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Contents

The Positive Deviance Approach to Improve Health Outcomes: Experience and Evidence from the Field

The positive deviance approach to improve health outcomes: experience and evidence from the field—Preface —David R. Marsh and Dirk G. Schroeder	3
Positive deviant behavior and nutrition education —Warren L. Berggren and Joe D. Wray	7
Ti Foyer (hearth) community-based nutrition activities informed by the positive deviance approach in Leogane, Haiti: A programmatic description —K. Bolles, C. Speraw, G. Berggren, and J. G. Lafontant	9
Sustained positive deviant child care practices and their effects on child growth in Viet Nam —U. A. T. Mackintosh, D. R. Marsh, and D. G. Schroeder	16
Comparison of a positive deviant inquiry with a case-control study to identify factors associated with nutritional status among Afghan refugee children in Pakistan —K. Lapping, D. Schroeder, D. Marsh, R. Albalak, and M. Z. Jabarkhil	26
Design of a prospective, randomized evaluation of an integrated nutrition program in rural Viet Nam —D. R. Marsh, H. Pachón, D. G. Schroeder, T. T. Ha, K. Dearden, T. T. Lang, N. D. Hien, D. A. Tuan, T. D. Thach, and D. Claussenius	34
Weighing Vietnamese children: How accurate are child weights adjusted for estimates of clothing weight? —T. Tuan, D. R. Marsh, T. T. Ha, D. G. Schroeder, T. D. Thach, V. M. Dung, and N. T. Huong	45
An integrated child nutrition intervention improved growth of younger, more malnourished children in northern Viet Nam —D. G. Schroeder, H. Pachón, K. A. Dearden, T. T. Ha, T. T. Lang, and D. R. Marsh.....	50
Effect of an integrated child nutrition intervention on the complementary food intake of young children in rural north Viet Nam —H. Pachón, D. G. Schroeder, D. R. Marsh, K. A. Dearden, T. T. Ha, and T. T. Lang	59
Effect of an integrated nutrition program on child morbidity due to respiratory infection and diarrhea in northern Viet Nam —T. Sripaipan, D. G. Schroeder, D. R. Marsh, H. Pachón, K. A. Dearden, T. T. Ha, and T. T. Lang	67
Implementation of nutrition education and rehabilitation programs (NERPs) in Viet Nam —V. C. Dickey, H. Pachón, D. R. Marsh, T. T. Lang, D. R. Claussenius, K. A. Dearden, T. T. Ha, and D. G. Schroeder	75
Empowerment in Rural Viet Nam: Exploring changes in mothers and health volunteers in the context of an integrated nutrition project —J. L. Hendrickson, K. Dearden, H. Pachón, N. H. An, D. G. Schroeder, and D. R. Marsh.....	83
Caregiver styles of feeding and child acceptance of food in rural Viet Nam —P. B. Ha, M.E. Bentley, H. Pachón, T. Sripaipan, L. E. Caulfield, D. R. Marsh, and D. G. Schroeder	92
Work outside the home is the primary barrier to exclusive breastfeeding in rural Viet Nam: insights from mothers who exclusively breastfed and worked —K. A. Dearden, L. N. Quan, M. Do, D. R. Marsh, H. Pachón, D. G. Schroeder, and T. T. Lang	99
Identification of model newborn care practices through a positive deviance inquiry to guide behavior-change interventions in Haripur, Pakistan —D. R. Marsh, M. Sternin, R. Khadduri, T. Ihsan, R. Nazir, A. Bari, and K. Lapping	107
What influences health behavior? Learning from caregivers of young children in Viet Nam —K. A. Dearden, L. N. Quan, M. Do, D. R. Marsh, D. G. Schroeder, H. Pachón, and T. T. Lang.....	117
The positive deviance approach: Challenges and opportunities for the future —K. Lapping, D. R. Marsh, J. Rosenbaum, E. Swedberg, J. Sternin, M. Sternin, and D. G. Schroeder	128

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The positive deviance approach to improve health outcomes: experience and evidence from the field—Preface

David R. Marsh and Dirk G. Schroeder

Positive deviance programming

Positive deviance (PD) refers to a phenomenon that exists in many resource-poor communities, that is, the finding that a few individuals and families employ uncommon, beneficial practices that allow them and their children to have better health as compared to their similarly impoverished neighbors. These PD behaviors are likely to be affordable, acceptable, and sustainable by the wider community because their peers are already practicing them.

Programmers who use the PD approach for improving health outcomes work with communities to determine community norms regarding a specific, desirable outcome (e.g., good child growth), to identify a few (usually four to six) individuals who have achieved the good outcome (i.e., not the “normal” or expected outcome) despite high risk, to conduct a PD inquiry to learn from these PD individuals the behaviors that are likely to explain the good outcome and be feasible for their neighbors, and to design behavior change interventions to enable adoption of these new PD behaviors. Most PD interventions thus far have targeted childhood malnutrition and have provided communal opportunities to observe and practice new behaviors until skills are mastered (e.g., hearth settings).

In the early 1990s, a series of small-scale studies suggested that programs based on the PD approach were efficacious and well accepted. During the mid- to late-1990s, some of these programs were scaled-up, reaching millions of people in developing countries. At the same time, programmers in disciplines outside of nutrition were anxious to learn how PD could be adapted to new technical areas.

Because international community development workers sought to invest significant effort in furthering the PD approach, we felt that the time was right

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to evaluate the validity and sustainability of the PD approach, to conduct a rigorous evaluation of a PD-informed, large-scale field intervention, to describe some novel applications of PD currently underway, and to present the theoretical challenges and opportunities for more extensive use of PD. As veteran users and students of the PD approach, this supplement is the result of this effort.

Supplement content

This supplement has three sections that trace the evolution of our program learning. The **Background** section commences with a brief overview of the history of PD [1] and a detailed description of an on-going application in Haiti [2]. The sustainability study [3] sparked much of what follows. The first author on this paper revisited former PD program communes in Viet Nam two years after a Save the Children program based on PD had ceased. She found that former program children *and their younger siblings born after the project stopped* were better nourished than counterpart children in communes that never had the program. Moreover, former program mothers reported applying PD practices learned in the program to the younger children. It appeared that the promise of the PD approach for acceptability, affordability, *and sustainability* had been successful. Meanwhile Lapping et al. [4] compared the findings from a small sample PD inquiry to a large sample case control study in the same population of Afghan refugees in Pakistan. The case control study confirmed many of the PD inquiry findings, satisfying us that the PD methods were sound. Thus, armed with exciting impact data and methodological corroboration, we sought and acquired funding from the USAID LINKAGES project to conduct a rigorous evaluation of a large-scale implementation of the PD approach to better understand “why and how PD works.” This so-called ViSION (Viet Nam study to improve outcomes in nutrition) project is the basis for the next section of this supplement.

The section on *prospective evaluation* is devoted to papers reporting a prospective, longitudinal, randomized evaluation of one iteration of Save the Children's community empowerment and nutrition program (CENP) in northern Viet Nam. CENP uses a PD approach and aims to sustainably rehabilitate malnourished children and prevent malnutrition among future community children. Rigorous effectiveness evaluations (i.e., under real field conditions, as opposed to efficacy evaluations with tightly controlled conditions) are rare, and we believe that the findings will interest many in the international health community, above and beyond their interest in PD.

We planned our research, analysis, and documentation in accordance with UNICEF's conceptual framework for child survival [5] (fig. 1). A key objective of our analysis was to document through which causal pathway PD-improved behaviors led to better growth. In earlier work, we often referred to the mechanisms that led from the PD approach to better growth as a "black box." Section two of this supplement is our attempt to begin to lift the lid off this box.

We start the section with a detailed methods paper [6] that describes a complex integrated program and the evaluation research design. Tuan et al. [7] then report on innovative methods to accurately calculate the weight of clothed children in different seasons in Viet Nam. After these methodological papers, we work from top-to-bottom within the UNICEF conceptual framework. The paper by Schroeder et al. [8] reports the impact of the CENP program on growth, the final outcome for the program (i.e., mortality was not

measured). The next two papers present analyses of diet [9] and morbidity [10]. Moving one-level down the framework, Dickey et al. [11] provide an evaluation of the central CENP intervention, the "hearth sessions," hamlet-level, daily gatherings of mothers and their malnourished children learning to practice and adopt new feeding, health, and childcare practices under the supervision of trained local volunteers. Hendrickson et al. [12] used qualitative methods to longitudinally study empowerment and selected enablers of behavior change among health volunteers and mothers. Finally, Ha et al. [13] provide insights into rural Vietnamese feeding styles through preliminary analyses of a sample of directly observed and videotaped feeding episodes.

In the last section, *new directions*, we report on new experience and new thinking. Dearden et al. [14, 15], report two related LINKAGES-funded studies in Viet Nam. The first, a large-sample PD inquiry, confronts the challenge of poor exclusive breastfeeding practices in rural Viet Nam and identifies PD women and PD strategies to inform a behavior change intervention [14]. The second reports the use of elicitation procedures to systematically study behavioral determinants critical for single behavioral outcomes like breastfeeding as compared to a nutritional status outcome for which a host of behaviors may impinge [15]. Marsh et al. [16] then report a new application of a PD inquiry for improved newborn care in Pakistan. Finally, Lapping et al. [17] complete the supplement, teasing out lessons learned, sharing even fresher PD applications in progress, challenging researchers to tighten up the theoretical underpinnings of PD, and proposing some next steps.

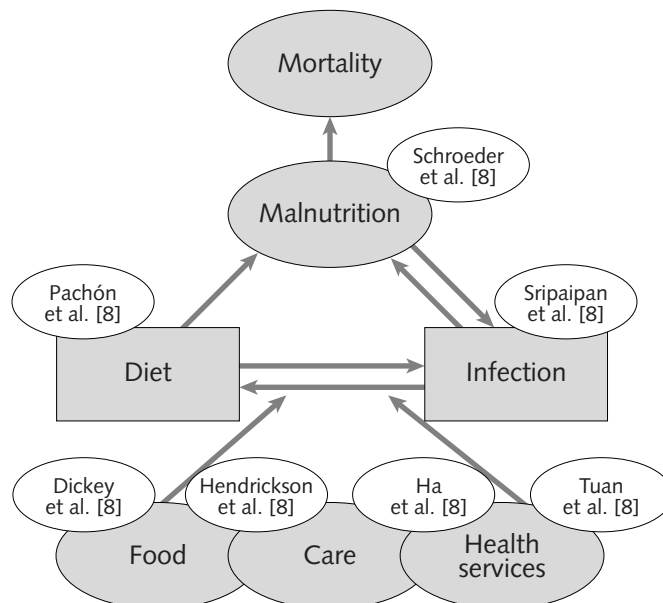


FIG. 1. Modified UNICEF conceptual framework of child health and survival (unshaded ovals indicate supplement papers)

Conclusion

The authors of these papers neither discovered PD nor creatively applied PD to programs. The credit for this goes to a generation of international health thinkers and doers, including Joe Wray, Marian Zeitlin, Gretchen and Warren Berggren, and Jerry and Monique Sternin, among others. Our task, rather, was to shed light on the how and why of PD-informed programming. In addition to the individuals just listed, heartfelt acknowledgement also goes to USAID and the LINKAGES project for financially and technically supporting the research; to Hanoi's Research and Training Center for Community Development for their outstanding field research team; and to the John Grant Fund to promote child survival, the Ford Foundation, and Save the Children Federation/US for supporting the documentation and publication of these findings. Three individuals deserve special recognition, without whom the ViSION project would not have succeeded: Helena Pachón,

co-principal investigator; Kirk Dearden, co-principal investigator and LINKAGES evaluation specialist; and Tran Thu Ha, scientific coordinator.

The PD story is far from complete. In many ways we are left with more questions than we started with; we challenge researchers to continue to investigate the unknowns regarding positive deviance. We encourage programmers to apply what we have learned about PD in new and creative ways and to share these experiences with us and among themselves. This volume is dedicated to the field workers and families who will benefit from more effective strategies for them to improve their own health.

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Positive deviant behavior and nutrition education

Warren L. Berggren and Joe D. Wray

Dr. Joe D. Wray, in his 1972 *Tropical Pediatrics* editorial, asked, "Can we learn from successful mothers?" His question had not previously appeared in a scientific journal, possibly because it may have embarrassed many professional scientific nutrition teachers to consider it seriously. Nutritional surveys often discover well-nourished children in poor families that inhabit villages where nearly all children are both poor and malnourished. Such well-nourished children are evidence that some mothers, despite poverty, can feed and care for their children successfully. Wray pointed out that, in order to teach useful child-care and feeding practices to poor mothers, we need to learn what local, successful, poor mothers are practicing [1].

No one published any answers to Wray's question, but many of us who read it looked for successful mothers and listened to them. In 1976, Sam Wishik and Susan Van der Vynckt of Columbia University proposed a project to identify "positive deviant" (PD) families in order to observe their care and feeding behaviors. They intended to teach those behaviors to mothers of malnourished children and, finally, to evaluate the teaching's impact on children's nutritional status [2].

Without referring to Wray's editorial, Wishik and Van der Vynckt characterized the families as "positive deviants" because they deviated from their population's norm in that their children were in the upper quartile of weight-for-age and height-for-age, and their deviation from the norm was in an upward, or "positive," direction. Wishik and Van der Vynckt thus gave "successful mothers" an academically erudite title. They also described methods to identify PD families, study their behavior, and teach PD feeding practices throughout the population. There is no published report of their project's implementation or its achievements.

Fourteen years later, in 1990, Zeitlin et al. published

extensive observations of PD behavior among Yoruba and Javanese families and their relation to children's nutritional status [3]. Their work, and a subsequent publication by Shekar et al. in 1992 [4], made the study of mothers' PD behavior and its impact on childhood nutrition a respectable category for academic and operational research. Today, there are published reports of children's improved nutritional status in populations that have learned to practice the care and feeding behaviors of PD mothers [5, 6]. Wray's question has been answered affirmatively.

Finding PD mothers and identifying the behaviors that make them successful is a "rapid assessment" procedure rather than a survey [7]. An assessor locates PD mothers by weighing a population's children. The assessor selects, from among children weighing in the top 10% or 25% of the weight-for-age distribution, those whose families' resources are meager. The assessor next interviews the selected children's mothers to identify any caring or feeding practices that distinguish them from mothers of malnourished children.

The behaviors vary with season, food prices, family illness, and unforeseen political events that further constrain resources and options. Assessment of PD behavior, called a "positive deviant inquiry" (PDI) [5], should therefore be done in each new community and with each important change in season. Programs can quickly lose their effectiveness by neglecting to repeat their PDIs appropriately.

It is important that nutrition teachers learn the PD behaviors and even more important that mothers of malnourished children begin to practice them as soon as possible. Their learning process must include discovering the appropriate information, practicing the PD behaviors under supervision, and experiencing proof that their children recover their health as they are fed and cared for appropriately.

Current learning programs are called "nutritional education and rehabilitation projects," "hearths," or a variety of other names. All of them induce mothers to rehabilitate their own and their neighbors' malnourished children in their own homes or similar settings,

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using foods and feeding and caring behaviors learned from local PD mothers. Mothers' performance of the PD behaviors should be sustained over a period of at least four weeks so that mothers acquire them as habits

[8]. Learning programs are most successful when all participants are valued, respected, and especially affirmed when they practice the PD behaviors and their children regain their health.

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Ti Foyer (hearth) community-based nutrition activities informed by the positive deviance approach in Leogane, Haiti: A programmatic description

Kathryn Bolles, Catherine Speraw, Gretchen Berggren, and Jack Guy Lafontant

Abstract

This paper details the steps to design and implement a positive deviance-informed, “Hearth” approach for the nutritional rehabilitation of malnourished children in the district of Leogane, Haiti. Groups of four to five children met daily for two weeks at the home of a local volunteer mother for nutritional and health messages and a well-balanced meal. Health messages and meal components were determined using information gathered from interviews with the mothers of positive deviant children in the community who are well nourished despite their family’s limited economic resources. Hearth participants were then followed for six months in their own home by the program “monitrices,” women hired from each village and intensively trained to supervise the Hearth program, periodically weigh the children to evaluate their progress, and liaise between the hospital and the community. Monitoring from the first cycle indicated that 100% of children in eight villages and 66% of children in the remaining five villages continued to gain weight as fast or faster than the international standard median six months after participating in a Hearth program. At the conclusion of this cycle, programmers interviewed participant and non-participant families and made six modifications to the model, including the addition of a microcredit option for participating mothers.

Key words: Hearth, malnutrition, positive deviant, nutrition, Haiti

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Introduction

Hearth or “Ti Foyers” in Haiti: historical background

Haiti and the Hearth model have a long history together, originating in the 1970s in the “Projet Intégrée de Santé et de Population” (PISP) under Haiti’s Division of Family Hygiene [1]. Prior to that, in Haiti’s “Centres d’Education et de Rehabilitation Nutritionnelle” (CERNS), mothers used local foods daily in three month sessions in village centers to rehabilitate their malnourished children under the supervision of nutrition aids known as “monitrices” [2, 3]. Although children recovered and their mothers adopted better child-feeding practices, CERNS were too expensive and were phased out [4].

In 1976, the PISP in rural Haiti modified the above model and integrated it into a community health program that included family registration, growth monitoring and counseling (GMC), periodic deworming, immunization, maternal education, and temporary distribution of food supplements to children whose growth faltered [5]. The CERN activities, including use of local foods, extra meals, and snacks, were reduced to two week intensive daily training sessions for groups of mothers and their malnourished children in “Grand Foyers” (large outdoor kitchens of a volunteer home, church, or school). In this modification, 20 or more malnourished children identified by the ongoing growth monitoring program came daily with their caretakers to two weeks of nutrition rehabilitation sessions where volunteer mothers assisted monitrices in nutrition and child-feeding “learning tasks” [6], and then committed themselves to continue the rehabilitation process in their own homes. During the two weeks of intensive training, a change in the malnourished child became obvious: appetite returned, edema disappeared, and children began to run and play again. The child was then followed in ongoing community health growth monitoring sessions. Evaluations carried out by the

PISP showed that this approach was as effective as the use of more permanent nutrition rehabilitation centers (CERNS), but reached many more children, with the monitrice serving as an itinerant worker, going from village to village to implement the sessions [7].

The “Ti Foyer,” or Hearth, is a neighborhood model for rehabilitation of children in nearby home-kitchens that first emerged in the Hôpital Albert Schweitzer’s community health program in the face of an economic embargo in the 1990s [1, 7]. The hospital pediatric ward was overwhelmed with cases of severe malnutrition; and its district community health workers were confronted with the problem of more than 9,000 children in need of rehabilitation. Monitrices were trained to rehabilitate children in small groups, neighborhood by neighborhood, in the context of each community’s ongoing growth monitoring and promotion program [7–9].

At this time the “positive deviance inquiry” (PDI), derived from work by Zeitlin, and local market surveys were added to the curriculum for monitrices who in turn trained volunteer mothers [10]. They found poor mothers who were managing to keep their children well nourished in the face of the deteriorating economic situation in rural Haiti. These “positive deviants” were using local foods to prepare extra meals and snacks and exhibited model child feeding and child-caring behaviors. These mothers were willing to be interviewed and observed by the neighborhood women who in turn volunteered to rehabilitate malnourished children in their own homes. Mothers of malnourished children attended daily sessions for two weeks and contributed food or fuel as their “ticket” to admission. Monitrices walked from one session to the other to supervise and assist in encouraging the anorectic children to begin to eat. Berggren and Grant reported preliminary findings that nearly two-thirds of the Hearth-attending children were growing at rates as fast or faster than the international standard median as measured by the weight-for-age index during the two months subsequent to the rehabilitation sessions.* The population at the time was highly mobile, and although a subsequent retrospective study two years later failed to show the sustainability of the effect, it was flawed by high numbers of cases lost-to-follow up [8, 11]. The next major Ti Foyer endeavor that adhered to the above model began in 2000 in the District of Leogane with the Nutrition Program of Hôpital St. Croix (HSC), described below.

Child health in Leogane

Leogane has a population of approximately 200,000,

divided among 120 villages of diverse geography. Mountainous villages have higher childhood malnutrition than plains villages (61% vs. 32%, respectively), apparently due to less local food availability and nutrient variety [12]. The community health workers of HSC visit each village once per month to hold “rally posts” where they vaccinate, distribute vitamin A, and carry out GMC for children under-five years old using the “road-to-health” card with a weight-for-age graph.

Historically, the only nutrition program available in the Leogane area was the GMC program and food supplements for malnourished children as measured by the Gomez standard (e.g., those weighing less than 75% of the international standard median of weight-for-age). Although the rations proved helpful for many families living close enough to the hospital to access the service, staff interviews revealed its limitations: participant mothers feared losing eligibility for the supplement if their children gained weight; mothers lived too far away to reach the distribution site; the rations became a commodity sold at the local market rather than consumed by the malnourished child; and most importantly, mothers became dependent on an imported commodity and were not learning how to use local, inexpensive foods to prevent or treat malnutrition.

This paper details the steps involved in the design, implementation, and modifications of a PD-informed Hearth approach to addressing moderate-to-severe malnutrition in children under five years of age in an area with little existing GMC in place.

Methodology

Setting

The nutrition program of the HSC is community-based, and began in 2000 in response to an observed increased number of severely malnourished children dying in the hospital. Its staff discovered PD mothers in most villages, and planned to integrate nutrition intervention activities within the existing village health worker program using the Hearth model. At the same time, they sought funds to upgrade nutrition services at the HSC, so that children suffering kwashiorkor and severe marasmus could be treated according to the WHO protocol [13].

The original goal of the nutrition program was to rehabilitate malnourished children and prevent it at the community level. The program planners started by examining GMC data from 120 surrounding villages and planned the steps to implement a PD-informed program. Their intent was to target motivated villages with the greatest malnutrition problem. However, village health workers did not have updated records of post-attending children, vital records, or information

* Berggren W, Grant J. Report to the Board of Directors of the Albert Schweitzer Hospital, Deschapelles, Haiti, Albert Schweitzer Hospital, Deschapelles, Haiti, 1996.

on non-attending children. Given Haiti's countrywide vaccination coverage rate of 35% by age 5, the staff estimated that about 65% of the children in Leogane were not being followed at all. Therefore, the nutrition program staff consulted with health workers and selected the first cohort of villages from areas with observed high levels of malnutrition.

Implementation

Step 1. Community preparation

The nutrition program staff collaborated with village health workers of selected villages to organize meetings with community leaders to introduce the idea of how to combat malnutrition and to reach consensus on the need to prevent it. This meeting usually included the local priest, the Voodoo practitioner, the head school-teacher, and respected merchants. In an effort to assure that no child would be left out, villagers agreed to help map and assign house numbers in their village for a door-to-door registration. Community leaders were asked to identify women from the village who might serve as nutrition educators (monitrices) to supervise the local program. Candidate criteria were the ability to read and write at eighth grade level and perform simple mathematical calculations.

Step 2. Monitrice candidate testing

Villagers willingly attended the second meeting to present their candidates and observe the monitrice testing. The written test involved simple knowledge of child health, plotting points on a graph, math calculations, and opinion questions. After the written test, each candidate was given an oral test in which the interviewer looked for elements of a dynamic personality and ability to problem-solve.

Step 3. Village registration, creation of child register, data gathering, and analysis

Mapping, house-numbering, and registration

Nutrition program staff trained the selected monitrices, the local health workers, and supervisors in registering households and completing the registration form. The form included the following sections: women of childbearing age (14–49), including family planning information, pregnancy, tetanus vaccine history, breastfeeding, and knowledge about oral rehydration solutions (ORS); children under five years old, including vaccination history and that day's weight; child death and cause of death; and socioeconomic information on the household, including type of roof and floor, ownership of a radio, and source of drinking water. The nutrition program staff and the local

health worker drew a detailed map of each village, and numbered each inhabited house prior to beginning registration. Less than 3% of families in all villages refused to participate.

Creation and use of the register

Nutrition program staff members analyzed data from the registration using Epi Info6, with weight-for-age as the indicator of nutritional status. The nutrition program consulted the health worker supervisors and designed a child register that included vaccinations and weights, deworming, and home-visits, and gave the health worker from each registered village a copy with data from all children in the village. Staff conducted a separate training day with these health workers to demonstrate how to update the register, track births and deaths, and establish a system for encouraging absentee children to attend the next post. Results from the registration indicated that only 30% of children were completely vaccinated by age five.

Step 4. Monitrice training

The first cycle of monitrice training included 13 selected candidates from the 13 registered villages. The five-week training provided housing for monitrices from far-away villages. After completing the training and the final exam, graduates signed a contract for six months detailing their responsibilities for supervising Hearth and related activities in their village. The nutrition program staff conducted the training, along with guest-speakers from the hospital and community health program. The schedule is outlined below.

Week one

Topics included group-building exercises, introduction to nutrition, the Ti Foyer concept, the role of the monitrice, professionalism and ethics, immunizations and the cold chain, breastfeeding, family planning, diarrhea and ORS, acute respiratory infection (ARI), and exam one.

Week two

Topics included HIV/AIDS, hygiene, malaria, scabies, worms, malnutrition, a tour of the hospital pediatric ward, an explanation of the dry food ration program, demonstration of the preparation of enriched milk to rehabilitate children from severe protein-energy malnutrition, stages of child development, using the child growth card, and exam two.

Week three

Topics included principles of participatory adult learning, a short teaching experience in which each monitrice prepared a lesson on one health topic, peer suggestions on improving teaching techniques, and an introduction to PD.

Positive deviance instruction

Using participatory learning techniques, the nutrition program developed several handouts for use in the PD segment of the training. Participants were asked to come up with possible PD behaviors in their villages within the following three categories: good child-care, good health practices, and good foods. Even though this was a group-generated list, the monitrices learned that PD practices were unique to each village and, in the case of PD foods, were seasonal. In preparation for a group home visit to a PD family, monitrices learned observation skills and recording techniques and generated a list of behaviors and conditions that they would observe in the household; for example, Did the house and kitchen look clean? Were animals present? Was the child clothed? and Who fed the child and how often?

As a group, monitrices and supervisors visited three pre-selected PD families to practice observing PD behaviors and conducting a 24-hour diet recall with caretakers before going to their own villages. Then each monitrice received a list of several PD children in her own village (defined as normal or greater-than-normal weight-for-age Z score (WAZ) and low socioeconomic status determined by the house characteristics section of the village registration form). The monitrices returned to their villages to independently conduct the PD inquiry (PDI) and 24-hour dietary recall in these selected households.

Week four

Monitrices returned to the classroom to discuss their PDI and dietary recall findings from which they created well-balanced and nutritious Ti Foyer menus, which included foods with adequate protein, vitamin A, and iron. Monitrices then learned how to read a food value table for Haiti and how to use a dietary weighing scale, and were given exercises on food value calculations. Other PDI findings (good child care, good health care) were discussed and included in the Ti Foyer daily agenda as key messages.

'Aller au marche' or market survey exercise

Monitrices gathered their village-specific menus and took a trip to the local market. They were given 50 gourdes (approximately US\$ 2) and instructed to buy enough food to feed five children (number of children attending a Ti Foyer) a meal and snack with a total of 800 kcal and 26 g of protein. The meal had to include a source of iron and vitamin A. Upon return to the classroom, monitrices calculated the price, calories, and protein of the menus for each child. The final cost of the meals varied from 6 to 8 gourdes (approximately US 25 cents) per child. Each monitrice was given a printout of all the meals in detail to use as examples in the Ti Foyers. Food availability and market food prices in each village fluctuated with the seasons requiring new PDIs for each season.

Week five

Topics included final exam review; a discussion of food availability in Haiti and Haiti-specific maternal and child health challenges (e.g., only 6% of mothers exclusively breastfeed for the first six months, and 86% of children under five years old are fed only one or two times per day); the responsibilities of the monitrice; the volunteer mother training; and an explanation of forms and data collection (see Step 8 below). After a final exam, those who passed signed a contract with detailed weekly responsibilities for six months. In addition to the village responsibilities, all monitrices attended a monthly staff meeting to review data forms and plan. To close the training, all participants (passing or failing) enjoyed a small ceremony in their honor with invited guests and a certificate of accomplishment.

