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**Description and Evaluation of the  
"Hearth" Nutrition Program  
at the Albert Schweitzer Hospital  
in Deschepelles, Haiti**

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The HAS Hearth Program is the latest development in a long-term effort by Gretchen and Warren Berggren to find practical solutions to the difficult problems related to malnutrition and child survival and development in Haiti and other developing countries. The vision and dedicated effort of Gretchen and Warren Berggren is what made the HAS Hearth Program and evaluation a reality, working with the staff and institution of Hospital Albert Schweitzer. This activity was supported by Hospital Albert Schweitzer and by the BASICS project/Partnership for Child Health, Inc., Arlington, Virginia, where the authors work. World Relief Corporation and its staff, especially Arnie Bergstrom, Muriel Elmer and Olga Wolinka, were instrumental in conceiving and organizing the effort. Valuable technical advice and assistance was received from Laura Caulfield, Faisal Faruque and Dory Storms of The Johns Hopkins University, and Jay Ross of the Academy for Educational Development. The work of Jeff Grant was vital to the conduct of the evaluation, and he and Warren Berggren are equal contributors with the authors to the conception and implementation of the evaluation, although they are not responsible for this report. Although these friends and colleagues have been vital to the conduct and success of the work reflected in this paper, any misinterpretations, errors, or other problems with this report are the sole responsibility of the authors.

## ACRONYMS

AIDS	Acquired Immunization Deficiency Syndrome
BASICS	Basic Support for Institutionalizing Child Survival
CERN	Centre d'Education et Rehabilitation Nutritionelle (Mothercraft Centers)
GMP	Growth Monitoring and Promotion
HAS	Hospital Albert Schweitzer
IG	Income Generation
NDF	Nutrition Demonstration Foyers
ORT	Oral Rehabilitation Therapy
STD	Sexually Transmitted Diseases
U5	Under 5 Years of Age
USAID	United States Agency for International Development
WAM	Weight-for-Age as % of Reference Median
WAZ	Weight-for-Age Z-Score
WMP	Women's Microenterprise Program

## EXECUTIVE SUMMARY

Combating childhood malnutrition by feeding malnourished children, along with educating and motivating their mothers, has evolved from the approaches used in the Mothercraft Centers and Nutritional Demonstration Foyer (NDF) Programs of the 1970s and 1980s, particularly because of the isolation and lack of community-wide impact, their often long duration, and their costliness. This paper describes the Hearth Program of the Hospital Albert Schweitzer (HAS) in Haiti, a result of such revolutionary modifications, and analyzes data evaluating its impact on malnutrition.

At its simplest, the Hearth Program arranges for volunteer community mothers to feed malnourished children a single nutritious morning meal each day for nearly two weeks. First the children are dewormed. The volunteer mothers ("*animatrices*"), who are selected for their interest and leadership qualities, prepare the 12 meals in their own homes' kitchens. Each *animatrice* feeds three to five malnourished children who were identified by weighing all the children in 15 households that she selects.

The involvement of volunteer mothers in the program and the location of the feeding at the hearths of these mothers, rather than in special often distant feeding and training centers, are the critical differences from earlier approaches. A group of *animatrices* (typically 10-20) from a single community are trained and motivated in a week-long educational program held in their own community. During this training they learn about growth curves, are led to do a 24-hour recall dietary study on a single child from one of their 15 households who has been growing well (a "positive deviant"), and then are helped to combine their one-family information with that of the other *animatrices* in the group to define a nutritious meal that is clearly available locally and is affordable. The *animatrices*-in-training then prove to themselves and the community the economic feasibility of the diet by purchasing food for such a meal at the local market, after which they practice the process of preparing that meal early the next morning in one of their own kitchens and feeding it to any available local children. At the end of the training week, all the children aged 1-5 years from the selected households are dewormed and weighed, and those with malnutrition are identified. Then the mothers are convinced to have the children participate in the 2-week feeding program beginning the following week. The program provides the *animatrices* with money to buy the food for the feeding (about \$0.25 per meal).

The two weeks of feeding, although brief in duration, are sufficient to bring about a dramatic improvement in the appetite, general demeanor, and activity level of the fed children. They are transformed from listless, apathetic children with poor appetites, to energetic children who seemingly cannot get enough to eat. This change is believed to convince the *animatrices* of the effectiveness of the diet and the importance of their role in working with the children and mothers as motivator and neighborhood leader, even without pay. It is also believed to powerfully influence the mothers to continue giving the children the new diet after the Hearth feedings are completed, and hopefully, to use the new feeding approach with younger siblings as well. With the exception of talks given at the first weighing, there is no special effort to educate

the mothers of the malnourished children; they learn by watching, participating, and by talking with the *animatrices*, and perhaps other mothers.

The program follows-up with weighings at four and eight weeks after the feedings. Children with no weight gain are referred to the hospital for a medical diagnostic exam and treatment if necessary.

The program intends for the *animatrices* to continue to working with their 15 mothers. The trainers and motivators of the *animatrices*, nutrition educators called "*monitrices*," use monthly meetings of the *animatrices* from a particular locality to involve them in a broader range of public health activities, such as AIDS and STD prevention. Their positive experience with the impact of the feeding program appears to be sufficient to convince the *animatrices* to continue to be involved with the program and to work with their 15 families on other health-related activities.

A retrospective impact evaluation used a longitudinal sample of 192 program participants and 187 controls to determine the effect of the HAS program on the nutritional status of participants after one year. The program and control samples were similar, except that the control sample participated in a growth monitoring and promotion (GMP) program, but not in the Hearth Program, while the program sample all participated in the Hearth Program and about one-third participated in the GMP program.

The results indicate that while the Hearth Program makes a significant contribution to the solution of the malnutrition problem, it does not by itself solve the problem. More specifically, the Hearth Program prevented deterioration in the nutritional status of mildly underweight children relative to the control, but did worse than the control with respect to severely underweight children. The finding about the mildly underweight children was highly significant ( $p < .01$ ) and the gain over the control was substantial (about 30 percent of a standard deviation on the reference weight-for-age distribution), while the negative finding about the severely underweight was not statistically significant. This result suggests that a combination of Hearth and GMP programs may be the most effective solution.

The Hearth Program appears to be remarkably successful as a way to recruit and motivate community volunteers. The motivation generated in *animatrices* by the successful rehabilitation of malnourished children was notable and has established the cadre of *animatrices* as a valuable force for reaching the community with other primary health care activities.

The evaluation produced several other notable findings. The use of "positive deviant" mothers was more important as a device to convince the other mothers that the menu was a good idea (familiar, effective, economically feasible) than to discover the best local foods. The *animatrices* were selected because of their personality and interest, with little consideration given to finding a set of *animatrices* that lived spread out over the community. Further, the *animatrices* themselves decided which families they would work with. This approach caused some families to be left

out, but tapped into the mobile dynamics of the Haitian countryside and probably made a key contribution to the success of the program. The age of the participants was not correlated with nutritional status or gain in nutritional status over the course of the program, a surprising result in light of previously published findings.

The cost of the program is relatively small, about \$7.00 (U.S.) per program participant. This includes about \$3.00 for food per child (\$0.25 per meal), and another \$4.00 per child for all costs associated with salaries, transport, and documentation for *monitrices* and other program staff.

The evaluation faced several methodological issues that threatened the validity of the results. Issues related to external historical events, regression-toward-the-mean, seasonality, program learning, and age of participants were adequately dealt with, but selection bias and community effects were not fully resolved and their potential effects on the results remain uncertain. However, we believe that most of the unresolved issues will tend to understate the real effects of the program.

To address these methodological issues, future evaluations should be done prospectively, with samples that are representative of the population rather than of program participants. Future evaluations should study the contribution that individual program components (including deworming, feeding, hospital referral, and *monitrice* and *animatrice* characteristics) make to better nutritional status, as well as the interactive impact of GMP and Hearth Programs on nutritional status.

## INTRODUCTION

The Hearth Nutrition Model discussed in this paper has its historical roots in the Mothercraft Centers implemented in Haiti and other countries in the 1960s (Berggren *et.al.*, 1984; King *et.al.*, 1968; 1974; 1978). The Mothercraft Centers (known by the acronym "CERN," French for Centre d'Education et Rehabilitation Nutritionelle) used paid nutrition educators (called *monitrices*) to care for and feed moderate and severely malnourished preschool children daily for three to four months in community centers (Mothercraft Centers). To the extent possible, the mothers or caretakers of malnourished children were incorporated into the rehabilitation process at the centers in order learn to prevent future malnutrition in the children. The program used locally available foods as well as a special weaning food, and covered a broad range of child health topics beyond feeding; sometimes started vegetable gardens at the center; and tried to visit the home of each child at least once. While the immediate goal of the Mothercraft Centers was to rehabilitate individual children, the long-range objective was to eliminate severe childhood malnutrition in the community. Once this was achieved, the successful Mothercraft Center was to be closed and the *monitrice* transferred to a new community.

Numerous studies of Mothercraft Center Programs reported positive impacts in one way or another. For example, King *et.al.* (1968; 1978) and Berggren (1971) reported improvements in

food selection and preparation practices by mothers, in family diets, in nutritional status of participating children, and in the survival of younger siblings of participating children as a result of the program. Berggren *et.al.* (1985) found that the weights and heights of children participating in the program improved significantly more than country-wide advances. However, as Berggren *et.al.* (1984) noted, Mothercraft Centers had some serious limitations, including (1) they were expensive (about \$6,000 per center per year in Haiti in 1980); (2) slow to reach the entire needy population in a community (estimated at 10 years); (3) too dependent on animal protein rather than on local grains and legumes; and (4) became permanent fixtures in the community with associated problems of absenteeism and dependence.

To address these problems, Berggren and colleagues (1984) devised a modified approach working out of the Hospital Albert Schweitzer (HAS) in Haiti. The new model, called the "Nutrition Demonstration Foyer" (NDF), drastically shortened the period of exposure from three to four months to 12 days. The basic hypothesis was that 12 days was enough time to demonstrate that the malnourished child could be rehabilitated, because it was enough time for appetite to return, for the child to begin to smile again and to interact positively with its mother, and to gain some weight, thereby convincing the mother to continue the practices she learned in the NDF. The NDF also differed from the Mothercraft Centers in that they borrowed a local kitchen for two weeks instead of constructing a special fixed center, albeit modest. This increased the mobility of the program, permitting it to move from one community to the next more readily. The NDF tried to build on the strengths of the Mothercraft Centers, including the use of *monitrices* to plan and carry out the demonstration foyers, menus based on affordable local foods, teaching mothers through a learning-by-demonstration-and-doing approach, and referring children suspected of having serious illness to a hospital. The *monitrices* worked in three week cycles—two weeks to implement an NDF in one community, and one week to set up an NDF in the next community. With 20-25 children per NDF, each *monitrice* directly reached about 340-425 families per year.

