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# Comparative Analysis of Cost and Effectiveness of LINKAGES' Infant and Young Child Feeding Programs in Ghana, Madagascar, and Zambia

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*Prepared for*
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Academy for Educational Development

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# Abstract

This study analyzes the cost and effectiveness of infant feeding programs in Ghana, Madagascar, and Zambia to determine how differences in program design affect cost effectiveness. Each country program was structured quite differently and used a unique set of indicators to measure progress. This comparison focuses on the common indicators across the three countries: 1) Exclusive breastfeeding rate (EBF) rate among women with infants 0-6 months of age; 2) Timely initiation of breastfeeding (TIBF) within the first hour of birth. The measures of cost effectiveness used are the cost per new EBF acceptor and cost per new TIBF acceptor. The size of the target population appeared to affect cost effectiveness, with cost per new EBF acceptor and cost per new TIBF acceptor generally decreasing as the target population increases. While higher baseline rates of EBF were associated with higher cost per new EBF acceptor, this trend was not clear when examining baseline rates of TIBF and cost per new TIBF acceptor. There seems to be an association between the level of training activities and cost per new acceptor, with cost per new acceptor generally decreasing as training costs become a smaller portion of total costs. One explanation is that training activities have less impact on behavior change when they are not accompanied with the necessary activities to reinforce key messages at the community level. Several qualitative factors related to program implementation across the three countries also may affect cost effectiveness – notably who the key partners were and the relationships among the partners, the mode of training, and mode of operation. The design of the training, including the length of training (which ranged from several days in Madagascar to up to eight weeks in Zambia) and the key trainers involved, affect training costs and cost effectiveness. The choice of staffing also affects implementation costs, especially considering the costs of expatriate staff versus local staff. It would seem important to develop local capabilities early on in order to minimize these costs. Lastly, although the data do not verify the importance of local partner commitment, a more collaborative relationship, where the partners also make substantive investments in the program, is associated with cost effectiveness.

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# Acronyms

**ARV** Antiretroviral Drugs

**BCC** Behavior Change Communication

**EBF** Exclusive Breastfeeding

**CRS** Catholic Relief Services

**CRS FACS** CRS Food Assisted Child Survival

**DALY** Disability Adjusted Life Year

**DHMT** District Health Management Team

**GRC** Ghana Red Cross

**IE&C** Information, Education & Communication

**IMCI** Integrated Management of Childhood Illnesses

**JSI** Jereo Salama Isika

**LAM** Lactational Amenorrhea Method

**M&E** Monitoring & Evaluation

**MOH** Ministry of Health

**NGO** Non-governmental organization

**NDP** Ndola Demonstration Project

**PMTCT** Prevention of Mother to Child Transmission

**PPP** Purchasing Power Parity

**RHA** Regional Health Administration

**TBA** Traditional Birth Attendant

**TIBF** Timely initiation of breastfeeding

**USAID** United States Agency for International Development

**VCT** Voluntary Counseling and Testing

**ZIHP** Zambia Integrated Health Program

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# Executive Summary

**Introduction**

The LINKAGES Project, implemented by the Academy for Educational Development under a USAID-funded cooperative agreement, is committed to improving the health and nutritional status of children. LINKAGES uses a combination of strategies to improve infant feeding practices. These strategies include collaboration with MOH partners, nongovernmental organizations (NGOs), private sector health providers, and community groups/leaders to implement community level behavior change interventions, advocacy and information dissemination on the national policymaking level, and curricula reform for health workers and students. Interventions aimed at changing behavior at the community level are the focus of this study.

LINKAGES provides training, materials, and technical assistance to enable its partners to promote appropriate nutrition-related and other health practices more effectively within their ongoing program of activities. While LINKAGES has been successful in increasing target behaviors, USAID and other stakeholders became increasingly interested in the cost of these interventions relative to results. LINKAGES requested Abt Associates to conduct a series of cost and effectiveness analyses of its breastfeeding and maternal nutrition promotion activities in Ghana, Madagascar, and Zambia. Each of the country studies provided useful results, but comparison across countries would allow analysis of how differences in program scale, scope, and implementation affect cost effectiveness. Although each country used a unique set of indicators to measure its progress, this comparison focuses on the common indicators across the three countries:

1. Exclusive breastfeeding (EBF) among women with infants 0-6 months of age
2. Timely initiation of breastfeeding (TIBF) within the first hour of birth

The original country studies analyzed the cost and effectiveness of LINKAGES' nutrition promotion activities and estimated the cost implications of replicating the activities within each country, but also highlighted questions which could not be answered with data from the individual countries. These questions included:

1. What is the impact of each of the individual activities?
2. What is the optimal mix of activities?
3. How do factors such as target population or baseline behavior rates affect cost effectiveness, or the level of input required for an effective program?
4. How does the scale and scope of the program impact cost effectiveness?
5. How sustainable is the behavior change?

Using data across the three countries, this comparative analysis allows us to answer questions 3 and 4, by analyzing differences in program design and implementation and their impact on cost effectiveness. The overall objective is to increase our understanding of how differences in program design affect cost effectiveness and how LINKAGES may be able to improve its cost effectiveness through changes in the design and implementation of programs in the future.

The programs in each country are quite different – the Ghana program focused on infant feeding exclusively, while the Madagascar program was an integrated infant and young child feeding and

maternal nutrition program, and the Zambia program included the component of prevention of mother to child transmission (PMTCT) of HIV/AIDS. In addition to differences in program design, there were also significant differences in the program scale and coverage in the three countries. Table ES-1 summarizes key characteristics of each of the country programs.

**Table ES-1: Key Program Characteristics in Each Country**

| | Madagascar | Ghana | Zambia |
|---|---|---|---|
| Program Focus | Program strategy based on Integrated Management of Childhood Illnesses (IMCI) approach, targeting seven child nutrition and maternal health behaviors | Program focused solely on infant feeding, targeting exclusive breastfeeding, timely initiation of breastfeeding and timely complementary feeding only | Program integrates infant feeding with prevention of mother to child transmission, including voluntary counseling and testing for HIV. Five behaviors were targeted |
| Geographical Coverage | Entire population of 10 districts in two regions, increasing to 23 districts by end of study period | Selected communities in nine districts in three regions | Catchment population of 6 health centers in one urban district |
| Population Covered during Study Period* | 1.33 million | 124,800 | 125,650 |

* Where the population changes over the study period, an average of covered population at the beginning and end of the study period is used.

**Methodology and Data Collection**

The same methodology was used for analysis of cost effectiveness in all three countries, thus enhancing their suitability for comparison. The analysis used financial costs based on retrospective data. All financial costs, including administrative and support costs, were included. Costs and outcomes were analyzed for a defined period. All costs were allocated to specific activities and to behaviors targeted. The key indicator used to measure cost effectiveness is the total cost per new acceptor for each of the target behaviors. The number of new acceptors is calculated by multiplying change in the rate of the targeted behavior (e.g., the EBF rate) by the total number of children targeted over the period. For example, the cost per new EBF acceptor, the indicator of the cost effectiveness of promoting EBF in each district, is expressed in the following formula:

$$\frac{\text{[cost of activities to promote EBF]}}{\text{[target population]} * (\text{[EBF rate at end of period]} - \text{[EBF rate at baseline]})}$$

The period of study in Ghana was October 1999 through September 2000, coinciding with the beginning of LINKAGES' community level activities in August/September 1999 and an appraisal of infant feeding practices conducted in September/October 2000, which provides outcome data. The period examined in Madagascar was January 2000 through October 2001, coinciding with the baseline household survey and a rapid assessment of LINKAGES' and JSI's behavior change strategy. In Zambia, the period of the study was April 2000 to April 2001, coinciding with the baseline and midterm survey conducted by the Horizons project.

We considered two factors that might potentially affect the comparison – the difference in purchasing power between the three countries, and the timing of the three studies. We considered whether to convert costs to international dollars to eliminate differences in purchasing power between the three countries.[1] We chose not to make any adjustments for purchasing power because: 1) differences in adjusted and unadjusted figures do not affect overall conclusions; 2) we wanted to avoid having many different sets of cost figures, including figures that would different from ones shown in the individual country reports; and 3) comparison of health costs using the US dollar, simply calculated at the prevailing exchange rate, is commonly used and accepted. We also considered the timing of the studies and the need to express costs in constant dollars. However, given how close the time periods were (the study periods in the three countries were all between October 1999 and October 2001), the overlap in the time periods, and the relatively low inflation rates during this period, it was decided that such an adjustment was unnecessary. All costs shown are in current US dollars converted at the prevailing exchange rate.

The comparisons made throughout this paper are of implementation costs only. Start-up or development costs are not included because they would skew the results, as the Ghana study took place over a period with high development costs whereas the Madagascar and Zambia programs had much fewer development activities over the study period.

**Findings**

Total costs to promote EBF were significantly higher in Madagascar, compared with Ghana and Zambia, partly reflecting differences in the scale of the programs. In contrast to total costs for EBF, total costs to promote TIBF were highest in Zambia, despite its much smaller scale program. This higher cost reflects relatively more effort devoted to TIBF in Zambia compared with EBF. Both regions in Madagascar were more cost effective compared with the five districts in Ghana and with Zambia.

The size of the target population appeared to affect cost effectiveness, with cost per new EBF acceptor and cost per new TIBF acceptor generally decreasing as the target population increases. For example, cost per new EBF acceptor in Antananarivo region in Madagascar (target pop: 52,859) was $8, while cost per new EBF acceptor in Lawra district in Ghana (target pop: 310) was $60.

The relationship between the baseline rates of the target behaviors and cost per new acceptor was less clear. While higher baseline rates of EBF were associated with higher cost per new EBF acceptor, this trend was not clear when examining baseline rates of TIBF and cost per new TIBF acceptor.

Based on economic theory and general understanding of the programs in the three countries, it does seem likely that economies of scope can be realized when integrating health interventions. There are savings to be gained because costs of many of the activities supported by LINKAGES do not increase

[1] International dollars are local currency amounts that have been converted into dollar terms with an adjustment to reflect differences in purchasing power. An international dollar has the same purchasing power in the relevant country as a U.S. dollar has in the United States. For example, a sandwich may cost $5 in the United States, while the same sandwich would cost US $1in Zambia. Thus, US $1 in Zambia would be converted to an equivalent of $5 international dollars, because US $1 in Zambia has the same purchasing power as does US $5 in the United States.

with the size of the population, and increase only moderately with additional targeted behaviors. For example, the cost of training district level health staff does not change much whether the program covers 10% of the district or the whole district. At the same time, the number of days of training is the same despite adding more topics in some cases, which also suggests that shorter (and therefore less costly) training may be equally effective.

The data are insufficient to provide a more rigorous analysis of this concept[2], nor are we able to disaggregate the effects of program scale and scope. Further, the data from Zambia do not support this conclusion and leads to the question of whether some health interventions, at least on a cost basis, may not benefit from integrated delivery. In addition, other factors in Zambia that negatively influence cost effectiveness may be mitigating any positive impact from economies of scope.

While in Ghana higher partner participation seemed to improve cost effectiveness, the cross-country data did not further confirm this pattern. No clear pattern can be seen when examining partner costs as a percent of total costs (our gauge of partner participation) and cost per new acceptor across the three countries. Several possible explanations come to mind. One explanation may be that while partner contribution to costs appeared to be a good indicator of partner participation and commitment in Ghana, this was not true in Madagascar. In Madagascar, there was high partner commitment and a true partnership, however, this commitment was not accurately captured in our crude indicator. Another possible explanation is that the design of the program in Madagascar is such that while the partners may not be directly investing funds into promoting EBF and TIBF, their investments in other child health areas provide indirect benefit and support, which is not captured in their costs to promote EBF or TIBF. Lastly, it may be that there are negative effects of lower partner inputs in Madagascar, which are merely masked by other factors that improve its cost effectiveness.