Step five. Volunteer mother training

Each village's monitrices received a list of all children with weight-for-age Z scores of -2 or less to invite into the Ti Foyer program. The number of qualifying children determined the number of volunteer mothers needed to host the program (one volunteer mother per five children). The monitrices had previously selected mothers with PD children and invited them to host the Ti Foyers, and the monitrices held a five-day training session for these volunteers. All monitrices were given a detailed agenda of how to conduct the training session. The last day of the volunteer mother training was the weighing day, in which all invited children were weighed and which was used as the official pre-program weight. At this time, mothers met the monitrice(s) and the volunteer mother and together decided upon the menu and the food contribution from each mother for the first day (the nutrition program staff contributed the snack each day for each Ti Foyer).

Step 6. Implementation of Ti Foyer activities

The Ti Foyers were designed to last a maximum of two hours each day at a convenient time, for 10 days. Monitrices dewormed all selected children with albendazole or piperazine two weeks prior to the start of the Ti Foyers. Monitrices followed the following daily agenda. Mothers gather with children and sing or pray. Mothers offer their food contribution, wash their hands, and begin meal preparation. Mothers wash the children's hands and distribute a small snack to each child to stimulate their appetite before the meal (e.g., one mango per child or bread with peanut butter). Monitrices deliver a key message (one of the health topics discussed in the training) and all sing a related health song. Mothers feed their own children the supplemental meal. Monitrices encourage the anorectic child and help the mother. Mothers assist the volunteer mother in cleaning up the kitchen area. All discuss the next

day's menu, why that choice is a well-balanced meal, and decide upon a key message they would like to hear about for the next day.

The monitrices were required to deliver a key message each day according to the interests of the mothers or the specific needs of the village with the caveat that three key messages must be breastfeeding, the importance of vaccines, and diarrhea control and prevention (with demonstration of ORS preparation). In addition to the key message, each day's discussions reinforced the lessons learned from the three categories of PDI behaviors in that village (good child care, good health care, good food) as well as highlighted the reasons why that day's menu was selected. Monitrices emphasized the idea that children should eat from five to seven times each day in order to change the behavior of Haitian children typically eating once or twice a day and to safeguard against mothers substituting the Ti Foyer meal for the child's only meal of the day.

Step 7. Follow-up

After the two weeks of the Ti Foyer, monitrices made home visits for two weeks to maintain contact with the mothers, discuss the children's progress, and observe meal preparation and good practices in the home. Monitrices also attended each month's rally post and personally visited any Ti Foyer children who did not attend.

Step 8. Surveillance

Monitrices filled out two forms during and after the Ti Foyers. The daily Ti Foyer report tracks child and mother daily attendance, daily menu, key messages, and general observations of the day and of each child. The surveillance form tracks each child by age in months at initial weight; weight, date, and nutritional status at month one, two and six; and remarks about hospitalization, drop-out, and significant observations of progress.

Step 9. Hospital and community integration

All hospital staff and health workers were aware and supportive of the Ti Foyers, and the hospital pediatrician was regularly informed of the activities, which established a hospital-health worker-community network that had not previously existed.

Preliminary findings

A total of 50 children participated in the first cycle of Ti Foyers, and monitrices recorded their weights at months one, two, and six (fig. 1). The nutrition program also followed the 55 invited children whose

mothers opted not to participate in the Ti Foyers to better assess the impact of the program. Program children grew better than comparison children after one month (68% vs. none growing at or better than the international weight-for-age median rate). Moreover, many program children who were faltering at month one were, in fact, recovering from illness and clearing edema. Program children continued this catch-up growth through months two and six (40% and 60%, respectively). Put another way, all (100%) of the children in eight villages and two-thirds (66%) of those in the remaining five villages continued to gain weight as fast or faster than the international standard median six months after participating in the Ti Foyer.

A follow-up survey with participant mothers indicated economic strain as the primary reason they felt they were unable to continue the healthy feeding practices learned in the Ti Foyers.

Lessons learned

The participation rate in the first cycle of Ti Foyers was lower than expected (47.6%, 50 of 105), especially given the high community interest. All participants and non-participants (those invited who did not attend or dropped-out) were interviewed after completion of the first Ti Foyer cycle to strengthen the model. For non-participants, the daily food contribution, the time commitment each day, and paternal objections were the primary deterrents to participation. This section highlights modifications made to the model.

Food contribution

Ti Foyers were enlarged from five children to eight children to reduce the amount of food required per participant to create a balanced menu. In addition, the

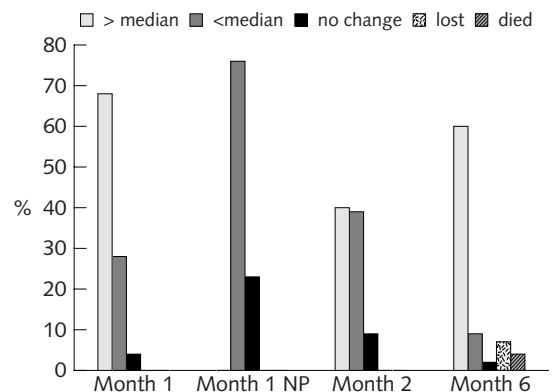


FIG. 1. Nutritional status (weight-for-age) of children by month after Ti Foyer. 50 participants and 55 non-participants (NP)

monitrice and the nutrition program contributed one item to each menu.

Time commitment

This proved to be a difficult hurdle, as the model of a daily meeting is designed to reinforce habitual good practices. However, Haitian women have many responsibilities, and some simply could not devote time every day. The requirement of 100% attendance was reduced to the mother present three times per week and another responsible adult with the child on the other days.

Paternal objections

The Ti Foyer model had been advertised as a program for children who were not in "good health," which was culturally more appropriate terminology than "malnourished." However, given the few, but important, paternal objections across all villages, the marketing of Ti Foyers was altered to being a small "school" for mothers, due to the high regard Haitians hold for education. Experience from the on-going second large cycle of Ti Foyers has suggested that this has improved participation.

Microcredit opportunity

The nutrition program has partnered with Fonkoze Bank, a countrywide microcredit institution that works with other projects and nongovernmental organizations in Haiti. This addition to the Ti Foyer model has increased overall interest and participation in the program, and is expected to also address the issue of mothers not maintaining the good practices learned in Ti Foyers due to financial difficulties. One added benefit of the partnership is that Fonkoze decided to hire the monitrices to teach the required literacy classes for the women, which will continue the relationship between the monitrices and the women as well as offer some financial support for their work as monitrices.

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"Permanent" monitrices

The nutrition program altered the Hearth model of transient monitrices to maintain a well-trained health educator in each village upon program completion. The monitrices are hired on a contractual basis, and have on-going monthly meetings to maintain contact with the program even in months with no scheduled activity in their villages.

Two-week weight

Due to mothers' overwhelming requests to know how much their child weighed after the two weeks of the Ti Foyer, another weighing day was added. Mothers were excited to know how their children fared in weight gain in addition to the visible changes they observed such as increased appetite, and improved demeanor.

In summary, we detail the methods of a complex nutrition program to combat a severe childhood malnutrition challenge in Haiti using local personnel, identified model practices, and community-led modifications. We believe that this approach has wide applicability for achieving health objectives in nutrition and possibly beyond.

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Sustained positive deviant child care practices and their effects on child growth in Viet Nam

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Abstract

Save the Children's (SC) successful integrated nutrition program in Viet Nam, the poverty alleviation and nutrition program (PANP), uses the positive deviance (PD) approach to identify key growth promoting behaviors and provides participatory adult education allowing mothers to develop skills related to these behaviors. We investigated whether improvements seen during a PANP intervention (1993–1995) were sustained three and four years after SC's departure. Cross-sectional surveys were administered to 46 randomly selected households in four communes that had previously participated in the PANP and 25 households in a neighboring comparison community in 1998 and 1999. Two children per household, an older child who had participated in the PANP and a younger sibling who had not, were measured (total n = 142 children), and their mothers were interviewed. Older SC children tended to be better nourished than their counterparts. Their younger siblings were significantly better nourished than those in the comparison group, with adjusted mean weight-for-age Z scores of -1.82 versus -2.45 ($p = .007$), weight-for-height Z scores of -0.71 versus -1.45 ($p < .001$), and height-for-age Z scores of -2.11 and -2.37 (ns , $p = .4$), respectively. SC mothers reporting feeding the younger siblings more than their counterparts did (2.9 versus 2.2 main meals per day, $p < .001$, and 96.2% versus 52% offering snacks, $p < .01$). SC mothers reported washing their hands "often" more than comparison mothers (100% vs. 76%, $p < .001$). Growth-promoting behaviors identified through PD studies and practiced through neighborhood-based rehabilitation sessions persisted years after program completion. These sustained behaviors contributed to better growth of younger siblings never exposed to the program.

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Mention of the names of firms and commercial products does not imply endorsement by the United Nations University.

Key words: positive deviance, childcare, complementary feeding, nutritional status, nutrition education, Viet Nam, Save the Children

Introduction

Childhood malnutrition in Vietnam remains a serious and widespread problem. Despite recent downward trends, at the time of this research 45% of all children under five years of age were more than two standard deviations below the reference median for weight-for-age, one of the highest rates of malnutrition in the world [1].* Reducing the prevalence of under-five malnutrition to less than 30% by the year 2000 was a key goal in the 1995 National Plan of Action [2].

In 1990, the Vietnamese government, through the Ministry of Health, invited Save the Children Federation/US to help improve child nutrition in the country. In response, Save the Children developed the poverty alleviation and nutrition program (PANP) [3]. Based on two years of pilot testing, the PANP included four main components when it was implemented in 10 communes in Thanh Hoa Province, Vietnam from 1993 to 1995. These were a community registration, a growth monitoring and promotion (GMP) program for all children under three years of age, a positive deviance inquiry (PDI) to identify key growth promoting behaviors, and a nutrition education and rehabilitation program (NERP), that incorporated the results of the PDI, for children suffering from severe malnutrition (< -3 WAZ). A revolving loan program was in place for some of the intervention period. An evaluation of the PANP in four of the 10 communes at program completion, 24 months after initiation, found that severe malnutrition, defined at weight-for-age Z score (WAZ) more than three standard deviations below reference values, had been reduced from 23% to 6% [4].

Save the Children's program success in Vietnam

* Regional technical assistance document (RETA), Viet Nam, draft, April 1998.

has been attributed, in part, to its use of community-based positive deviance studies [5] and “hearth nutrition model” [6] to rehabilitate malnourished children in their own neighborhoods, using village volunteers to train mothers of malnourished children to use growth promoting behaviors. The PANP used the positive deviance studies carried out by villagers and staff members to identify good child rearing behaviors in homes where children were well nourished despite impoverished conditions. During the positive deviance inquiry, poor families with well-nourished children (i.e., WAZ ≥ -2) were identified, interviewed, and observed regarding their feeding and care-giving practices. These interviews were analyzed to identify the key foods and behaviors that were thought to have explained the good nutritional status of positive deviant (PD) children. The foods identified during this PD inquiry are referred to hereafter as “PD foods.” Information gathered during the PD inquiry informed the content of two-week NERP sessions that were modeled on the “hearth approach” originally developed in Haiti. Villagers rehabilitated their children in their own neighborhoods using local foods and promoting the behaviors identified during the PD inquiries.

The two main objectives of the NERP were to rehabilitate malnourished children and to teach parents to sustain their child’s improved nutritional status at home. NERP health volunteers taught basic UNICEF “Facts for Life” messages [7], promoted PD behaviors with specific local examples of PD families identified through the PDI, and supervised mothers’ preparation of nutritious, calorie-dense supplemental meals. Mothers made daily contributions of positive deviant foods (e.g., shrimp) as their “price of admission” to the NERP. Health volunteers instructed mothers to add PD foods to every NERP menu and once weekly guided them to prepare a meal wholly of PD foods. The NERP lasted for six mornings a week for two consecutive weeks. In November 1995, Save the Children withdrew from the intervention areas, although local leaders opted to maintain some activities (i.e., growth monitoring and promotion but rarely NERPs). SC occasionally visited program implementers (not beneficiaries) in former intervention communes with colleagues who were interested in learning about the model.

The objective of the present study was to determine whether the PANP’s successes were sustained three and four years after SC had withdrawn from the study area. Our hypothesis was that SC children would have better nutritional (anthropometric) status than their counterparts in comparison communities that had not been exposed to the PANP. It was also hypothesized that caretakers in the SC communes were still applying the lessons learned during the NERP sessions. Finally, we also hypothesized that the children’s younger siblings in SC communes, who were born after 1995 and were

never directly exposed to the PANP, would be better nourished than age-equivalent counterparts in non-SC communes.

Methods

Study site

Thanh Hoa, a rural northern traditional Vietnamese Province, with a population of three million, is located approximately 150 km south of Hanoi. In the series of two follow-up surveys, we revisited four communes that had participated in Save the Children’s poverty alleviation and nutrition program in 1993 to 1995. These communes, Hai Ninh, Trieu Duong, Tan Dan, and Ngoc Linh, have a combined population of 25,862 inhabitants residing in coastal and lowland delta areas. Hereafter these four communes will be referred to as SC communes. We chose a fifth commune, Thanh Thuy, which had never been exposed to the PANP, as a comparison site. This commune, with a population of 6,248, was selected because of its proximity to the SC communes, and similar socioeconomic and ecologic characteristics (based on rice production per capita) to the SC communes. We conducted a comprehensive health and nutrition survey in the five communes in April-May, 1998 and returned to these communes again in July, 1999 to re-measure anthropometry only.

Data collection

Fifty-five households were randomly surveyed in the four SC communes. Two main criteria for inclusion in the SC study group were that the family had one child who previously participated in the PANP during 1993 to 1995, and that the family had one younger child, referred to as the “younger sibling,” who had not received any PANP exposure. In each commune, we chose two or three of the poorest hamlets from which we randomly selected 10 to 20 households to survey. For household selection, health volunteers created a census roster of the children born after the PANP in the four SC communes. This roster was then cross-referenced with a roster of children who had participated in the PANP. Households appearing on both lists were randomly sampled to make up the target population.

In the comparison commune, we identified eligible households as those that had no previous exposure to SC program activities (which could have occurred, for example, if the family had migrated from a SC-commune), and that included an older and younger sibling in the age range of the SC children. We sought village leaders to help identify 25 families with children of the same sex and approximately the same age as their respective SC counterparts. Village leaders were una-

ware of the hypotheses of the study.

Interviews were conducted in Vietnamese by a trained field worker who formerly worked with SC and was working with Vietnam's National Institute of Nutrition. A pre-tested 55-item questionnaire was administered in the SC communes and the comparison commune to mothers of children who met the study criteria. The 1998 survey gathered information regarding household and family characteristics, anthropometric measurements, limited to weight and mid-upper arm circumference, child feeding practices, child care practices, health seeking practices, and when applicable, caretaker's recall of the SC-NERP experience. All questions about practices referred to current practices in 1998. Weight was measured to the nearest 0.1 kg using a UNICEF-approved SECA 25.0 kg scale (SECA Ltd., Birmingham, UK) that was calibrated between each weighing. A measuring band was used to collect upper arm circumference to the nearest 0.1 cm. Behavior-related questions focused on the positive deviant child care practices that had been promoted in the PANP.

At the second follow-up in 1999, only anthropometry, including linear growth, was collected. Children's lengths (≤ 24 m) and heights (> 24 m) were measured to the nearest 0.1 cm using a Shorr measuring board (Shorr Productions Growth Unlimited, Olney, Md., USA). Seven children were lost to follow-up between 1998 and 1999. The characteristics (e.g., WAZ, socioeconomic status) of these subjects were not significantly different from those re-measured in 1999.

Data analysis

All textual data were recorded in Vietnamese. The data were translated into English, coded, entered, and first analyzed in Epi Info (Version 6.04) [8]. Nine records from the SC study group were excluded from analysis, as three records contained information on twin sets and six younger siblings were less than one month old. Comparative analyses focused on four groups of interest: SC older children (41–91 months), SC younger children (6–67 months), comparison older children (43–82 months), and comparison younger children (7–48 months).

Weights and heights/lengths were compared to the international NCHS/WHO/CDC reference standards* and converted to weight-for-age, height-for-age, and weight-for-height Z scores using the Epi-Info program. Comparison of differences between the groups was done using chi-squares for proportions and Student's *t* test for means. Multiple variable modeling was done using mixed models (SAS, Cary, N.C., USA) to control for potential confounders, test for interactions, and to account for the fact that multiple children came from

the same household. P values less than or equal to 0.05 were considered statistically significant.

Results

Household information

The majority of household variables were similar for SC and comparison communes (table 1). SC mothers differed significantly from comparison mothers, however, in years of education and hours spent working outside of the home (both, $p < .001$). On average, SC mothers had 2.4 years more education than mothers from the comparison community. Moreover, SC mothers spent 1.6 fewer hours per day working away from home. Multiple variable analyses controlled for these differences. Farming was the primary occupation of all parents surveyed in the comparison community; some mothers in the SC communes worked as vendors, fish net makers, and teachers as well as farmers (table 1). We ran sub-analyses limited to farmers only.

The two populations were similar on other socioeconomic factors, including house ownership, type of latrine, water source, total number of people residing in each household, and total number of children (table 1).

Children were balanced within each group on age and sex. Younger siblings in both study groups were similar ages—29.0 months (SC), 26.8 months (comparison), $p = .30$. However, SC older children tended to be older than their counterparts (63.8 versus 59.6 months, respectively, $p = 0.11$). Age was controlled for in multivariate analyses.

Child nutritional status

Children from the SC study group were nutritionally better off than those in the comparison group in both 1998 and 1999 (tables 2 and 3). In the older age group in 1998, SC children had an adjusted mean weight-for-age Z score (WAZ) of -2.35 Z versus -2.59 Z for comparison children, although this difference was not statistically significant ($p = .29$). In the younger group, however, SC children had markedly better nutritional status than their counterparts (age-adjusted mean WAZ -1.82 versus -2.47 , respectively, $p < .021$). Results from the mid-upper arm circumference (MUAC) in 1998 are consistent with the WAZ findings (table 2).

The distributions of older (fig. 1) and younger (fig. 2) children by WAZ category dramatically illustrate that the younger SC group had 2.6 times more children in the normal category than did their younger counterparts or either of older age groups. Indeed, the nutritional status of comparison children is strikingly similar in both age groups as reflected by the Z score

* www.cdc.gov/growthcharts

category distributions (fig. 1 and 2).

Multivariate analyses controlled for age, sex, maternal education, and hours mother works outside home used the 1998 WAZ and MUAC as dependent variables. Dif-

ferences between groups were only slightly attenuated. Restricting the multivariate analyses to only farmers in both study groups, we found the pattern of results was identical to those using the whole sample.

TABLE 1. Caretaker, household and subject characteristics and indicators of health services

Household information	SC commune (<i>n</i> = 46)	Comparison commune (<i>n</i> = 25)	<i>p</i> value
Mother's age (yr) ^a	30.4 ± 4.1	30.5 ± 5.0	.892
Mother's education (grades completed) ^a	8.2 ± 2.5	5.8 ± 1.9	< .001*
Mother's primary occupation ^b			
Farmer	38 (80.9)	25 (100.0)	.019
Other	9 (19.2)	0 (0.0)	.019
Father's primary occupation ^b			
Farmer	31 (66.0)	25 (100.0)	.004
Fisherman	8 (17.0)	0 (0.0)	.004
Other	8 (17.0)	0 (0.0)	.004
Time mother works outside home (hours) ^a	5.4 ± 1.8	7.0 ± 1.6	< .001*
Own house ^b	42 (89.4)	21 (84.0)	.513
Latrine type ^b			
None	12 (26.7)	11 (44.0)	.331
Brick	15 (33.3)	6 (24.0)	.331
Thatch	18 (40.0)	8 (32.0)	.331
Water source ^b			
Pumped water	6 (12.8)	0 (0.0)	.164
Well water	40 (85.1)	24 (96.0)	.164
Other	1 (2.1)	1 (4.0)	.164
Household members (no.) ^a	5.0 ± 1.1	5.3 ± 1.6	.366
Children in household (no.) ^a	2.6 ± 0.9	2.9 ± 1.4	.377
Age of older sibling (mo) ^a	63.8 ± 11.7	59.6 ± 9.6	.111
Age of younger sibling (mo) ^a	26.8 ± 14.0	29.0 ± 10.4	.503
Sex of older sibling (% male) ^b	18 (38.3)	7 (28.0)	.382
Sex of younger sibling (% male) ^b	19 (41.3)	11 (44.0)	.826

a. Mean ± SD.

b. Number (%).

* *p* value is statistically significant.

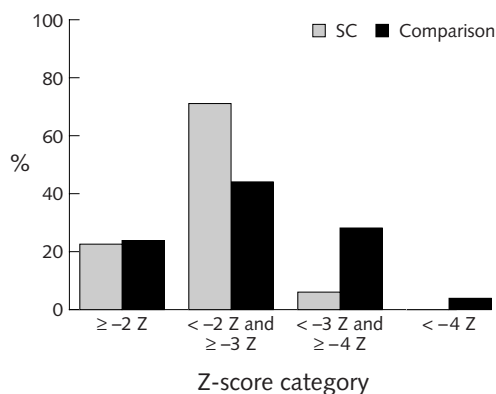


FIG. 1. Nutritional status of older children by study group

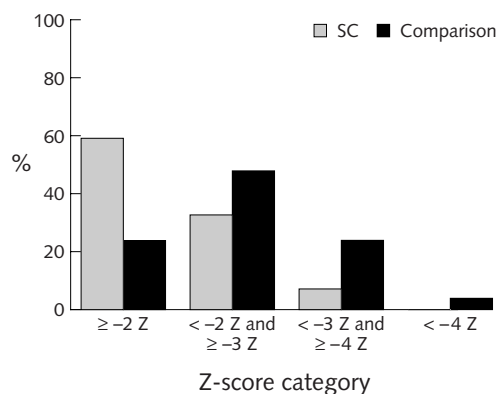


FIG. 2. Nutritional status of younger children by study group

A second set of anthropometric measurements taken in 1999 found that the differences in nutritional status between the two groups persisted and indicated that improvements were primarily due to better ponderal, rather than linear, growth (table 3). Adjusted weight-for-height Z scores for older children favored SC children by about 0.4 Z ($p = .07$). Adjusted WHZs for younger children, however, were 0.74 Z greater in favor of SC children ($p < .001$). Differences in height-for-age Z scores (HAZ) between the groups favored SC children by about one-third of a Z score, but were not statistically significant. Results were generally similar for boys and girls, although there was some tendency for the benefits to be stronger among girls (results not shown).

Feeding and child care practices

Feeding and childcare practices reported by caregivers in 1998 differed between SC and comparison groups (table 4). At the time, more SC mothers were currently breastfeeding (41%) as compared with comparison mothers (20%, $p = .07$). SC mothers fed the younger siblings more meals per day on average than did their counterparts, 2.9 ± 0.4 versus 2.2 ± 0.4 , respectively ($p < .001$). Second, while 96.2% of SC mothers fed snacks to their children in addition to main meals, only 52% of comparison mothers reported that they fed snacks ($p < .001$). Of those who reported feeding snacks, SC mothers fed on average 2.4 ± 1.0 snacks per day versus 1.6 ± 0.6 snacks per day in the comparison group ($p < .001$).

Hygiene and health seeking behaviors among SC mothers were also better. SC mothers unanimously reported that they washed their hands "often" before preparing a meal as compared with 76% of mothers in the comparison group ($p < .001$). SC families reported they were more likely than their counterparts to seek care for fever or diarrhea at a health center (72% vs. 52%, $p = .04$). Children did not differ in regards to use of preventive health services. Immunization and vitamin A coverage was similarly high between both study groups (table 4).

We investigated weaning foods used, age of introduction, and frequency of feeding (table 5). SC parents reported introducing a variety of weaning foods, including previously identified PD foods, at a younger and more appropriate age as compared with their counterparts (fig. 3). Moreover, SC mothers reported more frequent feedings of all identified foods, except fish and greens.

Significantly better feeding practices among SC mothers remained significant even after controlling for age, sex, maternal education, and hours mothers worked outside the home using multiple variable modeling.

Caretaker's recall of the SC-NERP experience

Most SC mothers recalled the six UNICEF messages taught during the NERP sessions without prompting from the interviewer. Forty-five of the 46 mothers reported that they recalled and still applied some of

TABLE 2. Adjusted WAZ and MUAC by age and study group at 1998 follow-up

Nutritional indicator	N	SC commune	Comparison Commune	Difference	<i>p</i> value
Older children					
WAZ, unadjusted	67	-2.34	-2.58	0.24	.145
WAZ, age-adjusted	67	-2.31	-2.63	0.32	.051*
WAZ, multivariate ^a	62	-2.35	-2.59	0.24	.292
Younger children					
WAZ, unadjusted	69	-1.81	-2.56	0.75	< .001*
WAZ, age-adjusted	69	-1.82	-2.54	0.72	< .01*
WAZ, multivariate ^a	63	-1.82	-2.47	0.65	.021*
Older children					
MUAC, unadjusted	68	15.2	14.2	1.0	< .001*
MUAC, age-adjusted	67	15.2	14.2	1.0	< .001*
MUAC, multivariate ^a	62	15.2	14.2	1.0	.012*
Younger children					
MUAC, unadjusted	69	14.4	13.2	1.2	< .001*
MUAC, age-adjusted	69	14.4	13.2	1.2	< .001*
MUAC, multivariate ^a	63	14.3	13.4	0.9	.01*

a. Adjusted for age, sex, maternal education, hours worked outside home.

* *p* value is statistically significant.

the messages that they were taught approximately 3 to 5 years earlier. When asked why they followed these nutrition messages, the most frequent answer (22 of 45;

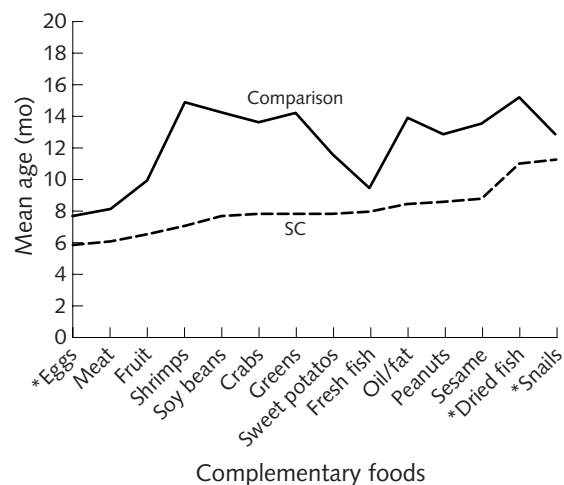


FIG. 3. Mean introduction age of complementary foods among SC and comparison communes

48%) was that the child looked healthier after completing a NERP session. Most mothers (39 of 45; 86.7%) reported caring differently for the younger sibling as compared with the older, by following the messages they were taught in the NERP (19 of 45), giving younger child a variety of foods (13 of 45; 28%), and/or giving food at an earlier age (30 of 45; 57%).

Discussion

This study examined the long-term effects of a nutrition education and rehabilitation program implemented by the Save the Children/US in Vietnam. Nutritional status improvements experienced by program beneficiaries during the PANP were sustained up to four years after the implementing agency had withdrawn. The unique finding of this study is that the largest nutritional benefits were seen among younger siblings who had never been directly exposed to the intervention itself. Sustained improved childcare and feeding practices likely contributed to the better growth

TABLE 3. Adjusted mean WAZ and mean HAZ by age and study group at 1999 followup

Nutritional indicator	<i>n</i>	SC communes	Comparison commune	Difference Z	<i>p</i> value
Older children					
WAZ, unadjusted	63	-2.17	-2.49	0.32	.021*
WAZ, age-adjusted	63	-2.15	-2.52	0.34	.011*
WAZ, multivariate ^a	58	-2.16	-2.53	0.37	.063
Younger children					
WAZ, unadjusted	66	-1.78	-2.49	0.71	< .001*
WAZ, age-adjusted	66	-1.79	-2.48	0.69	< .001*
WAZ, multivariate ^a	61	-1.82	-2.45	0.63	.007*
Older children					
WHZ, unadjusted	63	-1.13	-1.43	0.30	.055
WHZ, age-adjusted	63	-1.12	-1.45	0.33	.031*
WHZ, multivariate ^a	58	-1.09	-1.48	0.39	.070
Younger children					
WHZ, unadjusted	66	-0.70	-1.45	0.75	< .001*
WHZ, age-adjusted	66	-0.71	-1.45	0.74	< .001*
WHZ, multivariate ^a	61	-0.71	-1.45	0.74	< .001*
Older children					
HAZ, unadjusted	63	-2.24	-2.58	0.34	.054
HAZ, age-adjusted	63	-2.24	-2.59	0.35	.047*
HAZ, multivariate ^a	58	-2.28	-2.58	0.30	.232
Younger children					
HAZ, unadjusted	66	-2.06	-2.41	0.35	.133
HAZ, age-adjusted	66	-2.07	-2.40	0.33	.158
HAZ, multivariate ^a	61	-2.11	-2.37	0.26	.399

a. Means adjusted for age, sex, maternal education, hours worked outside home.