Modified versions of the Nutrition Demonstration Foyer Program have been implemented and evaluated by Save the Children Foundation in several countries. As with the Mothercraft Center evaluations, positive findings of various sorts are reported. In Haiti, Dubuisson *et.al.* (1994) found significant reduction in moderate and severe malnutrition in foyer children relative to controls (the prevalence of moderate and severe underweight children dropped from 77 percent to 47 percent in program children after two years compared to a constant 63 percent in controls), although this finding may be compromised because potential confounders were not analyzed. In Bangladesh, Kaye *et.al.* (1994) reported significant reduction in the mortality rate in younger siblings of foyer children relative to controls, although this result may be compromised by unanalyzed confounders and regression-to-the-mean. Sternin *et.al.* (1996) reported dramatic improvements in Viet Nam in the nutritional status in communities where the NDF was implemented using a modified version of the NDF that resembles the Hearth Program in many ways and includes additional social and health components.

In 1993, Berggren and colleagues implemented a new version of the Nutrition Demonstration Foyer Program at HAS which they call the Hearth Program—"hearth" being the English translation of the French word *foyer*.<sup>1</sup> The Hearth Program retains most of the features of the earlier NDF program, but makes some key changes in procedures and goals. For example, the Hearth Program enlists volunteer mothers (called "*animatrices*") to perform the foyers rather than the *monitrices*, uses the hearths of the *animatrices* as feeding sites rather than borrowing community kitchens as is done in the NDF programs, and makes use of a positive deviant approach. The Hearth Program shares short-term goals (rehabilitate moderately and severely malnourished preschool children, and train and motivate the mothers of these children) and some long-term goals (maintain the rehabilitated nutritional status of participants, and reduce the prevalence of malnutrition in the community) with the NDF program, but the Hearth Program also hopes to "jump-start" a network of volunteer mothers who help the hospital provide improved primary health care services in the communities.

The authors of this paper traveled to HAS in Haiti in May 1996 to support the efforts of Dr. Warren Berggren and his colleagues to describe and evaluate the Hearth Program at HAS. They were able to use data previously collected by Dr. Berggren and Jeff Grant, and with their help, completed the analysis reported here.

## **DESCRIPTION OF THE HEARTH PROGRAM**

This analysis dissects the program into its various components, discussing the potential influence of each component on the success of the program in improving the nutrition of the index participating child and other children in his/her family and community. This discussion focuses on the Hearth Program as implemented by Erve Bottex, Mona Cassion-Menager, and Warren and Gretchen Berggren in the Artibonite Valley service area of the Hospital Albert Schweitzer (HAS) consisting of some 200,000 persons.

### **Growth monitoring and promotion program (GMP)**

The HAS GMP program, run by the HAS *Agents Communautaires* (called "*agents*"), weighs under-five (years of age) children (U5s) every two months at community gatherings called Rally Posts. These posts provide an opportunity for immunization, vitamin A distribution, and other public health interventions, as well as weighing and counseling. There is no comprehensive process to get mothers to come with their U5s for weighing, which is evidenced in the low attendance figures—only about one third of the eligible children attend the weighings. The cultural environment in the Haitian community may be responsible in part for this low attendance rate; compared to other countries such as Indonesia, there is minimal community cohesiveness or

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<sup>1</sup> Following the practice of Dr. Berggren, this paper uses the term "hearth" to refer to the program implemented at HAS since 1993 and its derivatives to clearly distinguish them from the earlier NDF program. The term "foyer" is reserved here to refer to the actual feeding sessions rather than the entire program.

solidarity, and few ongoing collaborative efforts among households. "People mind their own business," according to one experienced HAS Haitian field supervisor, "except for church-related interactions, and encouraging others to attend a communal weighing session may not be a customary type of behavior." Whatever the cause, the low rate of participation by the mothers who participate in the Hearth Program makes it hard to believe that the GMP program has much influence on mother's awareness of malnutrition, or their knowledge of the principles of a good diet and practical food substitution possibilities to ensure a balanced diet at reasonable cost.

The GMP and Hearth Programs can support each other. GMP provides a mechanism for on-going follow up of the children who complete the 2-week feeding program. The *animatrices* may increase attendance in the GMP program by stimulating mothers in their neighborhood to attend. Prior to the start of the Hearth Program, there were no community workers other than the *Agents Communautaires* to perform this role; the cadre of *animatrices* had not yet been formed. Furthermore, the results of the evaluation reported below suggest the possibility that the GMP program may be more successful in reducing severe malnutrition, and that the Hearth Program may work better on mildly malnourished children.

### ***Monitrice* qualifications and activities**

The *monitrice* functions as trainer and supervisor for the *animatrices*. These women have an eighth grade or higher education and receive initial training for two months, with an emphasis on skills in nutrition program activities and the management of the foyers. During the period of intensive hearth program activities, the *monitric*es spend one week arranging for the *animatrice* 5-day training course and weighing activities, one week giving the course, and the subsequent week monitoring the first week of feeding. During the first week, they help the new *animatrices* to find their 15 families and obtain preliminary information about these families. During the third week (first feeding week), they provide the funds to the *animatrices* for the second feeding week, as well as completing data collection and documentation about the households served by each *animatrice*, including lists of the participating children for each foyer and other reports. This cycle is then repeated for the next area and group of *animatrices*. During the week of arranging, they also conduct the 4- and 8-week weighings of the children who have completed their foyers. In a typical cycle, time is available, especially during the second feeding week, for the *monitric*es to conduct monthly meetings with their *animatrices*, teaching them the new preventive initiatives in exclusive breastfeeding, family planning, and AIDS and STD prevention, as well as hearing reports of local activities and problems for immediate or later problem solving.

A range of skills must be acquired by the *monitric*es to be able to conduct the training course and to motivate and lead the group of *animatrices* during the foyer and afterwards. Skills in training and motivational leadership are needed in addition to skills in various activities related to nutrition. The program leaders comment that much of the success of the HAS foyers is due to the dedication and skill of the *monitric*es.

## **Training course for *animatrices***

The training course for *animatrices* conducted by one or two *monitrices* is critical to the success of the Hearth Program. Based on principles of effective adult learning, it stresses learning by discovery as well as actual practice. The *animatrice* training takes five days.

**DAY ONE:** On the first day the *animatrices* are informed about the formation and implementation of the foyers and are motivated to make a commitment to being an *animatrice*. They also learn how to interpret a growth curve on a standard growth card and to identify malnourished children on the basis of that curve or a single weight. Finally they learn to carry out a simple 24-hour recall dietary history that focuses on the types of food rather than the quantity of food consumed. They are assigned to seek out a child with normal nutrition or mild malnutrition on the basis of his/her growth card (a positive deviant), and then to carry out the simple 24-hour recall dietary survey on that child, for reporting the next day.

**DAY TWO:** The next day each *animatrice* reports the components of the diet of the positive deviant child they studied. The *monitrice* tabulates these reports, noting the frequency that each type of foodstuff was included in the positive deviant diets. She then reports these frequencies to the *animatrices* in the form of a menu based on the most frequently used foods in the "positive deviant" diets. Quantities are taken into account by the *monitrices* at this point in order to provide a nutritionally balanced menu. Together the *animatrices* and *monitrice* estimate the cost of each item in the marketplace, usually accompanied by expressions of concern that the items are too expensive and reassurances by the *monitrice* that each of these food items are in fact being purchased daily by their neighbors.

**DAY THREE:** Each *animatrice* is given money for purchasing food for two children according to the menu of most frequent items. Meanwhile, one of the HAS program staff members purchases the same items at the same time in the same market to breed an atmosphere of competition for getting the lowest price. The *monitrice* weighs the purchased items to estimate their nutritional value in calories and proteins. This allows the conclusion that a nutritionally complete and full diet can, in fact, be purchased for this same amount of money.

**DAY FOUR:** Called the Rehearsal Day, small teams of *animatrices* prepare the specified diet and have it ready by 8 or 9 o'clock in the morning for consumption by unspecified neighborhood children, in order for the *animatrice* to see that the food is satisfying to the children, is sufficient for children up to 5 years of age, and also that the process of preparation early in the morning is feasible. That afternoon the *animatrice* trainees visit all of their 15 selected homes to get all the U5 children to attend the weighing scheduled for the following day.

**DAY FIVE:** When the U5 children and their parents (usually mothers) have assembled, all of the U5s are weighed by the *monitrice*, together with the *animatrices*. The program is explained to the parents, including the reason for giving children a balanced meal made up of local foods used by mothers of well-nourished children that is affordable. Parents of children with moderate or

severe malnutrition (less than 75 percent of the standard weight-for-age median) are then invited to participate in the foyers. Most accept or are persuaded, and frequently some mildly malnourished children are also accepted into the program.

As might be expected, experience up to the present shows that the menus which are derived from the "survey" of positive deviants turn out to be nearly identical from place to place, as does the cost of these menus in the local markets. Because of this, there has been some pressure on the program to shorten the course and merely prescribe this effective menu without having the trainee *animatrices* carry out the survey or actually practice buying the menu in the market. The program leaders have strongly resisted this pressure, both because of their conviction that the "discovery approach" to adult education is valid and because their experience during the process of meeting with and convincing the mothers of poorly nourished children to participate in the foyer convinced them that the derivation of the menu from local homes and the local market is critical to the success of that "marketing" effort.

### ***Animatrice* recruitment and activities**

The *animatrices* are mothers who volunteer to carry out the Hearth Program. These same women, following the completion of the Hearth Program, are currently being trained to do other community-level health related activities, such as promotion of exclusive breastfeeding, promotion of AIDS and STD preventive measures, and family planning promotion.

The ideal form of *animatrice* recruitment probably would be to have communities themselves select (perhaps by election) women to serve this role. In practice, the *Agent Communautaire* responsible for a particular community identifies women from that community who, in his opinion, can do the job well, and then asks them to volunteer. We found the *animatrices* to be women with attractive personalities, with interest in the work, and with obvious leadership qualities. Given that the *Agent* must continue to collaborate with the *animatrices* in his or her area (about 90 percent of *Agents* are men), this approach may be both practical and effective in selecting women who are likely to be energetic and capable, although it is susceptible to inappropriate influence.

