infant Feeding Assessment in El Salvador; UNICEF = report by Julio Ramos Chorro 1992.



DATA/INDICATOR	SOURCE*
<u>Public sector health care infrastructure</u>	
No. of MSPAS facilities: 14 hospitals, 15 health centers, 356 health units, posts, dispensaries	Infant Feeding Assessment in El Salvador, 1993
No. of promoters trained by MSPAS: 1442	ANSAL, Maternal and Child Health Situation
No. of trad. birth attendants trained by MSPAS: 2948	ANSAL, Maternal and Child Health Situation
No. of ISSS hospitals performing deliveries: 1 (Primer de Mayo)	Carlos Melendez, interview with ISSS authorities
No. of ISSS ambulatory facilities: 38	Carlos Melendez, interview with ISSS authorities
<u>Births/deliveries</u>	
No. annual births: 151,200	ANSAL, Maternal and Child Health Situation
Crude Birth Rate: 29.95	Figure was imputed from the number of total births and the total population figure of 5,047,925 reported in ANSAL/MCH Situation
% births attended by MSPAS: 38.1%	Infant Feeding Assessment in El Salvador, 1993
% births attended by ISSS: 9.7%	Infant Feeding Assessment in El Salvador, 1993
% MSPAS deliveries by cesarian: 19%	Infant Feeding Assessment in El Salvador, 1993
% ISSS deliveries by cesarian: 25%	Infant Feeding Assessment in El Salvador, 1993

* Source abbreviations: ANSAL = El Salvador Health Sector Assessment 1993/94; FESAL = Family Health Survey (DHS) 1993; Infant Feeding Assessment in El Salvador; UNICEF = report by Julio Ramos Chorro 1992.



DATA/INDICATOR	SOURCE*
Length of stay normal delivery at MSPAS: 12 hours	Carlos Melendez, interview with MSPAS authorities
Length of stay cesarian delivery at MSPAS: 3 days	Carlos Melendez, interview with MSPAS authorities
Cost of normal delivery at MSPAS hospital center: 289 colones	MSPAS Sistema de Información Gerencial for 1993 Hospital de Maternidad
Cost of cesarian delivery at MSPAS hospital: 1004 colones	MSPAS Sistema de Información Gerencial for 1993 Hospital de Maternidad
Length of stay normal delivery at ISSS: 18 hours	Carlos Melendez, interview with ISSS authorities
Length of stay cesarian delivery at ISSS: 4.5 days	Carlos Melendez, interview with ISSS authorities
Cost of normal delivery at ISSS hospital: 285 colones	Extrapolated from 380 colones/24 hours cost of ISSS obstetrics bed day x LOS
Cost of cesarian delivery at ISSS hospital: center: 1712 colones	Extrapolated from 380 colones/24 hours cost of ISSS obstetrics bed day x LOS
<u>Salary costs</u>	
Monthly salary national breastfeeding coordinator (physician): 4080 colones	Carlos Melendez/interview with MSPAS MCH Dept. authorities
Monthly salary national breastfeeding coordinator (soc. worker): 2405 colones	Carlos Melendez/interview with MSPAS MCH Dept. authorities
Monthly salary national breastfeeding coordinator (grad. nurse): 3760 colones	Carlos Melendez/interview with MSPAS MCH Dept. authorities

* Source abbreviations: ANSAL = El Salvador Health Sector Assessment 1993/94; FESAL = Family Health Survey (DHS) 1993; Infant Feeding Assessment in El Salvador; UNICEF = report by Julio Ramos Chorro 1992.



DATA/INDICATOR	SOURCE*
Monthly salary MSPAS hosp. or central level physician: 4080 colones	Carlos Melendez/interview with MSPAS MCH Dept. authorities
Monthly salary MSPAS regional supervisor physician: 4080 colones	Carlos Melendez/interview with MSPAS MCH Dept. authorities
Monthly salary MSPAS health center director physician: 3860 colones	Carlos Melendez/interview with MSPAS MCH Dept. authorities
Monthly salary MSPAS nurse supervisor: 2045 colones	Carlos Melendez, interview with MSPAS MCH Dept. authorities
Monthly salary MSPAS health center nurse: 2160 colones	Carlos Melendez, interview with MSPAS MCH Dept. authorities
To obtain daily salary, divide monthly salary by ave. 20 work days/month.	Estimate
To obtain hourly salary, divide daily salary by 8 work hours/day	Estimate
Monthly salary MSPAS Promoter: 1600 colones	Carlos Melendez
<u>Bottle feeding costs</u>	
Prep. and administration time per bottle by hospital nurse: 20 minutes	Estimate
No. bottle feeds/24 hours for newborn: 8	Estimate
Cost per 1-pound can of infant formula: 30 col.	Carlos Melendez
No. bottle feeds per 1-pound can: 8	Estimate