There seems to be an association between the level of training activities and cost per new acceptor, with cost per new acceptor generally decreasing as training costs become a smaller portion of total costs. For example, in Zambia, training costs represent 90% of costs with a cost per new EBF acceptor of $100, while in Madagascar, training costs represent 76%-78% of costs, and cost per new EBF acceptor was $8-$14. However, to suggest that training costs should be decreased because they are associated with lower cost effectiveness would be an inappropriate interpretation. To be sure, we examined the relationship between total training costs and cost per new acceptor and found none. A more plausible explanation is that training activities have less impact on behavior change when they are not accompanied with the necessary activities to reinforce key messages at the community level, such as mass media, IE&C, and community services and sensitization. This finding may be an important part of the explanation for Zambia's relatively lower cost effectiveness. While Madagascar clearly benefited from the economies of scope and scale of its program, its activity mix, with significant expenditures on non-training activities, may also have contributed to its higher cost effectiveness.

Lastly, we examined qualitative factors related to how the program was implemented across the three countries that may influence cost effectiveness. We studied the same key implementation factors, including who the key partners were, LINKAGES' relationships with its partners, the mode of training, and LINKAGES' mode of operation. The design of the training, including the length of

[2] There are effectively only three data points for comparison, as the program scope across the regions and districts of Madagascar and Ghana are the same. Thus, we can only examine economies of scope at the country level.

training (which ranged from several days in Madagascar to up to eight weeks in Zambia) and the key trainers involved, affects training costs and cost effectiveness. The choice of staffing also affects implementation costs, especially if we consider the costs of expatriate staff versus local staff. It would seem important to develop local capabilities early on in order to minimize these costs. Lastly, although the data does not verify the importance of partner commitment, it does seem that a more collaborative relationship, where the partners also make substantive investments in the program, is associated with cost effectiveness.

Based on this analysis, LINKAGES may be able to improve its cost effectiveness by implementing programs of a larger scale and scope, selecting areas with low baseline rates of the targeted behaviors, and ensuring a broad set of activities (beyond training). LINKAGES and its partners can use this data to anticipate the cost effectiveness of its programs prior to implementation. For example, using a proposed program budget and the target population, LINKAGES can calculate a crude estimate of the cost per targeted child. Calculating an estimated cost per targeted child, together with information on the baseline behavior rates can provide very useful information on the potential cost effectiveness of a program. For example, if the cost per targeted child is estimated to be $20, and the baseline EBF rate is 50%, we can calculate that the minimum cost per new EBF acceptor will be $40 ($20/(100%-50%)), assuming you achieve 100% EBF. At the same time, if the cost per targeted child is estimated to be $2, and the baseline EBF rate is 20%, even if the EBF only increases to 40%, the program is more cost effective with a cost per new acceptor $10 ($2/(40%-20%)).

Comparable results from other cost effectiveness studies of breastfeeding promotion interventions are limited. The most notable studies of breastfeeding promotion cost were a series of studies conducted in 1992-93 in seven hospitals in Brazil, Honduras, and Mexico (funded through the USAID LAC-HNS project). Disaggregated data from those studies are only available for Brazil, and so detailed comparisons are made with that study only. It is difficult to compare the results of the LAC-HNS studies due to differences in the nature of the programs (hospital- vs. community-based settings, and urban vs. rural settings) and the nature of the study methodology. Despite these differences, some comparison is useful. After making necessary adjustments for comparability, the results from Brazil are compared with Ghana, Madagascar, and Zambia in Table ES-2.

**Table ES-2: Cost per New EBF Acceptor in Madagascar, Ghana, Zambia, and Brazil**

| Country | Cost per New EBF Acceptor* |
|---|---|
| Ghana | $34 |
| Madagascar | $10 |
| Zambia | $104 |
| Brazil | $59 |

* All costs shown in 2000 US dollars.

As shown, there is significant variation in cost effectiveness across the three study countries. In both Ghana and Madagascar, the cost per new EBF acceptor was lower than in Brazil. In Zambia, however, cost per new EBF acceptor was higher than Brazil.

**Conclusions and Discussion**

This cross-country analysis confirms findings from each of the three country studies, and provides additional insight in the area of activity mix, program scope, and mode of implementation. The program scale (size of the program or target population), the baseline behavior rates, the activity mix,

and to some extent the program scope (range of interventions), all seem to impact cost effectiveness. Also important is the way a program is implemented – including the partner relationships, choice of staff, training design, etc. Estimates of program costs, together with baseline behavior rates, can provide an indication of the likely range of the cost per new acceptor prior to project implementation, informing the implementation decision and program design. The cost per new acceptor data from Madagascar, Ghana, Zambia, and Brazil show that cost effectiveness can differ significantly based on the program characteristics and program design. This study provides information that can be used to estimate the cost per new acceptor prior to implementation, a practice which to-date is seldom undertaken. Being able to estimate cost effectiveness and translating that into health impact are critical factors for decision-makers who must choose between alternative health interventions.

To make comparisons between different programs requires the use of a common methodology and the ability to convert behavioral and other outcomes to a common health impact indicator (such as DALYs) reliably. Absent such conditions, comparisons of cost effectiveness are inexact and each intervention must be assessed on its own merits. Additional research to provide information on the sustainability and longevity of behavior change (ie, the period of impact of a behavior change intervention, and whether and when behaviors can be culturally self-reinforced) would be useful so that we can capture the full effect of long term outcomes.

While we have identified factors that seem to affect cost effectiveness, we cannot isolate the effects of each of these factors, nor do we know how they interact. Additional cost effectiveness studies would provide more data points so that more conclusive findings can be obtained. More data points that allow analysis of the relative importance and interplay of various factors influencing cost effectiveness would also be extremely useful. Given our experience with these three country studies, it seems unlikely that a retrospective study would be able to provide all the data needed. Purposely designed operations research may be needed to understand these relationships better.

# 1. Background

The LINKAGES Project, implemented by the Academy for Educational Development under a USAID-funded cooperative agreement, is committed to making significant improvements in the health and nutritional status of children. LINKAGES uses a combination of strategies to improve infant feeding practices. These strategies include collaboration with MOH partners, nongovernmental organizations (NGOs), private sector health providers, and community groups/leaders to implement community level behavior change interventions, advocacy and information dissemination on the national policymaking level, and curricula reform for health workers and students. Interventions aimed at changing behavior at the community level are the focus of this study.

LINKAGES provides training, materials, and technical assistance to enable Ministry of Health (MOH), NGO, private sector, and community-level partners to promote and support appropriate infant feeding. These partners have an established presence and network within the targeted communities, and most conduct health promotion activities as part of their ongoing activities as health workers or community leaders and volunteers. LINKAGES' interventions enable the partners to promote appropriate nutrition-related and other health practices more effectively within their ongoing program of activities.

While LINKAGES has been successful in increasing target behaviors, USAID and other stakeholders are increasingly interested in the cost of these interventions relative to results. LINKAGES requested Abt Associates to conduct a series of cost and effectiveness analyses of its breastfeeding and maternal nutrition promotion activities in Ghana, Madagascar, and Zambia. Each of the country studies provided useful results, but comparison across countries would allow more rigorous analysis than is possible in each country alone.

There was careful consideration of whether comparison between these three countries was appropriate, given the differences between the programs in each country. It was decided that in fact the differences between these country programs would be useful to explain the determinants of cost effectiveness. Thus, this report compares and contrasts the findings from all three countries. The programs in each country are quite different – the Ghana program focused on infant feeding exclusively, while the Madagascar program was an integrated infant and young child feeding and maternal nutrition program, and the Zambia program included the component of prevention of mother to child transmission (PMTCT) of HIV/AIDS. In addition to differences in program design, there were also significant differences in the program scale and coverage in the three countries. It is through analysis of the similarities and differences across the three countries that we can gain insight to the conditions and factors that can influence cost effectiveness.

Although each country used a unique set of indicators to measure its progress, this report will focus on the common indicators across the three countries. Analysis of findings across these countries should allow us to understand better the unanswered questions arising from each of the individual country studies. The two common indicators used for comparative analysis are:

1. Exclusive breastfeeding (EBF) among women with infants 0-6 months of age
2. Timely initiation of breastfeeding (TIBF) within the first hour of birth

# 2. Objectives of the Study

The objectives of the original country studies were:

- to analyze the cost-effectiveness of LINKAGES' nutrition promotion activities in each country during the specified study period; and
- to determine the cost implications of replicating the activities within each country.

While the country studies met the objectives above, they also pointed to many other questions that would help us understand how to improve cost effectiveness, but were not able to be answered given the available data and experience in each country. The additional questions arising from the country studies include:

1. What is the impact of each of the individual activities?
2. What is the optimal mix of activities?
3. How do factors such as target population or baseline behavior rates affect cost effectiveness, or the level of input required for an effective program?
4. How does the scale and scope of the program impact cost effectiveness?
5. How sustainable is the behavior change?

Using data across the three countries, this comparative analysis will focus on questions 3 and 4, by analyzing differences in the design and implementation and their impact on cost effectiveness. The overall objective is to increase our understanding of how differences in program design affect cost effectiveness and how LINKAGES may be able to improve its cost effectiveness through changes in the design and implementation of programs in the future.

Because these additional questions arose as a result of the individual country findings, the original studies were not specifically designed to provide data to answer them. This comparative analysis therefore is opportunistic – it takes advantage of the availability of a set of cross-country data collected for other purposes, and opportunity for insightful comparison, to study these important questions. However, the data available and the number of datasets is not ideal, as later discussed in detail in the methodology section.

# 3. Description of Program Activities

In all three countries, LINKAGES interventions focused on community based behavior change strategies implemented in close coordination with local partners that have established presence in the areas targeted. In addition to the community-based efforts, LINKAGES also conducted national-level activities such as advocacy and policy development and health staff curriculum development. Only the community level activities and outcomes were considered in the original cost and effectiveness analysis, as that was the primary focus of LINKAGES' work and was the component with measurable outcomes. While the overall approach was the same, the activities differed in each of the countries, as did the relationship with the local partners.

## 3.1. Activities in Madagascar

LINKAGES' activities in Madagascar aimed to promote improved infant and young child feeding and maternal nutrition practices by targeting health providers, community leaders and volunteers, and household members. LINKAGES' community approach is based on the Integrated Management of Childhood Illness (IMCI) strategy adopted by the Ministry of Health (MOH) and other key partners. Its approach included training, community mobilization, mass media, and information, education and communication (IE&C) to promote key nutrition behaviors. The key behaviors targeted were:

- Timely initiation of breastfeeding within 1 hour of birth
- Exclusive breastfeeding for the first 6 months of life
- Use of the lactational amenorrhea method (LAM) as a modern family planning method
- Timely complementary feeding of infants beginning at 6 months
- Increased frequency of breastfeeding during illness of a child
- Maternal nutrition – including increased eating by breastfeeding women
- Control of vitamin A deficiency, anemia, and iodine deficiency

To implement its community-based behavior change strategy, LINKAGES partnered with Jereo Salama Isika (JSI), a USAID-funded bilateral child survival and reproductive health project, and MOH personnel. LINKAGES and JSI formed two-person teams of health technicians at the district level to support activities in that district. The LINKAGES and JSI technicians provide coordinated and complementary support to district MOH personnel to strengthen their training and supervision of health workers and community volunteers. Whereas LINKAGES technicians focus on organizing and strengthening activities to promote key nutrition behaviors, JSI technicians support activities related to family planning, reproductive health, immunizations, and IMCI. One area of overlap is the promotion of breastfeeding and LAM.