The *animatrice* is the front-line worker who is the direct contact with the mothers of malnourished children, and hence, is one of the keys to the success or failure of the program. Responses of the mothers in various areas where the program has been in action for some time indicate that they clearly identify "their" *animatrice*, and have allegiance to her.

Trained in the 5-day program just described, these volunteer mothers conduct foyers for 12 days, preparing the daily morning meal and overseeing its consumption by the selected malnourished children from the 15 houses in their circle of responsibility (usually two to six children). They are responsible for ensuring that the children attend and consume the food. Our interviews with a few *animatrices* indicated that they responded to the request for them to volunteer because of their desire to serve their community, because they felt an obligation to repay help that had been

given to them by the hospital, or because they felt that the program was worthwhile and they would benefit from participating.

Following the training, they are given the funds to pay for the food, quite a substantial sum in local terms; this helps to convince them that the program is serious. They also know that the families whose children have been selected for participation know precisely what the *animatrices* are supposed to do with the money, including the particular foodstuffs that comprise the menu which they are to serve the children and the cost of these foods in the local market. Both these influences help to ensure that the *animatrices* carry out their accepted tasks as designed by the program.

In addition to these motivational inputs, as the foyers progress, the *animatrice* sees children transformed by the diet change from being lethargic, passive, and often lacking in appetite, to becoming bright, energetic children who eat ravenously the comparatively huge amounts of food provided. This dramatic change in behavior helps to convince the *animatrice* that her efforts have had an impact, which appears to strengthen her commitment to the program and to the balanced menu and more frequent feeding pattern the program recommends. However, this process of increasing conviction and deepening commitment by the *animatrices* has not been objectively assessed.

Following the completion of the 12 days of foyer meals, the *animatrices* are expected to work with the *monitrices* to carry out the 4-week and 8-week follow-up weighings. Some of the *animatrices*, it is reported, take an activist approach to continued contact with the households of the children who have been in their foyer group and visit and interact with the mother (perhaps with other caretakers as well) to encourage them to continue the aggressive feeding efforts. It has not been determined what proportion of the *animatrices* continue to function in this fashion as motivators following the foyers, nor how long such interaction persists for those who are doing it.

While the creation of the cadre of *animatrice* volunteer mothers was ostensibly for the purpose of implementing the nutrition foyers, the HAS has begun to extend the role of the *animatrices* to other preventive community programs as well. The first such added program was an effort to encourage exclusive breastfeeding for the first six months of life. Like the nutrition foyers, this program too is likely to be maximally effective if it is combined with ongoing monitoring of growth and health status, so as to be able to visualize the positive impact of exclusive breastfeeding in preventing illness and supporting the continuous weight gain which leads to energetic infants that every mother admires.

The HAS community health staff believe that this emphasis on activities with visible results (unlike many other preventive efforts for which the product is the absence of something) is an important motivator and keeps the *animatrices* committed to making the efforts requested by the program while continuing to be unpaid. Not that they prefer this status—they frequently request payment of a salary for their work. But when offered the chance to quit and allow someone else

in their neighborhood to take their 15 households, they have universally chosen to continue to serve without pay. HAS is extending the *animatrices'* activities to include AIDS and STD prevention, and plans to add other preventive efforts in the future. HAS has not planned for these workers to function in the capacity of local providers of curative primary health care, such as ORT for diarrhea, because HAS wishes to give maximum emphasis to preventive activities.

With some 1800 *animatrices* scattered over the Artibonite Valley service district of the hospital, the Community Health Department now has a channel for reaching into every household with information and motivation for preventive efforts. Indeed, the creation of this cadre of volunteer, multipurpose, community-based workers with the potential for impact well beyond nutrition alone, must be taken into consideration in calculating the benefits of the Hearth Program relative to its costs. The high drop-out rate of volunteer community health workers seen in many other public health programs in other countries does not seem to be a problem in this program, although objective assessment of the proportion of *animatrices* who are continuing to function actively has not been carried out.

### **Step-by-step implementation process**

Although described in a scattered manner in the above expositions, it is useful to characterize the full process used by the Hearth Program. The first step in the process after the training of the *monitrices* is the recruitment of the *animatrices* by the *Agent*. While the program hopes that the households to be served will participate in the identification and selection of the *animatrices*, it has not been determined to what extent this takes place. From the point of view of the *Agent*, s/he wants an *animatrice* who will be willing to work and is easy to collaborate with, in particular for later weighing activities. Whatever the level of household participation, it is likely that the households selected for participation do hear about the Hearth Program to some extent at this point.

Following the first meeting of the *monitrice* with the selected *animatrices*, as part of the 5-day course of *animatrice* instruction, the *animatrices* are required to obtain or complete a list of house numbers, children, and birth dates from the 15 households they chose to work with, as part of completing the initial "picture" of the area. A draft of the list of houses and children has already been prepared by the *monitrice* in concert with the *Agent*. Having already been introduced to the program, the *animatrices* are able to tell the mothers during this visit what to expect, and they invite them for the weighing of all their U5 children, which will take place on Thursday, two or three days later.

Following their teaching on the growth card, the *animatrices* circulate among their 15 households to identify a child whose weight-for-age is normal by looking at the growth cards of those children who have participated in the regular weighing program. The mothers of these children are then interviewed by the *animatrice* to determine the diet they are feeding these children. They record the names of the foods most frequently fed to the children, but do not attempt to estimate the quantities of each type of food fed to the child. This process also attracts the

attention of the 15 selected households and others in the neighborhood and begins to confirm the idea that good nutrition is possible in this environment using the foods available to every household, even those which are poor. As noted above, the *animatrices* then collectively determine the menu to be served to the children in the households in the area being supervised by a single *monitrice*, based on the menus being served by the "positive deviant" mothers. It should be noted that the *animatrices* may or may not be such "positive deviant" mothers—a number of *animatrices* have had children who were selected to participate in the foyers because they were underweight.

The group weighing is accompanied by administration of deworming medicine which helps to ensure full participation by the targeted mothers and children and may contribute substantially to the improved growth of the participating children, although the present evaluation does not attempt to separate out the influence of the deworming. At the weighing, the mothers are informed somewhat more fully about the purposes and activities of the program. The weighing identifies those children under 75 percent of the reference weight-for-age median—moderately or severely malnourished according to the Gomez classification—who are invited to become the participants in the program. Although the program established the policy of only inviting children below the 75 percent cutoff, in fact, the foyers included many mildly malnourished children above the cutoff. (The sample of 192 program children used in the evaluation included 52 [27 percent] above the 75 percent cutoff.)

After the weighing, the mothers of the underweight children are asked to stay behind and are given a full description of the program by the *monitrice* in the presence of the *animatrices*. This talk includes a full description of the process used to determine the menu that will be served to the children at the foyers, namely, the menu derived from the foods most frequently fed by the "positive deviant" mothers to their well nourished children. The similarity of the positive deviant mothers to those in attendance is emphasized: they live in the same neighborhood, usually in similar economic conditions, and buy in the same marketplace at the same prices as the other mothers. Thus, the mothers know that they should be readily able to provide the same menu to their own children. The HAS program staff noted that many mothers are insulted by the invitation to participate because it carries the insinuation that they have not provided adequate care and food to their own child, and as a result, some mothers do not readily agree to participate. In these cases the *animatrices* negotiate in the community with the reluctant mothers using enticements such as, "participation will enable us to find out if your child has a disease," and "if your child does not grow adequately, s/he will be referred to the hospital for care." Refusals to participate are described as rare, although the proportion has not been measured objectively nor has it been linked to whether or not visits and negotiating by the *animatrices* take place.

The following Monday the *animatrice* prepares the first of 12 meals at her own hearth. The target time for feeding is set for between 8 and 9 am, a time chosen because it does not compete with any other mealtime in the usual household and because it requires some hours to cook the beans needed to provide the bean sauce, the standard source of protein in the usual menu. Given that there is a wide spread of ages, and the distance is not far, some children come to the foyer

themselves, while others are brought by their mothers or older siblings. It should be noted that this foyer session is not intended to be a mechanism to provide the *animatrices* an opportunity to harangue the mothers. Rather it is aimed almost entirely at getting a nutritionally rich diet into the participating children.

About 3.5 children participate in the average foyer, which suggests that about 2.5 children out of every 15 households with children are moderately or severely malnourished.<sup>2</sup> Haiti is just emerging from a period of economic hardship related to the embargo and blockade of Haiti during its political changes. It is quite possible that fewer malnourished children would be found in 15 houses at a future time, should the program be repeated. This might require asking each *animatrice* to select more than 15 households to ensure a similar number of children for each foyer as at present, or a reduction in the number of children attending if the same admission criteria and families per *animatrice* were used.

Participants eat the foyer meal for 12 days (daily except Sunday). The menu is changed from day to day with regard to type of grain (rice, corn) and type of vegetable (various types of leaves, okra, tomatoes), but bean sauce seems to be a constant component, ensuring adequate protein intake.

During this period the more severely malnourished children, who often arrive listless and disinterested in food at the beginning of the 12 days, are "cured" by the enhanced nutritional intake. They are often transformed, becoming active, playing, losing their cranky whining or crying mood, and developing such an intense appetite that they often are able to consume amounts of food at a single foyer session that astound their mothers. This behavior change alone is a very powerful motivating factor for the mothers of these children, as well as for the *animatrice*, providing visible evidence that the recommended menu really works. It would be of interest to document the proportion of participating children who exhibit this dramatic behavioral transformation.

Following the two weeks of foyer feedings, full responsibility for feeding reverts to the mother, who is encouraged to continue the foyer menu. The HAS program in Haiti does not specifically encourage an increase in feeding frequency, while the Bangladesh Hearth Program, in contrast, has set the feeding of these children more frequently as a specific behavioral target. The HAS program also has not measured changes in the frequency of feeding at various times following the foyer sessions.