* Source abbreviations: ANSAL = El Salvador Health Sector Assessment 1993/94; FESAL = Family Health Survey (DHS) 1993; Infant Feeding Assessment in El Salvador; UNICEF = report by Julio Ramos Chorro 1992.



DATA/INDICATOR	SOURCE*
Cost per bottle = Formula cost + 30 minutes of auxiliary nurse time = approx. 8 colones	Estimate
Cost of glucose used in ISSS 1o de Mayo Hospital: 180 lb/month @ 5.90 colones/lb	Carlos Melendez, interview with ISSS
No. of deliveries per year at ISSS 1o de Mayo Hospital: 14,000 deliveries	Carlos Melendez, interview with ISSS authorities
Ave. consumption of breast milk substitute by non-BF infant: 10 lb. per mos.	Belize Economic Analysis BF
Ave. consumption of breast milk substitute by partially BF infant: 5 lb. per mos.	Belize Economic Analysis BF
Cost of 1-pound can of powdered milk: 17.5 colones	UNICEF
<u>Miscellaneous</u>	
Min. monthly salary, San Salvador (May 1991): 705 col.	UNICEF
Min. monthly salary, other urban (May 1991): 675 col.	UNICEF

* Source abbreviations: ANSAL = El Salvador Health Sector Assessment 1993/94; FESAL = Family Health Survey (DHS) 1993; Infant Feeding Assessment in El Salvador; UNICEF = report by Julio Ramos Chorro 1992.



**ANNEX 4: EXCESS MORBIDITY FROM DIARRHEA AND ACUTE RESPIRATORY INFECTIONS
UNDER THREE LEVELS OF SUBOPTIMAL BREASTFEEDING/EL SALVADOR 1993**

	Scenario #1: No BF 100% Subopt. (0% EBF 0-5.9 mos)	Scenario #2: Current 58% Subopt. (14.9% EBF 0-5.9 mos)	Scenario #3: Intervention 44% Subopt. (30% EBF 0-5.9 mos)
Diarrhea			
Relative risk of diarrhea morbidity	1.99	1.46	1.42
% episodes attributable to subopt. BF	49.7%	21.1%	14.9%
# episodes attributable per infant per year	$5.8 \times .497 = 2.88$	$5.8 \times .211 = 1.22$	$5.8 \times .149 = 0.86$
Total # episodes attributable per year	$2.88 \times 151,200 = 435,456$	$1.22 \times 151,200 = 184,464$	$0.86 \times 151,200 = 130,032$
Marginal reduction in excess episodes from previous scenario	-	250,992	54,432
Upper Respiratory Infections (URI)			
Relative risk of URI morbidity	1.89	1.32	1.28
% episodes attributable to subopt. BF	47.1%	15.7%	10.5%
# episodes attributable per infant per year	$8.4 \times .471 = 3.95$	$8.4 \times .157 = 1.32$	$8.4 \times .105 = 0.88$
Total # episodes attributable per year	$3.95 \times 151,200 = 597,240$	$1.32 \times 151,200 = 199,584$	$0.88 \times 151,200 = 133,056$
Marginal reduction in excess episodes from previous scenario	-	397,656	66,528
Lower Respiratory Infections (LRI)			
Relative risk of LRI morbidity	2.66	2.30	2.27
% episodes attributable to subopt. BF	62.4%	43.1%	34.6%
# episodes attributable per infant per year	$0.5 \times .624 = 0.31$	$0.5 \times .431 = 0.21$	$0.5 \times .346 = 0.17$
Total # episodes attributable per year	$0.31 \times 151,200 = 48,872$	$0.21 \times 151,200 = 31,752$	$0.17 \times 151,200 = 25,704$
Marginal reduction in excess episodes from previous scenario	-	17,120	6,048