* *p* value is statistically significant.

of younger siblings in the intervention group.

As hypothesized, child nutritional status was better in the communities that had been exposed to the PANP three and four years earlier. The results and magnitude of the effects are consistent with previous SC evaluations conducted immediately after program completion. Sternin et al. found an overall 0.36 Z score improvement in WAZ for 1,893 children under three years of age at the conclusion of the PANP (from -2.14 at entry to -1.78 post PANP, $p < .001$). Berggren and Tuan's study* of four SC communes in a neighboring

district found a 40% decrease in prevalence of malnutrition ($WAZ < -2 Z$). An independent evaluation conducted by the National Institute of Nutrition [9] in four communes in Tinh Gia District found a 31% decrease in malnutrition (defined as $WAZ < -2 Z$) among children less than three years of age.

* Berggren G, Tuan T. Evaluation of the Save the Children (SC) poverty alleviation nutrition program (PANP), Thanh Hoa Province, Vietnam, unpublished document, November 1995.

TABLE 4. Child feeding, hygiene behaviors and health seeking practices pertaining to the younger sibling by comparison commune and SC communes

	SC communes (<i>n</i> = 46)	Comparison commune (<i>n</i> = 25)	<i>p</i> value
Child feeding and hygiene behaviors			
Currently breastfeeding ^a	19 (41.3)	5 (20.0)	.070
Stop breastfeeding (months) ^b	16.8 ± 4.5	16.6 ± 4.5	.867
Main meals fed per day ^b	2.9 ± 0.4	2.2 ± 0.4	< .001
Child eats from family pot ^a	34 (75.6)	23 (92.0)	.090
Feeds child snacks ^a	44 (95.7)	13 (52.0)	< .001
Snacks fed per day ^b	2.5 ± 1.1	1.6 ± 0.6	< .001
Frequency of Mother's handwashing ^a			
Often	46 (100.0)	19 (76.0)	< .001
Once in a while or never	0 (0.0)	6 (24.0)	< .001
Frequency mother washes Child's hands			
Often	46 (100.0)	16 (64.0)	< .001
Once in a while or never	0 (0.0)	9 (36.0)	< .001
Reported child vaccinations completed ^a			
BCG	46 (100.0)	24 (96.0)	.172
Polio	45 (100.0)	23 (95.8)	.168
DPT 3	42 (93.3)	21 (95.5)	.731
Measles	40 (88.9)	23 (100.0)	.097
Number of prophylactic tablets received by child in past year ^a			
Deworming ^a			
0	17 (37.0)	14 (56.0)	.122
1 or more	29 (63.0)	11 (44.0)	
Vitamin A ^a			
0-1	11 (23.9)	4 (16.7)	.483
2-3	35 (76.1)	20 (83.3)	
Child had diarrhea in last 2 weeks ^a	3 (6.7)	3 (12.0)	.445
Treatment when child is sick with fever or diarrhea ^a			
None	2 (4.6)	3 (12.0)	
Treatment at home	1 (2.3)	5 (20.0)	
Treat at commune health center	30 (68.2)	13 (52.0)	
Other	11 (25.0)	4 (16.0)	

a. Number (%)

b. Mean ± SD.

* *p* value is statistically significant.

TABLE 5. Complementary feeding patterns of comparison and SC children among the younger age group

Complementary food	Feed to child No. (%)	Age of introduction (mo) Mean + SD	Frequency of feed- ing (times/wk) Mean + SD
Positive deviant foods			
Peanuts	*	**	**
SC	40 (88.9)	8.3 + 3.4	2.7 + 1.5
Control	17 (68.0)	12.9 + 4.6	0.03 + 0.05
Sesame	**	**	**
SC	40 (88.9)	8.5 + 3.5	2.8 + 1.7
Control	15 (60.0)	13.6 + 4.9	0.03 + 0.06
Dried fish	**		*
SC	9 (20.9)	11.6 + 4.7	2.3 + 1.8
Control	16 (64.0)	15.3 + 5.5	0.8 + 1.1
Snails			**
SC	20 (46.5)	10.8 + 3.8	3.4 + 2.6
Control	15 (60.0)	12.9 + 2.9	0.4 + 1.0
Shrimps	*	**	**
SC	42 (93.3)	7.0 + 2.2	3.2 + 1.5
Control	19 (76.0)	14.9 + 5.6	1.0 + 1.8
Crabs ^a		**	**
SC	42 (93.3)	8.0 + 2.8	3.7 + 1.8
Control	20 (80.0)	13.7 + 6.3	1.0 + 1.9
Greens ^a		**	
SC	42 (93.3)	8.0 + 3.3	6.9 + 1.9
Control	24 (96.0)	14.2 + 3.6	6.4 + 1.7
Other foods			
Sweet potatoes		**	**
SC	42 (97.7)	7.9 + 3.5	6.7 + 1.1
Control	22 (88.0)	11.6 + 3.9	3.2 + 2.7
Soy Beans		**	**
SC	42 (93.3)	7.5 + 2.6	2.9 + 1.2
Control	20 (80.0)	14.3 + 5.7	0.6 + 0.9
Eggs	**		**
SC	45 (97.8)	6.1 + 3.2	4.0 + 1.5
Control	18 (72.0)	7.8 + 4.1	1.5 + 2.4
Fresh fish			
SC	43 (95.6)	8.1 + 2.7	5.6 + 1.9
Control	24 (96.0)	9.5 + 3.6	4.6 + 2.7
Meat		*	**
SC	45 (97.8)	6.2 + 2.7	2.6 + 1.2
Control	23 (92.0)	8.1 + 3.5	0.7 + 1.0
Fruit	*	**	**
SC	44 (100.0)	6.5 + 2.6	5.4 + 2.0
Control	22 (88.0)	9.9 + 3.7	1.5 + 2.1
Oil/fat		**	**
SC	40 (90.9)	8.5 + 3.6	6.6 + 1.2
Control	22 (88.0)	13.9 + 6.3	2.8 + 3.0

a. Denotes previously identified positive deviant foods during the 1993-1995 SC nutrition education rehabilitation program.

* Denotes statistically significant difference between SC and comparison groups ($p < .05$).

** Denotes statistically significant difference between SC and Comparison group ($p < 0.01$).

The unique contribution of our study is that it documents better growth among younger siblings who had never been directly exposed to the PANP intervention. We conclude that the better nutritional status of SC children versus their age-equivalent counterparts is, at least in part, due to better feeding, child-care, and health care. It appears that the “good foods, good child-care, and good health care” taught at NERP sessions and the growth monitoring and promotion sessions did result in lasting changes in maternal care-giving behavior in the SC communes, which then led to better nutritional outcomes for younger siblings. Importantly, the similarity in the distribution of nutritional categories between older and younger comparison children is consistent with unchanged maternal care practices during this same time period.

Numerous studies of nutrition interventions have been conducted in the last decade, but relatively few have examined the sustainability of program effects. Even fewer have attempted to document lasting specific behavior changes as a result of nutrition education. Some of the best evidence for the sustainability of the impact of a nutrition intervention comes from a series of studies conducted in Guatemala by the Institute of Nutrition of Central America and Panama (INCAP). In these studies, four villages in Guatemala were randomly assigned to one of two nutritional supplements from 1969 to 1977. Consumption of the high-energy, high-protein supplement by pregnant women and children up to seven years of age was found to improve birth weights and child growth, among other outcomes [10, 11]. A follow-up study in 1988–89 found that supplemented children were taller, heavier, had higher fat-free mass, and did better on psychosocial tests in adolescence than those who were given a control supplement [12, 13]. In another, recently completed follow-up study of this same population, Martorell et al. documented that the benefits of nutritional supplementation were passed on to the next generation [14].

The authors acknowledge some limitations to the study. There was a single comparison community, and it was selected and measured only years after the end of the intervention. It would have been preferable to select and measure multiple comparison communities at the initiation of the PANP. We believe, however, that the

sociodemographic and geographic similarity between the comparison community and the SC communities, and the nutritional similarity between the older and the younger siblings in the comparison community, both support our conclusion that the comparison community is representative of how the SC communes would have looked if there had been no intervention. Another limitation is that we focused on gathering information on only some of the PANP program components (i.e., the child-care and feeding practices). Other components of the PANP, (i.e., household loans) may have contributed to the sustained effects.

The success of the PANP program has led to its expansion throughout Vietnam. By 1994, interest in the PANP led to the establishment of a “Living University” where representatives from government and other international organizations attend a two-week training program to learn how to implement the PANP in their districts. The PANP and its adaptations have been implemented in over 250 communes in 9 of the 61 provinces in Vietnam, with beneficiaries totaling over 1.5 million.

Evaluations of the positive deviance approach found that it is a relatively rapid and inexpensive method for identifying potentially beneficial care practices. A recent study by Lapping et al. [15] found that the positive deviance inquiry did a good job at identifying growth associated caring and feeding practices, particularly those associated with breastfeeding, when it was compared to a traditional case-control study. Save the Children has developed a manual to instruct other programmers how to carry out a positive deviance-based nutrition intervention [16].

In conclusion, we feel that the positive deviance approach has the potential to identify growth promoting child-care practices that are easy and affordable to adopt. These characteristics result in behavior changes that can be sustained many years after an external implementing organization like Save the Children has withdrawn. Because such self-reliance is the ultimate goal of all international health and development efforts, we encourage researchers and programmers to explore the potential of the PD approach for identifying key behaviors related, not only to child health, but also to other domains, e.g., reproductive health and agriculture, as well.

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Comparison of a positive deviant inquiry with a case-control study to identify factors associated with nutritional status among Afghan refugee children in Pakistan

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Abstract

We compared the positive deviance (PD) approach in *Save the Children's* field guide with a case-control study (CCS) to identify behaviors associated with good nutritional status in Afghan refugee children 6 to 24 months of age in the Northwest Frontier Province (NWFP), Pakistan. The positive deviance inquiry (PDI), utilizing observations and interviews with mothers, fathers, and secondary caregivers in eight households, identified 12 feeding, caring, and health-seeking behaviors that were not widely practiced. The CCS, using the same selection criteria and content as the PDI with 50 mother-child pairs not in the PDI, yielded six significant associations with good nutritional status. Both the PDI and CCS detected feeding behaviors. The PDI alone identified complex phenomena (active feeding and maternal affect). The CCS alone confirmed the beneficial use of health services. The PD approach was an affordable, participatory, and valid method to identify feeding behaviors and other factors associated with good nutrition in this context.

Key words: positive deviance, validation, child nutrition, formative research, Pakistan

Introduction

Malnutrition is an outcome of a complex set of inter-related behavioral, social, psychological, and physi-

ological factors at the community, household, and individual levels. In environments with high levels of malnutrition and poverty most nutritional studies and programs have focused on common factors that contribute to poor growth rather than on less common factors that encourage good growth. The positive deviance (PD) approach is a strategy that identifies factors that enable some children to thrive in harsh environments. In nutrition, the term positive deviance (PD) has been used to describe children who grow and develop well in hostile environments [1]. This concept emerged from the observation that well-nourished children can be found in most poor communities with impoverished families [2]. Numerous studies have been completed examining the results of PD studies [2–4], but we could find none that attempted to validate the PD methodology.

Save the Children/US (SC/US) incorporated PD as a cornerstone of its two-year poverty alleviation and nutrition program (PANP) in Vietnam from 1993 to 1995. This program was associated with a 40% reduction in moderate malnutrition and a 68% reduction in severe malnutrition [1]. Mackintosh et al. [5] returned to the study commune sites three and four years after the end of the PANP and found that younger siblings of the PANP participants were nutritionally better off than those of non-participants and that many of the good care-seeking, health-seeking, and feeding behaviors persisted.

In 1998, SC published a manual, *Designing a community-based nutrition program using the hearth model and the positive deviance approach—A field guide*, to assist in operationalizing the PD approach [1]. The key steps in the guide are identifying a village health committee and community health volunteers (CHVs); measuring the nutritional status of the children; conducting the positive deviance inquiry (PDI); and designing nutrition education and rehabilitation sessions based on the PDI.

The PD methods are increasingly used in nutrition programs (personal communication, S. Tobing, CORE, "Hearth Technical Advisory Group Meeting,"

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April, 2000), but their validity remains untested. The objective of the present study was to compare the results of the two studies—a positive deviance inquiry (PDI) as presented in the SC manual and a case-control study (CCS)—for identifying the factors associated with good nutritional status in Afghan refugee children 6 to 24 months of age.

Methods

Study site and population

Afghans remain the largest single caseload of refugees in the world for the 17th year in succession for the United Nations High Commission for Refugees [6]. The majority of refugees arrived in Pakistan in 1979–80 following the Soviet invasion of Afghanistan. In 1994, a new wave of refugees entered Pakistan to escape fighting in Kabul, and an additional wave entered following the Taliban take-over of the capital. Most refugees reside in the Northwest Frontier Province (NWFP) and the Federally Administered Tribal Areas [6]. In 1999, the population of the refugee camps in and around Haripur, NWFP was estimated at 115,000. Most refugees are ethnically Pashtun, come from provinces bordering Pakistan, have low levels of formal education, and require women to live in strict *purdah* (isolation).

The Saudi Red Crescent Society initially established refugee camps in Haripur in 1980. They instituted basic health units (BHU), which persist as the primary setting for health services in the camps. In 1999 seven BHUs served the refugee population. In 1991, Save the Children (SC/US) assumed responsibility for the health services to the camp and supplemented the curative with preventive services, i.e., expanded program for immunizations, control of diarrheal diseases, and growth monitoring. The Haripur camps are permanent settlements on the plains along the Indus River two hours northwest of Islamabad. We conducted the PDI and CCS in the camps between May and July 1999.

Sample for the positive deviance inquiry (PDI)

The positive deviant inquiry (PDI) studied eight families from various basic health unit catchment areas. Staff helped to identify the families from existing basic health unit “at risk registers” which identified and tracked children who were malnourished using locally adapted PDI-inclusion criteria—between the ages of 6 and 24 months, Pashtun ethnicity, families with at least three children, families with one primary wage-earner employed as day labor or earning the equivalent to 50–100 Rs/day (US\$1–2)—and PDI-exclusion criteria (severely malnourished child in the same family, food scavenging personality, multiple births, mental or physical impairments, or chronic illness). The selection criteria sought typical families (i.e., no twins or

handicapped child) whose child’s nutritional success was likely due to their care, and not due to non-transferable factors (i.e., a scavenging personality or being an only child). The principal investigator confirmed the eligibility of each child and obtained verbal informed consent from those interviewed and the head of the household.

We used locally developed, Afghan refugee-specific World Food Programme guidelines to determine the socioeconomic level of families in the camps. Only households classified as “very poor” or “poor” were included in the studies. “Very poor” households lacked an able-bodied man and were typically headed by a female. “Poor households” had one able-bodied man who was typically engaged in day labor earning the equivalent of one US dollar per day. Neither very poor nor poor households had landholdings in Afghanistan [7].

We classified children as either positive deviant (PD) or non-positive deviant (NPD). A “PD child” was a well-nourished child from a poor or very poor household while a “NPD child” was a malnourished child from a poor family in the same neighborhood. Additionally, each child was considered part of either a “PD family,” a poor or very poor family with a well-nourished child, or a “NPD family,” a poor or very poor family with a malnourished child who lived in the same neighborhood [1]. This study departed from the guide in that it did not include negative deviant (ND) children, malnourished children of non-poor households, as there was little economic heterogeneity in the Afghan refugee community. Thus, the current PDI studied four PD children and their families and four NPD children and their families.

Sample for the case-control study

The case-control study included 50 children, 25 malnourished controls (12 male, 13 female) and 25 well-nourished cases (13 male, 12 female). The principal investigator (K. Lapping) applied the same selection criteria used in the PDI to identify potential study participants. Each field worker was assigned to a different basic health unit catchment area. They went house to house and screened potential participants based on the study criteria until they identified 25 well-nourished and 25 malnourished children.

Data collection: PDI

The PDI team included basic health unit male and female medical doctors, translators, and the principal investigator. The team conducted the PDI using two qualitative methods: observation of practices, food availability, household environment, and living quarters and interviews using closed- and open-ended

questions with mothers, mothers-in-law, and fathers. We recorded observations on structured worksheets. Female team members interviewed the mothers and mothers-in-law. Male team members interviewed the father at night after he returned from work. All interviews were conducted and transcribed in Pashto, translated into English by the head medical officer, and recorded by the principal investigator at the end of each day. The interview included five sections: background information on the child and family, child feeding practices, child caring practices, health-seeking behaviors, and questions to other family members (i.e., time spent with the child; opinion of child's health). The PDI team pre-tested and revised the questionnaire and the checklist during practice home-visits.

Data collection: case-control study

The case-control study (CCS) questionnaire replicated the content of the PDI questionnaire. The CCS team comprised four lady health visitors and the principal investigator. They gathered data on seven areas: demographic and socioeconomic indicators (i.e., number of children in family, years in the refugee camp, water source); child feeding practices (i.e., setting, eating order, number of meals per day, snacks, feeding during and after illness, breastfeeding frequency); child caring practices (i.e., frequency of bathing and hand washing, assistance with care-giving); health-seeking behavior (i.e., vaccination history, attendance at growth monitoring, treatment of illness); reproductive health (i.e., use of modern contraceptives, use of skilled birth attendants, desire for more children); sources of health and nutrition information (i.e., who is consulted for questions, attendance at basic health unit education classes and/or non-formal education classes) and anthropometric measurements (i.e., mid-upper arm circumference).

The case-control questionnaire was in English and all textual data were recorded in a combination of Urdu and English. If a fieldworker did not know an expression in English, she used Urdu, and later it was translated into English. The CCS team, working in pairs, pre-tested and revised the questionnaire.

The basic health unit staff trained lady health visitors to measure weight and mid-upper arm circumference (MUAC) for children in both studies. They obtained weights using a Salter spring balance model 235 PBW (Salter Brecknell Weighing Products, Minneapolis, Minn., USA) measuring a maximum of 25 kg precise to 100 g, calibrated daily. They measured MUAC with a UNICEF cloth armband precise to 0.1 cm. All measurements were taken twice, once by the principal investigator and once by a field worker. Measurements

were compared to the WHO/CDC/NCHS* reference population using weight-for-age indices. Each child was assigned a weight-for-age Z score (WAZ) using a hard copy of the reference population table. Children who were greater than 2 standard deviations below the reference population median were classified as malnourished.

Data analysis

The PDI team organized PDI data from each family, as suggested by the guide [1], into four categories: identifying information, feeding behaviors, health-seeking behaviors, and caring behaviors. The PDI team reconvened, reviewed the eight individual cases, and developed a summary table according to the guide to develop a PD profile for their community. The team identified PD behaviors according to the guide's criteria: "accessibility", or economic feasibility; "uniqueness" or different from the norm and not part of the conventional wisdom (more children would likely benefit from a new practice than from an already common practice); and "replicability" or ease of uptake by neighbors. Certain characteristics did not meet the selection criteria because they were hard to replicate or not immediately accessible to all caregivers. The guide classifies behaviors that were not accessible to the community (i.e., a wealthy uncle providing financial support) as "true but useless" that is, the factors were true for the family in question but useless for its neighbors since the behaviors were not transferable.

Quantitative data from the questionnaire were entered into and first analyzed in Epi Info, version 6.04 (CDC, Atlanta Ga., USA). A p value less than or equal to 0.05 was considered statistically significant. The primary dependant variable of interest was nutritional status as determined by WAZ. We used chi-square tests to assess statistically significant bivariate associations with nutritional status and a Fischer's exact two-tailed test to assess associations when a cell contained fewer than five values. We then imported the data into SAS (Cary, N.C., USA) and performed logistic regression to control for confounding.

After the two studies were independently analyzed, we made a matrix to compare the results of the two methods. The matrix illustrated the variables that each study identified as associated with better growth, not associated with better growth, or not asked.

Results

Positive deviance inquiry profile

Child gender was balanced (two PD girls, two PD boys, two NPD girls, and two NPD boys). The PD children

* www.cdc.gov/growthcharts

were younger than their NPD counterparts (7.5, 9.5, 10, and 11 months old versus 18, 18, 23, and 24 months old, respectively). Well-nourished older and malnourished younger children were uncommon.

The PD profile in this Afghan refugee community was strongly associated with feeding practices (table 1), including both breastfeeding and “special foods.” Although PD children were younger than 24 months, their mothers expressed the intention to continue to breastfeed for two years. The special foods (*suji halvah* and *shira*, made with sugar, flour, oil, and water with differing consistencies; and *arkhanak*, wild vegetables) were not unique, but they were nutritious and not typically fed to non-PD children. The PDI also identified good caring practices (i.e., active feeding including supervision and assistance eating or playing games and singing if the child refused to eat), and good health-seeking practices (i.e., increasing breastfeeding during diarrhea).

The PDI team isolated a number of additional behaviors, but classified them as “true but useless” (i.e., not readily transferable). These behaviors include the family supporting the mother and assisting with caregiving, the father taking an active role in family life, the mother not exhibiting a depressed temperament, the family with a strong relationship with the basic health unit staff, and the caregiver valuing preventive health measures.

Case-control study

The well-nourished and malnourished sample populations were similar for all background characteristics except age (table 2). As in the PDI, well-nourished children were younger than malnourished children (12.6 ± 3.5 vs. 15.1 ± 4.8 months, respectively, $p < .001$). We controlled for age in the multivariate analysis (table 3).

Bivariate analysis

Bivariate analysis identified six statistically significant associations with nutritional status (table 3). Younger

age was significantly associated with good nutritional status, as were up-to-date immunizations and a mother’s desire for more children. Feeding practices associated with good nutritional status included current breastfeeding, increasing breastfeeding during diarrhea, and increasing feeding during and after illness.

Adjusting for age

To control for the role that age played in nutritional status, we calculated age-adjusted comparisons (table 3). Four associations remained strong—up-to-date immunizations, increasing breastfeeding during diarrhea, increasing feeding during and after illness, and desiring more children.

Comparison of methods

We made a matrix to compare the results of the PDI and CCS (table 4). The CCS identified four of the 12 behaviors identified by the PDI (table 1): breastfeeding for two years, exclusive breastfeeding, increasing breastfeeding during diarrhea, and increasing feeding during and after illness. The CCS failed to find an association for five behaviors identified by the PDI: active feeding, three meals a day with small snacks, seeking appropriate medical care, paternal involvement (presence at family meals and time spent with the children), and family valuing preventive health services. The CCS did not explore three of the behaviors from the PDI since they were not part of the question guide: covered and freshly cooked food, supportive family, and non-depressed mother. All three were characterized as “true but useless” in the PDI. A mother’s desire for more children and child age were significant in the CCS but were not investigated in the PDI. Lastly, the PDI asked about, but did not include in the PD profile, two significant associations found in the CCS: immunization status and use of growth monitoring services.

Discussion

This study evaluated the PD approach by comparing a PD profile to a case-control study using both methods

TABLE 1. PD profile of poor families with well-nourished children

Good feeding practices	Good caring practices	Good health-seeking practices
Intention to breastfeed for two years Exclusive breastfeeding for first four to six months Feeding 3 or more times a day Snacks throughout the day Special foods given including: <i>shira</i> , <i>halvah suji</i> (sugar, flour, oil and water mixtures of different consistencies), <i>arkhanak</i> (wild vegetables)	Active feeding, including supervision and assistance eating as well as games and songs if child doesn’t want to eat The importance of child not eating last and receiving good foods is understood Food is freshly cooked and covered to keep flies away Mother has help with care-giving and some family support	Mother increases breastfeeding during episodes of diarrhea Child is fed more during illness and recovery period Appropriate medical responses are sought based on child’s symptoms (religious leader may be consulted but in conjunction with other methods)

TABLE 2. Descriptive statistics of Afghan refugee case-control study population, Haripur NWFP, Pakistan

Variable	WAZ > -2 (n = 25)	WAZ < -2 (n = 25)	p value
Mother's age (yr) ^a	28.8 (5.38)	30.7 (5.39)	.86
Child's age (mo)	12.6 (3.49)	15.1 (4.79)	.06
Child's age (mo)			
6–12	21 (84)	4 (16)	<.001*
12–24	10 (40)	15 (60)	
Child's gender			
Male	13 (52)	12 (48)	.77
Female	12 (48)	13 (52)	
No. of children	5.5 (2.3)	5.8 (1.9)	.77
Mother's level of formal education ^b			
None	25 (100)	22 (88)	.20
Primary	0	2 (4)	
Secondary	0	1 (8)	
Number of years in camp			
> 5	2 (8)	5 (20)	.06
5–10	6 (24)	1 (4)	
11–15	3 (12)	1 (4)	
16–20	14 (56)	13 (52)	
> 20	0	1 (4)	
Unknown	0	1 (4)	
Mothers who can go to basic health unit without permission	9 (36)	7 (28)	.54
How often visited by a female health supervisor			
Never	0	1 (4)	.39
Seldom	5 (20)	2 (8)	
Often	18 (72)	18 (72)	
All the time	2 (8)	4 (16)	
Type of gate			
None	7 (28)	4 (16)	.566
Wood	16 (64)	18 (72)	
Metal	2 (4)	3 (12)	
Household possessions			
Radio	4 (16)	7 (28)	.30
Fan	21 (84)	22 (88)	.68
Watch	14 (56)	14 (56)	.97
Bicycle	20 (8)	5 (20)	.22
Sewing machine	1 (4)	2 (8)	.55
Have a garden	2 (8)	0	.48
Have animals	14 (56)	15 (60)	.77
Growth monitoring last month	16 (64)	9 (36)	.51
Correctly vaccinated for age	24 (94)	18 (72)	.048*
Want more children	14 (56)	7 (28)	.047*
Gave colostrum	23 (92)	20 (80)	.41
Currently breastfeeding	25 (100)	19 (76)	.022*
Had diarrhea in past two weeks	8 (32)	13 (52)	.16
Increase breastfeeding during diarrhea	23 (92)	10 (40)	<.001*
Increase feeding during/after illness	22 (88)	5 (20)	<.001*

a. Mean (SD), ANOVA test for significance.

b. Number (%), Chi square test for significance.

* $p < .05$ (significant).

to identify behaviors associated with better or worse nutritional status among Afghan refugee children 6 to 24 months old. This is the first study to compare the smaller-sample, qualitative PD approach with a conventional larger-sample, quantitative research design to identify associations between independent and dependent variables. It is instructive to examine the kinds of information provided by one, the other, or both methods.

Behaviors identified by both studies

Two of the behaviors that both studies captured as associated with good nutritional status were related to the nutritional management of childhood illnesses: increasing breastmilk when the child had diarrhea and increasing feeding during the illness and recovery period. In Pakistan, diarrhea has been the number

one cause of mortality for children under five years of age [7]. Within this context, the PDI and CCS both identified critical life-saving behaviors. Moreover, the other two behaviors that both identified, sustained breastfeeding and exclusive breastfeeding, will prevent diarrhea and other morbidity. The intention for sustained breastfeeding, as discovered by the PDI, probably has a tenuous association with good current nutritional status.