LINKAGES' activities were being implemented in 10 districts in Madagascar at the beginning of the study period. By the end of the study period, LINKAGES was active in a total of 23 districts. The population covered in the program areas during the study period was approximately 1.33 million.

At the district-level, LINKAGES' core activities during the study period included workshops to train trainers among MOH and NGO partner organizations. These trainers then trained public and private health providers and community volunteers in nutrition and effective behavior change communication (BCC) methods. In addition, LINKAGES health technicians provided on-going technical assistance

to District Health Management Teams (DHMT) to plan and organize new trainings, education activities, and supervisions for health workers and community volunteers.

At the community-level, LINKAGES organized and implemented trainings for community leaders and volunteers and members of women's groups. Community volunteers and women's group members then worked within their community to assist women in adopting infant and young child feeding and maternal nutrition practices. As part of its training activities, LINKAGES provided and trained partners in the use of IEC materials, such as counseling and health cards and "Gazety" health education pamphlets.

A key component of the LINKAGES program in Madagascar was building the capacity of and utilizing community-based volunteers, including women's groups, to disseminate nutrition messages and assist women in adopting improved health behaviors. During the study period, community volunteers received training in breastfeeding and nutrition and effective BCC methods. Community volunteers were selected due to their leadership or involvement in community affairs or groups and/or because they were well-respected members of the community. These volunteers were then expected to carry out nutrition education activities within their communities through household visits, community meetings or educational sessions, and daily life activities.

At the health facility level, MOH health staff were trained to incorporate the promotion of infant and young child feeding and maternal nutrition behaviors into their health facility activities, including patient consultations and formal and informal health education talks. Health facility staff also assisted in training and supervision of community leaders and volunteers and women's group members, who then disseminated nutrition messages and assisted women in adopting nutrition behaviors in their own communities.

In addition to district and community-based activities, LINKAGES also conducted monitoring and evaluation activities during the study period. The main activities of this type were the baseline household survey of essential nutrition actions conducted in January 2000 and two rapid assessments of LINKAGES' and JSI's behavior change strategies in October 2000 and October 2001. These studies were collaborative efforts between the MOH, LINKAGES, and JSI.

## 3.2. Activities in Ghana

In contrast to the broad infant and young child feeding and maternal nutrition program in Madagascar, LINKAGES' program in Ghana was much more focused. It was committed to improving the nutritional status of Ghanaian children by targeting the following three behaviors:

- Exclusive breastfeeding for the first 6 months of life
- Timely initiation of breastfeeding within 1 hour of birth
- Timely complementary feeding

LINKAGES worked with three NGO partners – Catholic Relief Services (CRS), Ghana Red Cross (GRC), and UNICEF – and the MOH in selected communities in nine districts within three northern regions of Ghana (Northern Region, Upper East Region, and Upper West Region). These regions are the most remote regions in Ghana, and the most sparsely populated. All of the NGOs had existing programs with health components.

There was variation in the activities implemented from district to district. Partner staff attended LINKAGES' training, and in most districts were active in training mother's group leaders, health staff and health volunteers. CRS and GRC also funded community festivals (durbars), World Breastfeeding Week events, outreach activities, and monitoring and evaluation. In one district, certain key training activities were not conducted during the study period. The total population covered in Ghana during the study period was 124,800, with significant variation from district to district.

Many of LINKAGES' activities during the study period represent start-up or development activities. As of October 1999, LINKAGES had just established a long-term presence in Ghana, with the arrival of a resident advisor, and the establishment of an office in Accra. The development work related to community level breastfeeding promotion included a series of workshops and focus group discussions aimed at defining and developing the messages and materials to be used at the community level. There was also a workshop to review and validate the literature on infant feeding practices in Ghana; this workshop helped to ensure consensus on the key issues to address related to infant feeding.

These development activities are distinct from LINKAGES "core" implementation activities – providing support to partners who in turn implement activities within the target communities. These core activities included workshops to train trainers from among the NGO and MOH partner organizations. These trainers then trained mothers' support group leaders, as well as other health and community health staff in BCC techniques. LINKAGES also funded development of promotional materials such as calendars and T-shirts that were distributed at the regional, district and community level. Lastly, LINKAGES sponsored Breastfeeding Week events and radio broadcasts promoting recommended infant feeding practices. These activities represent LINKAGES' ongoing activities to promote appropriate infant feeding.

LINKAGES conducted monitoring and evaluation activities during the study period. The main activity of this type is the community assessment conducted in September/October 2000. LINKAGES' also traveled regularly to the northern regions for planning, monitoring and review of activities with its partners.

Three of the districts in Ghana were part of the CRS Food Assisted Child Survival (FACS) program, which includes many components, such as antenatal care, growth monitoring, diarrhea management, immunization, micronutrients, and promotion of appropriate infant feeding. All components included a food distribution element linked to child health. LINKAGES trained CRS staff, who supported activities in these districts, as well as Regional Health Administration (RHA) and DHMT staff in these districts. These staff then trained mother support group leaders, other community health volunteers, and other health staff. Some of the people trained are key participants in regular community outreach clinics, which offer immunization, growth monitoring, health talks, and individual counseling. Promotion of appropriate infant feeding became a regular component of these outreach clinics. Mother support groups also meet regularly to discuss appropriate infant feeding, sometimes with health staff present. In addition to supporting training, CRS also supported community festivals, Breastfeeding Week activities, community outreach (with per diems and transport costs), and monitoring and evaluation activities.

The GRC operated a Child Survival (CS) Project working in the areas of nutrition (including infant feeding), malaria, HIV/AIDS, diarrheal disease, immunization, and acute respiratory infections.

More broadly, GRC primarily is involved in health promotion (including child survival), provision of infrastructure, and income generation activities, relying on an extensive network of volunteers. During the study period, several RHA staff were very active in infant feeding activities. They attended LINKAGES' training, trained mother's group facilitators, and promoted appropriate feeding practices in community festivals and on the radio. The CS project also funded Mothers' Support Group training, supervision costs, outreach activities, and monitoring and evaluation. Although community festivals also were held, GRC did not provide financial support to community festivals as CRS did in its FACS districts.

The scale and scope of activities in the UNICEF district were quite different from the CRS and GRC districts. UNICEF did not have the same type of community level network as did CRS and GRC. Although breastfeeding topics were covered in some UNICEF supported training (such as TBA training), there was little focused training on appropriate infant feeding. Some key activities that were conducted in the other districts did not take place – for example, training for group leaders and community extension workers.

## 3.3. Activities in Zambia

Officially launched in 1999, the Ndola Demonstration Project (NDP) was an integrated, comprehensive approach to PMTCT, with infant feeding as its centerpiece, in antenatal clinic settings and surrounding communities in Ndola district. During the NDP period, women did not have access to short-course antiretroviral drugs (ARVs), such as neviraprine or AZT, regardless of their HIV status. Nonetheless, PMTCT was recognized as an important component of HIV/AIDS control, and significant resources were provided for PMTCT activities.

The NDP enhanced the antenatal care package at six DHMT health centers in Ndola, a semi-urban district, covering a total population of 125,650 during the study period. The NDP clinical intervention package included infant feeding counseling and HIV testing and counseling services. The key behaviors targeted were:

- Exclusive breastfeeding for the first 6 months of life
- Timely initiation of breastfeeding within one hour of birth
- Use of assisted deliveries at a health center
- Use of HIV testing and counseling
- Knowledge of risk of HIV transmission through breastfeeding

As in Madagascar and Ghana, LINKAGES did not implement activities directly at the health center or community level, but instead strengthened the capacity of it local partners to promote improved health behaviors. Somewhat different from Madagascar and Ghana, however, the NDP also trained health workers to deliver a new service – VCT. LINKAGES' core activities during the study period focused on developing training strategies and training curricula and conducting training workshops for health care and community service providers. Training activities were extensive in terms of the duration of training, the number of trainings, and the number of participants. For example, health workers were trained in a 12-day basic integrated infant feeding course, as well as an 8-week psychosocial counseling course (including a 5-week practicum).

In addition to health worker and community training activities carried out during the study period, LINKAGES staff provided overall NDP coordination support and technical assistance to the Ndola DHMT to manage and oversee NDP-related clinic and community health services. LINKAGES also provided financial support for infrastructure and other upgrades to one of the NDP health centers, including a laboratory for HIV testing, a counseling room, and an expanded waiting room area within the antenatal care ward. Lastly, in collaboration with Horizons and other partners, LINKAGES participated in the design and implementation of monitoring and evaluation activities during the study period.

During this period, LINKAGES worked closely with Hope Humana, MOH (including the Ndola DHMT and health center staff), ZIHP, and the Horizons Project to implement NDP activities. Hope Humana, under a subcontract with LINKAGES, assisted LINKAGES in organizing and implementing many of the training courses and workshops conducted under the NDP, in addition to providing the equivalent of one full-time counselor and a lab technician to provide initial VCT services and to mentor newly trained staff at NDP clinics. The Ndola DHMT provided oversight for all NDP service provision activities, including supervising staff at NDP clinics and monitoring activities ranging from infant feeding counseling and VCT to health education talks at the clinics. Health staff at the six NDP clinics were responsible for providing all antenatal care, infant feeding counseling, VCT services, and health education activities included in the NDP intervention package. The USAID-funded Horizons project, in collaboration with LINKAGES and other NDP partners, was responsible for monitoring and evaluation (M&E) activities, including conducting and analyzing the baseline and midterm households surveys. Horizons also provided support for staff, as well as equipment and supplies, to the DHMT to assist in M&E activities. During the study period, the Zambia Integrated Health Project (ZIHP) provided financing and support for some of the NDP community trainings.

# 4. Methodology

This section summarizes both the cost effectiveness analysis methodology used to conduct the individual country studies, as well as the methodology used for examining the comparative findings.

## 4.1. Cost Effectiveness Analysis

The same methodology was used for analysis of cost effectiveness in all three countries, thus enhancing their suitability for comparison. The analysis used financial costs based on retrospective data. All financial costs, including administrative and support costs, were included. Costs and outcomes were analyzed for a defined period. All costs were allocated to specific activities and to behaviors targeted.

The full costs of LINKAGES activities that support the promotion of targeted behaviors, including allocation of all overhead/fixed costs associated with the in-country central and district-level offices, were included in the analysis. Direct costs of the LINKAGES DC office associated with nutrition promotion activities in each country were also included. Indirect costs of the LINKAGES DC office were excluded. The direct costs of LINKAGES' partners were included, but overhead costs are always excluded because infant and young child feeding/maternal nutrition promotion represents a very small portion of their overall activities and has minimal impact on fixed costs. Household and volunteer costs are not included in this study.

Once all the costs were compiled, costs were allocated to achieving behavior change by allocating costs to the full set of LINKAGES activities, a subset of which target community level behavior change and were included in the country studies. In Ghana and Madagascar, costs for the subset of activities were then allocated to the regions or districts in which LINKAGES worked. In Zambia, this type of comparison by health center was not possible because of limited outcome data, so costs are only available for the NDP as a whole. Lastly, costs for each of the activities in the regions or districts were allocated to the behaviors targeted.