Repeat weighings are scheduled by the *monitrices* at four and eight weeks following the foyers. The *animatrices* are expected to motivate the families of the participant children to come. *Ad hoc* observations have noted that the children who have benefitted least from the foyer feedings

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<sup>2</sup> The foyers included nearly all of the moderately and severely malnourished children between the ages of 12-60 months from the 15 families served by each *animatrice* and some of the mildly malnourished children. Twenty-seven percent of the program group was mildly malnourished, and 73 percent was in the moderate and severe category. Thus we can estimate that 73 percent of the 3.5 children attending the average foyer, or about 2.5 children, were moderately or severely malnourished in each 15 households.

are often brought to the weighing by a neighbor or older sibling, not by the mother. The weighings are accompanied by counseling aimed at encouraging the mothers to continue the foyer diet.

Children who have not gained at least 200 grams during the eight weeks are considered failures and are referred to the Hospital Albert Schweitzer for assessment and treatment by a pediatrician. A small sample indicates that approximately 30 percent of the participants in the HAS program fall into this category. Of these, about 30 percent are found to have tuberculosis and are treated accordingly. The remaining 70 percent of the failures are a mixture of problems, some medical, some social. Detailed assessment of this remainder has not been carried out up to this time.

Following the 8-week weighing, the children are expected to attend the routine weighing conducted by the *Agent* at nearby Rally Posts. The *animatrices* are expected to collaborate with the *Agents* in getting the children to attend, and several *animatrices* reported that they continue to visit the families of the children that were in their foyers. No assessment of participation in regular weighing by the program children as compared to control children, nor any formal assessment of the activities of *animatrices* in continuing to motivate the mothers of their foyer children has yet been made.

A recent addition to the effort is the Women's Microenterprise Program (WMP). This program picks up 8-week foyer failures who show continued failure to grow at one year. This year 65 women were offered the opportunity to participate in the WMP, and 53 accepted. Following a 10-session training program, the women worked in teams to prepare mid-morning lunches for five schools, based on the same dietary principles used in the foyers. Program personnel visit the homes of participating mothers during their work periods, and where adequate arrangements for care of the children are absent or where the children fail to gain weight during the early weeks of the effort, the mothers are eliminated from the program. A complex financial arrangement for repayment of loans and required savings ensures that the mothers who complete the four to five month program will have a sizable amount of capital to invest in some commercial enterprise (approximately US\$50). This component of the program has not been formally evaluated, but in *ad hoc* interviews, eight participants were uniformly unable to describe in any detail what they plan to do with the capital they will receive. Most plan to use it for some sort of petty trading, hoping for a small profit on sales of household food items. None indicated hopes to initiate either production of a salable product (including cooked food) or service activities. One did indicate her intention to sell produce from her own garden.

The cost of the HAS program is running about \$7.00 (U.S.) per program participant. This includes about \$3.00 for food per child (\$0.25 per meal), and another \$4.00 per child for all costs associated with salaries, transportation, supervision, and documentation for *monitrices* and other program staff.

## Comparison with other programs

The design of the HAS Hearth Program is the result of several decades of experience and learning from other efforts to rehabilitate and prevent malnutrition in preschool children. The lessons from those previous attempts, both positive and negative, and the resulting similarities and differences of the HAS Hearth program to the programs from the past is instructive for understanding the operation of the current Hearth program. This section discusses some of these similarities and differences, and the reasons why the HAS team chose the approach that it did. Much of the information on Mothercraft Centers and NDF programs comes from Berggren *et.al.* (1984).

The greatest contrast to the Hearth Program is hospital-based nutritional rehabilitation, which was and is still being practiced at HAS for those very severely malnourished children who find their way to the hospital, usually for illness. In fact, part of the rationale for the Hearth Program is that its success will move the care of most malnourished children out of the hospital and into the community, thus reducing the number of children admitted to the hospital for malnutrition. Hospitals are typically far from the homes of the majority of malnourished patients, making access to care difficult for many. Management of a malnourished child in a hospital “medicalizes” malnutrition and its care, leading to the inappropriate belief that it is a medical rather than a social or behavioral problem which can and should be handled in the home. Most malnourished children managed in the hospital receive medicines, leading mothers to think that the medicines are responsible for the reduction in malnutrition and the return of energy and life to the child. While Mothercraft Centers based at hospitals often may be effective in teaching mothers of malnourished children (when a mother is able to attend her child there), it is unlikely that those lessons are spread widely in the community on her return home. Hospital care of malnutrition is very costly and can usually handle only a comparatively few children during a year, thus not significantly reducing the entire community’s nutrition problem. It obviously represents an alternative suitable only for the sickest and most severely malnourished children because it has almost no public health or epidemiologic impact.

The earliest community alternatives were fixed “Mothercraft” Centers located in a community building. The Haitian version of this strategy, called the CERN, was run by a “*monitrice*” and accepted 15 to 30 children at a time, many more than those attending a single *animatrice*’s foyer in the HAS Hearth Program. The CERN activities went on six days a week for three to four months for each group of children, making it difficult for these programs to deal effectively with the overall community load of malnutrition in a large population. The children stayed for most of the day, rather than just a couple of hours as in the current Hearth Program, and mothers typically would attend once or twice in two weeks. The mothers who were present received structured teaching (some might say preaching) every day for 1-2 hours, rather than the learning-by-demonstration-and-doing approach seen in the HAS program. CERNs usually emphasized the use of a special blend of cereal with legume (*akamil*) rather than the ordinary foods from the market emphasized in the HAS foyers, again making it appear that a kind of “medicine” was needed to overcome malnutrition. Menus were determined by “experts” at universities rather

than derived from the practices of "positive deviant" mothers living in the same neighborhood. While communities in which a CERN was located might well show a reduction in overall rates of malnutrition, the fixed location of CERNs meant that more distant communities were likely to show little impact of the effort. CERNs had the potential for being mobil, but in practice often stayed in one place for a long time, thus being difficult for many mothers to access. The CERNs functioned like a kind of SWAT team, coming in from the outside for an extended period of time, with little of the community mobilization which is at the heart of the Hearth approach, and no ongoing weighing program (growth monitoring) to provide a focus for follow-up assessments and continuing motivation of the mothers.

It was the high cost of the CERN (some \$6,000 per year for one center in 1980), the few number of children able to be served per year (only about 100, when ten times that figure was needed for the typical community) because of the three to four month duration of each session, and the lack of mobility leading to poor coverage of the malnourished population, which led to the next approach used in the Haitian context, the Nutrition Demonstration Foyer (NDF).

The NDF was the immediate precursor of the HAS Hearth Program. Developed in the mid-1970s, it combined the demonstration or "mothercraft" elements of the CERNs with an ongoing nutrition monitoring program, and limited the demonstration period to two weeks rather than three to four months. This shorter period, while not completing the rehabilitation and recovery process, was sufficiently long for the improved diet and increased quantity and frequency of feedings to produce the improvements in the malnourished child's level of activity and interaction with the mother which would convince her that the approach was effective. She could then complete the process herself, with monthly monitoring of the child's weight gain to provide ongoing support.

The NDF approach uses a loaned community kitchen (the foyer or hearth) in a 3-week cycle of activities. During the first week, the *monitrice* makes advance visits to the community, negotiates for the kitchen to be used, and obtains agreement of the mothers to attend every day for the two weeks of sessions. Instead of including only the malnourished children, nearly all U5s from a particular village location are included. All are weighed and the result on a Road-To-Health Card is explained to the mothers. The *monitrice* then stays in the village and leads the daily sessions in which she and the mothers cook and administer the food to the children. In the following week the *monitrice* prepares her report and carries out the advance visits to the next location. With 20-25 mothers in each "course," she can cover 340 to 425 women in a year.

Some important differences between the earlier NDF and the subsequent HAS Hearth Model include

1. Each NDF foyer contains a much larger group of children (and mothers), 20-25 versus 3-4 in the HAS Hearth Program foyers. This requires large scale cooking with special larger pots provided by the *monitrice*, rather than the simpler family-scale cooking with ordinary sized pots of the Hearth Model. Note, however, that the HAS Hearth Model

includes 8 to 20 new *animatrices* per 3-week cycle, each of whom feeds an average of 3.8 malnourished children, making for a total productivity of from 30 to 76 children per cycle, so the output is potentially greater with the Hearth Model.

2. In the NDF model there is no local volunteer mother to take responsibility; the *monitrice* works directly with the participating mothers. In the Hearth Model, some 8 to 20 village women per cycle become *animatrices* who promote the new diet and feeding approach, and are subsequently available for other health promotion activities in addition to nutrition.
3. Only one *monitrice* runs the NDF program cycle, while the Hearth Model currently uses two *monitric*es to run each cycle. HAS believes it can cut back to one *monitrice* per cycle, but so far they are working in pairs.
4. The daily sessions are longer in the NDF model, 8 am to 2:30 pm, with much more emphasis on structured education and demonstration activities conducted by the *monitrice*. This contrasts with the shorter time—about an hour sometime between 8 and 10 am—and the informal interaction of the mothers with the *animatrices* during the Hearth Program foyers. In the Hearth Model, the emphasis is on just getting the food into the child and letting the changes in the child speak for themselves. The only structured education for the community mothers in the Hearth Model is at the weighing session the week before the foyers begin, when the *monitric*es explain the process and its rationale to the mothers whose malnourished children have been selected to participate. There is extensive education of the *animatrices*, however, which is likely to be reflected in both their actions and in the messages that they convey to their neighbor mothers in informal conversations during the two weeks of feeding and beyond.
5. In the NDF, the menu is “imposed” by the *monitrice* rather than being developed from the diets of the better nourished children in each locality as is done in the Hearth Model. The NDF program does use local foods, however, not *akamil* or other special mixes.
6. The NDF has no market exercise in which the *animatrices* prove to themselves that they can buy the ingredients for a healthy diet at their own market at an affordable price.
7. The NDF foyers provide three meals a day—a morning snack, a mid-day balanced meal, and an afternoon snack. The Hearth Program provides only one meal per day.
8. The NDF has no formally defined mechanism for referral of a particular group of children to a source of medical assessment and care, in contrast to the Hearth Program which formally refers those who have failed to progress at the 8-week weighing.
9. There is no income generation component in the NDF model. The Hearth Model has recently added an income generation component.

Both the NDF and the Hearth Programs in Haiti put emphasis on community mobilization, but the direct involvement of the participating *animatrices* in the Hearth Model seems likely to be more effective in stimulating changes in community attitudes and practices over time than the NDF programs which rely solely on *monitrices*.