Behaviors identified by the PDI, but not by the CCS

The CCS questionnaire replicated the content of the PDI question guide. However, some PD behaviors were missed either because they were not significant in or not investigated by the CCS. In the “not significant” group, some concepts were difficult to measure by interview. For example, “snack” was difficult for the study population to understand in the interview format. On the other hand, with the PDI, the team was able to observe whether or not a child was fed snacks. Furthermore, complex behaviors, such as active feeding typically defy measurement by closed-ended questioning, and direct observation is mandatory.

The not investigated by the CCS group included conditions not anticipated by the PDI observation/interview guide. A strength of the semi-structured PDI approach is the encouragement to record serendipitous, new observations. Obviously food preparation and storage were items that might have been anticipated and sought in a semi-structured way. On the other hand, a supportive family that assisted with childcare and maternal affect were new concepts. The team ultimately categorized them as “true but useless;” however, community dialogue had begun, and perhaps long-term programming goals to mobilize community support for mothers and children were influenced.

We are reassured that the conditions identified only by the PDI were likely to be beneficial, have low- or

TABLE 3. Unadjusted age and adjusted age models predicting good growth

Variable	Unadjusted		Age adjusted	
	OR	p value	OR	p value
Child’s age (mo)	6.75	.001*		
Correctly vaccinated for age	9.33	.02*	10.57	.046*
Currently breast-feeding ^a		.02*		.96
Increase feeding during and after illness	29.33	<.001*	21.45	<.001*
Increase breastfeeding during diarrhea	17.25	<.001*	19.25	.003*
Want more children	3.27	.04*	6.53	.03*

a. A cell contained no values and an odds ratio could not be calculated

* Statistically significant.

TABLE 4. Behaviors associated with better growth as captured by PDI and case control methods

Positive deviance inquiry	Case-control study		
	Significantly associated	Not significantly associated	Not asked or not considered
Significantly associated	Intention to breastfeed for 2 years Exclusive breastfeeding Increases breastfeeding during diarrhea Fed more during and after illness	Active feeding 3 + meals/day and snacks Appropriate medical care sought Paternal involvement Preventive services are worthwhile	Food freshly cooked and covered Family supportive Mother’s temperament
Not significantly associated	Went to growth monitoring last month Correctly vaccinated for age		
Not asked or not considered	Wants more children Age of child		

no-risk if adopted, and have little opportunity cost. However, we could not tell if the behaviors identified by the PDI alone were invalid because of method flaw, such as small sample size, or valid but uncorroborated by the CCS because the latter lacked the power or the measurement method to identify them.

Identified by the CCS, but not by the PDI

The CCS identified important factors not captured by the PDI, i.e., use of growth monitoring and immunization services, child age, and desire for more children. One must consider both the methodological explanation and the implications. A very small sample PDI has even less statistical power to identify valid associations than a small CCS. Fortunately, providers and families in Haripur already recognized the risk of non-use of preventive health services. On the other hand, the PDI’s failure to identify use of immunizations and growth monitoring may have been a missed opportunity for community reflection, problem-solving, and response. The CCS’s association of “wanting more children” did not contribute useful information. A fuller understanding of this complex desire would be needed before a programmatic response could be fashioned. At first glance, the programmatic response (less family planning) seems counter-intuitive. Child age was not included in the PD profile, but during the course of subject selection, the team remarked on the scarcity of well-nourished older children and the relative abundance of well-nourished younger children. The implication that nutrition interventions need to occur early in a child’s life, however, was lost in the PDI process. We feel that the selection criteria in the manual may need to be modified to result in groups more balanced on age.

An explanation for some of the insensitivity of this PDI may be that we omitted the final step. That is, the guide suggests that after the team reviews the individual tables, selects the key practices, and develops the composite table, then the team should present the conclusions to the community. If community consensus confirms the findings in the composite table, then the PDI is likely valid. If not, the guide recommends that dialogue occur until reaching consensus and that the table should be adjusted to reflect this. In our situation, the community was not consulted regarding the selection of PD characteristics. Perhaps with more community interaction, the PDI would have identified more factors.

There were additional limitations to this study. Medical professionals helped to conduct the PDI, and their biomedical orientation may have influenced what they observed and recorded in PD and NPD households and what they classified as PD and NPD behaviors. Another limitation is that different field workers were used for the two studies. Generalizability of specific findings

may have been limited since we gathered data during the summer. Finally, the ages of the PD and NPD children differed because of the difficulty of locating closely matched subjects without rosters of children, ages, and weights. Except for sustained breastfeeding, however, this age difference would have unlikely biased the other PDI findings.

The use of the PD approach in Pakistan differed from most SC programs, which typically follow the PDI with a series of home-based rehabilitation sessions for malnourished children and their caregivers [1]. Our experience demonstrated that the PDI can be done as a “stand-alone” rapid assessment tool and can be accomplished with minimal baseline malnutrition data. In a departure from some other PD studies [4], this study looked at NPD rather than ND children. On one hand, comparing a poor family’s nutritional success (PD) to a better off family’s lack of success (ND) may be “doubly motivating” by demonstrating that impoverished families can raise well-nourished children *and* that wealth is neither necessary nor sufficient for such outcomes. On the other hand, comparing PD and NPD families’ behaviors is less confounded by socioeconomic status and, thus, more valid.

In conclusion, the PDI identified key feeding behaviors associated with good child growth and may have been better than the CCS in capturing attitudes (i.e., mother’s affect) and complex behaviors (active feeding) that the CCS may have lacked the power or design to detect. Each method has its strengths and weaknesses (table 5). Goals, resources, and staff ability should

TABLE 5. Comparison of pros and cons of the positive deviance inquiry and the case-control study

Pro	Con
Positive deviance inquiry	
Captures practical, important behaviors Mobilizes, challenges community Includes observations Less expensive Results available same day Controls for confounders by selection criteria May detect key behaviors that CCS lacks power to detect	Cannot measure strength of association (although community vetting is a qualitative way to assess importance) Tiny sample may miss important, even less common, behaviors
Case-control study	
Measures strength of association Can control for confounding by selection criteria and in analysis	Expensive Community more detached from study Results not immediately available Lacks power to detect all important associations

determine the use of PDI versus CCS. If resources allow, use of both approaches may be optimal. Even alone, the PDI approach as outlined in the guide provides prompt, useful information regarding replicable and sustainable health-seeking, caring, and feeding practices that enable good growth.

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Design of a prospective, randomized evaluation of an integrated nutrition program in rural Viet Nam*

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Abstract

Few prospective studies of child growth and its determinants take place in programmatic contexts. We evaluated the effect of Save the Children's (SC) community empowerment and nutrition program (CENP) on child growth, care, morbidity, empowerment, and behavioral determinants. This paper describes the research methods of this community-based study. We used a longitudinal, prospective, randomized design. We selected 12 impoverished communes with documented child malnutrition, three comparison, and three intervention communes in each of two districts in Phu Tho Province, west of Hanoi. SC taught district trainers in November 1999 to train local health volunteers to implement the 10-month CENP, including situation analysis, positive deviance (PD) inquiry, growth monitoring and promotion, nutrition education and rehabilitation program (NERP), deworming, and monitoring. PD inquiries aim to discover successful care practices in poor households that likely promote well-nourished children. NERPs are neighborhood-based, facilitated group learning sessions where caregivers of malnourished children learn and practice PD and other healthy behaviors. We dewormed all intervention and comparison children. We weighed all children less

than 24 months of age living in the intervention and comparison communes and randomly selected 240 children (120 intervention and 120 comparison). We gathered information on nutritional status, diet, illness, care, behavioral determinants, empowerment, and program quality, monthly for six months with a re-survey at 12 months. We collected most information through maternal interview but also observed hygiene and program quality, and videotaped feedings at home. Some implementation and research limitations will attenuate CENP impact and measurement of its effectiveness.

Key words: Positive deviance, effectiveness evaluation, child nutrition, Viet Nam, hearth, diet, child-care, malnutrition

Introduction

The ViSION (Viet Nam study to improve outcomes in nutrition) project evaluated the implementation and impact of an integrated nutrition program on the nutritional status, morbidity, and diet of and care for children 5 to 25 months of age at baseline in rural Viet Nam. The ViSION project involved a partnership among Save the Children/US ([SC] Hanoi and Westport, Conn., USA), the USAID-funded LINKAGES Project (Washington, D.C.), Emory University Rollins School of Public Health (Atlanta, Ga., USA), and the Research and Training Center for Community Development (RTCCD, Hanoi). The SC Viet

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Mention of the names of firms and commercial products does not imply endorsement by the United Nations University.

* The ViSION (Viet Nam study to improve outcomes in nutrition) project evaluated the implementation and impact of an integrated nutrition program on the nutritional status, morbidity, diet of, and care for children 5 to 25 months old in rural Viet Nam, through a partnership among Save the Children/US (Hanoi and Westport, Conn., USA), the USAID-funded LINKAGES project (Washington, D.C.), Emory University's Rollins School of Public Health (Atlanta, Ga., USA), and the Research and Training Center for Community Development (Hanoi).

Nam field office developed the program model and implemented it through government partners. The LINKAGES project evaluated models for improving complementary feeding. Emory University provided technical assistance for research design, technical support, and analysis. RTCCD implemented the research, and SC headquarters identified the partners and coordinated the effort.

This paper presents the methods and describes the intervention for this 12-month longitudinal study.

Methods

Objectives and design

The ViSION project aimed to identify the results and causal pathways of SC's integrated nutrition program, the community empowerment and nutrition program (CENP). Principal aims of the research project included documenting the implementation of all aspects of the CENP, and measuring the impact of the program elements on maternal care behaviors and dietary intakes and growth of children.

We used a longitudinal, prospective, randomized, "probability effectiveness" design [1]. We randomized at the commune level (six intervention and six comparison) and then followed a total of 240 children (120 in intervention and 120 in comparison communes at baseline) longitudinally for six months with a re-survey at 12 months. Blinding subjects or data gatherers to the intervention was not feasible.

Setting and commune selection

The study took place in Phu Tho Province, 98 km northwest of Hanoi. This north central ecological region has the worst child nutrition profile (47% underweight, 46.5% stunted, and 9.9% wasted) in the country.* The province has 1.3 million rural lowland, midland, and highland inhabitants in thousands of hamlets in 249 communes in eight districts. The main ethnic group is Kinh, the predominant national majority, with some Muong, Dao, San Chay, and San Diu minorities. The population is poor with an average per capita monthly rice production of 17.8 kg.** The area is principally agricultural (rice, tea, palm oil, banana, papaya, eucalyptus) with a tropical climate (average

temperature 23.4°C). The province serves as a regional transportation hub for road, rail, and inland waterways and has some industry (fertilizer and paper).⁴ There are two rice harvests (May and June and September and October). Diarrhea season is May and June; respiratory infection season is September to December. The rainy season is February to July, and the dry season is August to January.

SC's district selection criteria were no prior SC activity, supportive officials, and a preference for lowland or midland (not highland) ecology to maximize population density. SC selected Thanh Ba and Phu Ninh Districts. SC's commune programming selection criteria were a greater than 30% malnutrition rate (weight-for-age Z score less than -2) among children under five years of age; poverty as measured by per capita rice production; and feasibility factors such as at least 300 children under five, supportive local leadership, and food generally available as reported by community leaders. We excluded extremely poor communes, which belonged to the government's "Phase One 10,000 Poorest Communes" and were already targeted by the government for special intervention programs. Commune selection criteria for research sought comparability and minimal contamination between intervention and comparison communes. To minimize confounding, we selected four groups of three communes (two in each district) from the 18 communes (10 in Thanh Ba District and 8 in Phu Ninh District) eligible for programming. The group means or prevalences for childhood malnutrition level, ecology, ethnicity, and distance from district center were as similar as possible ($p > .05$) between each group in a district. We avoided contiguous communes where possible. We then combined two groups of three communes, one group from each district, maximizing similarity of background characteristics. Finally, we randomly assigned, by coin toss, one group of six for the intervention and the other group of six as comparison communes.

The commune profiles were similar (table 1) in both study groups. All commune economies were agriculture-based, subsistence and cash crop; only one (Thanh Ba) added bamboo weaving. All communes were accessible by dirt roads with seasonal difficult access; one commune (Yen Noi) was commonly one-third submerged during July and August. All communes were Kinh ethnicity and had supportive leaders, and none had a food program. Each commune had a commune health center (CHC) with a staff of three to seven, including "doctor's assistants" and nurses. Patients obtained free consultation but paid for treatments. The CHC provided ambulatory and brief observational care. Seriously ill patients were referred to the district hospital, usually in a local vehicle.

* UNICEF and National Institute of Nutrition 1998 survey preliminary results, 1999.

** The Ministry of Labor, Invalids and Social Affairs categories food insecurity and poverty: less than 13kg of rice produced per person per month represents "food deficiency" while less than 20 kg per person per month in lowlands and less than 16 kg per person per month in the less fertile mountainous areas represents "poverty."

* Viet Nam sights and tourism, Viet Nam tourism department, 2000

TABLE 1. Study commune characteristics

Commune	Study status	Hamlets (study/total)	Area (hectares)	Total population	Children under 5	Childhood malnutrition rate (%)	Rice production (kg per capita/year)	Distance to district center (km)	Ecology: Lowland, Midland, Highland	School: Primary, Junior, High	Electricity, Telephone at Peoples' committee	CHC Staff ^a
Tri Quan	Intervention	7/10	1,022	4,433	385	30	257	10	H	P, J	E,	4
Binh Bo	Intervention	4/12	454	3,597	302	36	262	9	M	P, J	E, T	3
An Dao	Intervention	5/11	654	5,778	461	38	267	7	H	P, J	E, T	2
Chi Tien	Intervention	3/9	1,200	5,438	900	52	248	9	L	P, J	E, T	5
Dong Thanh	Intervention	7/17	1,056	6,692	1,115	53	228	8	L	P	E, T	4
Thanh Van	Intervention	8/12	1,168	5,579	950	54	138	5	H	P, J	E	4
Average		.48	926	5,253	686	44	233	11				3.7
Phu Nham	Comparison	1/7	552	3,966	318	33	258	5	H	P, J	E, T	2
Tien Du	Comparison	3/8	580	4,793	482	42	200	7	H	P, J	E, T	4
Tram Than	Comparison	3/8	1,077	3,819	329	44	240	20	H	P, J	E	4
Do Xuyen	Comparison	8/12	472	6,448	580	49	232	15	L	P, J	E, T	4
Yen Noi	Comparison	3/5	582	2,852	413	52	244	3	H	P, J	E	3
Thanh Ba	Comparison	10/18	486	6,957	404	48	142	14	L	P, J	E	5
Average		.37	625	4,806	421	45	219	11				3.7

a. Number of doctor's assistants.

Intervention

The intervention consisted of preparatory activities, training, situation analysis, and implementation (table 2). Below we describe the intended intervention as specified in SC's training manuals [2]. A concomitant process evaluation assessed adherence to protocol (table 3).

Preparatory activities

Save the Children approached district and commune officials (June and July 1999) to explain the CENP, obtain permission, evaluate potential program sites, and select actual sites. Upon finalization of the sites, SC assisted local partners to form two district management steering committees (DMSC) and six commune management steering committees (CMSC). The district and commune management steering committees monitored the CENP at their respective levels. The CMSC included the commune people's committee chairman or vice-chairman, head of the women's union, head of the CHC, and often those responsible for early childhood development and nutrition.

Training

SC staff conducted a training of trainers in November, 1999 that included two days of management training for provincial, district, and commune partners and an additional five days of implementation training for designated district trainers. These, in turn, trained local health volunteers to implement the 10-month CENP, including the situation analysis and interventions in their communes.

Situation analysis

The situation analysis included developing a roster of all children less than three years of age, conducting the first growth monitoring and promotion (GMP) session, and conducting the baseline positive deviance inquiry (PDI). The SC staff developed the child roster based on government records from commune health centers and official family planning records. The ViSION study team validated these official records with a census in a comparison commune, Yen Noi, and found the government records to be 99% complete and accurate.

TABLE 2. CENP components

Preparatory activities (June–July, 1999)	Training (November, 1999)	Situation analysis and implementation (December, 1999–August, 2000)
Brief provincial, district, commune officials Obtain permission Select districts and communes Formation of provincial management steering committee (PMSC), district management steering committees (DMSC), district facilitator teams (DFT), and commune management steering committees (CMSC)	Training of trainers Management training for PMSC and DMSC Implementation training for DFT and CMSC Training of implementers (health volunteers)	Situation analysis Census or roster development Growth monitoring session #1 Positive deviance inquiry and analysis Implementation Nutrition education and rehabilitation program every month Growth monitoring sessions 2–6 every two months Deworming once after GMP 2 Monitoring

Growth monitoring and promotion sessions

Health volunteers then conducted the first every-two-month commune-level GMP session at which they weighed all children less than 3 years of age on a UNICEF-approved, locally made, Salter 25 kg (0.1 kg interval) infant scale (Salter Brecknell Weighing Products, Minneapolis, Minn., USA). At each GMP session, health volunteers plotted weight-for-age on children's national, combined-sex, "road to health" cards displaying four growth channels: A ("normal") -2 standard deviations (SD) or more below the reference median weight-for-age; B ("moderate malnutrition") less than -2 and -3 SD or more; C ("severe malnutrition") less than -3 and -4 SD or more; and D ("very severe malnutrition") less than -4 SD. Health volunteers counseled about growth, reinforced or introduced good care-giving behavior, and referred ill children or those who failed to gain weight after two GMP sessions (four months) to the community health center for medical evaluation.

Positive deviance inquiry

The results of the first GMP session and household wealth ranking served to identify children eligible for the positive deviance inquiry (PDI). The purpose of the PDI was to identify behaviors that poor families with healthy children ("positive deviant families") practiced that were different from the norm and likely contributed to the children's good health. The CENP team grouped children according to nutritional status and age. Then health volunteers and the CMSC members identified those who were very poor and those who were better off based on family per capita rice production, occupation, land holdings, and possessions. They identified four positive deviant and two negative deviant children per commune. Positive deviant children were well-nourished (channel A) children from poor families and negative deviant children were malnourished (channel C or D) children from better

off families. Selection criteria for positive deviant children included normal nutritional status, not an only child, and 12 to 36 months of age.

SC staff trained district trainers and members of the CMSC in the concepts and methods of the positive deviance approach using the CENP training manual developed by SC [2]. They conducted the PDI with health volunteers by visiting the six families and using a question and observation guide to gather information from family members about child feeding, care, and health. The CENP teams also visited the better-off families with malnourished children to identify the causes of their children's malnutrition and to highlight the lesson that money was neither necessary nor sufficient for child health. District trainers attempted to schedule the PDI to allow observation of a child feeding. They followed a question guide with prompts and took notes. Accompanying health volunteers were encouraged to ask questions. The two district CENP teams organized PDI data from each family, according to SC's manual and field guide [3], into four categories: demographic information, feeding behaviors, health-seeking behaviors, and caring behaviors.

After the home visits, the CENP team and interested community members convened in an open forum to review the cases and to develop a summary profile for their commune of uncommon behaviors that seemed to contribute to the positive deviant (PD) children's good nutritional status despite their families' poverty. The team invited community input to develop a final consensus. The behaviors identified through the PDI informed messages taught at the nutrition education and rehabilitation program (NERP) and GMP sessions to help malnourished children in the commune.

After the situation analysis, the intervention proper consisted of GMP sessions every two months, monthly NERP sessions as long as the number of malnourished children warranted them for up to nine months, deworming after the second GMP session, and internal (i.e., apart from the ViSION evaluation) monitoring of implementation and nutritional outcomes.

TABLE 3. Data collection instruments, methods and variables for program impact

Data collection instrument number	Data collection instrument name	Method	Informant	Variables and variable families	Duration to implement (minutes)	Frequency (mo)
1A	Demographic, behavioral determinants, household environment	Interview	Mother	Variables and variable families Mother's and father's demographics, education, occupation, income, government group participation Household size, possessions; construction Sanitation, water, fuel, salt Pregnancy, delivery; pregnancy and postpartum diet Child's breastfeeding Child's meal preparation Child care, decisions, care-giver Beliefs, attitudes, self-efficacy, and norms about breast and complementary feeding Daily activities Overall satisfaction with life	35	0, 6, 12
2A	Child anthropometry and motor milestones	Anthropometry, observation, interview	Child and caregiver	Length, weight, mid-upper arm circumference 23 graded measurements of gross motor function	15	0, 1, 2, 3, 4, 5, 6, 12
2A	Maternal anthropometry	Anthropometry	Mother	Weight, height	5	0, 6, 12
3A	Child morbidity	Interview	Caregiver	Diarrhea and constitutional symptoms in last 2 weeks by day	5	0, 2, 4, 6, 12
3B	Health-seeking behavior for diarrhea	Interview	Caregiver	Breastmilk and complementary feeding by illness day Patterns of care-seeking and treatment by illness day	35	0, 2, 4, 6, 12
4A	Hygiene spot observation	Observation	Caregiver and child	Appearance of mother and child Appearance of clothes of mother and child Drinking water container Dish washing tub and dishes Food storage Garbage, animals, human and animal feces, toilet paper, flies	5	0, 1, 2, 3, 4, 5, 6, 12
5A	Child 24-hour recall	Interview	Caregiver	Food, liquids, preparations, ingredients Quantity consumed Breastfeeding episodes	30-60	0, 2, 4, 6, 12
6A	Care observation	Videotaping	Caregiver	Two, two-hour continuous videotaped record of child and care-giver, focusing on mealtime Activity log every 60 seconds for sub-sample	120	At age 12 or 17 months

8D	Community empowerment	Interview, open-ended	Health volunteers and mothers	Changes in empowerment domains identified in Viet Nam, including: Knowledge Confidence Community relationships Household decision-making	60	0, 6, 12
9A	Program participation	Interview	Caregiver	Child and mother immunized; child given vitamin A capsule Prior participation in weighing or feeding programs Child and mother's illness and care-seeking in last month Mother's care-seeking for preventive care in last month	7-10	0, 1, 2, 3, 4, 5, 6, 12
10A	Program awareness	Interview	Caregiver	Knowledge of health and nutrition messages and source of knowledge Knowledge of nutrition programs Knowledge of "positive deviant" foods or behaviors and source of knowledge	20	0, 6, 12

Nutrition education and rehabilitation program sessions

All channel B, C, and D children, i.e., less than -2 WAZ, were referred to NERPs. Health volunteers conducted monthly NERP sessions for 12 days (six days weekly for two weeks) in their hamlets to enable families to both rehabilitate and to sustain the enhanced nutritional status of their malnourished children. In the spirit of "learning by doing," mothers and caretakers were told to bring a handful of positive deviant foods each day as the "price of admission" to the NERP. Health volunteers taught hygiene, child development, and the preparation and feeding of calorie- and nutrient-dense meals from locally available, affordable foods. They stressed that the "positive deviant" foods brought by participants, such as shrimps, crabs, and greens, were all abundant in the paddies. Participants learned six key "facts for life" [4] messages concerning breastfeeding, food variety, complementary feeding, health care, and taking care of healthy children at home. Key NERP education tools included "food squares" and "clover leaf diagrams." Food squares listed the four recipes to be prepared and fed to children as extra daily meals during the 12 days. Each included breastmilk, local positive deviant foods (informed by the PDI), and common local sources of energy, protein, and micronutrients (tofu, oil, fish, eggs, etc.). Cloverleaf diagrams showed the commune's PD behaviors for a "model (i.e., PD) family" under the headings: good food, good child care, and good health care.

On each of the 12 NERP days each participating child received a nutritious meal prepared by two or more caregivers in rotation. The meal was designed as additional to the usual diet, but in practice it may have substituted for another meal [5]. Health volunteers allowed mothers to take home the unconsumed food if the child was reluctant to eat at the NERP session. In addition to mothers' contributions, the CENP provided funds to the CMSC, according to the baseline level of severe malnutrition, in this case about 1400 VND (US\$ 0.10) per NERP enrollee per NERP day. The CMSC, in turn, allocated the money to the NERP centers for the purchase of oil, rice, and eggs or tofu. The health volunteers weighed the participating children at entry and at the completion of each two-week NERP session and reviewed the progress of each NERP session with the participant mothers. The CMSC discontinued NERP sessions when the number of malnourished children made further group rehabilitation inefficient. Thereafter, health volunteers individually made home visits to malnourished children identified through GMP sessions. CENP technical support for NERPs ceased at month nine.

Prior to this CENP in Phu Tho, SC had designed NERPs to enroll only severely malnourished children (< -3 Z weight-for-age). However, the ViSION project's

TABLE 4. Data collection methods and variables, and frequency for program implementation

Data collection instrument number	Data collection instrument and CENP step	Method	Informant	Variables and variable families	Frequency (mo)
11A-1	Training of trainers	Observation	SC trainer	Completion of training topics, interactive training methods, field trips to GMP and NERP sessions	0
11A-2	Training of trainers	Interview	SC trainer	Quality of training, estimation of district trainees' ability, suggestions for improvement, time allotment, estimation of effect of RTCCD field workers	0
11A-3	Training of trainers	Interview	District trainee	Understanding of the two central tenets of CENP (PD and mothers' contributions)	0
11B-1	Census training	Interview	District trainer	Satisfaction with training, estimation of commune trainees' ability, suggestions for improvement	0
11B-2	Census training	Observation	District trainer	Age calculation, calendar use, form completion, report completion	0
11C-1	GMP training	Observation	District trainer	Community group involvement, weighing, plotting, counseling, report completion	0
11C-2	GMP implementation	Observation	Health volunteer	Community group involvement, weighing coverage by age group	0,2,4,6,8
11C-3	GMP training	Interview	District trainer	Satisfaction with training, estimation of commune trainees' ability, time allotment, suggestions for improvement	0
11C-4	GMP implementation	Validation	Health volunteer	Re-weigh the first ~5 children	0,2,4,6,8
11D-1	PDI training	Observation	District trainer	Household selection, PDI data gathering methods, PDI analysis categorization	0
11D-2	PDI training	Interview	District trainer	Satisfaction with training, estimation of commune trainees' ability, time allotment, suggestions for improvement	0
11D-3	PDI training	Interview	SC supervisor	Satisfaction with training, estimation of commune trainees' ability, time allotment, suggestions for improvement	0
11D-1	PDI Implementation	Observation	District Trainer and Health Volunteer	Interview methods, adherence to question guide, probing, time spent, scheduling visit around child feeding, # families visited; categorization of findings, use of valid data, enthusiasm	0
11D-4	PDI implementation	Interview	SC supervisor	Satisfaction with implementation, estimation of commune trainees' performance, validity of household selection criteria, time allotment, suggestions for improvement	0
11E-1	NERP training	Observation	District trainer	Completion of training topics (health education messages, encouraging mothers' contributions, NERP report), estimation of trainees' knowledge	0
11E-2	NERP training	Interview	District trainer	Satisfaction with training, estimation of commune trainees' understanding, time allotment, suggestions for improvement	0

11E-3	NERP implementation	Observation	Health volunteer	Health message, mothers' contribution and participation in food preparation, mothers' and children's hygiene, health volunteers' weighing, attendance	1-6,8
11E-4	NERP implementation	Interview	Caregivers	Attendance, enthusiasm, contribution, cooking, child diet, knowledge of rationale for participation, suggestions for improvement	1-6,8
11-E5	NERP training	Interview	SC supervisor	Satisfaction with training, estimation of district trainers' ability, estimation of health volunteers' ability, time allotment, suggestions for improvement	0
11E-6	NERP implementation	Observation	Health volunteer	Use of "food squares" and "clover diagrams"	3,5,6,8
11E-7	NEPP implementation	Interview	Food vendor	Availability and price of positive deviant and other foods	3-6,8
11F	Deworming	Interview	Health worker	Treatment protocol, distribution method	3

CENP, community empowerment and nutrition program; SC, Save the Children/US; GMP, growth monitoring and promotion; NERP, nutrition education rehabilitation program; RTCCD, Research Training Center for Community Development; PD, positive deviance; PDI, positive deviance inquiry.

baseline showed that the level of malnutrition was lower than official Ministry of Health level (30.0% vs. 44.5%, respectively). Thus, this CENP also included moderately malnourished ($< -2 Z$ and $\geq -3 Z$) children; whereas, prior CENPs graduated severely malnourished children upon achieving moderate malnutrition status. Children graduated from the NERPs in this CENP either by attaining normal nutritional status or by attending four consecutive NERPs with weight gain despite remaining moderately malnourished.