The key indicator used to measure cost effectiveness is the total cost per new acceptor for each of the target behaviors. The number of new acceptors is calculated by multiplying change in the rate of the targeted behavior (e.g., the EBF rate) by the total number of children targeted over the period. For example, the cost per new EBF acceptor, the indicator of the cost effectiveness of promoting EBF, is expressed in the following formula:

$$\frac{\text{[cost of activities to promote EBF]}}{\text{[target population]} * (\text{[EBF rate at end of period]} - \text{[EBF rate at baseline]})}$$

The period of study in Ghana was October 1999 through September 2000, coinciding with the beginning of LINKAGES' community level activities in August/September 1999 and an appraisal of infant feeding practices conducted in September/October 2000, which provides outcome data. The period examined in Madagascar was January 2000 through October 2001. This period was selected to coincide with the JSI/LINKAGES' baseline household survey of essential nutrition actions conducted in January 2000 and the rapid assessment of LINKAGES' and JSI's behavior change strategy conducted in October 2001. In Zambia, the period of the study was April 2000 to April 2001, coinciding with the baseline and midterm survey conducted by the Horizons project. In all

three countries, survey results are used to provide data on the prevalence of the targeted behaviors at the beginning and end of the study period. perfect

## 4.2. Comparative Analysis

This comparative analysis compares and contrasts the results across Ghana, Madagascar, and Zambia to understand how differences in program design can affect cost effectiveness. Comparison of the cross country data is feasible (although with limitations, as discussed in the next sub-section) and of particular interest because the cost analysis was conducted using the same methodology in all three countries, allowing an exact comparison of costs. Further, similarities and differences in program design allow us to analyze and compare results across countries under similar and different program scenarios. The results are disaggregated to five districts in Ghana and two regions in Madagascar, which when combined with results in Zambia, allow for eight sets of results for comparison. We considered two factors that might potentially affect the comparison – the difference in purchasing power between the three countries and the timing of the three studies.

Differences in purchasing power may affect comparison of cross country data because some portion of the cost difference may be due to inherent differences in costs between countries – that is, goods and services in one country may be relatively more costly, reducing its cost effectiveness. One way to eliminate this difference is by converting to international dollars using purchasing power parity (PPP) rates to reflect an adjustment based on differences in purchasing power.[3] A review of the PPP adjustment factors across the three study countries shows differences in purchasing power, as shown in Table 1.

**Table 1: Comparison of Purchasing Power Across Ghana, Madagascar, and Zambia**

| (US dollars) | GNI per capita* | GNI in Int'l Dollars* | PPP Adjustment Factor |
|---|---|---|---|
| **Ghana** | $340 | $1910 | 5.62 |
| **Madagascar** | $250 | $820 | 3.28 |
| **Zambia** | $300 | $750 | 2.50 |

Source: World Development Indicators 2002. Data shown is for 2000.

As this table shows, the purchasing power of US $1 is more than twice as high in Ghana as in Zambia. In other words, goods are much less costly in Ghana than in Zambia (or in Madagascar). This data alone may lead us toward making PPP adjustments, however, converting all costs to international dollars can create another distortion if a significant portion of inputs are purchased in the international market, so that they are not subject to in-country cost differences. In all three countries, field-based costs represent less than 50% of total costs.[4]

[3] International dollars are local currency amounts that have been converted into dollar terms with an adjustment to reflect differences in purchasing power. An international dollar has the same purchasing power in the relevant country as a U.S. dollar has in the United States. For example, a sandwich may cost $5 in the United States, while the same sandwich would cost US $1in Zambia. Thus, US $1 in Zambia would be converted to an equivalent of $5 international dollars, because US $1 in Zambia has the same purchasing power as does US $5 in the United States.

[4] Field based costs here are defined as costs incurred in-country (excluding DC-based costs and international staff), and represent 36% of total costs in Ghana, 49% in Madagascar, and 45% in Zambia.

Based on both the PPP rates and the percent of costs incurred in-country, we calculated a simple adjustment factor to convert Madagascar and Zambia costs to Ghana dollars, as shown below.

**Table 2: Calculation of Adjustment to Comparable Ghana Dollars**

| (US dollars) | Percent of Costs Incurred In-country | PPP Adjustment Factor | Total Adjustment Factor |
|---|---|---|---|
| **Ghana** | 26% | 1.00 | 1.00 |
| **Madagascar** | 49% | 0.58 | 0.80 |
| **Zambia** | 45% | 0.44 | 0.75 |

Source: World Development Indicators 2002. Data shown is for 2000.

Thus, costs per acceptor in Madagascar and Zambia would need to be adjusted by a factor of 0.80 and 0.75, respectively, to make them comparable to costs in Ghana. We calculated the costs in the three countries both adjusting for PPP and simply converting costs to US dollars at the prevailing exchange rates. Both methods yield the same overall conclusions – the absolute costs change, but the cost relationships across the different countries remain the same. Actual and adjusted costs per new acceptor are shown in Annex A.

After careful consideration of many different factors, costs are presented simply in US dollars, unadjusted based on differences in purchasing power. First, differences in adjusted and unadjusted figures do not affect overall conclusions. Second, we wanted to avoid having many different sets of cost figures, including figures that would be different from ones shown in the individual country reports. Lastly, comparison of health costs using the US dollar, simply calculated at the prevailing exchange rate, is commonly used and accepted.

The second difference is in the timing of the studies in the two countries. The period of study in Ghana was October 1999 to September 2000, while the period of study in Madagascar was January 2000 through October 2001, and in Zambia April 2000 to April 2001. We considered the time difference and the potential need to adjust all costs so they are expressed in constant dollars. However, given how close the time periods were, the overlap in the time periods, and the relatively low inflation rates during this period, it was decided that such an adjustment was unnecessary.

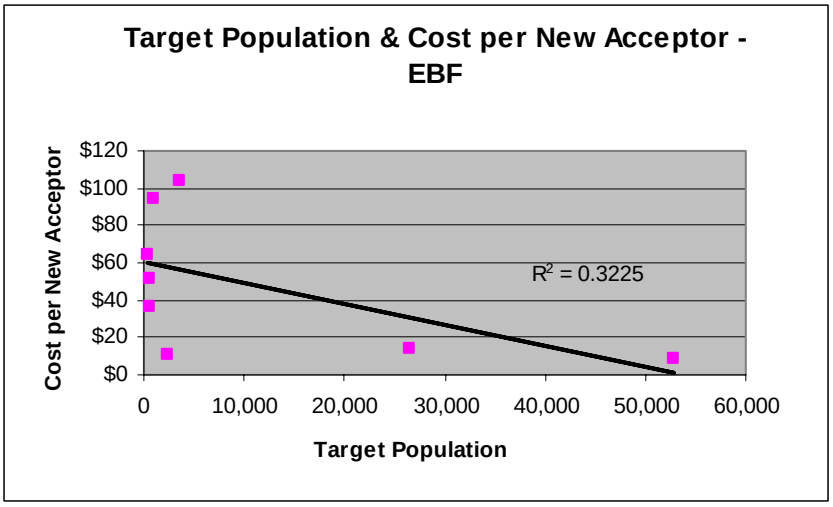
The comparisons made throughout this paper are of implementation costs only. Start-up or development costs are not included because they would skew the results, as the Ghana study took place over a period with high development costs whereas the Madagascar and Zambia programs had much fewer development activities over the study period.

## 4.3. Limitations of this Study

The study questions posed here are ones that arose as a result of the individual country findings. The original studies were not specifically designed to provide data to answer all these questions, nor did we purposely collect the data needed to fully address these questions. This comparative analysis merely takes advantage of existing data to address the study questions – no additional in-country data was collected for this comparative study. As a result, while this cross country analysis increases our understanding of the study questions beyond the individual country studies, and suggests certain cost and effectiveness relationships, these relationships cannot be considered conclusive.

One key data limitation is the limited number of datapoints for comparison – up to eight data points for certain variables when disaggregated data is available at sub-national levels within the three countries. Ideally, we would like to have a much larger dataset, with normal distribution of the key variables hypothesized to affect cost effectiveness. Such data would allow multiple regression analysis to be performed that would indicate the statistical significance of each of the key variables, and allow interactions among the variables to be analyzed.

To illustrate our data limitations, a linear regression using target population to predict cost per new acceptor is shown below.




Given the number of data points, and the skewed distribution of the independent variable, the statistical significance of this analysis is limited. As a result, we do not try to use the data to predict cost effectiveness, but merely show that certain cost effectiveness outcomes seem to be associated with different program characteristics. While these results are not conclusive, they do expand our understanding of why some programs may be more cost effective than others.

## 4.4. Costing Terminology

There is a common terminology that is often used to describe different types of costs. This sub-section reviews the common costing terminology and explains some of the terms used within this report to minimize confusion in terminology.

Costs are often categorized into fixed and variable costs, or capital and operating costs. *Fixed costs* are costs that do not vary with the volume of output (in this case the target population, or the number of children changing behavior), while *variable costs* do vary with output. *Capital costs* refer to costs of goods that have a useful life of more than one year (such as equipment or vehicles), while *operating costs* refer to items that have a useful life of under one year (such as supplies, radio broadcasts). Categorizing costs in these ways can serve many purposes, including analysis of pricing, cost control, profit maximization, and budget planning.

Categorizing costs in this manner has limited applicability to the questions addressed in this study – all costs are included in this study and are allocated to activities as described earlier in this section.

One important point that should be understood about the cost structure of these interventions is that most of the costs in both Madagascar and Ghana are fixed costs. Given that the unit of output is the number of people targeted or changing behavior, costs for most of the activities (district level training/workshops, Breastfeeding Week activities, monitoring and evaluation) are not tied to the target population. The activities that are related to the size of the target population (such as community outreach, where health personnel would spend more time in a village with many more people) are relatively low cost. Understanding the value of fixed costs and being able to determine the minimum level of fixed costs per district/region will allow LINKAGES to improve cost effectiveness in the future.

These concepts are useful in understanding economies of scale and economies of scope, two terms used in this report. Economies of scale and scope exist when the average cost decreases with additional units of output, primarily because fixed costs are spread over a higher level of output. *Economies of scale* refers to savings that can be gained by increasing the volume of output, which in this context refers to the total population covered. There are economies if fixed costs can be spread over a larger population, thus lowering the average cost per person targeted. *Economies of scope* refers to savings that can be gained by increasing the types of outputs – again lowering the average cost per person per output. In this context, a type of output refers to targeted behaviors. Economies exist if savings can be realized by conducting activities on a larger scale (ie, covering more people) or including a larger scope of activities (ie, addressing more behaviors for the same population). Both these concepts are important in understanding how to improve cost effectiveness.

Another cost-related term often used is marginal cost. *Marginal cost* refers to the additional cost to produce one additional unit of output. This study does not seek to analyze the marginal cost of reaching an additional child – this intervention is not a standard production or service delivery one, where the marginal cost is related to capacity and variable costs. Analysis of marginal cost goes beyond costing and would require data on the rate of behavior change, given varying baseline behavior rates and varying levels of intervention.

Lastly, the measure of cost effectiveness primarily used in this report is the *cost per new acceptor*. This term refers to the total costs incurred per child that is induced to change behavior – it does not refer to marginal cost, which is the additional cost incurred per additional child changing behavior.

# 5. Data Collection

Data collection for all three country studies occurred in a similar fashion. Data on total LINKAGES' costs related to country-specific activities were collected from records kept in the LINKAGES DC and in-country offices. Data to determine the specific activities conducted in support of community level breastfeeding promotion were collected based on review of LINKAGES documents and LINKAGES staff interviews. Data on costs incurred by NGO partners and various levels of the MOH were collected through interviews and document reviews. The interviews focused on description of the overall program, specific activities undertaken during the study period, costs of activities, and staff time dedicated to breastfeeding activities. Data on funds spent were gathered through review of expense reports, budgets, and staff estimates of costs. Whenever possible, data were reconciled across several sources.