Two other implementations of the Hearth Model besides that at HAS are reported in this volume, one in Vietnam (Sternin *et.al.*, 1996) and the other a more recent implementation in Bangladesh by World Relief Corporation (Filaramo, 1996). These other programs are very similar to the Haitian one, but there are some important variations which may be particularly appropriate in the Vietnamese or in the Bangladesh setting:

1. In the Viet Nam program, more attention is given to community mobilization and to the education of the whole community. Repeated meetings are held in the community in which commune leaders as well as mothers are actively included. These meetings are the occasion for structured education of those who attend.
2. Based on the community weighings, the Vietnamese educators prepare "pie-charts" showing the proportion of the village's population suffer various levels of malnutrition. These charts appear to have been particularly effective in convincing all the community members that they do really have a malnutrition problem in the community.
3. All three programs do 24-hour dietary recall data collection, but whereas the Haiti program seeks out well nourished children and assesses only their diets, the Viet Nam program collects dietary information from both well nourished and poorly nourished children, and then contrasts it. This appears to be particularly useful, because the mothers of well nourished children appear to include additional nutrient dense components (e.g., shrimp or crabs from irrigation channels) in their children's diets. In Bangladesh, they find that the components of the diets of the well nourished and poorly nourished have similar nutrient dense components, but the variety and frequency of feeding is greater in the better nourished children. Thus their recall survey emphasizes frequency of feeding and variation in components.
4. In Bangladesh they had trouble finding a meal made from generally used local ingredients that would reach 700 calories. Crushed peanuts were cheap and very acceptable and so were incorporated, even though they were not used much by positive deviant mothers.
5. In Haiti the volunteer mothers participate in a market exercise in which they buy the recommended diet. In Viet Nam, the mothers of the malnourished children are asked to contribute food each day as their "entry ticket" to the foyer/kitchen.
6. In Haiti, each foyer session is only two weeks in duration. In Viet Nam, the special food feeding and mother education is extended beyond two weeks or repeated for those mothers whose children have not yet responded with improved growth.

These differences, while minor, may be vital in certain environments to the success of the program.

## **EVALUATION OF THE "HEARTH" PROGRAM AT THE ALBERT SCHWEITZER HOSPITAL**

### **Program and evaluation objectives**

The HAS Hearth Program has several short-term and long-term objectives. The short-term objectives include the nutritional rehabilitation and maintenance of the pre-school children who participate in the program. The long-term objectives include reduction of the prevalence of malnutrition in the communities served and the development of a network of volunteer mothers working with the hospital to provide improved primary health care services throughout the area served by the hospitals.

The present evaluation is limited to one of the short-term objectives, namely, the reduction of weight-for-age malnutrition in program participants over a period of one year. This evaluation does not address the issue of immediate rehabilitation of the moderately and severely malnourished program participants during the program, nor the practices and attitudes of the mothers. Nor does it address the long-term objectives of reducing the prevalence of malnutrition in the *population* (in contrast to the prevalence in program participants), or creating a sustaining network of effective volunteers. These are important limitations because the findings of this evaluation will not be adequate to judge the overall value of the program. Nevertheless, the evaluation may be able to suggest whether the program is headed in the right direction and how a more definitive evaluation could be undertaken.

### **Evaluation methodology**

This evaluation was initiated in 1994 by Hospital Albert Schweitzer (HAS) to study the 1-year impact of the program on the nutritional status of participating children. Data collection and preliminary analysis was done by Jeff Grant under the direction of Dr. Warren Berggren. Details of the procedures used in data collection and some preliminary results are given in a paper by Grant (1995). The authors of the present paper traveled to HAS in May 1996, where they worked with Dr. Warren Berggren and others on the hospital staff to further the evaluation.

The evaluation uses a quasi-experimental design, with pre and post measurements of simultaneous program and control groups. For the program group, pre and post weighings were obtained for a sample of 192 children who participated in the hearth program during the first six months of the program (October 1993 - March 1994, a period referred to as the intervention period). Corresponding pre and post data were obtained for a control sample of 187 children who did not participate in the program, but who had similar characteristics to the program children. The program group was a systematic sample of all program participants, obtained by selecting every seventh participant from the list of children who participated in the program

during the intervention period, with substitution of the next child on the list when the child could not be located. There were 49 substitutions. The 192 children in the program sample came from 59 different communities. The control group included preschool children from communities similar to the program communities, but which had not yet participated in the Hearth Program and who had road-to-health cards showing that they were underweight during the intervention period (October 1993 - March 1994). Thus the control group was similar to the program group with respect to age and nutritional status, and the communities of the two groups were similar, although no attempt was made to match individual control group children to individual program group children. The two groups are dissimilar in the sense that all children in the control group were in the GMP program because they all had road-to-health cards with a weighing recorded at the time of the foyer, while the program group did not necessarily participate in the GMP program. Note that the participating children were not representative of all the preschool children in the program communities because the program contained a preponderance of moderately and severely malnourished children, and that the samples comprising the program and control groups may suffer from selection biases as noted below in the section on evaluation results.

A team of two (observer and recorder) went to the field about one year after the intervention period to find and weigh the children selected in the program group. The pre-weights were available from the program records. To obtain the control sample, 154 Rally Posts were assembled in all the villages that had not yet participated in the program. A 3-person team identified the children who qualified for the control group, recorded the pre-weights from their road-to-health cards, completed and recorded the post-weighing, and gave various other health services. Whenever possible the younger siblings of the children in the control group were weighed and the mothers were questioned about younger sibling mortality. The data was collected in two distinct phases: one for foyers implemented during October-December 1993, and the second for foyers implemented January-March 1994.

In addition, two focus groups of mothers of program children were held. One focus group included the eight mothers of the program children with the largest gains in weight-for-age in the year following the program; the other included the eight mothers of the program children with the smallest weight-for-age increments.

The data were entered into EPI-INFO and Paradox files at HAS in the Summer of 1995. The data are organized by treatment group (program and control) and by phase (phase 1 is October-December 1993, phase 2 is January-March 1994). Each file contains the following variables:

- Case identification number
- HASNO (hospital identification number)
- Name, sex, and resident community of child
- Birth date of child
- Name of volunteer mother for program children
- Date of pre-weighing and of post-weighing
- Weight in kilograms at pre-weighing (weight<sub>1</sub>) and post-weighing (weight<sub>2</sub>)

Weight gain ( $\text{weight}_2 - \text{weight}_1$ )  
WAM as calculated from  $\text{weight}_1$  and  $\text{weight}_2$   
WAM gain ( $\text{WAM}_2 - \text{WAM}_1$ )<sup>3</sup>  
WAZ as calculated from  $\text{weight}_1$  and  $\text{weight}_2$   
WAZ gain ( $\text{WAZ}_2 - \text{WAZ}_1$ )<sup>4</sup>  
Phase (from the file organization, not as an explicit variable)  
Program (from the file organization, not as an explicit variable)

The WAM and WAZ variables were calculated using EPI-INFO by HAS and Grant. Note that information was *not* obtained on the results of the 4- and 8-week weighings; which program children were referred to the hospital as a result of the 8-week weighing; the diagnosis, treatment or outcome of referred children; or whether or not the program children had a Road-to-Health Card.

Field observations and preliminary summary results were reported by Grant (1994) following data collection. Burkhalter and Northrup traveled to HAS in Haiti in May 1996 where they worked with Warren Berggren and the HAS staff to learn about the program and to begin the analysis of the sample data obtained by Berggren and Grant. They continued the analysis of the qualitative and quantitative data at the BASICS offices after returning from Haiti.

## Evaluation results

**Early report.** Grant (1994) reports preliminary results. In the Hearth Program participants, the percentage of positive WAM and WAZ increments were 52.2 percent and 58.5 percent respectively, compared to only 40.6 percent and 44.4 percent in the control group. Grant compares the nutritional status and mortality rate of younger siblings of the program and control group children. More younger siblings of program group children suffered moderate or severe malnutrition (13 of 53, or 24.5 percent) than siblings of the control group (5 of 31, or 16 percent) while fewer younger siblings of program group children died during the previous year (two, including one stillbirth, or 20 per 1000 livebirths) than younger siblings of the control children (four, or 100 per 1000 livebirths). Finally, Grant reports that there were no discernable differences between the focus groups in terms of feeding practices, hopes for the children, husband's roles and play activities. Both groups had very positive feelings about the foyers.

**Effect of program, without accounting for confounders.** The four indicators of 1-year change in nutritional status in Table 1 all show slightly higher gains in the program group than the control group, but only one of the four differences (percent (%) with positive WAZ gain) is close to being significant ( $p < .08$ ). Small improvements are present in both the program and control

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<sup>3</sup> WAM is Weight-for-Age as percent (%) of reference median. WAM1 is WAM at first weighing. WAM2 is WAM at second weighing.

<sup>4</sup> WAZ is Weight-for-Age Z-score. WAZ1 is WAZ at first weighing. WAZ2 is WAZ at second weighing.

groups which underscores the importance of a multivariate analysis that accounts for confounders and as we shall see, that analysis shows a much larger and more significant program effect than appears in Table 1.

Item	Program	Control	Significance of Difference
Sample size	192	187	
Average WAZ gain	0.13	0.06	p = .27 (t-test)
Average WAM gain	0.83	0.09	p = .27 (t-test)
% with Positive WAZ gain	58.3% (112/192)	48.7% (91/187)	p = .08 (Chi-sq)
% with Positive WAM gain	51.0% (98/192)	46.0% (86/187)	p = .33 (Chi-sq)

Dubuisson et.al. (1994) reported the change in percentage of moderately and severely underweight children for a similar Nutrition Demonstration Foyer Program in Haiti relative to its control. Table 2 compares the Dubuisson *et.al.* results to similar statistics for the HAS data. The results show a more dramatic effect in the Dubuisson study than in the HAS data. Although the comparison is interesting, these results are not conclusive judgements on the impact of either program because they do not adequately account for confounders. Further, the percentages from the two studies do not reflect prevalences and may not be strictly comparable because the program participants were drawn from the more malnourished segment of the population by methods that may have differed.

Study	Group(n)	Pre	Post	Percentage Point Gain
HAS	Program(192)	72.9%	62.0%	10.9
	Control(187)	76.5%	70.1%	6.4
Dubisson, <i>et.al.</i> (1994)	Program(122)	76.9%	46.3%	30.6
	Control(96)	63.5%	63.5%	0

**NOTE:** There is a one year duration between the pre and post measurements in the HAS study and a three year duration in the Dubisson *et.al.* study.