SC provided funds to deworm children under three years of age during or after the second GMP session. In the absence of a comprehensive national policy, different CMSCs, in dialogue with the DMSC, opted for various regimens, including Hatamintox Pyrantel, 125 to 250 mg for children 12 to 36 months of age; Pyrantel, 125 mg for 12 to 23 months of age and Vermox, 500 mg for 24 to 36 months of age; Mebendazol, 500 mg for 24 to 36 months of age; or Panatel, 125 mg for 24 to 35 months of age and 187.5 mg for 36 months of age. Children in comparison communes were also dewormed.

Monitoring

Health volunteers maintained NERP and GMP rosters and met with the CMSC monthly to report and review progress. A member of the CMSC supervised two to four NERPs, visiting each at least once monthly plus the relevant GMP session, if scheduled. The CMSC reviewed all health volunteers' hamlet summaries and aggregated the commune's data, often plotting them on a prominently displayed chart or table in the People's Committee headquarters or commune health center. A member of the DMSC visited each program commune monthly during a NERP and GMP session, if scheduled. The DMSC convened a monthly joint meeting with representatives of all CMSCs to review each commune's financial, GMP and NERP activities. It forwarded summary aggregates to SC monthly during the program and for one year after the end of the CENP.

Role of Save the Children

SC staff worked with government counterparts to select intervention communes, conducted the training of trainers, and advised the training and situation analyses. SC also visited the districts and each commune once or twice during implementation due to the CENP adaptation for moderately malnourished children and the requirement for more health volunteers than usual given the population dispersion. Total program cost was approximately US\$ 12,000 for the six communes.

ViSION project

Sample

The research team identified children 5 to 25 months of age in the intervention and comparison communes from the government population records. In intervention communes, the CENP team had already weighed all children less than three years of age. In comparison communes, the research team weighed all children less than two years of age. We calculated mean weight-for-age Z score (WAZ) for each hamlet and ranked the hamlets by mean WAZ within each commune. Since the SC program stressed rehabilitation of malnourished children, we selected the 34 (of 67) intervention hamlets and the 30 (of 60) comparison hamlets with the highest levels of malnutrition both to capture program impact and to maximize field efficiency. We sorted the eligible children from these hamlets by age and randomly selected children to achieve the desired sample size of 120 intervention and 120 comparison children. We excluded multiple births or children with severe medical problems, such as handicap or measles. We achieved the desired sample without refusal after 20 substitutions for families not at home.

The Ministry of Health used two growth-monitoring charts during the ViSION project. Upon enrollment, field workers gave comparison families a “new” chart (0–24 months, channel A vs. non-A) on which they recorded the weights. Although the chart had nutrition messages on the reverse, families were unlikely to read these since the field workers immediately taped them to the wall. When comparison children reached their second birthday, field workers gave them the “old” (0–60 months, channel A, B, C, and D) growth chart, taped it adjacent to the first one, and recorded subsequent weights. The CENP did not provide growth charts to intervention families, but about 20% of intervention families requested a chart, and the field worker provided them the “old” one, taped it to the wall, and recorded the weights.

These 240 study children represented the range of nutritional status of children in the study hamlets. Since the NERP, a central CENP intervention, targeted only malnourished children, we augmented the sample during month three of the study with an additional 41 NERP participants from the intervention communes to increase the sample size. We used the following selection criteria: not currently enrolled in the longitudinal study; resident of one of the 34 hamlets in the six intervention communes; attending NERPs according to the latest list available; and age 6.0 to 23.9 months at baseline. We achieved the desired sample after five refusals.

Data collection

Forms and equipment

We collected baseline data between December 23, 1999 and January 9, 2000. We used 11 forms (table 3) for gathering information on nutritional status, diet, illness, care, internal determinants of behavior (knowledge, beliefs, and attitudes including perceived advantages and disadvantages of the behavior, self-efficacy, norms, and skills), external determinants of behavior (time, father’s role, and maternal nutritional status), and empowerment or the ability to increase control over and to attain better health. During the longitudinal study we used an additional form to gather information on child feeding through video-recording. We developed all questionnaires in English, translated them into Vietnamese, trained field workers in their use, pilot-tested them in Phu Tho Province (but not in the study communes), revised them, re-trained field workers, and back-translated them into English for accuracy. We obtained all measurements on all subjects at baseline, except for videotaped care (obtained on one-half of the sample at either age 12 or 17 months starting two months after baseline) and the market survey (obtained in each of the communes starting four months after baseline). Throughout the study we used an additional group of forms (developed in a similar fashion to the original 11 forms) to evaluate the CENP implementation of the intervention (table 4).

Field workers obtained each anthropometric measurement three times at each measurement period. We used digital reading tare for the UNICEF electronic scale 890 (SECA Ltd. Birmingham, UK) precise to 100 g for weight; four-color mid-upper arm circumference tapes precise to 1 mm for mid-upper arm circumference; and Shorr infant/child/adult height measuring boards (Shorr Productions, Olney, Md., USA), precise to 1 mm for maternal heights and recumbent child lengths. Cold weather from December through February precluded undressing children, so we weighed representative clothing items, inventoried the subject’s clothing, calculated the total weight of the clothes, and subtracted this from the otherwise tared children’s weight (mother with partially dressed child versus mother alone) [6].

Field workers conducted a 24-hour dietary recall using photographs and digital reading weighing scales (Soehnle Attache Gram Scales, Montlingen, Switzerland), with 2-kg capacity and 1-g and 2-g precision for items weighing less than 1 kg and 1 to 2 kg) to identify and quantify child food preparations and ingredients [5].

We video-recorded two, two-hour segments of care timed around a child feeding. We conducted these recordings among a random sub-sample of 112 children when they were either 12 or 17 months old. Sub-

Additional information on variable construction and the analysis of growth [10], dietary [5], and morbidity variables [11] are presented elsewhere in this volume.

Discussion

This paper provides a detailed description of the implementation of the CENP, a complex integrated nutrition program in Viet Nam, and describes the rigorous methods to evaluate it. This is one of a few efforts of this kind. Most large-scale, detailed evaluations have been “efficacy trials” rather than full-scale effectiveness studies [12, 13]. Moreover, effectiveness trials typically have not involved randomization [12].

Implementation

SC succeeded in teaching district Ministry of Health partners to train local implementers to conduct a complex set of interventions: GMP, PDI, and NERP. Despite the implementers’ characteristic enthusiasm, some field realities prompt caution. The CENP is designed as a rehabilitation model for lowland, densely populated communes with high levels of severe malnutrition. Neither condition prevailed in the selected districts, which were drawn from a pool of similar districts with minimal non-governmental organizational activity and a SC commitment to introduce the program. Political support in Phu Tho province for district and commune selection was more restrained than in earlier iterations. These communes also had baseline levels of malnutrition that were far less than officially reported. In response, SC recommended including moderately malnourished children in the NERPs and revised graduation criteria, a modification that had been contemplated, but not tested. Thus, compared to children in prior CENPs, these intervention children were more likely to be enrolled in and slower to graduate from NERPs. Meanwhile, NERP implementation deviated from protocol in that daily contributions were not the norm, and home-delivered meals were common, perhaps because the population was dispersed, or caregivers were less concerned about moderate malnutrition than they would have been about severe malnutrition. It is possible that this and other local adaptations may have been implemented earlier in other settings without the knowledge of SC.

Research methods

The ViSION project trained its field research team to exacting standards of data collection. The Research Training Center for Community Development (RTCCD) team then identified and enrolled intervention and comparison households, repeated caregiver interviews and unobtrusive observations of households

and CENP implementation, mastered a new qualitative method, videotaping, achieved nearly complete data collection, and maintained exemplary data management. On the other hand, no research effort is watertight. The effect of repeated household visits remains unknown. The potential bias of demonstrating atypical behavior for the video camera is real, but can be reduced by restricting analysis to the second hour or even the second day when videotaping was less novel. The ethical requirement to provide caregivers of all comparison and some intervention children with a growth chart, which included nutritional messages, was unavoidable and may have mitigated detecting the impact of the CENP because comparison caregivers gained nutritional knowledge. Similarly, the detergent incentive may have influenced hygiene or other health outcomes in both groups. Likewise, to isolate the effect of the CENP apart from its deworming component, we dewormed all study children, and this might have improved the health and nutrition of the comparison children. We added 41 children who were attending the NERPs from month three. Interpreting their baseline and change may be difficult, given their late start, however, they were not included in most analyses to date. In addition, we decided to explore home care and care-seeking only for diarrhea, but its prevalence at baseline in December was trivial, so demonstrating change may be challenging. Finally, while non-governmental organization activity was nil at the baseline, three communes (two intervention and one comparison) received additional nutritional inputs.

On balance, the above factors are likely to have moderately attenuated differences between intervention and comparison children. All listed program factors would reduce CENP’s impact. Similarly, our provision of certain items (growth charts and detergent) to families in the comparison communes for ethical reasons would tend to improve some outcomes in comparison communes.

In summary, this evaluation documents the difference between CENP protocol and implementation and the effectiveness of the implementation in a challenging field setting. While the implementation may be similar to previous iterations, the effectiveness may be somewhat less, given the challenging field conditions and changes to protocol. Our thorough understanding of the CENP implementation allows us to better interpret its effect and thus the potential of PD-informed programs.

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Weighing Vietnamese children: How accurate are child weights adjusted for estimates of clothing weight?*

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Abstract

Children who are weighed for growth monitoring are frequently clothed, especially in the cold weather. Health workers commonly estimate and subtract the weight of these clothes, but the accuracy of these estimates is unknown. We assessed the accuracy of child weights adjusted for estimated clothing typical of hot, cold, and extremely cold ambient temperatures. Trained field workers weighed a sample of 212 children 6 to 42 months old from the ViSION project, adjusted the weights using a job aid describing the weights of common clothing by season and age, and then weighed the clothing to calculate the actual clothing and child weights. Fieldworker estimates of the weight of the clothing that children wore during weighing were remarkably good. In nearly all cases (207 of 212; 97.7%), the difference between the estimated and actual clothing weight was less than the precision of the child scales (± 50 g), and most (181 of 212; 84.5%) were within 25 g. Thus, the calculated child weights were, in fact, equivalent to the actual child weights. Using simulations, we found that improperly accounting for clothing weight can overestimate weight-for-age by 0.1 to 0.4 Z score. Accurate weights are possible, even under adverse conditions. Our training methods, clothing album, and job aid might benefit nutrition research and programming in Viet Nam as well as settings with colder climates.

Key words: Growth monitoring, validation, child clothing, weight estimation, Viet Nam

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Mention of the names of firms and commercial products does not imply endorsement by the United Nations University.

Introduction

Viet Nam has dozens of child nutrition surveys annually. The National Nutrition Program weighs nearly 10 million children under five years of age at least once a year, and non-governmental organizations weigh about one million children monthly. The proper identification of children who are growth faltering, and thus the effectiveness of these programs both at the population and the individual level, rests on accurate anthropometric measurements. These, in turn, are influenced by several factors embracing the observer (e.g., training, supervision, job aids, and performance of measurer and assistants), the equipment (e.g., scale accuracy, precision, state of repair, ambient temperature), and the subject (e.g., child's age, mood, health, clothing, and caregiver support).

Reports of nutrition-related studies [1, 2] indicate that standardization of measurement has not been widely applied in Viet Nam. Indeed, it is limited to a few studies conducted by the National Institute of Nutrition and some non-governmental organizations.** Improper accounting for clothing will clearly affect weights determined by the most accurate scales, for example those with 10 g precision [3]. Manuals for less precise scales [4] suggest that either the caregiver remove the clothes and diapers or the observer subtract the weight of the clothing from the observed

* The ViSION (Viet Nam study to improve outcomes in nutrition) project evaluated the implementation and impact of an integrated nutrition program on the nutritional status, morbidity, diet of, and care for children 5 to 25 months old at baseline in rural Viet Nam, through a partnership among Save the Children/US (Hanoi and Westport, Conn., USA), the USAID-funded LINKAGES Project (Washington, D.C.), Emory University's Rollins School of Public Health (Atlanta, Ga., USA), and the Research and Training Center for Community Development (Hanoi).

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weight. However, the weight of the clothing is generally unknown.

Viet Nam has no written protocol or manual for the common operational challenge of weighing a child who is not completely undressed. The amount of clothing worn by children while they are being weighed varies by season. Viet Nam has four seasons ranging in temperature from 30 to 34°C during summer (May–July) to 6 to 16°C plus wind chill during winter (Nov–Jan) [5]. Morbidity, food availability, and growth faltering also vary by season, potentially accentuating errors in clothing weight estimates. Weighing is often conducted outside in the open air or inside an unheated house. Under such situations, the child cannot be weighed undressed in winter. Some caregivers even resist completely undressing young infants in hot weather. At best, field workers estimate the weight of the child's clothing and subtract this from the observed weight of the clothed child to calculate the child's likely actual weight.

The purpose of this study was to assess the accuracy of field workers' estimates of the weight of children's clothing against the actual weights of the same clothing and thus to assess the accuracy of the field workers' calculated weights of the children against their actual weights. Findings from this study help validate results [6] from the ViSION (Viet Nam study to improve outcomes in nutrition) project [7] from which the subjects came, raise national attention to the accuracy of calculating child weight through clothing subtraction, and propose a method to assure quality.

Methods

Subjects

We approached nearly all (98%; 235 of 240) caregiver-child pairs) from the six intervention and six control communes of the ViSION Project described elsewhere [7]. Most (90%; 212 of 235) agreed to participate. One of six field workers weighed each child.

Measurements

We used the UNICEF SECA floor scale (SECA Ltd., Birmingham, UK) (weighing capacity: 1kg to 150kg in 100g increments with ± 100 g precision). It has a solar cell on-switch (light sensitivity 15 lux) and is powered by a long-life lithium battery, good for one million weighing cycles. This electronic scale allows weighing the mother with the child, then weighing the mother alone (or vice versa), and finally automatically calculating the difference between the two measurements as the child's weight. This is helpful for struggling children or those who would resist a sling or weighing pants. This

scale zeros itself so children can be weighed quickly [8]. Adding (or subtracting) 0 to 49.9 g does not affect the SECA digital read-out. Adding (or subtracting) 50 to 149.9 g causes the SECA scale to round up (or down) 100 g. We used a Soehnle Attache scale (Montlingen, Switzerland), accurate to 1 g with battery-powered digital display, to weigh children's clothing [8].

Data collection

This study occurred in summer from June to August with ambient temperature ranging from 30 to 34°C. Field workers either requested the caregiver to stand the clothed child on the SECA scale or used the mother-child difference method described above. The weighing was repeated three times, and the results recorded on a data-gathering form for later algorithmic derivation of the weight. Next, the field worker estimated the total weight of the child's clothes and recorded her estimate on the same sheet. Then the field worker asked the caregiver to remove all the child's clothes, which the worker weighed using the Soehnle scale. She immediately recorded the results on the data collection form. A supervisor observed approximately 10% of the sample to assure that each step was followed properly, including no post-entry modification. To simulate obtaining the weight of children's clothing during a colder season, field workers asked 123 mothers to dress their children accordingly, and 100 agreed to do so. Forty-nine of these mothers dressed their children for cold temperatures (12–16°C), and 51 dressed their children for extremely cold temperatures (6–10°C). Field workers also recorded the children's sex, date of birth, and date of survey.

Field worker training

The field workers all had bachelor or nursing degrees. The Research and Training Center for Community Development (RTCCD) trained field workers to adhere to standardized weighing guidelines and to use a reference sheet of the weights and descriptions of 30 popular children's clothing items based on the child's age and season (available on request). The RTCCD weighed and recorded approximately five examples of each item to prepare the sheet.

In addition to the reference sheet, the RTCCD prepared a training album of 35 photographs of 100 different items of popular children's clothes, including jackets, sweaters, shirts, pants, hats, shoes, socks, and scarves (available on request). An accompanying note for each photograph named the item, its principle fabric and main characteristics, the appropriate age of children wearing it, and its weight (i.e., "long-sleeve thick cotton T-shirt, 12 months, 250 grams").

Statistical analysis

We calculated the mean difference (with 95% confidence intervals) between the estimated and the actual clothing weights by season or by age. In addition, we compared the raw difference between the estimated and actual clothing weights at 25-g intervals according to season. The data were entered and analyzed in Epi Info 6.0 [9] and Excel (Microsoft Corporation, Redmond, Wash., USA). We used *t* tests to compare means and considered *p* values less than or equal to 0.05 to be statistically significant.

We used the current Vietnamese two-channel road-to-health chart to assess the effect on a calculated child weight if one failed to correct for clothing weight. We visually determined weights along the road-to-health chart curve separating normal from abnormal weight-for-age over representative ages between 6 and 24 months. We then subtracted ranges of weights representative of our actual clothing weight findings (100 to 400 g) from these child weights, calculated the sex-specific weight-for-age Z score (WAZ) for each uncorrected and corrected child weight, and calculated the difference in Z score between these child weights.

Results

The 212 subjects were well distributed by age and gender (table 1). Children's ages ranged from 6 to 42 months, and 112 (53%) were boys. There were 21 (10%) children under 12 months, 95 (45%) between 12 and 24 months, and 96 (45%) were between 25 and 32 months of age. As expected, younger infants were under-represented given that this study occurred during the second half of the larger longitudinal study.

Not surprisingly, clothing weight varied by season ($82 \text{ g} \pm 34$, $192 \text{ g} \pm 78$, and $357 \text{ g} \pm 119$, for warm, cold, and very cold seasons, respectively, $p < .001$). Older boys seemed to wear heavier clothes than girls for simulated cold conditions (264 vs. 191 g, $p = .07$).

Field workers' estimations for weights of hot weather clothing were accurate (actual minus estimated weight = $0.03 \text{ g} \pm 11.9$, $p = .97$). Estimates for cold

and extreme cold weather clothing were slightly less than actual clothing weights although not statistically, and certainly not programmatically significant (actual minus estimated weight = $6.9 \text{ g} \pm 24.4$, $p = 0.05$; and $6.6 \text{ g} \pm 27.3$, $p = 0.09$, respectively). The underestimates were minimal and similar across age groups and again not significant (actual minus estimated weight = $2.7 \text{ g} \pm 14.6$, $p = 0.4$; $3.1 \text{ g} \pm 18.3$, $p = 0.1$; and $3.4 \text{ g} \pm 22.5$], $p = 0.14$ for 6 to 11, 12 to 23, and 24 months or older, respectively).

Only three children (1.4%) had 100 g incorrectly added to their actual weights, and two children (0.9%) had 100 g incorrectly subtracted from their actual weights. In other words, nearly all estimated weights (207 of 212; 97.7%) were within the precision of the scales ($\pm 50 \text{ g}$), and most (181 of 212; 84.5%) were within 25 g (fig. 1). Six children (3%) were estimated exactly correctly.

Underestimating or neglecting to account for the weight of clothing such as those we measured would have resulted in calculating falsely elevated weight-for-age Z scores (up to 0.09-0.40 SD and 0.08-0.38 SD for boys and girls, ages 6 to 24 months, respectively) (table 2).

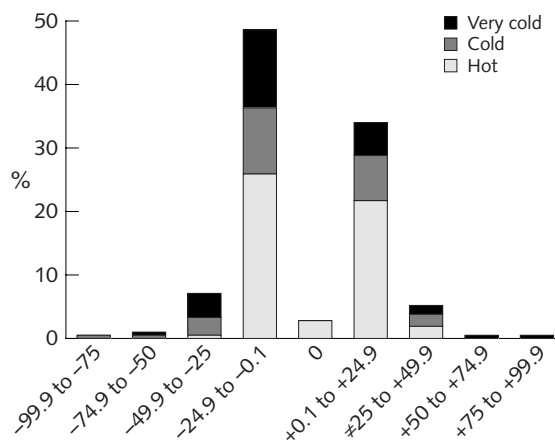


FIG. 1. Difference between actual and estimated clothing weights by season

TABLE 1. Actual weight (grams) of children's clothing by age, sex, and climate

Climate	Girls						Boys					
	6–11 mo		12–23 mo		24–32 mo		6–11 mo		12–23 mo		24–32 mo	
	<i>n</i>	Weight (g)	<i>n</i>	Weight (g)	<i>n</i>	Weight (g)	<i>n</i>	Weight (g)	<i>n</i>	Weight (g)	<i>n</i>	Weight (g)
Hot (<i>n</i> = 112)	5	67 ± 28	19	77 ± 36	30	89 ± 40	6	64 ± 34	30	81 ± 35	22	88 ± 22
Cold (<i>n</i> = 49)	2	158 ± 5	8	197 ± 85	12	191 ± 58	3	151 ± 26	14	151 ± 44	10	264 ± 104
Extreme cold (<i>n</i> = 51)	3	235 ± 29	9	331 ± 90	12	372 ± 85	2	295 ± 80	15	356 ± 153	10	413 ± 123
Total (<i>n</i> = 212)	10	136 ± 81	36	167 ± 125	54	175 ± 127	11	130 ± 97	59	168 ± 141	42	207 ± 157

TABLE 2. Effect of underestimating child weight (by 100 to 400 grams) on weight-for-age Z score

Age mo	Weight ^a kg	Male WAZ	Male d-WAZ ^b				Female WAZ	Female d-WAZ ^b			
			-100 g	-200 g	-300 g	-400 g		-100 g	-200 g	-300 g	-400 g
6	5.6	-2.30	-10	-21	-31	^c	-1.85	-11	-23	-34	^c
12	7.5	-2.61	-10	-20	-30	-40	-1.94	-09	-19	-28	-38
18	8.6	-2.43	-09	-17	-26	-34	-1.90	-09	-17	-26	-34
24	9.5	-2.53	-09	-18	-26	-35	-1.96	-08	-17	-25	-34

a. Weights visually determined from the curve demarcating normal from abnormal weight-for-age on the two-channel Vietnamese road-to-health chart in use in 2002.

b. d-WAZ, difference in weight-for-age Z score, i.e., initial male (or female) WAZ minus sex-specific WAZ when weight adjusted by 100 to 400 g.

c. These clothing weights were not observed for children age 6 to 11 mo.

Discussion

Improper correction for the weight of children's clothing can distort estimated child weights by hundreds of grams. Failure to take account of the clothing will systematically overestimate the nutritional status of a population or an individual child. Over-correction will have the opposite effect. The weights obtained in the ViSION project were accurate with regard to clothing with minimal random and no systematic error. We have suggested the training and tools (album and reference sheet) that were likely responsible for achieving this good performance.

The significance of the potential to overestimate children's weight is large. Effective child nutrition programs typically achieve an improvement in WAZ of 0.10 to 0.50 among 6 to 12 month old children [10]. Error in the range we calculated (0.1 to 0.4 Z score) could either negate an effective program (if children tended to be weighed clothed at baseline and unclothed at endline) or champion an ineffective program (if children tended to be weighed unclothed at baseline and clothed at endline). In the absence of a clear weighing protocol, one might predict greater error when baseline and endline weights were obtained in different seasons necessitating different amounts of clothing. Interpreting an individual child's growth could be equally problematic.

An unexpected observation was the tendency for these rural boys to be more warmly dressed than girls under conditions simulating cold weather. Whether this represents gender-specific style and clothing manufacture or a true difference in care between genders is not known. If the latter, then these differences might reflect varied expectations for exposure to cold (i.e., relative time inside versus outside the home), susceptibility to cold, or subtle gender preference, among others.

The study had limitations. Due to the ethical concerns about weighing undressed children in cold or extremely cold field conditions, the research team did not observe actual behavior in such settings. This

might be accomplished with another field study if an acceptably heated weighing station and open-minded caregivers were identified. Similarly, we did not assess the performance of less trained or less educated field workers typical of most programs. Whether these standards are transferable beyond a research setting remains to be seen.

In sum, we found that properly trained fieldworkers, trained with visual images of pre-weighed clothing and armed with reference sheets, can accurately calculate child weights by properly identifying clothing, estimating its total weight, and subtracting this from the child's clothed weight during a growth monitoring event. In most cases, the difference between field worker estimates and the actual clothing weight were within the precision of the child weighing scale; thus, the calculated child weights were, in fact, equivalent to the actual child weights. We suspect, however, that most growth monitoring programs have not trained field workers in a standardized, valid approach to account for clothing during weighing. Improperly accounting for clothing can lead to substantial errors in calculated child weights, misclassification, and false conclusions regarding a child's nutritional status and growth, a population's nutritional status, and a program's impact. We recommend that directors of growth monitoring programs develop locally appropriate visual aids such as those described in this paper and train fieldworkers in their use.

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An integrated child nutrition intervention improved growth of younger, more malnourished children in northern Viet Nam*

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Abstract

Integrated nutrition programs are widely used to prevent and/or reverse childhood malnutrition, but rarely rigorously evaluated. The impact of such a program on the physical growth of young rural Vietnamese children was measured. We randomized six communes to receive an integrated nutrition program implemented by Save the Children. We matched six communes to serve as controls. Our sample consisted of 238 children (n = 119 per group) who were 5 to 30 months old on entry. Between December 1999 and December 2000, we measured weight and height monthly for six months and again at month 12. Principle outcomes were weight-for-age Z score (WAZ), height-for-age Z score (HAZ), and weight-for-height Z score (WHZ), and the changes among these measures. As expected, anthropometric indicators relative to international references worsened as the children aged. Overall, children in the intervention communes who were exposed to the integrated nutrition program did not show statistically significant better growth than comparison children. Intervention children who were younger (15 months or less) and more malnourished (less than -2 Z) at baseline, however, deteriorated significantly less than their comparable counterparts. Between baseline and month four, for example, intervention children who were malnourished and less than 15 months old at entry lost on average 0.05 WAZ while similar comparison children lost 0.25 WAZ (p = .02). Lack of overall impact on growth may be due

to a lower than expected prevalence of malnutrition at baseline and/or deworming of comparison children. Targeting nutrition interventions at very young children will have the maximum impact on growth.

Key words: child, nutrition, growth, diet, Viet Nam

Introduction

Integrated nutrition programs are widely used to prevent and/or reverse childhood malnutrition, but are rarely rigorously evaluated. Malnutrition, as measured by poor anthropometric growth, has been widespread in Viet Nam. During the 1990s, 42% of Vietnamese children were stunted [1].

Since 1990 Save the Children has implemented integrated nutrition programs, designed around the positive deviance approach. This program has had various formulations and names, but will be referred to as the community empowerment and nutrition program or CENP in this paper. A previous formulation, called poverty alleviation and nutrition program and evaluated using internal monitoring data, reduced severe childhood malnutrition among children less than three years of age by 75% [2]. In addition, this improvement in children's nutrition was rapid (within the first year of implementation) as well as long lasting. Mackintosh et al. [3] found that children who participated in the program were significantly better nourished than children who did not, two years after Save the Children

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left the program area. In addition, the younger siblings of these children, born after the program ceased, were significantly better nourished than the younger siblings of children from comparison communities.

The success of the CENP in reducing malnutrition, quickly and sustainably, led us to seek to better understand how this integrated nutrition program worked. We thus undertook a large and much more methodologically rigorous evaluation of the CENP in northern Viet Nam using a randomized, prospective design. The research effect is referred to as the Viet Nam study to improve outcomes in nutrition (ViSION) project. We report here the effects of Save the Children's CENP intergrated nutrition program, as implemented within the ViSION project, on the growth of children.

Methods

The CENP intervention—as generally implemented

The CENP program is presented in detail elsewhere [4]. In summary, the CENP program incorporates three main elements: growth monitoring to identify malnourished children, a positive deviance informed approach to identify local foods or behaviors that are associated with better growth, and intensive feeding based on the “hearth model” [2]. These are briefly described below.

Identification of malnourished children and growth monitoring

At initiation of the program, local health volunteers weighed all children in the community less than three years of age. The objectives of this step are to identify malnourished children who need rehabilitation and to find positive deviant children who are growing well despite the fact that their families are poor. After the initial weighing, all children less than three years of age participate in growth monitoring and promotion sessions every other month for two years.