For the Ghana study, data collection in-country occurred primarily between February 2002 and April 2002. Data collection for the Madagascar study occurred primarily in two phases. The first phase of data collection took place in Washington, DC from October to November 2002, consisting of staff interviews and review of documents at LINKAGES headquarters. The second phase of data collection was conducted in Madagascar from April to May 2003. Data collection in Zambia also occurred in two phases – from August to October 2003 in Washington, DC and in November 2003 in Zambia. In all three countries, there was ongoing data collection to clarify and fill data gaps outside of the intensive data collection periods.

Given the nature of a retrospective study, data access was not always easy, and data sometimes required adjustment for use in this study. In some cases, data could not be reconciled across several sources, and a judgment was made to use available data from the source or sources deemed more reliable. There was no quantitative data regarding staff time dedicated to breastfeeding activities, so calculations of staff time costs are based on staff recall of estimated time spent on activities.[5] There were also instances of incomplete data – in these cases estimates were made to complete the study. Generally the estimates were based on data in other districts. For example, where there was no data on the amount of time a midwife spent on breastfeeding during a consultation or health education talk, an average from other districts was used.

Data for the comparative studies relies solely on the individual country studies. Except to obtain information related to inflation, exchange rates, and purchasing power adjustments, no additional data was collected for this comparative report.

[5] Chee et al (2002), Chee et al (2004), Chee & Smith (2006)

# 6. Findings

This section first summarizes the results from the country studies, followed by comparative analysis across the three countries. Cost effectiveness is calculated separately for the two indicators studied – EBF and TIBF.

## 6.1. Costs and Effectiveness Across Madagascar, Ghana and Zambia

### 6.1.1. Costs in Madagascar, Ghana, and Zambia for EBF

Table 3 shows the total LINKAGES and partner costs for EBF for each of the two program regions in Madagascar, itemized by key activities.

**Table 3: Total Costs per Region to Promote EBF in Two Regions in Madagascar (by Activity – US$)**

| Activity | Antananarivo | Fianarantsoa |
|---|---|---|
| Community Nutrition Promoters Training | 99,919 | 92,920 |
| Health Worker Training | 4,461 | 3,759 |
| PSI Training | 21,484 | 5,006 |
| Health Technician Training | 1,414 | 1,679 |
| JSI Training | 324 | 239 |
| BFHI activities | 9,574 | 5,126 |
| Mass Media | 295 | 11,815 |
| IEC materials | 11,896 | 9,517 |
| Festival, BF Week, etc | 8,981 | 3,270 |
| Sensitization & Community outreach | 2,185 | 1,234 |
| Mgmt/Supervision/Admin | 286 | 326 |
| Miscellaneous | 2,371 | 1,224 |
| **LINKAGES & Partner Costs to Promote EBF** | **$163,190** | **$136,115** |

Table 4 shows a similar presentation across the five study districts in Ghana.

**Table 4: Total Costs per District to Promote EBF in Five Districts in Ghana (by Activity - US$)**

| Activity | East Mamprusi | Bongo | Lawra | Bolgatanga | Yendi |
|---|---|---|---|---|---|
| Mother Support Grp Training | 3,720 | 3,165 | 2,852 | 364 | 1,487 |
| BCC Training | 2,489 | 2,271 | 3,375 | 2,839 | 3,011 |
| Other Training | 1,188 | 667 | 891 | 1,149 | 180 |
| Mass media | 448 | 161 | 195 | 472 | 436 |
| IEC materials | 57 | 60 | 68 | 48 | 45 |
| Festivals, BF Week | 1,219 | 955 | 2,167 | 816 | 759 |
| Sensitization & Community outreach | 79 | 93 | 40 | 285 | 61 |
| **LINKAGES & Partner Costs to Promote EBF** | **$9,200** | **$7,372** | **$9,588** | **$5,973** | **$5,979** |

Table 5 shows the activities and costs in Zambia to promote EBF.

**Table 5: Total Costs to Promote EBF in Ndola Demonstration Project in Zambia (by Activity – US$)**

| Activity | Cost |
|---|---|
| Health Worker (HW) Basic Training | 18,741 |
| HW Counseling Training | 21,966 |
| HW Supervision/On the Job Training | 2,788 |
| HW TOT – Basic Training | 6,003 |
| Community Basic Training | 5,428 |
| Community Counseling Training | 4,878 |
| BFHI Activities | 4,120 |
| Sensitization & Community outreach | 2,395 |
| Mgmt/Supervision/Admin | 21 |
| **LINKAGES & Partner Costs to Promote EBF** | **$66,340** |

As Tables 3-5 show, total costs to promote EBF were significantly higher in Madagascar, compared with Ghana and Zambia, partly reflecting differences in the scale of the programs.

### 6.1.2. Costs in Madagascar, Ghana and Zambia for TIBF

Table 6 shows the total LINKAGES and partner costs for TIBF for each of the two program regions in Madagascar, itemized by key activities.

**Table 6: Total Costs per Region to Promote TIBF in Two Regions in Madagascar (by Activity – US$)**

| Activity | Antananarivo | Fianarantsoa |
|---|---|---|
| Community Nutrition Promoters Training | 20,049 | 18,416 |
| Health Worker Training | 507 | 484 |
| PSI Training | 619 | 336 |
| Health Technician Training | 472 | 857 |
| JSI Training | 13 | 1 |
| BFHI activities | 1,473 | 789 |
| Mass Media | 52 | 1,142 |
| IEC materials | 2,868 | 2,295 |
| Festival, BF Week, etc | 5,388 | 1,962 |
| Sensitization & Community outreach | 330 | 246 |
| Mgmt/Supervision/Admin | 253 | 228 |
| Miscellaneous | 323 | 309 |
| **LINKAGES & Partner Costs to Promote TIBF** | **$32,347** | **$27,065** |

A similar presentation across the five study districts in Ghana is shown in Table 7.

**Table 7: Total Costs per District to Promote TIBF in Five Districts in Ghana (by Activity – US$)**

| Activity | East Mamprusi | Bongo | Lawra | Bolgatanga | Yendi |
|---|---|---|---|---|---|
| Mother Support Grp Training | 3,720 | 3,165 | 2,852 | 364 | 1,487 |
| BCC Training | 2,489 | 2,271 | 3,375 | 2,839 | 3,011 |
| Other Training | 1,188 | 667 | 891 | 1,149 | 180 |
| Mass media | 448 | 161 | 195 | 472 | 436 |
| IEC materials | 57 | 60 | 68 | 48 | 45 |
| Festivals, BF Week | 1,220 | 955 | 2,167 | 816 | 759 |
| Sensitization & Community outreach | 79 | 93 | 40 | 285 | 61 |
| **LINKAGES & Partner Costs to Promote TIBF** | **$9,201** | **$7,372** | **$9,588** | **$5,973** | **$5,979** |

Table 8 shows the activities and costs in Zambia to promote TIBF.

**Table 8: Total Costs to Promote TIBF in Ndola Demonstration Project in Zambia (by Activity – US$)**

| Activity | Cost |
|---|---|
| Health Worker (HW) Basic Training | 13,639 |
| HW Counseling Training | 21,966 |
| HW Supervision/On the Job Training | 2,784 |
| HW TOT – Basic Training | 4,402 |
| Community Basic Training | 3,936 |
| Community Counseling Training | 4,878 |
| BFHI Activities | 1,373 |
| Sensitization & Community outreach | 1,047 |
| Mgmt/Supervision/Admin | 21 |
| **LINKAGES & Partner Costs to Promote TIBF** | **$54,046** |

In contrast to total costs for EBF, total costs to promote TIBF were highest in Zambia, despite its much smaller scale program. This higher cost reflects relatively more effort devoted to TIBF in Zambia compared with EBF.

### 6.1.3. Cost Effectiveness Across Madagascar, Ghana and Zambia

Table 9 shows the cost effectiveness results across the three countries. As the data shows, both regions in Madagascar were more cost effective compared with Ghana and Zambia. Other preliminary differences to note include generally higher costs in Madagascar, as well as the difference in costs between EBF and TIBF. The remainder of this section will use data from these regions and districts to analyze differences in program design that may impact cost effectiveness.

**Table 9: Cost Effectiveness in Madagascar, Ghana and Zambia (US$)**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Total Costs – EBF | 163,190 | 136,115 | 9,201 | 7,372 | 9,588 | 5,973 | 5,979 | 66,340 |
| **Cost per New Acceptor – EBF** | **$8.12** | **$14.22** | **$36.30** | **$51.92** | **$64.44** | **$10.40** | **$94.16** | **$103.69** |
| Total Costs – TIBF | 32,346 | 27,066 | 9,201 | 7,371 | 9,589 | 5,973 | 5,979 | 54,047 |
| **Cost per New Acceptor – TIBF** | **$2.91** | **$1.88** | **$22.56** | **$50.13** | **$257.77** | **$12.48** | **NM*** | **$49.51** |

* Result is not meaningful because outcome rate of TIBF is below control rate.

## 6.2. Relationship between Cost Effectiveness and Program Interventions

Data across the country studies are used to examine relationships between cost effectiveness and program implementation characteristics, including:

- Scale or size of the program
- Baseline rates of targeted behaviors
- Scope of the program
- Level of partner participation
- Mix of activities
- Mode of implementation

### 6.2.1. Cost Effectiveness and Scale of the Program

The scale or size of the program differed significantly across the three countries. Table 10 shows the range in scale as represented by size of the target population, along with total program costs.[6]

**Table 10: Program Scale in Madagascar, Ghana and Zambia**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Target Population | 52,859 | 26,594 | 551 | 507 | 310 | 2,394 | 907 | 3,614 |
| Total Program Costs | $434,206 | $310,868 | $29,929 | $24,570 | $32,138 | $20,765 | $20,981 | $342,381 |

As can be seen, both the target population and total program costs in Madagascar, were much higher than in Ghana. The Madagascar program covered the entire population of 10 districts across two regions, representing a target population of 79,453. The scale of the program in Zambia was much smaller, with a target population of 3,614, across six health centers in one urban area. However, total costs were approximately the same as one of the regions in Madagascar. In Ghana, the total population was 4,669.

Table 11 shows the target population and the cost per new EBF acceptor. Although, there are two outliers, this data generally shows that as target population increases, the cost per new acceptor decreases. The outliers are Yendi district in Ghana (target pop: 907) and Zambia (target pop: 3,614). The high cost per new acceptor in Yendi may be more related to the low level of partner participation (partner costs represented 4% of total costs) and the higher baseline rate of EBF (66%), than the target population. Zambia also had a very high baseline rate of EBF (57%), but its high cost per new acceptor may be more easily explained by its mode of implementation, as discussed in a later section. This data, which suggest that cost per new acceptor decreases as target population increases, is as expected because of the high fixed costs associated with many of the activities.

[6] Target population is defined as the number of children in the targeted age group. Where the number of targeted children changes over the study period, an average of the number of children at the beginning and end of the study period is used.

**Table 11: Target Population and Cost per New EBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Target Population | 52,859 | 26,594 | 551 | 507 | 310 | 2,394 | 907 | 3,614 |
| Cost per New EBF Acceptor | $8.12 | $14.22 | $36.30 | $51.92 | $64.44 | $10.40 | $94.16 | $103.69 |

This general conclusion can also be seen if we look at the cost per new TIBF acceptor, as shown in Table 12. In this case, Zambia (target pop: 3,614) is the only data point that breaks the trend.