	Scenario #1: No BF 100% Subopt. (0% EBF 0-5.9 mos)	Scenario #2: Current 58% Subopt. (14.9% EBF 0-5.9 mos)	Scenario #3: Intervention 44% Subopt. (30% EBF 0-5.9 mos)
Diarrhea			
Relative risk of diarrhea mortality	10.99	4.26	3.80
Total # infant deaths per year	10,433	7860	7687
Diarrhea-specific infant mortality	25.5/1000	9.9/1000	8.8/1000
Total # deaths from diarrhea per year	25.5/1000 x 151,200 = 3855	9.9/1000 x 151,200 = 1493	8.8/1000 x 151,200 = 1331
% deaths attributable to subopt. BF	90.9%	65.5%	53.9%
Total # deaths attributable per year	3504	978	717
Marginal reduction in excess deaths from previous scenario	-	2526	261
Lower Respiratory Infections (LRI)			
Relative risk of LRI mortality	2.03	1.81	1.79
Total # infant deaths per year	10,433	7860	7687
LRI-specific infant mortality	9.3/1000	8.3/1000	8.2/1000
Total # deaths from LRI per year	9.3/1000 x 151,200 = 1406	8.3/1000 x 151,200 = 1258	8.2/1000 x 151,200 = 1240
% deaths attributable to subopt. BF	50.7%	32.1%	24.9%
Total # deaths attributable per year	713	404	309
Marginal reduction in excess deaths from previous scenario	-	309	95

NOTE: The expected numbers of infant deaths and cause-specific mortality rates under Scenarios #1 and #3 were calculated by taking into account the expected changes in risk of death from diarrhea and lower respiratory infections due to changes in prevalence of suboptimal breastfeeding.



ANNEX 5: CALCULATION OF CURRENT BREASTFEEDING PROMOTION COSTS

Area	Specific Activities	Costs
Advocacy/ monitoring	National breastfeeding promotion coordination	1 FT MD @ C\$4080/mos x 12 months + soc workers @ 20% time x C\$2405/mos x 12 mos + Nurse @ C\$3760/mos x 30% time x 12 mos. = C\$68,268
Hospital-based breastfeeding promotion	Estimated amount of time currently spent by RNs in MSPAS hospitals and health centers counseling mothers on breastfeeding	45 min. RN/day @ C\$2160/20 work days/mos. x 365 days x 29 MSPAS hosp/HC = C\$105,850
	15 training sessions on AIDS and breastfeeding, covering 205 persons from regional level hospitals and health centers	Total = C\$15,574
	Training on breastfeeding norms for 30 regional hospital and health center directors	Total = C\$2,250
	Training on breastfeeding for Baby Friendly Hospital coordinators and local breastfeeding support committees (230 persons total)	Total = C\$11,250
	Estimated amount of time spent by RNs in ISSS Primero de Mayo hospital counseling mothers on breastfeeding	30 min. RN/day @ C\$2532/20 work days/mos. x 365 days x 1 ISSS hosp = C\$2,920
Primary health facility and community- based breastfeeding promotion	Training of 35 MSPAS regional personnel on breastfeeding norms	Total = C\$2,625
	Training on breastfeeding norms for 1,699 MSPAS staff at the regional level	Total = C\$76,455
	Breastfeeding content of traditional birth attendant initial training courses (3 hours out of total 120); 5 courses held per year	3/120 x C\$13,000 cost per training course x 5 courses = C\$1,625
	No breastfeeding-related training activities are carried out for ISSS clinic staff	None
Information, education and communication	No IEC activities are currently being funded by MSPAS or ISSS	None



NOTES ON COSTS FOR CURRENT BREASTFEEDING PROMOTION ACTIVITIES:

National breastfeeding promotion coordination staff. Salaries and % time dedication provided by staff of MCH Department of MSPAS in interviews with Carlos Melendez in March 1994.

Time currently spent on breastfeeding promotion in hospitals. Estimates of amount of time spent daily by nurses in MSPAS facilities and in the ISSS hospital were based on observations of C. Melendez in MSPAS facilities and interviews with ISSS officials during March and April 1994.

Training costs for MSPAS hospital/health center staff related to breastfeeding promotion. Because data on prior year expenditures on breastfeeding-related training of hospital personnel were not available, current scenario hospital-based breastfeeding promotion training costs were taken as those budgeted for 1994 by the MCH Department of MSPAS.

Time currently spent on breastfeeding promotion by primary care facility staff and community-based personnel. Because the cost of adding appropriate breastfeeding messages to existing maternal education/counseling activities was considered to be inconsequential, no PHC personnel time was costed as part of the intervention.