Positive deviance approach and inquiry

The central premise behind the positive deviance approach is that in every community there are some families who are able to raise healthy children despite their economic poverty. These are referred to as positive deviant families and their offspring as positive deviant children. The objective of the positive deviance inquiry (PDI) is to identify feeding, caregiving, and health-seeking practices which allow positive deviant families to raise well-nourished children [5]. By design, the PDI includes interviews with just four positive deviant families. The validity of the PDI method has been evaluated and presented elsewhere [6].

Nutrition education and rehabilitation program (NERP)

Information gathered through the PDI informs the content of two-week long NERP sessions that are modeled after the hearth approach originally developed in Haiti [2]. The NERP intervention is described in detail elsewhere [4]. In brief, caregivers of malnourished children are invited to attend daily intensive nutrition rehabilitation sessions that last two weeks every month.

Other elements of the CENP intervention

Messages promoted at both the growth monitoring and at the NERP sessions include feeding children “good foods” (i.e., positive deviant foods) identified during the interviews with positive deviant families, and educating mothers in good caretaking practices based on UNICEF's Facts for Life. All children are dewormed once during the first six months of the program.

Study setting, enrollment and randomization

This study was carried out in a rural province northwest of Hanoi, which is characterized by subsistence farming and poverty. Details on selecting the study setting and carrying out enrollment and randomization are provided elsewhere [4]. We identified 12 communes with minimal geographic contiguity, and group matched them on potential confounders, e.g., rice production, altitude, percent malnourished. We randomly assigned one group as the intervention group and the other as a comparison group. Within each commune, we then ranked the hamlets by proportion of malnourished children and selected those with the highest rates of malnutrition. Within these “high malnutrition” hamlets, we randomly selected 120 children age 5 to 25 months from the intervention communes and another 120 children from the comparison communes.

The CENP—as studied

The CENP we studied was as similar as possible to the CENPs implemented elsewhere in the country. There were, however, a few notable differences between the “typical” CENP and the CENPs implemented within the ViSION project. These modifications were due to unexpectedly low rates of malnutrition in the study communes, attempts to isolate the effects of specific elements of the multifaceted intervention, and ethical and logistical considerations.

Although the official statistics on the rates of malnutrition were quite high in study communes, we found fewer children than we expected who met the NERP enrollment criteria—age 5 to 25 months, no serious illness, and severe malnutrition (local reference channel “C” or “D,” i.e., less than -3 WAZ). In this implementation of the CENP, Save the Children enrolled children who were less than -2 weight-for-age Z score (WAZ),

but greater than -3 WAZ (channel “B”) in NERP sessions. Of note, the Save the Children programmers had been considering such a modification apart from the objectives of the ViSION project with the aim of shifting the CENP to be more effective at preventing malnutrition rather than just rehabilitating children who had already become severely malnourished.

We dewormed all comparison as well as intervention children for ethical reasons and to isolate the other elements of the CENP intervention from the effects that may be due to deworming. As described elsewhere [4], universal deworming of children is a Vietnamese national policy.

Measurement of outcomes

Beginning in December 1999, we used a longitudinal, prospective design to gather anthropometry on children at baseline, monthly between months 1 to 6, and again at month 12 of the study. Data collection spanned the rainy and dry seasons (February to July and August to January, respectively).

We also gathered information on diet, illness, care, internal determinants of behavior (knowledge, beliefs, and attitudes including perceived advantages and disadvantages of the behavior, self-efficacy, norms, and skills), and external determinants of behavior (time, father’s role, and maternal nutritional status). Children who were severely ill were referred to the local health center. We developed all questionnaires in English, translated them into Vietnamese, trained field workers in their use, pilot-tested them in similar, non-study communities, revised them, re-trained field workers, and back-translated them into English for accuracy.

Field workers repeated each anthropometric measurement three times at each follow-up period. We used digital reading tare SECA scales (UNICEF, electronic scale 890, SECA Ltd., Birmingham, UK), precise to 100 g for weight; four-color mid-upper arm circumference tapes, precise to 1 mm for mid-upper arm circumference; and Shorr infant/child/adult height measuring Boards (Shorr Productions, Olney, Md., USA), precise to 1 mm recumbent child lengths. Cold weather precluded fully undressing children between December and February. Consequently, we weighed representative clothing items, inventoried the subject’s clothing, calculated the total weight of the clothes, and subtracted this from the otherwise tared children’s weight (mother with partially dressed child versus the mother alone). In a separate validation study, we found this methodology to provide excellent results [7]

The field workers and supervisors, affiliated with the Research and Training Center for Community Development (RTCCD) in Hanoi, were bachelor’s level physicians and sociologists with previous health data-collection experience in rural Viet Nam. Every evening, the field workers reviewed forms for completeness and

accuracy. Supervisors reviewed all forms and discussed any discrepancies. If necessary and logistically feasible, households were re-visited to reconcile these discrepancies.

Data were entered and cleaned by the RTCCD in Hanoi using Epi Info [8]. Further checks were run at Emory University and shared with the RTCCD staff who reviewed original forms and updated the data as needed.

Variable creation

Outcomes

The three primary outcomes of interest were weight-for-age Z scores (WAZ), height-for-age Z scores (HAZ), and weight-for-height Z scores (WHZ). Z scores were based on the child’s gender, height, weight, and age (in months) and were created using Epi Info 6.04d [8]. Given some differences in baseline Z scores between intervention and comparison children, we also calculated the change in WAZ, HAZ, and WHZ between entry and each follow-up point. We compared the differences over time for each indicator for both the intervention and comparison children.

Covariables

Diet

The child’s dietary intake was ascertained via the caregiver’s 24-hour recall of what the child consumed in the previous day [9]. The 1972 version of the Vietnamese food composition table was used to convert the food items into energy and nutrient intake, such as the amount of kilocalories, protein (grams), and vitamin A (micrograms of retinol equivalent). Vitamin A supplementation was not being regularly implemented by governmental or non-governmental organizations in the study communes during the study period.

Morbidity

Caregivers were asked to recall what illnesses the child experienced in the previous two weeks. The morbidity variables considered for the multivariate analyses were the number of days with diarrhea, slight anorexia, slight fever, or any respiratory illness (includes cough, difficult/rapid breathing, chest in drawing, bronchopneumonia, throat infection, sore throat, bronchitis, runny nose, or stuffed nose). These variables were chosen because more than 5% of the children reported these illnesses. These data were analyzed as continuous variables ranging from 0 to 14 days.

Other covariables

Additional independent variables considered for multivariate models were maternal age in years (continuous), parity (less than 2 vs. more than 2 live births), household income (categorized by baseline data quartiles), home roof material (categorical), and home floor mate-

rial (categorical). A composite socioeconomic status variable was created using factor analysis that included interviewee's self-reported standard of living, electricity access, house construction material, and interviewer's assessment of the family's socioeconomic status.

Potential effect modifiers

The child's sex as well as age and nutritional status at baseline were considered as effect modifiers. Age was dichotomized as less than or equal to 15 months versus older than 15 months, the approximate mean age of the sample population at entry, while nutritional status was dichotomized as -2 or less WAZ versus more than -2 WAZ at baseline.

Statistical analysis

Linear regression was used to determine whether the intervention had an effect on the outcomes of interest (WAZ, HAZ, and WHZ), while controlling for potential confounders. Effect modification was examined between the study group and age dichotomized at 15 months and -2 WAZ by examining whether the regression lines were parallel and/or had the same y -intercept. The regression coefficients of the interaction terms were examined for significance.

Pearson's correlation coefficients were used to determine whether the independent variables were correlated. Variables were determined to be correlated if the Pearson's correlation coefficient was greater than 0.50 and statistically significant. Further, the variables were examined for gross violations of linear regression assumptions.

Final multivariate regression models were selected using a backward selection procedure. Least significant variables were dropped from the model until all remaining variables were at least significant at the 0.10 level. Study group, age, and gender variables were retained in the models regardless of significance level. All analyses were performed using SAS 8.0 (SAS Institute, Cary, N.C., USA).

Results

Sample characteristics

Two hundred and forty-one children were enrolled in the study at baseline, including two children younger than five months and one child older than 25 months who were excluded from these analyses (table 1). Of the remaining 238 participants, five dropped out during the course of the study. At month six, there were a total of 232 children with complete data (114 in intervention communes and 118 in comparison communes).

At baseline, children were 15.5 months old on average, most were breastfeeding, and more than one-third

were stunted (table 1). Study mothers were about 26 years old, almost one-quarter of them were malnourished, about half did not complete secondary school, and most had two or fewer children and were farmers. Despite matching of communes and random selection, the intervention families were somewhat better off on a number of characteristics, although this differential only reached statistical significance for child wasting (2 or about 2% of children less than -2 WHZ in intervention communities versus 12 or about 10% of children less than -2 WHZ in comparison communities, $p < .001$). Although the actual number of wasted children was small in each group, and therefore did not likely have much impact on the overall results, we controlled for initial WHZ in multivariate models. Potentially more problematic, the mean WAZ for children in the intervention group was -1.51 Z (SD: 0.91) on entry while in the control group, it was -1.68 Z (SD: 0.87) ($p = .14$). In order to understand the impact of the intervention on growth, we primarily examined the change in Z score values from baseline to various points at follow-up; we also controlled for WAZ in the multivariate models.

About half (45%) of intervention children participated in NERP sessions; attending children were enrolled in NERPs an average of 4.5 months, i.e., from 4.5 two-week sessions.

Overall impact on growth

As expected, anthropometric indicators relative to international growth references worsened as the children aged (fig. 1). Overall, children in the intervention communes did not show statistically significant better growth than comparison children at any time as indicated by the parallel nature of the lines in figure 1. Key anthropometric outcomes did not differ between intervention and comparison children at six months of follow-up (table 2).

However, both age and nutritional status at baseline significantly modified the effects of the intervention on growth. Intervention children who were younger

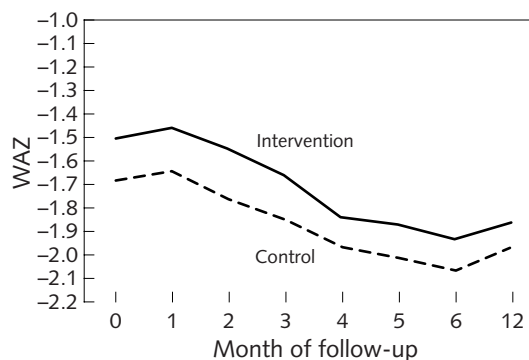


FIG. 1. Mean WAZ- intervention versus control

TABLE 1. Characteristics of the sample at baseline

Characteristics	Intervention ^a (<i>n</i> = 119)	Comparison ^a (<i>n</i> = 119)	<i>p</i> values if <i>p</i> < .05
Age (mo)	14.9 (5.1)	15.1 (5.1)	NS
Females (<i>n</i> , %)	52 (43.7)	59 (49.6)	NS
Weight (kg)	8.3 (1.3)	8.2 (1.3)	NS
Height (cm)	73.4 (5.1)	73.4 (4.7)	NS
Weight-for-age Z	-1.51 (0.91)	-1.68 (0.87)	NS
Weight-for-age < -2 Z (<i>n</i> , %)	36 (30.3)	42 (35.3)	NS
Height-for-age Z	-1.65 (0.97)	-1.67 (1.05)	NS
Height-for-age < -2 Z (<i>n</i> , %)	42 (35.3)	51 (42.9)	NS
Weight-for-height Z	-0.66 (0.76)	-0.90 (0.84)	.03
Weight-for-height < -2 Z (<i>n</i> , %)	2 (1.7)	12 (10.1)	< .01
Currently breastfeeding (<i>n</i> , %)	86 (72.3)	78 (65.5)	NS
Mother's age (yr)	26.2 (4.7)	26.9 (5.4)	NS
Mother's body mass index < 18.5 (<i>n</i> , %)	29 (24.4)	28 (23.5)	NS
Mother did not complete secondary school (<i>n</i> , %)	56 (47.1)	68 (57.1)	NS
Mother with 2 or fewer children (<i>n</i> , %)	104 (87.4)	93 (78.2)	
Mother a farmer (<i>n</i> , %)	111 (93.3)	114 (95.8)	NS
Family's yearly income, x 1000 dong ^b	6,527.0 (7109.5)	6,777.7 (6391.9)	NS
Family's socioeconomic status	-0.01 (1.03)	0.04 (1.15)	NS
Ever attended a NERP (<i>n</i> , % yes)	53 (44.5)	NA	NS
No. of months NERPs attended (<i>n</i> = 53)	4.5 (1.7)	NA	NS

NS, not significant. NA, not applicable.

a. Numbers in parentheses are mean ± SD unless indicated (*n*, %) in column 1.

b. 1US\$ = 14,025 Vietnamese dong.

TABLE 2. Key anthropometric outcomes at six months of follow-up by study group

Characteristics-coding	Sample size	Intervention group <i>n</i> =114	Comparison group <i>n</i> =118	<i>p</i> value
Child's gender				
Male, <i>n</i> (%)	231	64 (56.1%)	59 (50.4%)	0.38
Female, <i>n</i> (%)		50 (43.9%)	58 (49.6%)	
Weight-for-age (WAZ) z-scores				
Mean (SD)	232	-1.92 (0.78)	-2.06 (0.79)	0.19
Height-for-age (HAZ) z-scores				
Mean (SD)	232	-1.66 (0.94)	-1.66 (0.88)	0.96
Weight-for-height (WHZ) z-scores				
Mean (SD)	232	-1.25 (0.67)	-1.39 (0.68)	0.12
Wasting				
<-2 WHZ score: <i>n</i> %	232	17 (14.9%)	15 (12.7%)	0.63
≥-2 WHZ score: <i>n</i> %		97 (85.1%)	103 (87.3%)	
Stunting				
<-2 HAZ score: <i>n</i> , %	232	41 (36.0%)	39 (33.1%)	0.64
≥-2 HAZ score: <i>n</i> , %		73 (64.0%)	79 (67.0%)	
Underweight				
<-2 WAZ score: <i>n</i> , %	232	53 (46.5%)	66 (55.9%)	0.15
≥-2 WAZ score: <i>n</i> , %		61 (53.5%)	52 (44.1%)	

(15 months or younger) and more malnourished (less than $-2Z$) at baseline deteriorated less than their counterparts who were matched for age and nutritional status (fig. 2). Between baseline and month four, for example, younger, more malnourished intervention children lost on average 0.05 WAZ relative to reference values; whereas, younger, malnourished comparison children lost 0.25 WAZ during the same period ($p = .02$). The benefits of the intervention ranged from 0.15 WAZ to 0.21 WAZ in months two through five. The difference at months 6 and 12 were somewhat attenuated and not statistically significant.

A similar pattern was seen among this more malnourished, younger group for the onset of stunting. The HAZ scores of children in the intervention group had deteriorated 0.3 HAZ up to 0.65 HAZ less than comparison children at the various follow-up points (fig. 3). No significant benefits among younger, more malnourished children were seen for WHZ.

Multivariate models of these outcomes, controlling

for potential confounders, confirmed the significant modifying effects of age and nutritional status (table 3). A three-way interaction among intervention, age, and WAZ at entry was highly statistically significant ($p < .005$).

Discussion

Overall, rural children exposed to Save the Children's integrated nutrition program in northern Viet Nam did not show better growth than comparison children. However, children who were younger (less than 15 months old) and more malnourished (less than -2 WAZ) at baseline had significantly better growth than similarly young, malnourished comparison children. These effects were strongest during the most intensive first six-month period of the intervention and became attenuated and non-statistically significant three months after cessation of the feeding program.

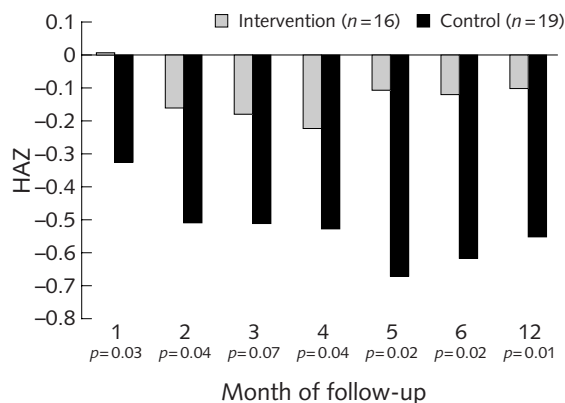
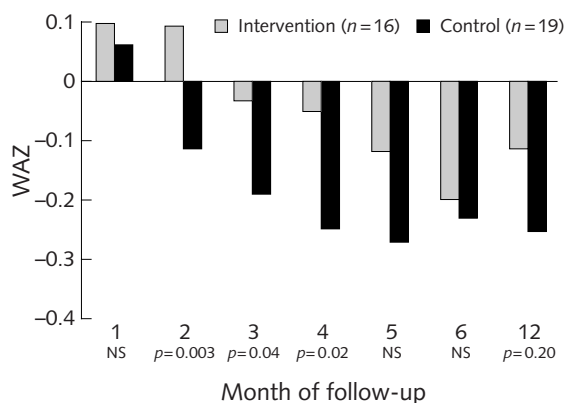


FIG. 2. Difference in WAZ between follow-up month and baseline children less than 15 months of age and less than -2 WAZ at baseline (intervention, $n = 16$, control, $n = 19$)

FIG. 3. Difference in HAZ between follow-up month and baseline children less than 15 months of age and less than -2 HAZ at baseline (intervention, $n = 16$, control, $n = 19$)

TABLE 3. Results of multiple variable analysis of the effects of the CENP intervention on change in weight-for-age Z-score (WAZ) between baseline and four months of follow-up

Variable	Label	Parameter estimate	Standard Error	Pr > t	95% confidence limits	
Intercept	Intercept	-0.01	0.07462	0.8935	-0.15704	0.13704
age15	Age ≤ 15 mo =1 age > 15 = 0	-0.24263	0.11095	0.0298	-0.46125	-0.02401
wazneg2	WAZ $> -2 = 1$ and WAZ $< -2 = 0$	-0.23886	0.09208	0.0101	-0.42031	-0.05741
intvgrp	Study groups (intervention vs. control)	-0.162	0.10942	0.1401	-0.37761	0.05361
age_grp	Age at baseline * intervention group	0.35776	0.16346	0.0296	0.03567	0.67984
age_unwt	Age at baseline * WAZ at baseline	-0.0482	0.13821	0.7276	-0.32054	0.22413
grp_unwt	Intervention group * WAZ at baseline	0.28794	0.13419	0.033	0.02352	0.55236
agegrpwt	Age at baseline * intervention group * WAZ at baseline	-0.56836	0.1998	0.0049	-0.96205	-0.17466
R-square						
0.2674						

Notably, the largest effects coincided with the months March-April, which immediately precede the May-June rice harvest.

There was no overall effect on growth in spite of the fact that the intervention was successful at improving dietary intakes and reducing morbidity among this same sample counterparts [9, 10]. Intervention children consumed more positive deviant foods and energy than their comparison counterparts [9]. Dietary intakes of youngest, most malnourished children in the intervention communes were significantly improved as compared to younger, malnourished comparison children. We found significantly fewer respiratory infections among the CENP group overall. Notably, rates of diarrheal disease, which has been most consistently associated with poor growth, were very low in both groups.

The finding that younger children benefited most from the intervention is consistent with other studies that have examined the effect-modifying role of age with nutritional interventions. In an efficacy study from Guatemala, researchers found that for each additional 100 kcal per day of dietary supplement, length growth per year was 9 mm, 5 mm, and 4 mm greater for one-year-olds, two-year-olds, and three-year-olds, respectively [11].

The fact that the greatest effects of intervention programs are consistently seen among the youngest children is due to three related factors: growth rates (e.g., weight gain per month) are highest in early infancy and decline significantly through childhood, growth faltering is highly concentrated during the period 6 to 15 months of age, and it is easier to prevent growth faltering than to reverse it. In regards to the first point, children gain more weight per month, relative to their body weight as well as in gross terms, during the first year of life as compared to the third. A dietary deficit or disease episode during the first year of life will thus have a greater relative impact on expected growth rate during infancy than during later childhood. In a separate analysis of programmatic data from over 46,000 children in seven developing countries, we found that growth faltering began at approximately three months of age and was essentially complete by 15 months of age across all regions [12]. Finally, it is well established that once a child has become anthropometrically malnourished, he/she requires much more intensive feeding and improved health to “catch-up” than if growth faltering had been prevented in the first place [13].

We acknowledge that the above emphasis on prevention is somewhat at odds with our finding in this study that children who were more malnourished on entry benefited more than those who were less malnourished on entry. It is important to reiterate that severe malnutrition was nearly non-existent among this study population. Our comparison is thus mild-moderate malnourished compared to non-malnourished. Other

researchers have documented a clear contribution of, for example, mild-moderate malnutrition on mortality [14]. Future research should seek to define the optimal balance between prevention of malnutrition versus targeting of resources towards the more malnourished populations. The relative combination between these two will certainly vary by locale, status of the population, program objectives, and resource availability.

The magnitude of the effects that we found among the younger, most malnourished sub-group, were in line with published efficacy trials. In a review of eight efficacy trials of food supplementation that improved dietary intakes by 65 to 302 kcal per day, infant growth measures were improved by 0.04 to 0.46 of a standard deviation [15]. Thus, the 0.15 SD to 0.6 SD improvements in WAZ we found in this sub-group are in line with the magnitude of effects found in other studies.

There are a number of potential reasons that we did not see an overall effect of the CENP on growth for the whole sample, including lower than expected rates of baseline malnutrition, the study design, and modifications to the CENP and challenges associated with program implementation.

As noted above and explained in detail elsewhere [4], we found significantly lower rates of malnutrition than we had anticipated or than had been observed in previous iterations for the CENP. While positive for Viet Nam, the finding required adapting the CENP model to enroll moderately as well as severely malnourished children in the NERPs. The fewer severely malnourished children attenuated the impact of the project on growth, as supported by the fact that children who were more malnourished on entry benefited most from the program. Additionally, because there were fewer malnourished children, NERPs covered larger geographic areas, caregivers had to travel greater distances to reach NERPs, attendance at NERP sessions was lower than expected, and in a number of cases, PD meals were delivered to the homes of caregivers who could not or did not participate in NERP sessions [16].

Regarding design issues, we dewormed comparison as well as intervention children for ethical reasons to better isolate the effects of the dietary elements of the CENP. Deworming of both groups likely improved diet and growth among the comparison children, which thereby attenuated the differential benefits of the CENP. The deworming of all subjects likely contributed to the lack of effect the program had on growth among older children, who are more likely to bear heavier worm loads [17]. In that the national policy of Viet Nam is to deworm all children, the effectiveness of the CENP should be judged on its impact on outcomes above and beyond that which would occur with deworming alone. The optimal study design, which would have included four groups, CENP and comparison, each with and without deworming, was beyond the resources of this project.

Despite a number of study limitations, there are important strengths as well. These include a clear hypothesis, a randomized design, large sample sizes, repeated measures using validated measurement instrument, well-trained field workers, and careful attention to data cleaning and analysis [18]. In other words, we feel confident that the results we are reporting of this project on growth are robust.

In conclusion, this rigorous evaluation of an integrated nutrition program in Viet Nam did not find the impact on child growth that was expected. The lack of an overall effect on growth is likely due to a combination of relatively low malnutrition rates among subjects on entry and deworming among both comparison as well as intervention children, among other factors. We did, however, find significant protection by the CENP intervention against deterioration of body mass (WAZ) and height (HAZ) among those intervention children who were younger and more malnourished on entry. This finding, along with a growing number of studies

conducted elsewhere in the world, strongly suggests that programs that aim to maintain and improve child growth will be most successful if they focus on children less than two-years old.

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Effect of an integrated child nutrition intervention on the complementary food intake of young children in rural north Viet Nam*

Helena Pachón, Dirk G. Schroeder, David R. Marsh, Kirk A. Dearden, Tran Thu Ha, and Tran Thi Lang

Abstract

Forty-two percent of Vietnamese children are stunted by two years of age. Since 1990, Save the Children Federation/US (SC) has implemented integrated nutrition programs targeting young children. We evaluated the effect of SC's nutrition program on the complementary food intake of young rural Vietnamese children. Using a longitudinal, prospective, randomized design, we followed 238 children (119 each from intervention and comparison communes) age 5 to 25 months old for six months with a re-survey at 12 months. We gathered 24-hour recall data at baseline and at months 2, 4, 6, and 12. Dietary energy intake was calculated using the 1972 Vietnamese food composition table. Key outcomes were daily frequency of consuming intervention-promoted food and non-breastmilk liquids and food, daily quantity of non-breastmilk liquids and food consumed, daily energy intake, and proportion of children meeting daily median energy requirements. Young rural children exposed to SC's program consumed intervention-promoted and any foods more frequently, ate a greater quantity of any food, consumed more energy, and were more likely to meet their daily energy requirements than comparison children. Some effects were only observed during the intensive intervention period; others persisted into or were evident only at the 12-month follow-up, approximately four months after program completion. Based on the mothers'

reports, the intervention did not apparently compromise breastfeeding prevalence or frequency. The intervention improved children's food and energy intake and protected them from declining as rapidly as comparison children in meeting their energy requirements.

Key words: nutrition, complementary food, complementary feeding, diet, dietary intake, intervention, infant feeding, Viet Nam

Introduction

Forty-two percent of Vietnamese children are stunted by two years of age [1]. Stunting in early life leads to impaired immune function, increased rates and severity of infection, delayed motor development, and impaired cognitive function and school performance [2]. Dietary interventions targeted at infants 6 to 12 months old can improve energy intakes and growth [3]. Further, data from Guatemala suggest that interventions targeted at younger children (less than 2 to 3 years old) have the greatest nutritional impact [4].

Since 1990 Save the Children (SC) has implemented integrated nutrition programs, based on the positive deviance approach, to reduce severe childhood malnutrition by approximately 75% [5]. The improvement in children's nutrition had been rapid (within the first year of implementation) permitting SC to move on to other program sites; and the impact was also long lasting. In a recent study [6], children who participated in the program were significantly better nourished than

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Mention of the names of firms and commercial products does not imply endorsement by the United Nations University.

* The ViSION (Viet Nam study to improve outcomes in nutrition) project evaluated the implementation and impact of an integrated nutrition program on the nutritional status, morbidity, diet of, and care for children 5 to 25 months old at baseline in rural Viet Nam, through a partnership among Save the Children/US (Hanoi and Westport, Conn., USA), the USAID-funded LINKAGES Project (Washington, D.C.), Emory University's Rollins School of Public Health (Atlanta, Ga., USA), and the Research and Training Center for Community Development (Hanoi).

children who did not two years after SC left the program area. In addition, the younger siblings of these children, born after the program ceased, were much better nourished than the younger siblings of children from comparison communes.

In this paper we report findings from the ViSION (Viet Nam study to improve outcomes in nutrition) project, a rigorous evaluation of SC's integrated nutrition program in rural north Viet Nam. Specifically, the effect of SC's program on young children's intake of complementary foods is presented.

Methods

The intervention

Details of the program implementation are presented elsewhere [7]. Briefly, the positive deviance approach was used to identify positive deviant children who were well nourished yet came from resource-poor families [8]. Families of positive deviant children were interviewed regarding their feeding and caregiving practices [9]. These interviews were analyzed to identify the key foods and behaviors that were thought to explain the good nutritional status of positive deviant children. Information gathered also informed the content of two-week long nutrition education and rehabilitation sessions that were modeled after the hearth approach originally developed in Haiti [5, 10]. Malnourished children and their caregivers participated in intensive nutrition rehabilitation sessions that lasted two weeks per month and continued for up to nine months. Furthermore, all children less than three years of age participated in growth monitoring and promotion sessions every other month for two years and were dewormed once during the first six months of the program. Messages promoted at the growth monitoring and at the nutrition rehabilitation sessions included feeding children "good foods" (i.e., positive deviant foods) identified during the interviews with positive deviant families, increasing the quantity of foods given to children, feeding 5 to 6 times per day, continued breastfeeding, and health-seeking and other caring behaviors not evaluated in this paper.