**Potential confounders and other threats.** Many different factors might confound the analysis or otherwise threaten the validity of the conclusion. In this analysis we have been able to address many, but not all of these potential threats, as summarized in Table 3.

*Historical effects* and *regression-to-the-mean* are adequately controlled by the control group. It is plausible to suspect that both factors could influence the gain in nutritional status—historical effects as a result of the economic and political changes experienced by Haiti during the data collection period, and regression-to-the-mean because the program and control samples were selected from the lower range of the WAM distribution. The increase in average WAZ gain and average WAM gain in the control group as seen in Table 1 supports this suspicion.

*Age* is a potential confounder because the program group children were, on average, nearly six months older than the control group children (34.5 months vs. 29.0 months). Age might influence the outcome in two ways: first, the responsiveness of children to interventions, either planned (e.g., the program) or unplanned (e.g., historical events) could vary with age, and second, the prevalence and severity of malnutrition in the study population may change with age, with the result that differences between the program and control could simply reflect effects of this natural aging process. Remarkably, neither of these two potential factors appears to be a confounder in this data set. A simple linear regression of age on WAZ gain found no relationship whatsoever in either the program or control group. The R-square values and the coefficients of age were very small in both models, thus eliminating age as a concern in spite of the difference in age between the two groups. In order to investigate non-linear relationships between age and weight-for-age status, initial WAZ was compared for children in six month age categories. No significant difference in WAZ1 was found between the program and control groups using a Chi-square test.

Table 3 Summary of Possible Confounders and Other Threats to Validity				
Possible Confounder or Threat	Controlled or Analyzed in Study	Effect Found by Study	(Probable) Direction of Effect	Comments
1. Historical effects	Yes	Probable	Neutral	Under control.
2. Regression-to-Mean	Yes	Probable	Neutral	Under control.
3. Age:				
a. Samples Differ	Yes	Yes	Neutral	Program children older.
b. Interaction with WAZ	Yes	No	--	No correlation.
c. Interaction with Program	Yes	No	--	No correlation.
4. Initial Nutritional Status:				
a. Samples Differ	Yes	No	--	Same WAZ1.
b. Interaction with Program	Yes	Strong program effect observed.	Positive	Program reduces deterioration in mild malnourished.
5. Program Learning	Yes	No	--	
6. Community Effect	No	--	Positive	Positive impact on non-participants likely.
7. Selection Bias:				
a. Road-to-Health Cards	No	--	Uncertain	Might understate effect.
b. Every 7th Participant	No	--	Uncertain	
c. Unfound Participants	No	--	Uncertain	Small number.
d. Program Refusers	No	--	Uncertain	
e. Mildly Malnourished Participants	No	--	Uncertain	Might overstate effect.

On the surface, it appears that the *initial nutritional status*, for example, as measured by WAZ1, is not a confounder because the average value of WAZ1 in the program and control groups is essentially the same (-2.75 in the program vs. -2.69 in the control). However, given the rehabilitation goal of the program, it is reasonable to suspect that children entering the program with lower nutritional status are more likely to respond than children with higher nutritional status, suggesting that the interaction of program and initial nutritional status may be an important determinant of program effect on nutritional status. The data in Tables 4 and 5 suggest that, indeed, this interaction may be a confounder, but the direction of the effect is the opposite of that anticipated. The one year effect of the program may be to prevent increased malnutrition in the mildly malnourished rather than to rehabilitate the moderately and severely malnourished. This can be seen most clearly in Table 5, which shows the combination of nutritional states that the children followed in the pre and post measurements—High-to-High, High-to-Low, Low-to-Low, and Low-to-High. These four combinations are termed "nutritional paths."

Nutritional Status	Program		Control	
	Pre	Post	Pre	Post
75% WAM or Above (High)	52	73	44	56
Below 75% WAM (Low)	140	119	143	131
Total	192	192	187	187

Path	Program	Control
High-to-High	40	28
High-to-Low	12	16
Low-to-Low	107	115
Low-to-High	33	28

In the program group, only 12 of 52 (23.1 percent) drop from high to low status during the year between the pre and post weighings, compared to 16 of 44 (36.4 percent) in the control group. Thus, more (77 percent) of the high status program children maintain their high status than the children in the control group (only 64 percent). Conversely, roughly equal percentages of program and control children rise from low to high nutritional status. Although not conclusive, this result suggests that perhaps the program is better at preventing deterioration in the mildly malnourished than curing the severely malnourished. This interpretation is supported by the multivariate analysis reported below.

A *phase* effect manifesting across both the program and control group might reflect the influence of external events, while a phase effect in the program group only might reflect *program learning*. In fact, Table 6 shows a similar phase effect in both groups, and no additional effect in the program group. Thus, it is likely that external events have caused a general improvement in nutritional status in the period between phase 1 and phase 2, but there was no program learning between the two phases. This conclusion is borne out in the multivariate analysis where the addition of the interactive term (PHASExPROGRAM) to the model has no effect.

Table 6 Average Gain in WAZ and WAM by Phase				
	Program Group		Control Group	
	WAZ Gain	WAM Gain	WAZ Gain	WAM Gain
Phase 1	0.07	0.25	0.01	-0.52
Phase 2	0.16	1.15	0.10	0.51

It is plausible that the program caused a *community effect*, in which the nutritional status of non-participating children in the program communities improved over the study year relative to the control communities. However, the data set did not permit such an analysis. Other behavioral change programs that have looked for such a community effect have often found it (Hornik, 1990; Hornik, *et.al.*, 1992). Thus it is likely that the present analysis underestimates the true effect of the program because it has not taken the community effect into account.

Finally, several types of *selection biases* may have influenced the results. First, the control group selected only children who had a Road-to-Health Card and who had been weighed (and found to be malnourished) one year earlier, while the program group used a totally different selection procedure that was not based at all on the presence or absence of a Road-to-Health Card. Only about one-third of the preschool children in the Hearth Program communities were enrolled in the GMP program by the time the Hearth Program was implemented in these communities. It is not clear whether this difference tends to underestimate the effect of the program (because children with cards are more responsive to the program than children without cards), overestimate the effect of the program (because children with cards are less responsive), or has no effect at all. We suspect that the control group may well consist of children with more attentive mothers who are more likely to participate in community health programs (such as GMP) than the average mother of the program children. Further, the control children are more likely to be referred for medical care when they need it because of their participation in the GMP program. Thus, this selection bias is likely to underestimate the true effect of the program.

Second, the program sample was selected by picking every seventh child on the roster of participants, a method which systematically excludes siblings (including twins). It is uncertain whether this tends to over or underestimate the program effect. Third, some of the children nominated for the program sample by the "every seventh name" method were not actually found in the field for various reasons, including death and moved. Other names were substituted for the unfound children (the next participant listed on the roster). It is uncertain whether the unfound children were systematically different from the found children, and whether this potential bias would tend to over or underestimate program effect. Fourth, the households selected by the *animatrices* to participate in the program were neither a 100 percent sample of the community nor a random selection, and thus are subject to selection bias. While the program staff believe the foyers included a preponderance of all the moderately and severely malnourished U5 children in the program communities, the program did not weigh 100 percent of the children in the

community, and therefore did not enroll every last one of the malnourished children. It is not clear how this possible bias might influence the results. Fifth, the program included a substantial number of participants (27 percent of the program group) who were mildly malnourished in spite of the fact that it did not formally intend to include these children. The method by which they became participants and the differences between the participating and non-participating mildly malnourished is unclear and may well involve an important selection bias. Although the nature of that bias is unclear, it is plausible that the mildly malnourished children who participated in the program had more aggressive mothers who made sure they did participate, a characteristic which might cause these children to be more responsive to interventions and might cause the results to overstate the actual effect of the program.

**Multivariate analysis (accounting for confounders).** The study data enabled some, but not all, of the potential confounders to be included as independent variables in a multivariate analysis. The model uses WAZ2 as the dependent variable and five independent variables: TREATMENT (program or control), WAZ1, AGE in months, PHASE, and TREATMENTxWAZ1. The latter variable (TRATMENTxWAZ1) reflects the different responsiveness of high WAZ1 children and low WAZ1 children to the program. WAZ2 is used instead of WAZ gain to avoid technical problem associated with the fact that WAZ gain is a linear composite of WAZ1 and WAZ2. In fact, when WAZ gain is substituted for WAZ2 as the dependent variable, there is essentially no difference in the results. As seen in Table 7, three of the five independent variables in the WAZ2 model are highly significant (WAZ1, TREATMENT and TREATMENTxWAZ1), one (PHASE) approaches significance ( $p=.08$ ), and one (AGE) is not significant. Treatment is significant only when accompanied by the interactive TREATMENTxWAZ1 term. As expected, WAZ1 is most important in predicting WAZ2, but surprisingly the combination of TREATMENT and TREATMENTxWAZ1 is most important in predicting WAZ gain.

Table 7 Results of a Multivariate Analysis with WAZ2 as the Dependent Variable		
Term	F Value	Significance
TREATMENT	10.2	$p = .002$
PHASE	3.7	$p = .06$
Initial WAZ (WAZ1)	47.6	$p = .0001$
AGE	0.8	$p = .38$
TREATMENT * WAZ1	9.3	$p = .003$

**NOTE:** This analysis used an ordinary least squares regression model calculated using SAS, PRO GLS procedure.

The key result of the multivariate analysis is that the program has a strong, positive, and highly significant effect on nutritional status, but only for children with relatively higher nutritional status at the beginning of the program. The effect on children entering the program with lower nutritional status is not statistically significant and tends to be negative.

In order to determine whether this counter-intuitive result is a statistical artifact caused by imposing a linear model on the data, the program and control groups were divided into four equal categories by WAZ1 quartiles. A WAZ gain regression analysis was performed for each quartile. The model predicts WAZ gain as a function of TREATMENT, AGE, and PHASE. Children in the top WAZ1 quartile do decidedly better if they are in the program ( $p=.02$ ); children in the middle two WAZ1 quartiles experience relatively stable WAZ whether or not they are in the program although the relationship is not significant for either quartile ( $p=.77$ ,  $p=.89$ ); and children in the bottom WAZ1 quartile appear to do worse if they are exposed to the program than if not, although this difference is not statistically significant ( $p=.21$ ). Thus, the results confirm that the result is a program effect and not an artifact of the linear model.