Training costs for primary health care facility and community-based breastfeeding promotion. Because data on prior year expenditures on breastfeeding-related training of PHC personnel were not available, current scenario PHC personnel breastfeeding promotion training costs were taken as those budgeted for 1994 by the MCH Department of MSPAS.



ANNEX 6: CALCULATION OF INTERVENTION COSTS FOR THE ALTERNATIVE SCENARIO

Area	Specific Activities	Costs
Advocacy/ monitoring	National breastfeeding promotion coordination	1 FT MD @ C\$4080/mos x 12 months + soc workers @ 20% time x C\$2405/mos x 12 mos + Nurse @ C\$3760/mos x 30% time x 12 mos. = C\$68,268
	Designation of 5 regional breastfeeding coordinators who spend 2 days per month promoting and monitoring breastfeeding-related activities in MSPAS facilities in each region	5 x 2 x C\$3000/20 work days/mos. x 12 mos. = C\$18,000
	Ongoing monitoring and yearly evaluation of breastfeeding situation by CALMA	Evaluators @ C\$ 204/day x 40 days and data collectors @ C\$108 x 100 days = C\$18,960 personnel Per diem @ C\$50 x 100 days = C\$ 5000 Other direct costs = C\$6040 Total = C\$30,000
	National workshop to standardize norms and training content related to breastfeeding for promoters, trained birth attendants, and community volunteers (including NGOs)	20 MSPAS staff @ C\$3800/mos/20 work days (ave. salary) x 3 days = C\$11,400 Meeting expenses @C\$75/day x 3 days x 50 participants = C\$11,250 C\$11,400 + C\$11,250 = C\$22,650*/3 = C\$7550
Hospital-based breastfeeding promotion	Double the estimated amount of time currently spent by RNs in MSPAS hospitals and health centers counseling mothers on breastfeeding	(45 min. RN/day @ C\$2160/20 work days/mos. x 365 days x 29 MSPAS hosp/HC = C\$105,850) x 2 = C\$211,700
	Double the estimated amount of time spent by RNs in ISSS Primero de Mayo hospital counseling mothers on breastfeeding	(30 min. RN/day @ C\$2532/20 work days/mos. x 365 days x 1 ISSS hosp = C\$2920) x 2 = C\$5,840
	Training to extend Baby Friendly Hospital Initiative to 4 uncovered MSPAS hospitals	4 @ C\$13,000 = C\$52,000*/3 = C\$17,333
	Designation of 1 breastfeeding coordinator per MSPAS hospital/health center who spends 1 day per month promoting and monitoring breastfeeding-related activities in each hospital	19 x C\$2160/20 work days/mos. x 12 mos. = C\$24,624
	Training to extend Baby Friendly Hospital Initiative to ISSS 1o de Mayo hospital	1 @ C\$13,000 = C\$13,000*/3 = C\$4,333
	Designation of 1 breastfeeding coordinator who spends 1 day per month promoting and monitoring breastfeeding-related activities in the ISSS 1o de Mayo hospital	1 x C\$2816/20 work days/mos. x 12 mos. = C\$1,690

* = "START-UP" cost that only has to be incurred periodically; for purpose of this analysis, assume start-up costs can be amortized over 3 years, such that the annual cost = total cost/3.