**Table 12: Target Population and Cost per New TIBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Target Population | 52,859 | 26,594 | 551 | 507 | 310 | 2,394 | 907 | 3,614 |
| Cost per New TIBF Acceptor | $2.91 | $1.88 | $22.56 | $50.13 | $257.77 | $12.48 | NM* | $49.51 |

* Result is not meaningful because outcome rate of TIBF is below control rate.

### 6.2.2. Cost Effectiveness and Baseline Rates of Targeted Behaviors

We examined the relationship between baseline rates of EBF and TIBF and cost per new acceptor in order to analyze the impact of increasing marginal costs. As explained in Section 4.4, marginal cost refers to the additional cost required to produce one additional unit of output. Marginal cost is generally expected to increase as you reach higher behavior rates – that is, it may be more costly to increase EBF from 80% to 90% than it is to increase EBF from 30% to 40%. Table 13 shows the baseline and outcome rates of the targeted behaviors, together with the change in the behavior rate.

**Table 13: Baseline Rates of EBF and TIBF in Madagascar, Ghana and Zambia**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Baseline/ Control EBF | 44% | 50% | 48% | 48% | 48% | 25% | 66% | 57% |
| Endline EBF | 82% | 86% | 94% | 76% | 96% | 49% | 73% | 75% |
| Change in EBF Rate | 38% | 36% | 46% | 28% | 48% | 24% | 7% | 18% |
| Baseline/ Control TIBF | 43% | 23% | 9% | 9% | 9% | 10% | 27% | 53% |
| Endline TIBF | 64% | 77% | 83% | 38% | 21% | 30% | 12% | 83% |
| Change in TIBF Rate | 21% | 54% | 74% | 29% | 12% | 20% | NM* | 30% |

* Result is not meaningful because outcome rate of TIBF is below control rate.

As can be seen, there was great variety in the baseline rates of EBF and TIBF, ranging from 9% prevalence of TIBF in three districts in Ghana to 66% prevalence of EBF in Yendi district in Ghana.

The results also show that where baseline behavior rates were low, the size of change in the targeted behavior was generally higher.

The data show that the baseline rates of the targeted behavior do seem related to cost effectiveness. Table 14 shows the cost per new EBF acceptor together with the baseline EBF rates across the three countries.

**Table 14: Baseline EBF Rate and Cost per New EBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Baseline EBF Rate | 44% | 50% | 48% | 48% | 48% | 25% | 66% | 57% |
| Cost per New EBF Acceptor | $8.12 | $14.22 | $36.30 | $51.92 | $64.44 | $10.40 | $94.16 | $103.69 |

The data in Table 14 show that higher baseline rates of EBF are associated with higher cost per new EBF acceptor. Examining data on baseline rates of TIBF and cost per new TIBF acceptor, however, the trend is less clear, as shown in Table 15. While the data from Zambia, and Antananarivo and Fianarantsoa regions in Madagascar do seem to show that higher baseline rates are associated with higher cost per new TIBF acceptor, the data from Ghana fail to confirm this trend with their similar baseline TIBF rates (9% and 10%), but large variations in the cost per new TIBF acceptor.

**Table 15: Baseline TIBF Rate and Cost per New TIBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Baseline TIBF Rate | 43% | 23% | 9% | 9% | 9% | 10% | 27% | 53% |
| Cost per New TIBF Acceptor | $2.91 | $1.88 | $22.56 | $50.13 | $257.77 | $50.13 | NM* | $49.51 |

* Result is not meaningful because outcome rate of TIBF is below control rate.

### 6.2.3. Cost Effectiveness and Scope of Program

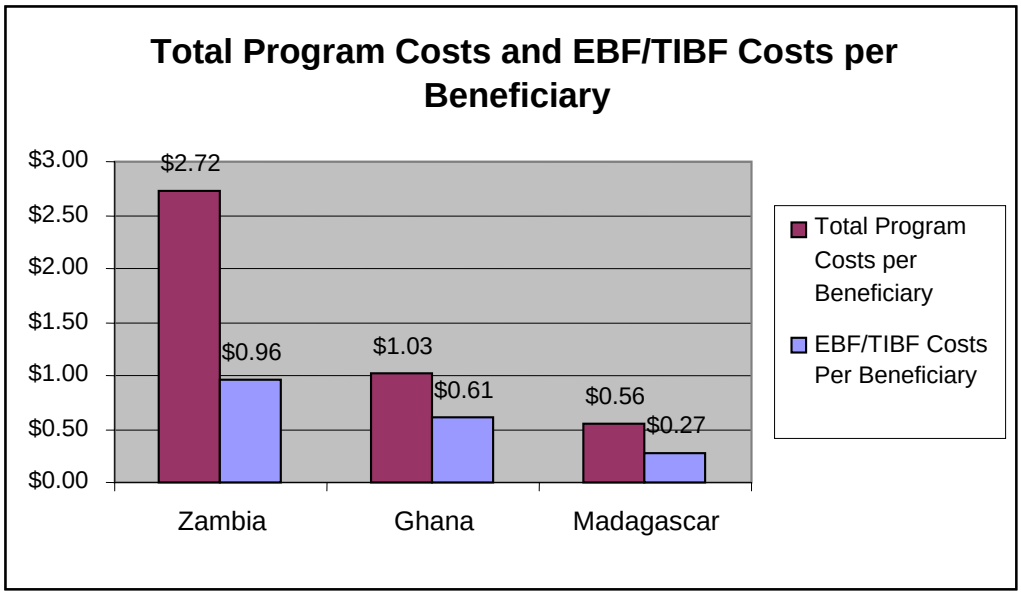
Sub-section 6.2.1 showed that the size of the target population, or the scale of the program had a strong influence on cost effectiveness. In addition to economies of scale, however, it is likely that economies of scope also contribute to cost effectiveness. Our analysis of the effect of economies of scope is limited, however, because there are effectively only three data points for examination. The program scope across the districts and regions of Ghana and Madagascar are the same, thus, we can only examine economies of scope at the country level.

While the scale of the program in Madagascar clearly contributed to cost effectiveness, it seems likely that the broader scope of the program, compared with Ghana, also contributed to its higher cost effectiveness. Unlike Ghana, the Madagascar program was not limited to infant feeding activities, but also included interventions in other areas of child health (appropriate feeding of a sick child, Vitamin A supplementation), maternal nutrition, and family planning (use of lactational amenorrhea as a method of family planning). The economies arising from the larger scope of activities in Madagascar

likely contributes to its lower cost per new acceptor. On the other hand, the Zambia program also integrates other health interventions including assisted delivery, VCT for HIV/AIDS, and HIV/AIDS knowledge. However, Zambia was the least cost effective of the three countries, although we found other factors that may have had a negative effect on cost effectiveness (lower target population, higher baseline rates, etc.)

The effect of the program scope is examined using the cost per beneficiary (per capita) in the program areas across the three study countries. Cost per beneficiary is used because differences in target populations for different target behaviors in Madagascar and Zambia prevent us from using a fixed target population. Figure 1 shows the total program costs, as well as EBF/TIBF costs exclusively, on a per beneficiary basis.

**Figure 1: Total Program Costs and EBF/TIBF Costs**




As the figure shows, total costs per beneficiary were highest in Zambia ($2.72) and lowest in Madagascar ($0.56) – much of this difference is due to the scale of the program and the activity mix. However, we also see that a broader program scope can lower the program costs for individual program interventions when we compare the total costs per beneficiary and the EBF/TIBF costs per beneficiary. In Zambia, the total costs per beneficiary are reduced from $2.72 to $0.96, or by 65%, when we consider only the EBF/TIBF costs. In Madagascar, total program costs are reduced by 52%, from $0.56 to $0.27 per beneficiary. On the other hand, in Ghana where the program is exclusively focused on infant feeding, total beneficiary costs are reduced only 41% (from $1.03 to $0.61) when considering only EBF/TIBF costs.[7] Thus we can see how expanding the scope of program interventions can reduce the costs of individual interventions.

The data are insufficient to provide a more rigorous analysis of this concept, nor are we able to disaggregate the effects of program scale and scope. Further, the data from Zambia do not support this conclusion and leads to the question of whether some health interventions, at least on a cost basis,

[7] The third infant feeding behavior targeted in Ghana was timely complementary feeding, which was not a key indicator in Zambia.

may not benefit from integrated delivery. In addition, other factors in Zambia that negatively influence cost effectiveness may be mitigating any positive impact from economies of scope.

Nonetheless, based on economic theory and general understanding of the programs in the three countries, it does seem likely that economies of scope can be realized when integrating health interventions. There are savings to be gained because costs of many of the activities supported by LINKAGES do not increase with the size of the population, and increase only moderately with additional targeted behaviors. For example, the cost of training district level health staff does not change much whether the program covers 10% of the district or the whole district. Similarly, the cost of community leaders does not change much regardless of whether the program focuses only on infant feeding or maternal and child health as well. In some cases, the number of days of training is the same despite adding more topics. This also suggests that shorter (and therefore less costly) training may be equally effective.

Another example is general administration costs, which would be similar even with a larger population and larger scope of activities. For example, there is only one district coordinator for a large or small district, or for a program that covers only infant feeding or infant feeding and maternal nutrition. And since the costs of this district coordinator would be spread over the entire population and all interventions, the cost per child or per intervention is lower.

### 6.2.4. Cost Effectiveness and Level of Partner Participation

Across the districts in Ghana, the level of partner participation, as measured by their contribution to total costs, appeared to affect cost effectiveness. The districts in Ghana where local partners were more active were relatively more cost effective districts. This trend was difficult to see in Madagascar because only two regions were studied, and LINKAGES' partners had a similar level of input in both regions. Analysis of partner input across both countries was conducted to see whether its impact on cost effectiveness was clearer. Table 16 shows partner contribution as a percent of total costs.

**Table 16: Level of Partner Participation in Madagascar, Ghana and Zambia**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Partner Costs as % of Total Costs – EBF | 11% | 10% | 20% | 13% | 14% | 26% | 8% | 16% |
| Partner Costs as % of Total Costs – TIBF | 15% | 12% | 20% | 13% | 14% | 26% | 8% | 14% |

With a few exceptions, partner costs as a percent of total costs were similar across the study areas. Two districts in Ghana had high partner participation – East Mamprusi (20%) and Bolgatanga (26%), while Yendi district in Ghana had a lower rate of partner participation (8%). Table 17 shows the level of partner participation and the cost per new EBF acceptor. No clear trend can be seen.

**Table 17: Partner Participation and Cost per New EBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Partner EBF Costs as % of Total Costs | 11% | 10% | 20% | 13% | 14% | 26% | 8% | 16% |
| Cost per New EBF Acceptor | $8.12 | $14.22 | $36.30 | $51.92 | $64.44 | $10.40 | $94.16 | $103.69 |

Similarly, there is no clear relationship between the level of partner participation and the cost per new TIBF acceptor, as shown in Table 18.

**Table 18: Partner Participation and Cost per New TIBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Partner TIBF Costs as % of Total Costs | 15% | 12% | 20% | 13% | 14% | 26% | 8% | 14% |
| Cost per New TIBF Acceptor | $2.91 | $1.88 | $22.56 | $50.13 | $257.77 | $50.13 | NM* | $49.51 |

* Result is not meaningful because outcome rate of TIBF is below control rate.