In order to estimate the size of the effect of the program, the WAZ2 multivariate model reported in Table 7 was used to compute WAZ2 and WAZ gain assuming different values of WAZ1. Different values of age and phase were also assumed but had no effect on WAZ gain. The results of this simulation, reported in Table 8, show that program children with WAZ1 equal to -2.0 average about 0.3 higher WAZ gain (in other words, 3/10ths of a standard deviation higher in the program children, which works out to be about one pound of additional weight in a 36 month old) than the control children with the same WAZ1. Program and control children with WAZ1 of -3.0 average about the same WAZ gain, and program children with WAZ1 of -4.0 average 0.38 less WAZ gain than the controls, although as noted above the difference between program and controls at WAZ1 = -4.0 is not statistically significant.

Initial WAZ (WAZ1)	WAZ Gain		Gain in WAZ due to Program
	Program	Control	
- 2.0	0.11	- 0.19	0.30
- 3.0	0.21	0.24	- 0.03
- 4.0	0.30	0.68	- 0.38

**NOTE:** The model predicts WAZ2 as a function of WAZ1, TREATMENT, PHASE, AGE and TREATMENTxWAZ1. WAZ gain is obtained by subtracting the assumed WAZ1 from the predicted WAZ2. Phase and age do not influence the results. The difference between the program and control was statistically significant only in the highest quartile of WAZ1, and therefore in this table the WAZ gain reported for WAZ1 of -3.0 and -4.0 is not reliable.

## DISCUSSION

The Hearth Program developed at the Hospital Albert Schweitzer in Haiti by Dr. Warren Berggren and his colleagues builds on earlier programs (Mothercraft Centers, Nutrition Demonstration Foyers) in Haiti and elsewhere. Hearth aims to be as or more effective than the earlier programs in reducing malnutrition, but at a lower cost and with greater community

participation. The present effort to document and evaluate the program produced several surprising results and raised a number of interesting issues.

The evaluation compared the 1-year gain in nutritional status in a sample of 192 preschool children who participated in the program to a control group of 187 preschoolers from non-participating communities. In spite of the fact that one of the primary objectives of the program was to rehabilitate moderately and severely malnourished children, a multivariate analysis of the data showed that the program prevented nutritional deterioration in mildly underweight children relative to the control, but severely underweight children became worse off relative to the control, although this latter result was not statistically significant. What can explain these surprising results?

The first part of this result, preventing deterioration of the mildly malnourished, might simply reflect real learning on the part of the mothers of mildly malnourished children in combination with a lower burden of serious infectious disease such as is more likely to be found in the severely malnourished. There is anecdotal evidence that the volunteer mothers (*animatrices*) maintain informal contact with many of the mothers in their group in the year following the foyers. It is not implausible that such contact may be greater or more effective with mothers of the mildly malnourished children than with mothers of more severely malnourished children, because the mothers of mildly malnourished children may be more responsive and competent. This result might also be partially explained by selection bias; that is, the mothers who got their mildly malnourished children into the foyers may be more attentive and/or aggressive than the mothers of the mildly malnourished in the control group, and thus more likely to keep their child from getting worse than the corresponding mothers in the control.

The second part of the surprising result, namely that the severely malnourished program children appear to do worse than the control children, is more difficult to explain. However, the Road-to-Health Card selection bias may be the reason. In effect that bias means that the control group is really a GMP group rather than a baseline group because 100 group of the control group were in the GMP program for the year following the foyers compared to only about one-third of the program group. It may be that GMP program is more effective in dealing with severely malnourished children over the course of a year (for example, because they are more likely to be referred for medical care when they need it), and the Hearth Program is more effective in dealing with mildly malnourished. The severely malnourished may well require the more persistent approach of a well-run GMP program. If so, then the combination of GMP and Hearth should produce the best of both worlds.

Nevertheless it is important to keep in mind that the result of the analysis, although unexpected and not easily explained, was very strong. The relationship between the program and 1-year gain in nutritional status of the mildly malnourished was highly significant ( $p < .01$ ) and quite large (nearly one third of a standard deviation).

Another unexpected finding was the complete lack of association between age of the participants and either nutritional status or response to the program. Other studies in the literature have consistently reported the opposite (Schroeder, *et.al.*, 1995). We do not understand the reasons for this difference, but it may suggest that the Haitian population studied differed in fundamental ways from many other populations.

The design of the HAS version of the Hearth Program contains several surprises, in the sense that it differs from our early expectations about the program which were based on what was written about the HAS program and other Hearth Programs. First, the fact that one of the major goals of the program is to "jump-start" a network of volunteer mothers (*animatrices*) that can then help deliver community-oriented primary care by using strong positive reinforcements found from watching malnourished children rehabilitate is extremely interesting and practical, but was unexpected. Our unsystematic observations and discussions indicate that the program is achieving this objective. Related to this is the approach used to select the volunteer mothers and the participant children. Many programs that develop networks of volunteer health workers take an almost geometric approach, dividing the service area into small sub-areas (such as a village, a neighborhood, or half a village), each serviced by one volunteer who is supposed to service everybody who lives in the sub-area. Not so with the HAS Hearth Program where the volunteers are selected because they have personality and interest, where the volunteers may live next to or very near to each other, and where the participants are selected by these volunteers. The HAS Hearth Model thus taps more into the dynamics of the community; for example, as depicted by a diffusion of innovation model (Rogers, 1962) than into the geometry of the community. We suspect that the HAS approach is better suited to the high mobility of families which is characteristic of Haiti.

Much has been made of the use of the "positive deviance" approach by this and other Hearth Programs to identify local foods and practices that would be effective and affordable at the local level. However, we believe that the "positive deviance" approach functions in the HAS program are primarily to promote the feeding behaviors advocated by the program (feed several foods, feed more) to the mothers of malnourished children, not to discover the best diet in each community. In fact, the same diet has emerged everywhere from the 24-hour recall of "positive deviant" mothers and is already well-known to the nutrition educators (*monitrices*). In our opinion, the use of the "positive deviance" approach to "sell" a nutritionally good and economically feasible diet to the mothers has been a very important contributor to the success of the HAS program.

Additional work is needed to understand the impact of the Hearth Program. The analysis here does not address the feeding and nutritional impact of the program on other mothers and children in the communities where it is implemented ("community effect"), nor the extent to which the effects of the program are sustained through time (as might be observed on mothers' practice with younger siblings). Representative samples drawn from the entire population in the program and control communities are probably required to assess the community effect rather than samples drawn from the program participants only. Improvements in the program could be

designed by evaluating the relative contribution of different components of the program. For example, the contribution of the *monitrices* and volunteer mothers could be analyzed if a true random sample were drawn, rather than a systematic sample such as was done. (An analysis of the relative contribution of the 12-day foyer component of the program and the hospital referral component for children who don't gain weight after 8 weeks.) The extent to which the structure of *monitrices* and volunteer mothers sustains and delivers other services which impact on the health and development of the children in the community is another issue that requires long-term evaluation. Finally it is important to gain a clearer understanding of the interaction between and the relative contributions made by the GMP and the Hearth Programs. Does the GMP program really provide follow-up care to the Hearth Program children? Do the *animatrices* increase the referrals and effectiveness of the GMP program? Is the Hearth Program really more effective for the mildly malnourished and the GMP program more effective for the severely malnourished? Do these two effects support or interfere with one another when both programs are done? These issues are addressed more systematically in the next section.

## **A PROPOSED MONITORING AND EVALUATION APPROACH FOR HEARTH PROGRAMS**

No service oriented organization wants to spend more on evaluation than is necessary and the approach taken by HAS to evaluation, with its emphasis on impact assessment (reduction in malnutrition in participants, and reduction in mortality in participants and younger siblings) is practical and low cost. Yet a program manager is equally anxious to obtain maximum impact from whatever resources are expended on an intervention. When impact appears to fall short of what might be possible, concerned managers will seek ways to revise a program to improve its effectiveness, as well as questioning whether the evaluation methodology has resulted in a falsely low impact.

To know where improvements might be made, especially if costs are to be contained, usually requires evaluation of the process elements of the intervention. The complete sequence of program inputs which make up the Hearth intervention are listed in Figure 1, with subcomponents of inputs where appropriate. Theoretically, each of these elements could be evaluated to determine if it had been carried out optimally, although such extensive evaluation would be costly and impractical. A subset of items which relate to potential impact on nutritional status is listed in Figure 2, along with potential indicators or measurement methods which could be used to assess them. It will probably not be practical for an evaluation to measure and analyze all of the indicators listed in Figure 2. Rather, the evaluator must choose those aspects which seem the most likely to bear fruit and/or are practical to carry out within a limited evaluation budget, and limit the scope of the process evaluation to those alone.

Some of the limitations and lessons associated with the impact evaluation reported above deserve closer inspection in future evaluations. The selection of one year as the duration over which to measure change in nutritional status does not allow us to determine if the moderately and

severely malnourished children were, in fact, rehabilitated, and whether a more substantive improvement in nutritional status was observed at eight weeks at the end of the year. The possible selection biases noted above also raise a number of uncertainties that should be dealt with in future evaluations. Selection bias associated with the selection of the program and control groups can be handled by more appropriate selection procedures. The selection biases associated with children who actually become program participants can be handled by using a representative sample of all preschoolers in the program communities rather than just participants.

With these considerations in mind, we would recommend consideration of the following points in planning future health program evaluations.

### *IMPACT ASSESSMENT*

1. **Assess total child population.** By confining monitoring of changes to only the malnourished children, the potential of the intervention to influence community behavior beyond the participants ("community effect") and to change the proportion of malnourished children in the whole population cannot be determined. As a public health measure, the impact on the whole population is of interest, not only the impact on the "sick" children (the malnourished ones). Furthermore, samples that are representative of the entire preschool population avoid several of the selection biases and other threats noted above.
2. **Use a prospective control.** Identify the malnourished cohort in both intervention and control populations with a prospective 100 percent weighing, not the retrospective selection of those children who had voluntarily participated in weighings a year previously. To facilitate agreement to participate as a control group, a community can be promised participation a year later.
3. **Determine impact on wasting and stunting.** While admittedly being cumbersome and expensive, measurement of height at the same time as weight would allow determination of the impact of the program on both wasting and stunting, as well as allowing a more precise assessment of the nutritional status of the population at the beginning and end of the program. Given the importance of height/stunting on future work productivity (shorter workers are less productive), height information helps to determine the economic benefit from the intervention.
4. **Assess impact at intermediate points.** To help differentiate the immediate impact of the foyers on the child's nutritional status versus the longer-term impact based on "permanent" improvements in the mother's feeding behaviors (or illness case management), measurement of weight in both intervention and control cohorts at zero, four, and eight weeks, and one year would be useful.