Study setting, randomization, and enrollment

This study was carried out in a rural province north-west of Hanoi characterized by subsistence farming and poverty. Details on selecting the study setting, randomization, and enrollment are provided elsewhere [7]. In brief, we identified 12 communes, paired them on common attributes that were thought to have been potential confounders of the associations under study (e.g., malnutrition level, ethnicity, rice production, ecology) [7], and randomly assigned one of each of the six resulting pairs for the intervention

and the other for comparison. Among the commune hamlets with the largest proportion of malnourished children (as determined by weight-for-age Z score less than -2), 120 children 5 to 25 months old were randomly selected from the intervention communes and another 120 children were randomly selected from the comparison communes. We dewormed all intervention and comparison children.

Measurement of outcomes

Beginning in December 1999, we used a longitudinal, prospective design to gather 24-hour dietary recall data at baseline and months 2, 4, 6, and 12 of the study. Data collection spanned the rainy and dry seasons (February to July and August to January, respectively). The form was used to gather children's dietary intake and breastfeeding status and frequency from their caregivers. The form was based on 24-hour recall forms used by the National Institute of Nutrition (NIN) in Viet Nam, the Instituto Nacional de Salud Pública in Mexico, and the Instituto de Nutrición de Centro América y Panamá in Guatemala and were pre-tested in Viet Nam. A doctoral-level nutritionist from the NIN trained four field workers and two supervisors in gathering, calculating, and coding the data, supervised the pre-test, and provided guidance and feedback as requested. The field workers and supervisors, affiliated with the Research and Training Center for Community Development (RTCCD) in Hanoi, were physicians and sociologists with previous experience collecting health data in rural Viet Nam.

Soehnle Attaché Gram scales (Montlingen, Switzerland) with 2-kg capacity and 1-g and 2-g precision for items weighing less than 1 kg and 1 to 2 kg, respectively, were used to measure non-breastmilk foods and liquids consumed by children using the household bowls, cups, and utensils in which they were served. When foods could not be weighed, estimates were derived using household bowls, cups, and utensils and NIN-developed, portion-size photos for commonly consumed foods.

The food composition table officially recognized by the NIN, published in 1972, was used for all analyses [11]. When foods consumed could not be found in the food composition table, a food in the table most closely resembling this food was substituted. Some commercially processed foods were added to the food composition table using the nutrient information printed on the labels.

During household visits, field workers interviewed the caregiver(s) who had fed the child the previous day. If a child was fed outside the home, we sought to identify and converse with the person(s) who prepared the food and fed the child. In a 45-minute visit during months two and four, the field worker collected data on several parameters such as anthropometry and morbidity and spent approximately 30 minutes of this time collecting the dietary intake information. During months 0, 6,

and 12, additional forms were applied. Over the course of a two-week field rotation, each field worker visited approximately four homes daily, seven days a week.

Daily meal times were reported by caregivers and could include at least seven meals or feeding times: snacks consumed before breakfast, breakfast, snacks consumed between breakfast and lunch, lunch, snacks consumed between lunch and dinner, dinner, and snacks consumed after dinner.

Current breastfeeding status was determined by asking the caregiver if the child breastfed at all on the previous day. Breastfeeding frequency was calculated based on the number of breastfeeds reported by caregivers during the 24-hour period of interest.

Every evening and with supervisor support, the field workers completed calculations (i.e., net grams consumed by children) by hand and entered these on the dietary recall form. Supervisors reviewed all forms and discussed any discrepancies on a daily basis. If necessary and logistically feasible, households were re-visited to reconcile these discrepancies.

Data were entered and cleaned by the RTCCD in Hanoi using Epi Info [12]. Further checks were run at Emory University and shared with the RTCCD staff who reviewed original forms and updated the data as needed.

This study was approved by the Emory University Human Investigations Committee. Written informed consent was obtained from the household head during the first home visit.

Data analysis

The impact of the intervention on dietary intake was evaluated during two periods: at months 2, 4, and 6 combined which correspond to the intensive Save the Children program period and at month 12 (follow-up) which was approximately four months after the program was completed. As such, the ViSION project and the SC program overlapped during seven of the nine months of the SC program, corresponding to months 0 to 6 of the ViSION project. The baseline and follow-up data correspond to the dry season and the intensive period corresponds to the wet season.

We created a socioeconomic status composite variable using factor analysis within SAS [13] considering the interviewee's self-reported standard of living, electricity access, house construction material, and interviewer's assessment of the family's socioeconomic status. We used Epi Info version 6.04b [12] to create anthropometric Z scores using the NCHS/WHO/CDC² reference values and other sociodemographic and outcome variables. To evaluate a child's energy intake relative to median requirements, we used age- and breastfeeding-specific kcal per kg requirements for breastfeeding and non-breastfeeding children 6 to

24 months old originally developed by WHO [2] and later revised by Dewey and Brown [14]. For breastfed children, average breastmilk intake was assumed. For children older than 24 months, sex- and age-dependent requirements published by King and Burgess [15] were used. For five-month-old children ($n = 3$), energy requirements for six-month-old children were used.

Univariate and bivariate analyses were carried out using Stata version 6.0 [16]; non-normally distributed data were transformed prior to carrying out analyses. A p value less than or equal to .05 was considered statistically significant.

Results

Sample characteristics

Two hundred and forty-one children were enrolled in the study at baseline, including three children younger than five months or older than 25 months of age who were excluded from these analyses (table 1). Of the

TABLE 1. Characteristics of the sample at baseline

	Intervention ^a (N = 119)	Comparison ^a (N = 119)
Characteristics of the child		
Age (mo)	14.9 ± 5.1	15.1 ± 5.1
Sex, females (<i>n</i> , %)	52 (43.7%)	59 (49.6%)
Weight (kg)	8.3 ± 1.3	8.2 ± 1.3
Height (cm)	73.4 ± 5.1	73.4 ± 4.7
Weight-for-age < -2 Z (<i>n</i> , %)	36 (30.3%)	42 (35.3%)
Height-for-age < -2 Z (<i>n</i> , %)	42 (35.3%)	51 (42.9%)
Weight-for-height < -2 Z (<i>n</i> , %)	***2 (1.7%)	12 (10.1%)
Currently breastfeeding (<i>n</i> , %)	86 (72.3%)	78 (65.5%)
Characteristics of the mother		
Age (yr)	26.2 ± 4.7	26.9 ± 5.4
Body mass index < 18.5 (<i>n</i> , %)	29 (24.4%)	28 (23.5%)
Less than secondary school (<i>n</i> , %)	56 (47.1%)	68 (57.1%)
≤ 2 children (<i>n</i> , %)	*104 (87.4%)	93 (78.2%)
Occupation, farmer (<i>n</i> , %)	111 (93.3%)	114 (95.8%)
Characteristics of the family		
Yearly income, × 1000 dong ^b	6,527.0 ± 7,109.5	6,777.7 ± 6,391.9
Socioeconomic status	-0.01 ± 1.03	0.04 ± 1.15

a. All values are mean ± SD unless indicated (*n*, %) in column 1.

b. US\$1 = 14,025 Vietnamese dong.

* $p \leq .10$, *** $p \leq .01$.

² www.cdc.gov/growthcharts

remaining 238 participants, five dropped out during the course of the study and another six could not be located for the month 12 follow up.

At baseline children were 15.5 months old on average, more than one-third were stunted, and most were breastfeeding (table 1). Participant mothers were about 26 years old, almost one-quarter of them were malnourished (BMI less than 18.5 kg/m²), about half did not complete secondary school, and most had two or fewer children and were farmers. Despite attempts to control for important confounders through matching, intervention families were significantly more likely than comparison families to have fewer children and significantly less likely to have wasted children.

Almost half (44%) of the intervention children participated in the nutrition education and rehabilitation sessions (NERPs) at least one time during the seven-month period during which the current study and the Save the Children program overlapped. These children attended NERPs an average of 4.5 months each, i.e., 4.5 two-week nutrition and education rehabilitation sessions.

Impact on food intake

Communes promoted locally identified positive deviant foods (table 2). The most commonly identified positive deviant food was crab (identified in all six intervention communes). During the intensive intervention period, intervention children consumed positive deviant foods more frequently than comparison children (table 3). In particular, peanuts, sesame seeds, and tofu were consumed approximately three times more frequently

by the intervention children than by the comparison children (data not shown).

NERP messages included encouraging caregivers to increase the quantity of food fed to the child. At base-

TABLE 2. The frequency with which positive deviant foods were promoted in the six intervention communes

Positive deviant food	Communes promoting (n = 6)
Crab	6
Fish	5
Fruit	5
Peanut	5
Sesame seed	5
Vegetables	5
Eggs	4
Shrimp	4
Tofu	4
Beans	3
Cassava	3
Meat	3
Potatoes	3
Rice	3
Snail	3
Clams	2
Corn	2
Sweet potatoes	2
Bananas	1
Green vegetables	1
Oranges	1
Papaya	1
Starches	1
Tangerines	1

TABLE 3. Daily complementary feeding and breastfeeding practices of children in the intervention and comparison groups at baseline, during the intensive intervention (months 2 to 6) and at the month 12 follow-up^a

	Month 0		Months 2–6		Month 12	
	Comparison (n = 119)	Intervention (n = 119)	Comparison (n = 119)	Intervention (n = 119)	Comparison (n = 115)	Intervention (n = 112)
Frequency of consuming positive deviant foods (times per day)	4.2 ± 1.8	4.3 ± 2.0	3.6 ± 1.1 **	4.1 ± 1.7	3.7 ± 1.4	3.8 ± 1.6
Quantity of food consumed (g)	243.5 ± 168.4	262.2 ± 197.0	254.5 ± 134.0 **	299.7 ± 155.2	340.3 ± 167.5 ***	409.8 ± 197.4
Meal time frequency (per day)	4.4 ± 1.6	4.6 ± 1.8	4.2 ± 1.0 ***	4.6 ± 1.3	4.4 ± 1.5 ***	4.9 ± 1.5
Energy intake (kcal)	596.6 ± 363.4	629.2 ± 386.9	597.4 ± 275.7 *	662.7 ± 301.0	718.4 ± 330.0 **	826.9 ± 324.4
Proportion met energy (kcal/kg) requirements	62.2%	66.4%	35.1% ***	49.0%	23.5%	31.3%
Breastfed previous day	65.5%	72.3%	47.8%	51.3%	13.9%	13.4%
Breastfeeding frequency	7.9 ± 3.1 **	7.0 ± 2.9	8.8 ± 2.9	9.3 ± 3.3	6.5 ± 3.0)	6.0 ± 3.0

a. All values are mean (± SD) unless indicated “%.”

* $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$.

line, intervention children consumed a slightly greater (262.2 vs. 243.5 g, not statistically significant) daily quantity of any food (i.e., not only positive deviant food) as compared to comparison children (table 3). This difference increased during the intervention and was sustained, such that intervention children consumed 20% or 70 g per day more (409.8 vs. 340.3 g, $p \leq .01$) than comparison children at month 12.

During the NERP sessions, caregivers were also encouraged to feed their children at least five to six times per day. Intervention children received more feedings than comparison children throughout the study, especially during the intensive period and 12-month follow-up when the difference represented one half of a feeding or 11% more feedings (4.9 vs. 4.4 feedings, $p \geq .01$) (table 3).

Impact on energy intake

Did improvements in food intake translate into improvements in energy intake? As expected, daily energy intake generally increased for all children over time as they aged and grew (table 3). Intervention children consumed more energy than comparison children at all three study points, reaching statistical significance only at the 12-month follow-up. Similarly, more intervention than comparison children met their median energy requirements (kcal/kg) throughout the study although the proportion in both groups decreased over time (table 3, fig. 1). The difference was greatest during the intensive intervention period when nearly 40% more intervention than comparison children met their requirements (49.0% vs. 35.1%, $p \leq .001$). The intervention children most likely to meet their requirements were younger, malnourished children (15 months or younger with a WAZ less than -2 at baseline) and older well-nourished children (over 15 months with a WAZ -2 or greater at baseline) (table 4).

Impact on breastfeeding

Continued breastfeeding through 24 months was promoted through the intervention. Although there was a decline over time in the proportion of children breastfeeding, there were no differences between the intervention and comparison groups in the reported breastfeeding prevalence during all three study points (table 3). At baseline, comparison children were reportedly breastfed with greater frequency (by about 1 breastfeed) in the preceding 24-hour period than intervention children. Between baseline and the intensive intervention, intervention children had a greater increase in breastfeeding frequency than comparison children (2.53 vs. 1.02, $p \leq .05$) (fig. 2). There was no statistically significant difference in the change in breastfeeding frequency from baseline to the month 12 follow-up between these intervention and comparison children.

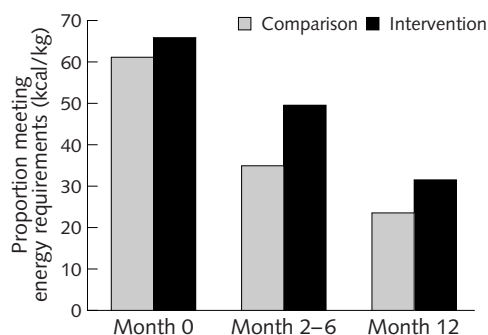


FIG. 1. The proportion of children in the intervention and comparison groups who met their daily median energy requirement (kcal/kg) at baseline, during the intensive intervention (months 2 to 6) and at the month 12 follow-up

TABLE 4. The proportion of children who met their daily median energy requirement (kilocalories/kg) stratified by age and weight-for-age Z score at baseline

Age and WAZ at baseline	Month 0		Months 2-6		Month 12	
	Comparison (n = 119)	Intervention (n = 119)	Comparison (n = 119)	Intervention (n = 119)	Comparison (n = 115)	Intervention (n = 112)
< 15 mo and WAZ < -2	84.2%	93.8%	44.6%**	68.8%	50.0%	46.7%
< 15 mo and WAZ > -2	66.7%	71.8%	39.4%	48.3%	40.0%	55.3%
> 15 mo and WAZ < -2	60.9%	60.0%	31.9%	42.4%	4.4%	15.8%
> 15 mo and WAZ ≥ -2	50.0%	50.0%	29.6%***	45.2%	11.4%	10.0%

** $p \leq .05$; *** $p \leq .01$.

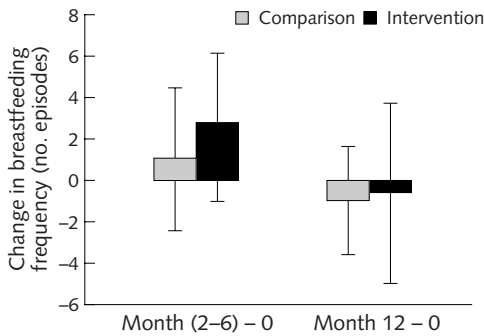


FIG. 2. Changes in the intervention and comparison groups in breastfeeding frequency between the intensive intervention (month 2 to 6) and baseline and between the month 12 follow-up and baseline.

Discussion

Young rural children exposed to Save the Children's integrated nutrition program in northern Viet Nam consumed positive deviant and other complementary foods more frequently, ate a greater quantity of any complementary food, consumed more energy, and were more likely to meet their daily energy requirements from complementary food than a comparison group of children. Younger, malnourished (15 months old or younger with a WAZ less than -2 at baseline) and older, well-nourished (older than 15 months of age with a WAZ -2 or greater at baseline) intervention children were more likely to meet energy requirements from complementary foods than comparison children. Some of these effects were only observed during the intensive intervention period while others persisted into or were evident only at the 12-month follow-up. The proportion of children breastfeeding and the frequency of breastfeeds were not affected by the intervention.

Energy

Although breastfeeding practices among Vietnamese children have been published [17, 18], we are unaware of any studies that have examined similar dietary outcomes among young Vietnamese children. However, an analysis of programs directed at improving intakes among infants 6 to 12 months old in developing countries reported improvements in total caloric intake between 71 and 164 kcal per day [3]. Our intervention infants 5 to 12 months old at baseline consumed an average of 49 kcal per day more than comparison children at the 12 month follow-up (data not shown), somewhat lower than in these other programs.

There was a 108.5 kcal per day difference between intervention and comparison children at month 12. For breastfed or non-breastfed children 6 to 24 months of

age, this represents 19% to 53% or 12% to 17% of median energy requirements, respectively. Thus, the improvements in energy intake observed among the intervention group contributed importantly to children's energy intakes.

Although children augmented their energy intake over time, increasingly children failed to consume enough to meet their weight-based requirements. At the 12 month follow-up, fewer than half of all children met their median energy requirement indicating that energy is limiting in the children's diets.

A greater proportion of younger, malnourished intervention children met their energy requirements than younger, malnourished comparison children. A similar finding was observed for older well-nourished children. In the case of younger, malnourished children, the intervention children seemed to be better off at baseline (not statistically significant) and continued to be better off during the intensive intervention. These two subgroups of intervention children also had greater improvements in WAZ than their comparison counterparts [19]. Perhaps these more active children took better advantage of improved household food availability than their counterparts who did not grow as rapidly, even when exposed to the same intervention.

The effects of the intervention on dietary outcomes were less than expected for several reasons. The intervention children were less malnourished (WHZ) at baseline than the comparison children, thus the intervention children had less potential to improve than the comparison children. In addition, the implementation of a sample of observed NERPs deviated from the standard protocol in important ways that may have limited the NERPs' ability to change behavior [20]: NERP attendance, caregiver contributions, caregiver participation in food preparation, and health message delivery by volunteers were all lower than expected. In some cases, food was "delivered" to children's homes, but we do not know if the children actually consumed the food. Finally, the concept of positive deviant food was not fully understood by program implementers. For example, positive deviant food should be specific, nutritious, and uncommonly consumed. Many of the foods promoted as positive deviant did not meet those guidelines (e.g., meats, fruit, and vegetables are non-specific; starches have limited nutritive value; and rice is eaten universally).

Breastfeeding

A concern with interventions to improve complementary food intakes among young children is the negative effect they can have on breastmilk intake [21, 22]. Based on reported recall by mothers, we detected no negative effect on breastfeeding prevalence and a positive effect on breastfeeding frequency.

The intervention

We found that the program was fairly effective in identifying nutritious positive deviant foods. Through the intensive rehabilitation (NERP) sessions and growth monitoring, the importance of feeding these positive deviant foods was apparently delivered and put into practice by caregivers whose children ate more of these foods than did children in comparison communes.

Behavior-change theory would favor the NERPs as being the primary route for the change in complementary feeding practices observed in the intervention children because they offer the opportunity to modify many behavioral determinants [23]: skills for preparing nutritious meals with locally available positive deviant foods, self-efficacy through participation in preparing and feeding meals, norms about what is considered a healthy child, a normal diet, and a normal serving, and knowledge regarding affordable and locally available nutritious foods.

Limitations

For analyses, we used the official Vietnamese food composition table published in 1972. Because techniques for calculating the energy content of foods have not changed considerably in the past 30 years, the use of energy values from the 1972 table is not likely to underestimate children's energy intake.

In using the breastfeeding-specific kcal per kg requirements, we were unable to accurately assess and categorize children's breastmilk intake as low, average, or high and thus used average for all children. Subsequently, we may have under- or overestimated children's energy requirements. Since we do not have information on the amount of food served to children or their micronutrient status, we were unable to evaluate the role of micronutrient deficiencies on children's appetite and the effect of appetite on food intake.

Lessons learned

Future effectiveness studies of dietary interventions to improve complementary feeding should include a process evaluation, as we have done, to detail program implementation. These data are useful in understanding how program components were implemented and could have affected the main outcomes of interest. Further, breastmilk intake should be quantified on a subset of children by weighing them before and after breastfeeds to better assess impact of the intervention on this parameter.

Programmatic implications

Save the Children's program primarily promoted four behaviors: the consumption of positive deviant foods, an increase in the quantity of foods given to children, feeding five to six times per day, and continued breastfeeding. The program was successful in increasing the first three behaviors, which resulted in improvements in energy intake. No concomitant increase (or decrease) was seen in breastfeeding prevalence due to the intervention. These findings suggest that the program was successful. On the other hand, process evaluation data indicate that program implementation was often not according to protocol. In future iterations of the program, greater attention should be placed on faithful implementation of the protocol. This will likely enhance the positive effects observed here. Further, the feeding frequency message should be updated to reflect age- and breastfeeding-specific recommendations [2].

Conclusions

We have documented that a positive deviance-informed program coupled with intensive feeding sessions can have positive effects on dietary intakes among young children in Viet Nam. Although the program was not exactly implemented as planned, children exposed to the intervention had improved complementary feeding intakes while breastfeeding practices were not negatively affected. These generally positive results provide evidence that improved diet is an important mechanism on the causal pathway to the observed better growth seen with positive-deviance informed programs.

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Effect of an integrated nutrition program on child morbidity due to respiratory infection and diarrhea in northern Viet Nam*

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Abstract

Infectious disease and poor diet are the two proximal causes of malnutrition in children. During the 1990s, integrated nutrition programs implemented by Save the Children (SC) in Vietnam reduced severe child malnutrition, but it has not been clear if this impact was due primarily to improved diet or reduced disease. The aim of this study was to determine whether a community-based, integrated nutrition program in Vietnam reduced child morbidity due to diarrhea or acute respiratory infections. Children 5 to 25 months old were randomly selected from randomly assigned intervention and comparison communes. Caregivers of children from the intervention and comparison groups (n = 119 per group) were interviewed about their child's morbidity at program baseline and at study months 2, 4, 6, and 12. Multiple logistic regression and general estimating equations (GEE) were used to evaluate the effect of the intervention on the occurrence of any diarrhea and respiratory illness in the preceding two weeks. Respiratory illness, mainly upper respiratory illness, was more common than diarrheal disease at baseline (54% vs. 6%, respectively). During follow-up, children in the intervention communes had approximately half the respiratory illness experienced by those in comparison communes (AOR = 0.5; p = .001). Diarrheal disease was

also lower in the intervention group, although differences were not statistically significant. We conclude that SC's integrated nutrition program was associated with reduced upper respiratory illness, perhaps due to improved hygiene practices and/or improved micronutrient intakes.

Key words: child nutrition, morbidity, ARI, positive deviance, Viet Nam

Introduction

As reflected in the UNICEF conceptual framework, poor diet and high rates of infectious disease are the two proximal causes of poor childhood growth [1]. Programs that aim to prevent or reverse childhood malnutrition can thus do so by either improving dietary intakes, reducing the burden of infectious disease, or both [2]. Both improving dietary intakes and reducing illness are likely to have a synergistic impact on better anthropometric outcomes [3]. In a programmatic setting, however, understanding why an intervention improves growth is complicated by the fact that poor diet and increased disease are themselves interrelated [4, 5].

In Viet Nam, an estimated 40% of children under five years of age are underweight [6]. Although overall morbidity due to infectious diseases in Viet Nam has declined in the past decade, diarrhea and acute respiratory infections remain among the leading child morbidities in the country [6].

Since the early 1990s, Save the Children (SC) imple-

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* The ViSION (Viet Nam study to improve outcomes in nutrition) project evaluated the implementation and impact of an integrated nutrition program on the nutritional status, morbidity, diet of, and care for children 5 to 25 months old at baseline in rural Viet Nam, through a partnership among Save the Children/US (Hanoi and Westport, Conn., USA), the USAID-funded LINKAGES Project (Washington, D.C.), Emory University's Rollins School of Public Health (Atlanta, Ga., USA), and the Research and Training Center for Community Development (Hanoi).

mented community-based, integrated nutrition programs to reduce childhood malnutrition in Viet Nam. These programs, informed by the “positive deviance approach” were found to significantly improve the nutritional status of participating children within a year of implementation [7], with children maintaining their improved status up to two years after program completion [8]. Even more strikingly, the younger siblings of these children, who had never been directly exposed to the SC intervention, grew better than counterparts whose parents had never participated in the program. While these effects were exciting, it remained unclear whether these significant, sustained effects on childhood growth were due to improvements in dietary intakes, reductions in the burden of infectious disease, or some combination of both.

With the overall objective of teasing apart and quantifying the mechanisms responsible for the program’s effects on childhood growth, we undertook a large-scale, randomized trial in northern Vietnam. This trial is referred to as the Viet Nam study to improve outcomes in nutrition (ViSION) project. We have examined the effects of the intervention on growth [9] and dietary intakes within the ViSION project elsewhere [10]. This paper reports on the effects of this program on child morbidity due to diarrhea or acute respiratory.

Methods

Study design and population

This longitudinal, prospective cohort study was conducted in rural Phu Tho Province northwest of Hanoi, beginning in December 1999. Details of the methods of this study are presented elsewhere [11]. In brief, the intervention was based on the positive deviant approach, in which foods and caregiver behaviors of better-nourished children from resource poor settings were identified and incorporated into the nutritional intervention program. Investigators identified 12 communes with the highest proportion of malnourished children (i.e., weight-for-age Z score less than -2) and group-matched them for common confounders. One of the resulting matched groups of three communes in each of two districts was randomly assigned to have comparison subjects, the other intervention.

Children age 5 to 25 months old were randomly selected from intervention and control communes to participate in the study, and caregivers of children from each group ($n = 119$ per group) were interviewed by trained field workers about child morbidity at program baseline and at months 2, 4, 6, and 12. During the same visit, field workers also collected data on anthropometry, caregiver health-seeking behaviors, hygiene, dietary intake, and socioeconomic status (SES). A SES composite variable was created using factor analysis taking

into account the caregiver’s self-reported standard of living, electricity access, house construction material, and interviewer’s assessment of the family’s socioeconomic status.

Outcome and case definitions

The outcomes for child diarrhea and acute respiratory infection were defined as a caregiver report of at least one day of diarrhea episode or respiratory illness in the 14 days preceding the interview during each study month. A diarrhea episode was defined as passing three or more liquid or semi-liquid stools in a 24-hour period. Acute respiratory infection was defined as one or more of the following signs, symptoms, or self-reported syndromes for upper respiratory infection (cough, runny/stuffy nose, sore throat/throat infection) or for lower respiratory infection (rapid/difficult breathing, chest indrawing, bronchitis, or bronchopneumonia).

Data analysis

Dichotomous and categorical baseline characteristics of each study group were compared using chi-square tests. Some continuous variables were initially categorized into quartiles, and if the frequencies within each category did not differ between study groups, these variables were dichotomized at the median. The generalized estimating equation (GEE) approach for multiple logistic regression was used for univariate and multivariate analyses to account for within-subject correlations resulting from repeated measures taken for each individual over time [12]. This accounts for correlations that may exist within individuals for time-dependent variables such as weight-for-age Z score (WAZ). If a variable was found to be significant in the univariate analysis, it was then included in a multivariate model. The significance of an interaction term (study group by study month) was tested to assess whether the time of year affected the association between intervention and morbidity outcome measures. A p value less than 0.05 was used to determine statistical significance.

All analyses were carried out using the SAS statistical software (SAS Institute Inc., Cary, N.C., USA).

Results

Baseline characteristics

Half (53%) of the 238 children eligible for analysis were males, 56% lived in high-/midland (vs. lowland) areas, and 33% were malnourished (weight-for-age Z score less than -2) (table 1). Children and mothers were young (median age 15 months and 26 years, respectively). About half of mothers and fathers were

TABLE 1. Baseline characteristics by study group

Characteristic	Total children <i>n</i> (%)	Study group		Chi-square <i>p</i> value
		Intervention <i>n</i> (column %)	Control <i>n</i> (column %)	
Total	238	119	119	
Sex				
Male	127 (53.4)	67 (56.3)	60 (50.4)	.364
Female	111 (46.6)	52 (43.7)	59 (49.6)	
Age (mo)				
≤15	107 (45.0)	55 (46.2)	52 (43.7)	.697
>15	131 (55.0)	64 (53.8)	67 (56.3)	
Socioeconomic status composite index (0 = average)				
<0	72 (30.3)	38 (31.9)	34 (28.6)	.573
≥0	166 (69.7)	81 (68.1)	85 (71.4)	
Ecology				
Lowland	105 (44.1)	31 (26.1)	74 (62.2)	<.0001
Midland	9 (3.8)	9 (7.6)	0	
Highland	124 (52.1)	79 (66.4)	45 (37.8)	
Maternal age at baseline (yr)				
≤26	145 (60.9)	72 (60.5)	73 (61.3)	.895
>26	93 (39.1)	47 (39.5)	46 (38.7)	
Maternal education				
Primary school or less	124 (52.1)	56 (47.1)	68 (57.1)	.12
Junior high school or higher	114 (47.9)	63 (52.9)	51 (42.9)	
Paternal education				
Primary school or less	106 (44.5)	50 (42.0)	56 (47.1)	.435
Junior high school or higher	132 (55.5)	69 (58.0)	63 (52.9)	
No. of live births				
0–1	98 (41.2)	55 (46.2)	43 (36.1)	.115
≥2	140 (58.8)	64 (53.8)	76 (63.9)	
No. of children under five years of age				
0 or 1	158 (66.4)	83 (69.8)	75 (63.0)	.273
≥2	80 (33.6)	36 (30.2)	44 (37.0)	
Maternal BMI at baseline				
≤20	172 (72.3)	84 (70.6)	88 (74.0)	.563
>20	66 (27.7)	35 (29.4)	31 (26.0)	
Child WAZ at baseline				
<−2	78 (32.8)	36 (30.3)	42 (35.3)	.408
≥−2	160 (67.2)	83 (69.8)	77 (64.7)	

educated through junior high school or higher (48% and 56%, respectively). About one-third of caregivers reported having two or more living children five years of age or younger. Intervention and comparison groups were similar in demographics except that intervention subjects were more likely to reside in high-/midland areas than comparison subjects (74% and 38%, respectively; $p = .0001$) (table 1).