Area	Specific Activities	Costs
Primary health facility and community-based breastfeeding promotion	Training of MSPAS regional breastfeeding coordinators (3-day training, with 3 national BF staff as trainers)	Participants: 5 persons @ C\$150 x 3 days = C\$2,250 Trainers: C\$308 x 3 days = C\$924 Per diem/expenses: 5 persons x 3 days x C\$75/day = C\$1,125 Total: C\$4,299*/3 = C\$1,433
	Refresher training on revised breastfeeding norms and lactation management for MSPAS health units and posts (1-day training held in each region, with 3 national BF staff and the regional BF coordinator as trainers)	364 persons X C\$108 = C\$39,312 Trainers: 150 + 308 = C\$458 x 5 trainings = C\$2,290 Per diem/expenses: (369 x C\$50) + (3 x 5 x C\$75) = C\$19,575 Total = C\$61,177*/3 = C\$20,392
	Refresher training on revised breastfeeding norms for 1442 MSPAS promoters (1-day training held for promoters in groups of approx. 30 in each region, with the regional BF coordinator as trainer)	1442 persons x C\$80/day x 1 day = C\$115,360 1 trainer x C\$150 x 48 training sessions = C\$7,200 Per diem/expenses: (C\$55/trainee x 1442 persons) + (C\$50/trainer x 48 training days) = C\$52,870 Total = C\$175,430*/3 = C\$58,477
	Refresher training on revised breastfeeding norms for 2948 trained birth attendants (1-day training held for TBAs in groups of approx. 15 in each region, with the local nurse supervisor as trainer)	Trainer: C\$102 x 200 training sessions = C\$20,400 Per diem/expenses: (C\$35/trainee x 2948 persons) + (C\$50/trainer x 200 training days) = C\$113,180 Total = C\$133,580*/3 = C\$44,527
	Refresher training on revised breastfeeding norms for 300 MSPAS Nutrition Collaborators (1-day training held in each region, with one regional nutritionist and the regional BF coordinator as trainers)	300 Nutrition Collaborators x C\$80 x 1 day = C\$24,000 Trainers: 2 x C\$150 x 5 trainings = C\$1,500 Per diem/expenses = (C\$50 x 300) + (C\$50 x 2 x 5) = C\$15,500 Total = C\$41,000*/3 = C\$13,667
	Training and supervision of 100 volunteer community-based BF support groups (initial training of 2 community volunteers for each of 100 groups/year and monthly supervision by MSPAS health center nurse, with one nurse supervising 5 community support groups)	Trainer: C\$102 x 6 days training per group x 20 training sessions = C\$12,240 Per diem/expenses: (C\$35/trainee x 200 trainees x 6 days) + (C\$50/trainer x 120 training days) = C\$48,000 Total training = C\$60,240 Total supervision: 20 supervisors @ C\$102 + C\$50 per diem x 1 day/month x 12 months = C\$36,480
	Training of ISSS clinic staff (obstetrics and pediatrics) on optimal breastfeeding and lactation management (1-day training with two MD trainers) and 1 MD and 1 RN trainee per facility	2 staff (C\$204 + C\$ 141) x 38 facilities = C\$13,110 Trainers = 2 x C\$204 = C\$408 Per diem/expenses = 76 x C\$75 = C\$5,700 Total = C\$19,218*/3 = C\$6,406

* = "START-UP" cost amortized over 3 years, such that the annual cost = total cost/3.



Area	Specific Activities	Costs
Information, education and communication	Printing of reference and educational materials on breastfeeding for MSPAS facilities, community-based workers, and volunteer support group coordinators	C\$ 50 x 5200 community workers = C\$ 260,000 C\$ 450 x 356 PHC facilities = C\$ 160,200 C\$ 50 x 100 community support groups = C\$ 5,000 Total = C\$425,200
	Printing of reference and educational materials on breastfeeding for ISSS facilities	C\$ 450 x 38 ambulatory facilities = C\$17,100

NOTES ON COSTING OF ALTERNATIVE SCENARIO INTERVENTIONS:

National breastfeeding promotion coordination staff. Salaries and % time dedication provided by staff of MHC Department of MSPAS.

Salary of Regional Breastfeeding Coordinators. Assume MD in 2 regions @ C\$4080/mos. and RN in 3 regions @ C\$2160/mos. $2 \times 4080 + 3 \times 2160 / 5 = 2928$ or 3000 average monthly salary, 150 average daily salary.

Salaries of three national breastfeeding staff as trainers. Only cost time of nurse and social worker, since MD is already covered 100%: $2405 + 3760 / \text{mos} = 6,165 / \text{mos}$. $6,165 / 20$ work days = C\$308/day for both staff.

Costs estimated for annual independent monitoring and evaluation activities to be carried out by CALMA under contract to MSPAS. Cost elements assume ongoing monitoring of routine data and any special studies, plus annual collection of breastfeeding prevalence (impact) and process data to assess progress of breastfeeding promotion activities.

Time currently spent on breastfeeding promotion in hospitals. Estimates of amount of time spent daily by nurses in MSPAS facilities and in the ISSS hospital were based on observations of C. Melendez in MSPAS facilities and interview with ISSS officials.

Initial training to enable a hospital to become Baby-Friendly. According to the Infant Feeding Assessment, UNICEF spent about 1/3 of its 1993 budget of US\$110,000 on training related to Baby Friendly Hospitals. 10 MSPAS hospitals and 15 health centers received training to receive Baby Friendly designation in this period. $1/3 \times \text{US}\$110,000 = \text{US}\$36,667 / 25 = \text{US}\$1467$ per hospital $\times 8.72$ colones/US\$ = C\$12,792 or roughly C\$13,000 per hospital.