While in Ghana higher partner participation seemed to improve cost effectiveness, the cross-country data did not further confirm this pattern. Several possible explanations come to mind. One explanation may be that while partner contribution to costs appeared to be a good indicator of partner participation and commitment in Ghana, this was not true in Madagascar. In Madagascar, there was high partner commitment – the program was implemented in a true partnership in that activities were planned together, JSI and LINKAGES each provided one staff to form a two-person team at the district level, even IE&C materials and mass media messages were jointly developed. However, the level of commitment does not appear to be accurately captured in our crude indicator. In Zambia, the mode of operation was somewhat different, as the program was based in health centers and much more reliant on the DHMT and health staff, who received significant support from LINKAGES. Another possible explanation is that the design of the program in Madagascar is such that while the partners may not be directly investing funds into promoting infant feeding behaviors, their investments in other child health areas provide indirect benefit and support, which is not captured by their level of investment in promoting early and exclusive breastfeeding behaviors. Lastly, the effect of lower partner inputs in Madagascar may merely be masked by other factors that improve its cost effectiveness.

### 6.2.5. Cost Effectiveness and Activity Mix

The cross-country data was also used to examine differences in the mix of activities and potential relationship to cost effectiveness. Activities were categorized into three broad categories: training, mass media and IE&C, and community services and sensitization. It was difficult to be more specific because activities in the three countries were not exactly the same. The mix of activities, represented by the percent of costs in each of these categories, was examined with respect to cost per new acceptor.

The analysis did not reveal very clear patterns, however, there seemed to be an association between the level of training activities and cost per new acceptor. Table 19 shows this comparison for cost per new EBF acceptor.

**Table 19: Training Costs as Percent of Total EBF Costs and Cost per New EBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Training Costs as % of Total EBF Costs | 78% | 76% | 80% | 83% | 74% | 73% | 78% | 90% |
| Cost per New EBF Acceptor | $8.12 | $14.22 | $36.30 | $51.92 | $64.44 | $10.40 | $94.16 | $103.69 |

Except for two outliers, the general trend shows that cost per new EBF acceptor generally decreases as training costs become a smaller portion of total costs. The two outliers are Yendi (78%) and Lawra (74%) districts in Ghana, where Yendi was a district with low partner support and Lawra was a district with the lowest target population. Table 20 shows the cost per new TIBF compared with training costs as a percent of total costs.

**Table 20: Training Costs as Percent of Total TIBF Costs and Cost per New TIBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Training Costs as % of Total TIBF Costs | 67% | 74% | 80% | 83% | 74% | 73% | 78% | 95% |
| Cost per New TIBF Acceptor | $2.91 | $1.88 | $22.56 | $50.13 | $257.77 | $50.13 | NM* | $49.51 |

* Result is not meaningful because outcome rate of TIBF is below control rate.

With the exception of Lawra district (74%) in Ghana, the same pattern can be seen – cost per new acceptor decreases as training costs become a smaller portion of total costs. This finding should be carefully considered as several interpretations could be made. To suggest that training costs should be decreased because they are associated with lower cost effectiveness would be an inappropriate interpretation. To be sure, we examined the relationship between training costs and cost per new acceptor and found none. Table 21 shows training costs together with cost per new EBF acceptor.

**Table 21: Total EBF Training Costs and Cost per New EBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Total EBF Training Costs (US$) | 127,601 | 103,603 | 7,397 | 6,103 | 7,118 | 4,353 | 4,677 | 59,804 |
| Cost per New EBF Acceptor | $8.12 | $14.22 | $36.30 | $51.92 | $64.44 | $10.40 | $94.16 | $103.69 |

As can be seen, there is no clear relationship between total training costs and cost per new EBF acceptor. Table 22 shows the cost per new TIBF acceptor together with total training costs, which also do not show a clear pattern.

**Table 22: Total TIBF Training Costs and Cost per New TIBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| Total TIBF Training Costs (US$) | 21,659 | 20,094 | 7,397 | 6,103 | 7,118 | 4,353 | 4,677 | 51,606 |
| Cost per New TIBF Acceptor | $2.91 | $1.88 | $22.56 | $50.13 | $257.77 | $50.13 | NM* | $49.51 |

* Result is not meaningful because outcome rate of TIBF is below control rate.

A more plausible explanation is that training activities have less impact on behavior change when they are not accompanied with the necessary activities to reinforce key messages at the community level, such as mass media, IE&C, and community services and sensitization. This finding may be an important part of the explanation for Zambia's relatively lower cost effectiveness. While Madagascar clearly benefited from the economies of scope and scale of its program, its activity mix, with significant expenditures on non-training activities, may also have contributed to its higher cost effectiveness.

### 6.2.6. Cost Effectiveness and Mode of Implementation

In addition to the quantifiable factors discussed in this section, we also examined some more qualitative factors related to how the program was implemented across the three countries that may influence cost effectiveness. We studied key implementation factors, including the phase of program implementation, who the key partners were, LINKAGES' relationships with its partners, the mode of training, and LINKAGES' mode of operation. Table 23 provides a summary of these factors, highlighting similarities and differences between the three countries.

**Table 23: Mode of Implementation in Madagascar, Ghana and Zambia**

| Implementation Factor | Madagascar | Ghana | Zambia |
|---|---|---|---|
| Phase of Implementation | • Built on activities of predecessor BASICS project<br>• Under BASICS, formative research had been conducted and materials for training and IE&C developed | • Study period included significant start-up activities, including formative research and materials development | • Study period included significant start-up activities, including formative research and materials development |
| Key Partners | • MOH<br>• JSI (USAID project)<br>• NGOs | • MOH<br>• Catholic Relief Services<br>• Ghana Red Cross<br>• UNICEF | • MOH<br>• Hope Humana<br>• Horizons (USAID project)<br>• ZIHP (USAID project) |
| Partner Relationships | • Collaborative relationship with JSI, with joint coordinators at the district level<br>• MOH provided minimal financial support | • All partners, except UNICEF, actively conducted training, community services and sensitization with their own funding<br>• MOH, particularly at district level, was very active in promoting key behaviors | • Hope Humana was under contract with LINKAGES<br>• MOH provided key services through health centers, but minimal financial support<br>• Horizons responsible for M&E |
| Mode of Training | • LINKAGES conducted training of trainers as well as training for health staff and community members<br>• Ongoing training as new training modules were introduced focusing on new key topics<br>• Training modules were 1-5 days in length | • LINKAGES conducted training of trainers for partner staff<br>• Secondary training of health staff and community members coordinated and funded by partners<br>• Key BCC/infant feeding training module was 15 days in length | • LINKAGES conducted training of trainers as well as training for health staff and community members<br>• Key training courses were 12 days and 8 weeks (including 5 week practicum) |
| Mode of Operation | • LINKAGES employed Resident Advisor in country<br>• Well-developed in-country operations and staff, including staff at district level<br>• Resident Advisor was less hands-on, due to the large scale of the project and available local staff<br>• Minimal DC based TA | • LINKAGES employed Resident Advisor in country<br>• Resident Advisor involved in all training activities<br>• Regular US-based TA during study period | • Resident Advisor posted in-country in the middle of study period<br>• Hope Humana responsible for in-country implementation<br>• Significant US-based TA during study period |

LINKAGES was in a more advanced phase of project implementation in Madagascar than in Ghana or Zambia. In Madagascar, LINKAGES was able to build on activities of a predecessor project (USAID-funded BASICS project), which had conducted formative research and had developed materials that LINKAGES used. In both Ghana and Madagascar, LINKAGES did not have such a base to build from, and was starting from scratch with research, and development of training and other materials. Building on a previous project also means there would have been a larger base of qualified staff and more developed infrastructure, which likely would have affected cost effectiveness.

There were also key differences in the type of partner relationships, and the mode of training that may have affected cost effectiveness. In Ghana, training of community members was conducted by partner organizations, while in Madagascar and Zambia, they were implemented by LINKAGES. However, a critical difference between Zambia and Madagascar is that LINKAGES in Madagascar had significant staff presence, including local staff at district level to coordinate these activities. LINKAGES relationship with local partners was also quite different in Zambia compared with Madagascar and Ghana. In Zambia, LINKAGES key implementing partner was Hope Humana, which was under contract to LINKAGES. Hope Humana contributed limited additional resources, and primarily acted as a contractor, representing LINKAGES in-country. In Madagascar, the key non-government partner was a USAID-funded project with its own ongoing activities in the program areas, and contributed resources to the integrated project. In Ghana, the key implementing partners were NGOs who integrated LINKAGES interventions into their existing child survival activities.

Lastly, the design of the training modules may also have affected cost effectiveness. In Madagascar, the training modules were all quite short and generally focused on one or two topics. In Ghana, the primary behavior change communication (BCC) training course was longer – 15 days – focusing on infant feeding. In Zambia, the training modules were of even longer length, ranging from 12 days to eight weeks (which included a five-week practicum). Another difference in the training design was the type of trainers used. In Ghana and Zambia, the training courses were more reliant on the resident or DC-based advisor.

Overall, the mode of implementation does seem to affect cost effectiveness. The design of the training, including the length of training and the key trainers involved, affects training costs. The choice of staffing also affects implementation costs, especially if we consider the costs of expatriate staff versus local staff. It would seem important to develop local capabilities early on in order to minimize these costs. Lastly, although the data shown in Section 6.2.4 could not verify the importance of partner commitment, it does seem that a more collaborative relationship, where the partners also make substantive investments in the program, is associated with cost effectiveness.

## 6.3. How Can LINKAGES Improve its Cost Effectiveness?

This analysis shows several program characteristics associated with higher cost effectiveness:

- Higher population or a larger scale program
- Lower baseline rates of targeted behaviors
- Larger program scope, or a broader program range (beyond infant feeding)
- Broad activity mix, including mass media, IE&C and community outreach

Based on this analysis, LINKAGES may be able to improve its cost effectiveness by implementing programs of a larger scale and scope, selecting areas with low baseline rates of the targeted behaviors, and ensuring a broad set of activities (beyond training). While LINKAGES may not be able to, and perhaps should not, select program areas to maximize cost effectiveness, this data can still be used so that LINKAGES and its partners can anticipate the cost effectiveness of its programs prior to implementation. Such predictions must be prepared and interpreted cautiously. Nonetheless, it would be helpful to policy-makers deciding how to design a program or whether to implement a program if even crude indications of its cost-effectiveness were available.

For example, LINKAGES can calculate a crude indication of cost effectiveness by analyzing the cost per targeted child. Using a proposed program budget and the target population, LINKAGES can estimate the cost per targeted child. While higher cost per targeted child is not necessarily a predictor of cost effectiveness, it is generally associated with higher cost per new acceptor. Table 24 shows the relationship between cost per targeted child and cost per new EBF acceptor. Although there are outliers, the general pattern that can be seen is that the cost per new EBF acceptor decreases as costs per targeted child decreases.

**Table 24: Cost per Targeted Child and Cost per New EBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| EBF Costs per Targeted Child | $3.09 | $5.12 | $16.70 | $14.54 | $30.93 | $2.50 | $6.59 | $18.35 |
| Cost per New EBF Acceptor | $8.12 | $14.22 | $36.30 | $51.92 | $64.44 | $10.40 | $94.16 | $103.69 |

Table 25 shows this same analysis for cost per new TIBF acceptor.

**Table 25: Cost per Targeted Child and Cost per New TIBF Acceptor**

| | MADAGASCAR | | GHANA | | | | | ZAMBIA |
|---|---|---|---|---|---|---|---|---|
| | Antana-narivo | Fiana-rantsoa | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi | Ndola |
| EBF Costs per Targeted Child | $0.61 | $1.02 | $16.70 | $14.54 | $30.93 | $2.50 | $6.59 | $14.95 |
| Cost per New TIBF Acceptor | $2.91 | $1.88 | $22.56 | $50.13 | $257.77 | $50.13 | NM* | $49.51 |

* Result is not meaningful because outcome rate of TIBF is below control rate.