5. **Disentangle impact of program components.** The program includes several distinct components that are likely to contribute substantially to the nutritional impact of the program in the short or long term, including deworming, the 2-week feeding foyers, and the referrals to the hospital of 8-week failures. These components have different costs and may have different effects on different types of children. The different contributions of deworming and feeding could be obtained with a 2x2 design (with and without deworming, with and without feeding), while the effect of the hospital referral component could be efficiently studied by identifying the children that were referred.
6. **Interactive impact of GMP and Hearth Programs.** The interaction of GMP and Hearth Programs may be the key to understanding the real potential of the Hearth Program. A 2x2 design can provide this understanding, where one study group includes both GMP and Hearth, one includes GMP only, one includes Hearth only, and one includes neither.
7. **Improve the validity of sibling assessment.** Despite an unavoidable tendency of the younger siblings of an "outlier" malnourished child to range closer to normality than their older siblings because of the statistical principle of "regression toward the mean," assessment of sibling growth as a measure of maternal behavioral changes is conceptually sound. A valid control group of malnourished children and their siblings must be used (see point #1 above), and the sample must be large enough to allow for matching of the ages of both the index and control malnourished children, and the younger siblings of each as both nutritional status and mortality rates differ widely by age. Ideally, one would use a total population sample (not just malnourished children) in order to allow comparison of changing results in the siblings of non-malnourished children as well.

#### *PROCESS ASSESSMENT*

1. **Assess differences among *animatrices* and among *monitrices*.** Much of the success of this intervention depends on the effectiveness of the *animatrices* in soliciting participation of the mothers (and children); convincing the malnourished to participate in the foyers; providing a diet which the children will enthusiastically eat (we observed dramatic differences in the food prepared by different *animatrices* and corresponding differences in the eagerness of the children to eat the different foods); following up at homes to ensure daily participation of the selected children; getting mothers to take part in the 4- and 8-week weighings, as well as in subsequent routine growth monitoring sessions; and in continuing to provide input to the participating mothers after the 12 daily feedings are completed. For this reason, collection of data on differences in *animatrice* performance and linking impact differences with those performance differences is likely to pay off in understanding the reasons for failures and successes among the overall cohort of malnourished children. Given the potential importance of *monitrice* supervision and continuing inputs on *animatrice* performance, it may also be of interest to

attempt to assess the extent and quality of *monitrice* inputs as well, and contrast results in the areas trained and managed by different *monitrices*.

2. **Assess other potentially important process indicators.** Program implementors are usually aware of aspects of program implementation where differences between families or villages, between program personnel, between seasons, or between other factors exist and have the potential to play an important role in ultimate outcomes and impact of the interventions. An evaluation program aimed at improving the effectiveness of the program will aggressively seek to identify the aspects which appear to be most important and to monitor objectively differences which are taking place and which might be reduced to improve the success of the program. Development of indicators from the list of program elements in Figure 1, or use of some of those mentioned in Figure 2, may be carried out during pilot efforts and early in the large scale intervention to prepare a suitable checklist of such process observations to be made in particular localities. The results of these observations can then be correlated with outcome and impact measurements to identify where improvements in the process elements may have the greatest impact on program success.

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**Figure 1**  
**Process Components in Hearth Programs**

<p>0. Pre-program routine growth monitoring, monthly or bimonthly by age and risk group</p> <p>1. Community mobilization</p> <ul style="list-style-type: none"> <li>- meetings</li> <li>- education</li> <li>- use of quantitative presentations of assessment data (eg. pie charts of malnourished children in the community)</li> </ul> <p>2. Volunteer mother recruitment</p> <p>3. Selection of families by <i>animatrices</i></p> <ul style="list-style-type: none"> <li>- families left out</li> </ul> <p>4. Volunteer mother training</p> <ul style="list-style-type: none"> <li>- growth chart education and understanding</li> <li>- 24-hour dietary survey of positive deviant children</li> <li>- menu preparation education and understanding</li> <li>- market buying exercise</li> </ul> <p>5. Under-five weighing and recruitment of malnourished for foyers</p> <ul style="list-style-type: none"> <li>- recruitment of 100% of U5s for weighing</li> <li>- recruitment of moderate and severe malnourished to foyer</li> <li>- enrollment of mild malnourished in foyer</li> </ul> <p>6. Community education; preparation for foyers</p> <ul style="list-style-type: none"> <li>- education of mothers (and community leaders if appropriate) about purpose and methods of foyers</li> <li>- motivation of mothers of malnourished U5s to participate in foyers</li> <li>- obtain commitment by participating mothers</li> </ul>	<p>7. Implementation of foyer meal preparation and mother education for 2 weeks</p> <ul style="list-style-type: none"> <li>- <i>monitrice</i> supervision</li> <li>- food preparation</li> <li>- child feeding</li> <li>- child consumption of feedings</li> <li>- recognition of changes in child activity and behavior with improved nutrition</li> </ul> <p>8. 4 week and 8 week follow-up weighings</p> <ul style="list-style-type: none"> <li>- participation of foyer children in weighings</li> <li>- counseling of children failing to grow</li> </ul> <p>9. Referral, examination, and treatment of foyer children failing to grow at 8 weeks</p> <ul style="list-style-type: none"> <li>- acceptance and implementation of referral</li> <li>- examination, diagnosis of illness, and treatment</li> </ul> <p>10. Post-program routine growth monitoring/weighing and counseling</p> <ul style="list-style-type: none"> <li>- participation of foyer children in weighings</li> <li>- counseling and motivation of mothers whose children did not grow</li> </ul> <p>11. 1 year follow-up weighing of foyer children</p> <ul style="list-style-type: none"> <li>- participation of foyer children in weighing</li> </ul> <p>12. Income generation activities for mothers of children who did not grow at 1 year follow-up</p> <ul style="list-style-type: none"> <li>- participation of mothers in IG activity</li> <li>- education of mothers during IG activity</li> <li>- post-IG activity implementation of new economic activities by participating mothers.</li> </ul>
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**Figure 2**  
**Potential Factors Leading to Improved Nutritional Status**  
**Following Hearth Programs**

Factor	Indicator/Measurement (P) = process, (O) = outcome, (I) = impact
1. Food/nutrient intake during the 12 meals of the foyer.	-- Daily observation of actual compared to theoretical intake in a sample of participating children. (P) -- Change in rate of weight gain 0 & 4 wks vs 4 & 8 wks. (I)
2. New mother knowledge on components and frequency of diet.	-- Mother knowledge regarding diet as measured in pre and post foyer interview (survey). (O)
3. Acceptance and routine practice of new diet (i.e. change in diet) following the foyer: -- new items (macronutrients and micronutrients) -- new volume and/or density -- new frequency (extra meal daily?) -- change in breast-feeding practice.	-- Survey mothers, 24 hour recall of child's diet. (O) - <i>(Unlikely to be valid measure of actual diet in Haitian environment.)</i> -- Rapid ethnographic assessment method involving observation of feeding in household. (O) -- Interview with neighbor, sister, etc. who is likely to know about mother's feeding practice. (O)
4. More attention by mother to the index child because: -- foyer and follow-up weighings force her to perform -- child is more demanding and energetic after foyer.	-- Anthropologic observation before and after foyer. (O) -- Interview with mother. (O) <i>(Not likely to be valid.)</i>
5. Child more energetic, aggressive, and thereby successful at getting more food.	-- Structured observations of children at beginning and end of program, in the foyer and at home using prevalidated ratings of child activity, food-demanding behavior, parental manipulation. (I)
6. Child fed by a different person (e.g. by mother instead of older child) or other change in how child is fed.	-- Interview with mother. (O) <i>(Possible validity problems.)</i> -- Observations in home. (O) -- Interview with neighbor. (O)
7. Force feeding, giving child more than it wants, so child achieves desired weight gain. <i>(Unlikely in Haitian culture.)</i>	-- Observations in home. (O)
8. More money spent on food after program than before.	-- Interview mothers or fathers (survey). (O)
9. <i>Animatrice</i> continues to monitor the mothers and encourages them to give the better foyer diet, or increased frequency.	-- Interview mothers, neighbors, or <i>animatrice</i> regarding visits or contacts with <i>animatrice</i> . (P)
10. Pressure on the mother or family by a village leader or by one or more neighbors (other than the <i>animatrice</i> ).	-- Interview mothers. (P) -- Interview village leaders. (P) -- Longterm anthropological observation in village. (P)
11. Deworming.	-- Observe weighing to see % receiving deworming medication. (P) -- Prospective study of nutritional improvement in dewormed group and non-dewormed control group. (I)
12. Care given at dispensary for illness occurring during program.	-- Study diagnoses and treatments of program children visiting dispensaries during and after program, for index cases. (P) -- Study effect of dispensary access by Hearth program participants on their nutritional improvement. (I)
13. Care following referral to HAS hospital because of failure to grow as measured at 8 week weighing (e.g. TB treatment).	-- Study diagnosis, treatment and outcome of cases referred, with in-home review of referrals without a clear causative diagnosis. (P)
14. Weighing of child at 4 and 8 weeks following the foyer as a continuing psychological pressure/stimulus to the mother, creating the feeling that someone is paying attention to her.	-- Assess participation at 4 & 8 wk weighings, and the counseling given during these weighings. (P) -- Prospective study of effect of follow-up hospital visit following low 8 wk weight comparing those who visited and did not visit. (I)
15. Agents. increase the amount and/or effectiveness of his or her participation in GMP due to the foyers and continuing presence and involvement of <i>animatrices</i> in the community.	-- Attendance at subsequent routine weighings. (P) -- Observe activities at routine weighings, and assess relative effort put on counseling mother vs merely weighing. (P) <i>(Weighing only assumed to have minimal effect on behavior.)</i> -- Analyze nutritional progress as a function of attendance. (I) -- Assess referrals for medical care. (O)
16. For those malnourished children whose mothers are <i>animatrices</i> , the various stimuli from the program may lead the mother/ <i>animatrice</i> to keep her child well fed.	-- Determine proportion of foyer cases with <i>animatrice</i> mother. (P) -- Analyze nutritional progress of <i>animatrice</i> children vs children with non- <i>animatrice</i> mothers. (I)