Time currently spent on breastfeeding promotion by primary care facility staff and community-based personnel. Because the cost of adding appropriate breastfeeding messages to existing maternal education/counseling activities was considered to be inconsequential, no PHC personnel time was costed as part of the intervention.

Refresher training on revised breastfeeding norms and lactation management for MSPAS health units and posts. Assume trainees are all nurses @ C\$2160/mos. salary or C\$108 daily salary. For per diem/expenses, assume all 364 participants and 5 regional BF coordinators receive 1 day of per diem @ C\$50 and that 3 national level trainers each receive 1 day $\times 5$ courses @ C\$75: $(369 \times \text{C}\$50) + (3 \times 5 \times \text{C}\$75) = \text{C}\$19,575$



Refresher training for MSPAS promoters. Monthly promoter salary = C\$1600 /20 work days = C\$80/day.

Refresher training for MSPAS trained birth attendants. Assume TBAs are not paid any salary by MSPAS. Salary of nurse supervisor/trainer = C\$2045/mos. / 20 work days = C\$102/day.

Refresher training for MSPAS nutrition collaborators. Assume monthly salary for nutrition collaborators is same as MSPAS promoter salary = C\$1600 /20 work days = C\$80/day. Assume salary of regional nutritionist is same as regional BF coordinator = C\$150/day.

Training and supervision of community-based mother support groups. Assume monthly salary for trainer and supervisors is same as MSPAS health center nurse salary = C\$2040 /20 work days = C\$102/day. Assume one nurse supervisor per 5 support groups (total of 20 supervisors if 100 group are formed) and that supervisors dedicate one day a month to supervising their five groups.

Breastfeeding training for ISSS clinic staff. Assume MD salary = C\$4080/mos = C\$204/day. Assume RN salary = C\$2816/mos = C\$141/day.

Reference/training materials for MSPAS facilities and community health workers. Unit cost estimated based on experience in other countries.



ANNEX 7: CALCULATION OF HOUSEHOLD COSTS ATTRIBUTABLE TO CURRENT PREVALENCE OF SUBOPTIMAL BREASTFEEDING

1. CALCULATION OF THE COSTS OF BREAST MILK SUBSTITUTES USED BY NON-BREASTFEEDING AND PARTIALLY BREASTFEEDING INFANTS

**Calculation of average % infants that are given breast milk substitutes in addition to breastfeeding and average % of infants given only breast milk substitutes (no breastfeeding)
(based on results of 1993 Family Health Survey)**

Age group	N	% breastfeeding + breast milk substitute	n	% only breast milk substitute	n
0-2 months	247	22.8	56	8.8	22
3-5 months	225	9.9	22	18.3	41
6-8 months	210	1.4	3	20.7	43
9-11 months	203	0.4	1	34.8	71
Weighted average		9.3		20.0	

Source: Infant Feeding Assessment In El Salvador, citing data from 1993 Family Health Survey

Total number of infants partially breastfed and given breast milk substitutes =
9.3% of 151,200 = 14,062

Total number of infants partially breastfed and given breast milk substitutes =
20.0% of 151,200 = 30,240

Total annual household expenditures on breast milk substitutes for partially breastfed infants = 14,062 x 5 lbs./month x 12 months x 17.5 colones/lb. = 14,765,100

Total annual household expenditures on breast milk substitutes for non-breastfed infants = 30,240 x 10 lbs./month x 12 months x 17.5 colones/lb. = 63,504,000 colones

Total annual household expenditures on breast milk substitutes for infants =
78,269,100 colones

Assumptions for the calculation of household costs of breast milk substitutes:

- All households use powdered milk as a breast milk substitute
- Cost of a one-pound can of powdered milk = 17.5 colones
- Partially breastfed infants consume average 5 lbs. breast milk substitute per month
- Non-breastfed infants consume average 10 lbs. breast milk substitute per month



2. CALCULATION OF THE COSTS OF SEEKING MEDICAL TREATMENT FOR THE EXCESS DIARRHEA, UPPER RESPIRATORY AND LOWER RESPIRATORY INFECTIONS ATTRIBUTABLE TO SUBOPTIMAL BREASTFEEDING