Based on these data, it may be reasonable to develop some general guidelines for new programs, such as foregoing programs that have a cost per targeted child over $30, or $20, depending on what is an acceptable cost per new acceptor. Calculating an estimated cost per targeted child, together with information on the baseline behavior rates can provide very useful information on the potential cost effectiveness of a program. For example, if the cost per targeted child is estimated to be $20, and the baseline EBF rate is 50%, we can calculate that the minimum cost per new EBF acceptor will be $40 ($20/(100%-50%)), assuming you achieve 100% EBF. At the same time, if the cost per targeted child is estimated to be $2, and the baseline EBF rate is 20%, even if the EBF only increases to 40%, the program is more cost effective with a cost per new acceptor of $10 ($2/(40%-20%)).

Applying this basic model should be feasible, given that total costs are subject to budget constraints, and thus somewhat predictable. At the development of the Ghana program, we may have calculated projections of the cost per new EBF acceptor as shown in Table 26.

**Table 26: Illustrative Projections of Cost per New EBF Acceptor in Ghana**

| | E. Mam-prusi | Bongo | Lawra | Bolga-tanga | Yendi |
|---|---|---|---|---|---|
| **Target Population** | 551 | 507 | 310 | 2,394 | 907 |
| **Baseline Rate of EBF** | 48% | 48% | 48% | 25% | 66% |
| **Estimated Program Costs** | $8,000 | $8,000 | $8,000 | $8,000 | $8,000 |
| **Estimated Cost per Targeted Child** | $14.52 | $15.78 | $25.81 | $3.34 | $8.82 |
| **Estimated Increase in EBF (low estimate)** | 20% | 20% | 20% | 20% | 10% |
| **Estimated Increase in EBF (high estimate)** | 50% | 50% | 50% | 73% | 32% |
| **Projected Cost per New EBF Acceptor (low EBF increase)** | **$72.60** | **$78.90** | **$129.03** | **$16.71** | **$88.20** |
| **Projected Cost per New EBF Acceptor (high EBF increase)** | **$29.04** | **$31.56** | **$51.61** | **$4.58** | **$27.56** |
| **Actual Cost per Targeted Child** | $16.70 | $14.54 | $30.93 | $2.50 | $6.59 |
| **Actual Increase in EBF Rate** | 46% | 28% | 48% | 24% | 7% |
| **Actual Cost per New EBF Acceptor** | **$36.30** | **$51.92** | **$64.44** | **$10.40** | **$94.16** |

Although this simple analysis provides a relatively wide range of estimates of cost per new EBF acceptor, it nonetheless would have provided guidance during the program development phase. Based on this data, LINKAGES may have been able to increase the number of communities participating in the program in Lawra to improve cost effectiveness, for example. Converting the cost per EBF acceptor to a cost per DALY would provide further basis for deciding whether to proceed with a program, or whether modifications are needed.

While LINKAGES should not necessarily select only the most cost effective programs, these results provide a good foundation for understanding the factors that affect cost effectiveness, as well as a basis for estimating the cost effectiveness of programs prior to implementation. LINKAGES should also consider the mode of implementation, as described in Section 6.2.6, to maximize cost effectiveness. Setting a quantitative "rule" about when to proceed based on cost effectiveness grounds may not be a good idea, as many other considerations (such as reaching the poorest communities) cannot be similarly quantified. Besides influencing the design of a program, perhaps an equally important use for these projections is to minimize later surprises about the cost effectiveness of a program and whether outcomes were worth the inputs invested.

## 6.4. Is LINKAGES Cost Effective Compared with Other Infant and Young Child Feeding Interventions?

Other cost effectiveness studies of breastfeeding promotion interventions are limited. The most notable studies of breastfeeding promotion cost effectiveness – indeed, the only studies available – were a series of studies conducted in 1992-93 in seven hospitals in Brazil, Honduras, and Mexico (funded through the USAID LAC-HNS project). It is difficult to compare the results of the LAC-HNS studies due to differences in the nature of the interventions (hospital- vs. community-based settings) and the nature of the study methodology. Nonetheless, some comparison is useful. Disaggregated data was only available for Brazil, and so detailed comparisons are made with that study only.

The nature of the interventions studied under LAC-HNS was very different from Madagascar, Ghana, and Zambia. Those studies included only interventions in hospitals in urban settings. In Madagascar, the intervention areas are a mix of urban and rural setting, while in Ghana, the intervention areas are among the most remote and least densely populated areas of the country, and in Zambia all the intervention sites are in an urban district. Because of the scale of the Brazil intervention, and the skill level of persons with direct contact with mothers, the hospitals studied did not use the model of cascading training of trainers, a component that accounts for a large portion of costs in the LINKAGES interventions. The primary costs in the LAC-HNS study hospitals were the costs of staff time for special clinics and individual counseling, changes in physical space required, and promotion materials.

The costing methodology and the effectiveness measures used were also very different. The LAC-HNS studies reported aggregate net costs, which took into account savings from breastfeeding (primarily the foregone cost of infant formula). The LAC-HNS studies include only implementation costs and exclude start-up or monitoring and evaluation costs. Hospital overhead and administrative costs were not included in the study. The measure of EBF was also different – in Brazil the EBF measure was based on interview results at a three-month follow-up visit. Thus, it only measures EBF at three months after delivery. The summary data provides only the net cost (after savings from formula) per additional child breastfeeding. The disaggregated data were available for Brazil and were adjusted to allow comparison here.

Under various assumptions, the gross cost of breastfeeding promotion per newborn in Brazil at the time of the study ranged from $11.09 to $11.94. The EBF rate was 43% in the program hospital and 20% in the control hospital. Based on an average cost per newborn of $11, this translates into a cost per new EBF acceptor of $48 ($11/23%). Applying the total inflation rate (in US dollar terms) of 22.4% between 1992 and 2000, the cost per new EBF accepter in Brazil was $59, in 2000 dollars. Table 26 compares the cost per new EBF acceptor in Brazil with the three LINKAGES program countries studied.

**Table 27: Cost per New EBF Acceptor in Madagascar, Ghana, Zambia, and Brazil**

| Country | Cost per New EBF Acceptor (2000 US$) |
|---|---|
| Ghana | $34 |
| Madagascar | $10 |
| Zambia | $104 |
| Brazil | $59 |

As shown, there is significant variation in cost effectiveness across the three study countries. In both Ghana and Madagascar, the cost per new EBF acceptor was lower than in Brazil. In Zambia, however, cost per new EBF acceptor was higher than in Brazil.

# 7. Conclusions and Discussion

## 7.1. Conclusions

This cross-country analysis served to confirm findings from the three country studies. It also provides additional insight in the area of activity mix, program scope, and mode of implementation. The program scale (size of the program or target population), the baseline behavior rates, the activity mix, and to some extent the program scope (range of interventions), all seem to impact cost effectiveness. Also important is the way a program is implemented – including the partner relationships, choice of staff, training design, etc.

Although there may be many factors to consider besides cost effectiveness, an estimate of a program's cost effectiveness should at least be one of the factors considered before implementation of a new program. Estimates of program costs, together with baseline behavior rates, can provide an indication of the likely range of the cost per new acceptor. This information may be used to alter program design to improve cost effectiveness.

Although comparable studies are limited, LINKAGES breastfeeding promotion interventions generally appear to be cost effective. The cost per new EBF acceptor of $10 in Madagascar, and $34 in Ghana, compares quite favorably with data from Brazil showing cost per new EBF acceptor to be $59. On the other hand, the cost per new EBF acceptor in Zambia, at $104, is higher than Brazil. The data presented from Madagascar, Ghana, Zambia, and Brazil show that cost effectiveness can differ significantly based on the program characteristics and program design.

## 7.2. Discussion

This study provided information on how various factors can affect cost effectiveness. It provides information that can be used to estimate the cost per new acceptor prior to implementation, a practice which to-date is seldom undertaken. Being able to estimate the cost per new acceptor and being able to translate that into health impact are critical factors for decision-makers who must choose between alternative health interventions.

Due to differences in measurement of outcomes, program structure, and administrative requirements, however, it is difficult (and may be unfair) to compare this intervention with other breastfeeding promotion or child survival activities. For example, the cost structure under a USAID contract, with its reporting, administrative and procurement requirements, cannot be compared to costs of a program funded by a community based NGO. Because it is difficult to eliminate precisely the effect of such management requirements, applying the methodology used in this study to analyze cost effectiveness of other USAID child survival interventions would provide the most accurate assessment of LINKAGES' cost effectiveness. Ability to make comparisons between child survival interventions would also be contingent on ability to convert behaviorial and other outcomes to a common health impact indicator (such as DALYs) reliably. Absent such conditions, comparisons of cost effectiveness are inexact and each intervention must be assessed on its own merits.

Another question that was raised in the individual country studies, nonetheless, remains unanswered. Our knowledge of the impact of the sustainability or longevity of behavior change is limited, and is a key question affecting how we analyze cost effectiveness, particularly if we are to compare this intervention with others. This point can be viewed in two ways:

1. *How long would the activities conducted during this study period continue to affect EBF and TIBF behavior?* That is, if LINKAGES had discontinued all activities at the end of the study period, would all new behavior have ceased? Because this scenario seems unlikely, to some extent we are underestimating cost effectiveness because the costs incurred during the study period are producing outcomes beyond the end of the study period. Nonetheless, we have no data about how long these effects would continue within the scope of this study.

2. *At what point do the behaviors become self sustainable?* That is, after some period of time, one may expect that the behaviors encouraged by these interventions would become cultural norms to be passed on by mothers, health workers, and others within the community. If we could determine how long it takes for these types of behaviors to become cultural norms, then we would have a more accurate measure of cost effectiveness, because we could then measure the total input required to produce long term benefits from these interventions.

Additional research to inform the sustainability and longevity questions would be useful so that we can capture the full effect of long term outcomes. Studying the longevity or sustainability of behavior change would require returning to program sites to see how behavior rates change some period after program activities have ended. Presumably there would also be differences in longevity and sustainability based on the length of intervention. That is, there would be different outcomes depending on whether the intervention period was one year or three years. While such information is an important part of accurately estimating cost effectiveness, it may prove difficult to garner support and funding for such research after program completion.

While we have identified factors that seem to affect cost effectiveness, we cannot isolate the effects of each of these factors, nor do we know how they interact. Additional cost effectiveness studies would provide more data points so that more conclusive findings can be obtained. More data points that allow analysis of the relative importance and interplay of various factors influencing cost effectiveness would also be extremely useful. Given our experience with these three country studies, it seems unlikely that a retrospective study would be able to provide all the data needed. Purposely designed operations research may be needed to understand these relationships better.

# Annex A: Cost per New Acceptor in US Dollars with PPP Adjustment to "Ghana" Dollars

| PPP Adjustment | Tana | Fiana | E Mamprusi | Bongo | Lawra | Bolgatanga | Yendi | Zambia |
|---|---|---|---|---|---|---|---|---|
| **Cost/new acceptor - EBF** | $8.12 | $14.22 | $36.30 | $51.92 | $64.44 | $10.40 | $94.16 | $103.69 |
| **Cost/new acceptor - EBF (Adjust)** | $6.47 | $11.32 | $36.30 | $51.92 | $64.44 | $10.40 | $94.16 | $77.80 |
| **Cost/new acceptor - TIBF** | $2.91 | $1.88 | $22.56 | $50.13 | $257.77 | $12.48 | NM | $49.51 |
| **Cost/new acceptor - TIBF (Adjust)** | $2.32 | $1.50 | $22.56 | $50.13 | $257.77 | $12.48 | NM | $37.15 |

# Annex B: Bibliography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