**Costs to households for treatment of diarrhea and acute respiratory infections episodes attributable to suboptimal breastfeeding
(in colones)**

Source of Care	No. seeking treatment	Cost of treatment per episode	Cost of treating all episodes
Public	415,800 x 32% = 133,056		
MSPAS	101,123	25.27	2,555,378
ISSS	31,933	21.20	676,980
MSPAS hospital	1,773	52.29	92,710
Private	415,800 x 16% = 66,528		
Pharmacy	39,917	21.22	847,039
NGO	19,958	26.11	521,103
Other private	6,653	86.13	573,023
TOTAL	201,357		5,266,233

Assumptions for the calculation of household costs of seeking care for excess morbidity:

- Total morbidity episodes attributable to current prevalence of suboptimal breastfeeding = 184,464 diarrhea + 199,584 upper respiratory infections + 31,752 lower respiratory infections = 415,800 (numbers of episodes attributable to suboptimal breastfeeding taken from Annex 4)
- Of all episodes of diarrhea, 0.28% end up hospitalized at MSPAS facility (figure based on 1992 diarrhea hospitalizations at MSPAS as % of total estimated number of annual diarrhea episodes)
- Of all episodes of lower respiratory infections, 3.96% end up hospitalized at MSPAS facility (figure based on 1992 LRI hospitalizations at MSPAS as % of total estimated number of annual LRI episodes)
- Total morbidity episodes attributable to current prevalence of suboptimal breastfeeding that require hospitalization in MSPAS facility = 0.28% (184,464) + 3.96% (31,752) = 516 + 1257 = 1773
- For all episodes of morbidity affecting children under 5 years of age, 31.86% seek treatment in public facilities and 15.68% seek treatment in private facilities (figures cited in ANSAL "Demand for Health Services" report, taken from 1989 USAID/REACH household survey)



- Of all cases seeking treatment in the public sector, 76 % seek treatment at MSPAS and 24 % seek treatment at ISSS (figures derived from percentages of population covered by major health care provider shown in Table 2 of main report)

- Of all cases seeking treatment in the private sector, 60 % seek treatment at pharmacy, 40 % seek treatment at NGO and 10 % seek treatment at private provider (figures are conservative estimates, based on assumption that households tend to seek care at sources which represent a lower cost to the household)

WELLSTART INTERNATIONAL

Wellstart International is a private, nonprofit organization dedicated to the promotion of healthy families through the global promotion of breastfeeding. With a tradition of building on existing resources, Wellstart works cooperatively with individuals, institutions, and governments to expand and support the expertise necessary for establishing and sustaining optimal infant feeding practices worldwide.

Wellstart has been involved in numerous global breastfeeding initiatives including the Innocenti Declaration, the World Summit for Children, and the Baby Friendly Hospital Initiative. Programs are carried out both internationally and within the United States.

International Programs

Wellstart's *Lactation Management Education (LME) Program*, funded through USAID/Office of Nutrition, provides comprehensive education, with ongoing material and field support services, to multidisciplinary teams of leading health professionals. With Wellstart's assistance, an extensive network of Associates from more than 40 countries is in turn providing training and support within their own institutions and regions, as well as developing appropriate in-country model teaching, service, and resource centers.

Wellstart's *Expanded Promotion of Breastfeeding (EPB) Program*, funded through USAID/Office of Health, broadens the scope of global breastfeeding promotion by working to overcome barriers to breastfeeding at all levels (policy, institutional, community, and individual). Efforts include assistance with national assessments, policy development, social marketing including the development and testing of communication strategies and materials, and community outreach including primary care training and support group development. Additionally, program-supported research expands biomedical, social, and programmatic knowledge about breastfeeding.

National Programs

Nineteen multidisciplinary teams from across the U.S. have participated in Wellstart's lactation management education programs designed specifically for the needs of domestic participants. In collaboration with universities across the country, Wellstart has developed and field-tested a comprehensive guide for the integration of lactation management education into schools of medicine, nursing and nutrition. With funding through the MCH Bureau of the U.S. Department of Health and Human Services, the NIH, and other agencies, Wellstart also provides workshops, conferences and consultation on programmatic, policy and clinical issues for healthcare professionals from a variety of settings, e.g. Public Health, WIC, Native American. At the San Diego facility, activities also include clinical and educational services for local families.

Wellstart International is a designated World Health Organization Collaborating Center on Breastfeeding Promotion and Protection, with Particular Emphasis on Lactation Management Education.

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