Diarrhea in the preceding two weeks was relatively uncommon at baseline (6%). Less educated mothers were more likely to have children with diarrhea

(OR = 3.6, 95% CI 1.0–13.3; $p = .04$).

Acute respiratory infection (ARI) was nine times more common at baseline than diarrhea (54 vs. 6%). Almost all ARIs (at baseline, 88.4%, 114 of 129) were upper respiratory infections typically characterized by cough (80.7%, 92 of 114) and/or runny nose (71.1%, 81 of 114). Less educated fathers were more likely to have children with respiratory illness (OR = 1.8, 95% CI 1.1–3.0; $p = .03$). Intervention and comparison children reportedly had nearly identical levels of ARI (53.8 vs. 54.6%, respectively) (table 2).

TABLE 2. Baseline prevalence of diarrhea or respiratory illness in the past 14 days

Variable	Total children <i>n</i> (%)	At baseline (month 0)			
		Any diarrhea (past 14 days)		Any respiratory illness (past 14 days)	
		Yes <i>n</i> (row %)	Chi-square <i>p</i> value	Yes <i>n</i> (row %)	Chi-square <i>p</i> value
Total	238	14 (5.9)		129 (54.2)	
Study group					
Intervention	119 (50.0)	6 (5.0)	.58	64 (53.8)	.897
Control	119 (50.0)	8 (6.7)		65 (54.6)	
Sex					
Male	127 (53.4)	8 (6.3)	.77	75 (59.1)	.109
Female	111 (46.6)	6 (5.4)		54 (48.7)	
Age (mo)					
≤15	107 (45.0)	7 (6.5)	.70	57 (53.3)	.795
>15	131 (55.0)	7 (5.3)		72 (55.0)	
Socioeconomic status composite index (0 = average)					
−2 or −1	72 (30.3)	5 (6.9)	.65	41 (56.9)	.577
0, 1, or 2	166 (69.7)	9 (5.4)		88 (47.0)	
Ecology					
Lowland	105 (44.1)	6 (5.7)	.97	58 (55.2)	.860
Midland	9 (3.8)	1 (7.1)		4 (44.4)	
Highland	124 (52.1)	7 (5.7)		67 (54.0)	
Maternal age at baseline (yr)					
≤26	145 (60.9)	9 (6.2)	.79	78 (53.8)	.875
>26	93 (39.1)	5 (5.4)		51 (54.8)	
Maternal education					
Primary school or less	124 (52.1)	11 (8.9)	.04	69 (55.7)	.642
Junior high school or higher	114 (47.9)	3 (2.6)		60 (52.6)	
Paternal education					
Primary school or less	106 (44.5)	5 (4.7)	.49	66 (62.3)	.026
Junior high school or higher	132 (55.5)	9 (6.8)		63 (52.3)	
No. of live births					
0–1	98 (41.2)	6 (6.1)	.90	52 (53.1)	.768
≥2	140 (58.8)	8 (5.7)		77 (55.0)	
No. of children under five years of age					
0 or 1	158 (66.4)	11 (7.0)	.32	81 (51.3)	.202
≥2	80 (33.6)	3 (3.8)		48 (60.0)	
Maternal BMI at baseline					
≤20	172 (72.3)	9 (5.2)	.49	98 (57.0)	.166
>20	66 (27.7)	5 (7.6)		31 (47.0)	
Child WAZ at baseline					
<−2	78 (32.8)	5 (6.4)	.81	39 (50.0)	.365
≥−2	160 (67.2)	9 (5.6)		90 (56.3)	

Prospective findings

The level of reported childhood diarrhea remained low across all study months, peaking at 12% during study month two (fig. 1). Statistical significance was nearly reached at month six when comparison subjects were three times as likely (8% vs. 3%, respectively) as their counterparts to experience diarrhea. However, no significant differences were shown in diarrhea prevalence between comparison and intervention groups during any of the study months. Although the overall prevalence of diarrhea declined from baseline to month 12 in both intervention and comparison groups, repeated measures analyses show the difference between study groups to be statistically significant ($p = .001$).

Intervention children had less respiratory illness than the comparison children for study months 2, 4, 6, and 12 (fig. 2), reaching statistical significance at month two (OR=0.4, 95% CI 0.3-0.7; $p = .002$) and month four (OR=0.5, 95% CI 0.3-0.9; $p = .01$). A greater reduction in respiratory infection prevalence from month 0 to month 12 was observed for the intervention group than for the comparison group (54% to 45% vs. 55% to 54%, respectively). Repeated measures analyses show the difference between study groups to be statistically significant ($p = .001$).

Upper respiratory infections consistently accounted for most respiratory illness in both the intervention and comparison children (table 3). We found no significant association between study group and reported lower respiratory infection (LRI) (data not shown).

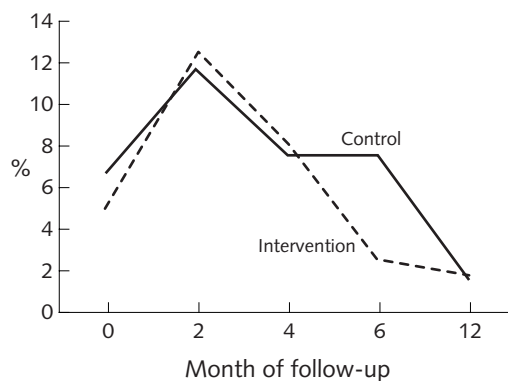


FIG. 1. Percent of mothers reporting their children had diarrhea in past 14 days by study group and month of follow-up

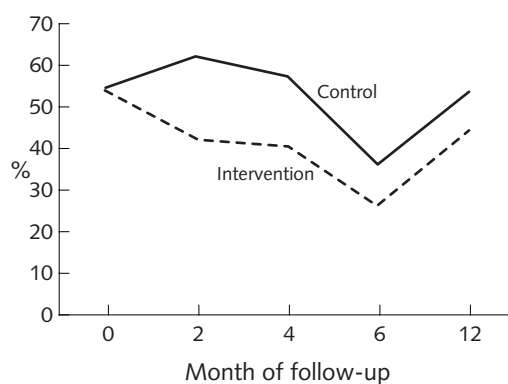


FIG. 2. Percent of mothers reporting their child had one or more symptoms of respiratory illness in past 14 days by study group and month of follow-up

TABLE 3. Acute respiratory infection signs, symptoms, and reported syndromes^a by study month

Symptom, sign, or reported syndrome	Study month				
	0	2	4	6	12
Total children (N)	238	238	235	232	227
Any ARI	129	124	115	73	111
URI (% of total)					
Cough	38.6	39.9	41.7	27.2	42.7
Severe cough	1.7	0.4	0.9	0.9	0.4
Runny nose	35.3	31.9	31.9	16.8	37.4
Throat infection/sore throat	1.3	0.4	3.0	2.6	0
Any URI	47.9	48.7	47.7	29.7	46.2
LRI (% of total)					
Bronchitis	2.1	2.5	0.9	0.9	0
Broncho-pneumonia	1.3	0.8	0	0.4	0
Rapid/difficult breathing with cough	2.9	0.4	0.9	0.4	2.6
Chest indrawing	0	0	0	0	0
Any LRI	6.3	3.4	1.3	1.7	2.6

a. Children may have more than one sign/symptom/syndrome.

URI, upper respiratory infection. LRI, lower respiratory infection.

TABLE 4. Multivariate GEE model for having any diarrhea in the past 14 days for study months 2, 4, and 6

Characteristic	Adjusted odds ratio (95% CI)	<i>p</i> value
Intervention	0.61 (0.35, 1.06)	.08
Age > 15 mo	0.47 (0.27, 0.81)	.01
Female	1.11 (0.66, 1.88)	.68
Reside in High-/midlands	2.82 (1.53, 5.23)	.001

Reference groups: Comparison study group; baseline child age \leq 15 mo; male; reside in lowlands

GEE, generalized estimating equation.

Multivariate analyses

Multivariate GEE models for the outcome of any diarrhea showed that the intervention was not independently associated with a decrease in diarrhea. Factors that were independently associated with a lower prevalence of diarrhea were older than 15 months of age at baseline and residing in highlands (table 4).

The intervention was significantly independently associated with less respiratory illness (AOR = 0.5, 95% CI 0.4–0.7; $p < .0001$), controlling for age at baseline, gender, ecology of residence, and taking within-subject correlations over time into account. Female children were less likely to have ARI than males, though this association was not quite significant. No other factor was independently associated with the respiratory illness outcome (table 5).

Interaction terms of study group by study month, as well as study group by gender and by age were assessed in both models. The interactions did not significantly contribute to either model and were subsequently dropped from further analysis.

Discussion

In this randomized trial of a multifaceted, community-based nutrition intervention, we found that children living in intervention communes had significantly lower levels of acute respiratory infections than children in comparison communes. No differences between the two groups were found for diarrheal disease.

The significant reductions in the prevalence of respiratory illness among the children in the intervention communes were due primarily to lower rates of upper, but not lower, respiratory illness. We do not fully understand why the intervention had such significant effects on upper respiratory infection (URI). These results may be due to improved hygiene, such as increased hand washing, and/or improved diet, including breastfeeding and micronutrient intake [13]. In an analysis of the quality of the implementation of the intervention we found that caretakers successfully practiced hand washing upon arrival at the nutrition education rehabilitation program (NERP) [14]. The

TABLE 5. Multivariate GEE model for having any respiratory illness in the past 14 days for study months 2, 4, and 6

Characteristic	Adjusted odds ratio (95% CI)	<i>p</i> value
Intervention	0.51 (0.36, 0.72)	0.001
Age > 15 mo	0.94 (0.68, 1.30)	0.71
Female	0.73 (0.53, 1.01)	0.06
Reside in High-/midlands	1.05 (0.75, 1.48)	0.76

Reference groups: Comparison study group; baseline child age \leq 15 mo; male; reside in lowlands.

GEE, generalized estimating equation.

intervention did not incorporate educational messages or other inputs that specifically targeted either upper or lower respiratory infections. In fact, it would be reasonable to think that the increased exposure to other children during the NERP sessions could have increased the rates of respiratory infections. The large magnitude (50% reduction) and consistency of our results from month to month, however, indicate that these results are real.

Our results are consistent with the findings of a similar study conducted in Viet Nam, which looked at the effects of a nutrition improvement project on child morbidity [15]. English et al., found that children enrolled in their nutrition improvement project had significantly fewer acute respiratory infections than their counterparts in control communes. In addition, they found that rapid breathing and chest indrawing were significantly less in the project communes.

The role of acute respiratory infections on nutritional status and growth of children has not been well documented as compared to diarrheal diseases [13]. In a small cohort of Gambian children, however, acute lower respiratory infections were associated with loss of 14.7 g of weight per day of illness, greater than the reduction observed with diarrheal diseases [16].

Although upper respiratory infections are generally not life threatening, they may lead to more serious complications in children, such as sinusitis or otitis media [17, 18]. In addition, Broor et al., found that significant predictors of child acute lower respiratory infection included upper respiratory infection among siblings, suggesting that preventing URIs in children may help prevent more serious respiratory diseases in children with whom they frequently come into contact [19].

The relatively low occurrence of diarrhea in all communes was unexpected. Low rates of childhood diarrhea have been reported in other studies conducted in Viet Nam [20, 21] so we do not believe that these low rates were an artifact or due to the presence of fieldworkers in the communities (i.e., the Hawthorne effect). The study by English et al. [15], conducted in Vietnam, similarly found no significant differences in diarrheal incidence between project and control communes over time.

Limitations of the study

One limitation of the study is the non-continuity of the morbidity data, which are based on two-week recalls every two months, until study month six, and then once more at study month 12. A limitation of the analysis presented in this paper is that the duration and severity of illness were not included in the analyses.

Relevance of findings to the larger ViSION project

An overall aim of the ViSION project was to determine whether the improvements in growth seen with the SC community empowerment and nutrition program (CENP) interventions were primarily due to improvements in diet and/or reductions in morbidity [11]. In this implementation of the CENP, it appears that reductions in morbidity were not likely responsible for any improvements in growth [9]. Although we found an improvement in URI with the intervention, other research does not indicate that URI is a major contributor to poor growth [13]. On the other hand, diarrheal disease is a well-established cause of malnutrition [22]. However, we found relatively low levels of diarrheal disease, and only mild, non-statistically significant reductions in diarrheal disease in the intervention communities.

Future research

The impact of predominantly diet and nutritional interventions on upper-respiratory infections found in this and other studies in Viet Nam [15] should be confirmed in other settings. In subsequent analyses, we will examine whether the duration and severity of illnesses varied between the intervention and comparison groups.

Programmatic implications

While URIs (including conjunctivitis, rhinitis, stomatitis, pharyngitis, otitis, sinusitis, and laryngitis, among others, singly and in combination) are rarely associated

with death, they can cause irritability, lassitude, temporary loss of appetite with decreased dietary intake, and tissue catabolism with concomitant fever. Affected children need extra care and generate often inappropriate and costly use of health services. Policy makers, donors, and programmers wisely promote interventions that save lives and reduce serious morbidity and disability. Reducing URIs makes only a small contribution to this calculus.

On the other hand, in the presence of other demonstrable benefits, such as improved growth [9] this added effect of a CENP-type program should interest providers and beneficiaries alike. Indeed, community members might perceive childhood URIs, which they commonly see, as a greater health threat than childhood malnutrition, which they rarely recognize. The prospect of reducing this nuisance might prove a powerful stimulus to community mobilization.

Summary and conclusion

In conclusion, this analysis found that an integrated nutrition program in northern Vietnam reduced the burden of URI, but not diarrheal disease. The mechanisms behind these large, nearly 50% reductions in URI, are unclear and thus require further investigation. In regards to the larger ViSION project, the intervention was effective at improving growth by increasing dietary intakes, which resulted in both direct improvements in nutrition and, possibly, better micronutrient intakes, this in turn, may lead to reductions in URI burden documented in this paper.

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Implementation of nutrition education and rehabilitation programs (NERPs) in Viet Nam*

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Abstract

Rigorous assessments of program quality are uncommon in developing countries. We evaluated the quality of the two-week, volunteer-facilitated, caregiver-child rehabilitation “hearth,” or nutrition education and rehabilitation program (NERP), sessions in Save the Children’s integrated nutrition program in Viet Nam. Field workers observed attendance, food contribution, food preparation, meal consumption, health message delivery, hygiene, and weighing at 240 NERP days at 59 NERP centers during seven months of implementation. Participation in cooking NERP meals (75.8%), washing mothers’ and children’s hands (75.7% and 81.6%, respectively), and weighing (74.5% on days 1 and 12) were high, but attendance rates (50.3%), food contributions (20.3%), and health message delivery (20.0%) were lower than expected, all with wide variation among communes, ecology, NERP day, and NERP round. Contrary to protocol, food was often delivered to malnourished children who stayed at home to accommodate caregivers’ workloads and other constraints. While home-delivery of food prevented caregivers from learning from each other in a group, it did bring “tangible messages” (i.e., a large serving size of a new food) to the doorstep. Health volunteers were wise to stress active learning over repetitive message

delivery. In summary, these NERPs were probably typical of previous NERPs although comparable quality measures are lacking. Despite imperfect implementation, the NERP’s active-learning and local problem-solving helped achieve measurable impact on growth, diet, morbidity, and empowerment despite uncommon program challenges, such as uncharacteristically low baseline levels of malnutrition and high population dispersion. Regular quality monitoring may enhance impact even further.

Key words: Hearth, program quality, positive deviance, health volunteer, Viet Nam

Introduction

Outcome evaluations are commonly carried out at the mid- and end-point of project implementation. Rigorous assessments that document how the project was implemented in comparison to what was intended are considerably less common, especially in developing country settings. Process evaluations illuminate the association between intervention and outcomes [1]. In particular, according to Green and Lewis, “process analysis helps us to learn as much as possible about how, why, and under what conditions a program brings about certain outcomes...” [2]. An exclusive focus on outcomes ignores the process of implementation and leaves evaluators unclear about what worked, what did not, and why [3]. Studies that measure an intervention’s quality can lead to improvements in primary health care [4].

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Mention of the names of firms and commercial products does not imply endorsement by the United Nations University.

* The ViSION (Viet Nam study to improve outcomes in nutrition) project evaluated the implementation and impact of an integrated nutrition program on the nutritional status, morbidity, diet of, and care for children 5 to 25 months old at baseline in rural Viet Nam, through a partnership among Save the Children/US (Hanoi and Westport, Conn., USA), the USAID-funded LINKAGES Project (Washington, D.C.), Emory University’s Rollins School of Public Health (Atlanta, Ga., USA), and the Research and Training Center for Community Development (Hanoi).

Nutrition education and rehabilitation program (NERP) sessions are local adaptations of “hearths” [5].* Hearths are neighborhood-based (“around a hearth”), 12-day monthly gatherings of caregiver-malnourished infant pairs for whom a trained local volunteer facilitates the adoption of better health and feeding practices for sustained, improved child nutrition. Hearths were first successfully used in Haiti to transfer nutritional rehabilitation of young children from the hospital to the community. The Vietnamese adaptation, the NERP, is a facilitated group of caregivers and toddlers who learn active feeding strategies and other key behaviors, such as food preparation, food handling, and hygiene from the health volunteer (HV) and especially from each other. NERPs help establish new norms (e.g., “Look how *much* my baby can eat! I didn’t think his stomach was that big!”), boost caregivers’ confidence through directly observing improved child affect and growth, and foster the acquisition of new skills and knowledge. Two factors that differentiate NERPs from the traditional approach to malnutrition rehabilitation are social support and a focus on building self-efficacy, which mothers of malnourished children often lack [6, 7]. In general, other nutrition education programs aim to educate mothers with the expectation that education will improve child nutrition and growth. However, as Bandura points out, “Effective personal functioning is not simply a matter of knowing what to do and being motivated to do it” [8]. NERPs provide an environment for creating new habits by facilitating the repetition of positive, culturally acceptable, financially accessible, effective behaviors. A better understanding of how the NERP sessions are implemented will provide insight into the design of nutrition programs in other settings.

In this article, we describe the results of observations conducted during NERP sessions within Save the Children’s community empowerment and nutrition program (CENP) in Viet Nam to compare implementation against design and to clarify the relationship between implementation of this critical intervention and program impact. A specific aim was to evaluate the extent that the outcomes (e.g., diet and growth) that we measured in the ViSION project [9] could be due to the NERPs.

Methods

Intervention as designed

Details of all intervention components are discussed

elsewhere [9]. While the intervention included a number of program elements, including training of trainers, growth monitoring and promotion (GMP), de-worming, positive deviance inquiries, and the NERP sessions, only NERP quality will be described here. According to training materials [10] which were used to create process evaluation indicators and to train the observation team, the goals of NERP were to transfer skills to caregivers regarding planning meals from high quality locally available foods and improving feeding and caring practices so that caregivers could rehabilitate their malnourished children and continue to improve and maintain their children’s enhanced nutritional status at home.

The first NERP included children from the baseline GMP with weight-for-age Z scores (WAZ) less than -2 . Subsequent NERPs included the same children if they had not been rehabilitated plus new children identified with WAZ less than -2 at the most recent GMP where community volunteers used the line demarcating normal versus abnormal on the single sex national road to health cards to categorize children.

Instrument development

The principal investigators, along with senior researchers from the Research and Training Center for Community Development (RTCCD) and Save the Children/US in Viet Nam reviewed training manuals, identified key NERP implementation steps, identified eight elements of successful NERPs (table 1), and developed, piloted, and revised data collection forms. The RTCCD then trained college-educated health professionals with previous data-collection experience to use the observation forms.

NERP sampling and observation

NERP sampling methods varied somewhat throughout the study period. In the first month of implementation (January), two field workers, one in each of two districts, observed all CENP activities, including one complete 12-day NERP to familiarize themselves with the intervention. After observing their assigned NERP, field workers observed other nearby NERPs within the same two communes. Thereafter, one or two field workers either randomly selected two communes daily from a list of all eligible communes and two to three NERPs from each commune (months two, three, and eight) or randomly selected both a commune and a single NERP and then, time permitting, an additional nearby NERP (months four to six). Observers did not assess NERPs in month seven. Field workers gathered data through direct observation and health volunteer interview; they did not share findings with the health volunteer or with other CENP implementers.

* Nutrition Working Group, Child Survival Collaborations and Resources Group (CORE). Positive deviance/hearth: A resource guide for sustainably rehabilitating malnourished children. Washington, D.C. In preparation for publication.

TABLE 1. Program elements for ensuring NERP quality

Program element	Standard	Rationale
NERP size (no. of caregiver-child pairs)	5–10	Helps foster interaction and participation among caregivers without overloading facilitator.
Attendance	12 days per NERP round	Interaction between caregivers and health volunteers is encouraged and new behaviors are reinforced. Two weeks is adequate for caregivers to begin to notice improvements in the recovering child's behavior and affect, further motivating families to adopt new behaviors.
Contribution of PD food	Daily	Caregivers "practice the practice" of incorporating new foods into the child's diet, thus routinizing the behavior change necessary to maintain improvements in nutritional status.
Food preparation	In rotation, 2 caregivers at a time	Caregivers practice preparing new meals, which incorporate positive deviant and other high quality foods.
NERP meal eaten at center	Daily	Promotes interaction among caregivers and health volunteer, assures that malnourished children receive supplemental meals, promotes varied active feeding maneuvers, and demonstrates how much children are able to eat.
NERP message delivered	Daily	Caregivers learn positive behaviors, such as immunizations, breastfeeding, care for sick children, and recognizing danger signs.
Hygiene	Daily	Caregivers practice hygiene behaviors, such as washing children's hands before every meal and clipping children's fingernails.
Growth monitoring	Day 1 and 12, before eating	Caregivers observe how much their children's nutritional status has changed and are encouraged to continue practicing new behaviors and preparing new recipes at home to sustain rehabilitation.

Data management and analysis

Data were entered into MS Excel (Redmond, Wash., USA, 2000) and later imported into Epi Info version 6 [11] for analysis.

Variable definitions

Variables were NERP-level, caregiver-level, or child-level observations. NERP-level variables include NERP size (the number of enrolled caregiver-child pairs), food preparation (the percent of NERPs to which one or more caregivers helped prepare the communal meal), NERP message delivery (the percent of NERPs at which health volunteers presented a behavior change message), and growth monitoring (the percent of NERPs that had child weighing on the scheduled day). Caregiver-level variables included contribution of PD food (the percent of attending caregivers plus those who had meals home-delivered who donated food) and hygiene (the percent of attending caregivers who washed their children's hands, their own hands, or did not feed the child food that fell on the floor or ground). Child-level variables included attendance (the percent of enrolled children present) and NERP meal eaten at center (the percent of children provided a NERP meal, either at the NERP or at home, who ate it at the NERP center). The NERP round refers to the month of the NERP session (1–8 = January–August).

The NERP day refers to the day of the week of the two-week NERP round (1–12 = Monday–Saturday, twice, i.e., 1 = the first Monday, 2 = the first Tuesday, 7 = the second Monday, and so on.).

We identified independent variables that might be associated with NERP quality. These included ecology, day of the NERP round, the NERP round, and commune. For example, attendance might be a function of ecology since lowland (paddy) communes are more densely populated and economically advantaged than the sparsely settled, forested midland and highland areas. Similarly, attendance might vary within the 12-day NERP schedule or by NERP round according to patterns of morbidity, food availability, or agricultural season. The commune itself could affect quality due to demographic, political, or organizational differences.

We used the chi-square statistic to assess differences in proportions. Significance for all analyses was defined as a *p* value less than or equal to 0.05.

Results

Field workers observed 282 NERP-days (days 1–12, inclusive) in all six intervention communes during seven months of the nine-month study period. We have complete data for 240 NERP-days, the basis of this report. All of the missing data come from the first NERP round when the researchers familiarized them-

selves with program implementation. Separate analyses compared NERP-days with missing data with those with complete data. There were few differences, so the days with missing observations were deleted. Observations at the 240 NERP days occurred at 59 different NERP centers, 48 of which had multiple observations (mean 4.78 ± 3.85], range 1 to 23 observations).

Size

The observed aggregate NERPs had, on average, a total of 253 enrolled children per month over the course of the study. Individual NERP size varied widely (mean

7.4 ± 3.0). Less than one third (29.2%; 70 of 240) of all NERP centers enrolled the recommended number of five to ten children. Most (60.4%) had one to four children; few (2.5%) had more than 10 children; and some (7.9%) had no children enrolled.

Attendance

Half of all children (50.3%; 891 of 1770) on NERP rosters were present on the observation day (table 2). NERP attendance was lower in months three and six than in other months (44.7% and 44.9% versus 50.3% to 66.4%, $p < .001$), and higher during the first two

TABLE 2. NERP performance: Key quality parameters, by likely determinants

Determinants	Attendance ^a		Contribution of PD food ^b		NERP meal eaten at center ^c		Food preparation ^d		NERP message delivered ^e	
	#/n	(%)	#/n	(%)	#/n	(%)	#/n	(%)	#/n	(%)
Overall	891/1,770	(50.3)	290/1,428	(20.3)	891/1,428	(62.4)	182/240	(75.8)	48/240	(20.0)
Commune										
14	207/314	(65.9)	32/291	(11.0)	207/291	(71.1)	29/32	(90.6)	4/32	(12.5)
15	116/259	(44.8)	18/228	(7.9)	116/228	(50.9)	14/24	(58.3)	4/24	(16.7)
16	93/244	(38.1)	31/200	(15.5)	93/200	(46.5)	23/28	(82.1)	3/28	(10.7)
24	88/214	(41.1)	69/201	(34.3)	88/201	(43.8)	28/38	(73.7)	2/38	(5.3)
25	221/505	(43.8)	69/316	(21.8)	221/316	(69.9)	47/75	(62.7)	22/75	(29.3)
26	166/234	(70.9)	71/192	(37.0)	166/192	(86.5)	41/43	(95.3)	12/43	(27.9)
District										
1	416/817	(50.9)	81/719	(11.3)	416/719	(57.9)	66/84	(78.6)	11/84	(13.1)
2	475/953	(49.8)	209/709	(29.5)	475/709	(67.0)	116/156	(74.3)	36/156	(23.1)
Ecology										
High-/Midland	497/1,031	(48.2)	150/920	(16.3)	497/920	(54.0)	94/122	(77.0)	14/122	(11.5)
Lowland	387/739	(52.4)	140/508	(27.6)	387/508	(76.2)	88/118	(74.6)	34/118	(28.8)
NERP day										
1–2	225/368	(61.1)	53/304	(17.4)	225/304	(74.0)	39/49	(79.6)	18/49	(36.7)
3–4	162/375	(43.2)	68/300	(22.7)	162/300	(54.0)	42/52	(80.8)	8/52	(15.4)
5–6	118/255	(46.3)	23/211	(10.9)	118/211	(55.9)	15/30	(50.0)	4/30	(13.3)
7–8	80/168	(47.6)	41/119	(34.5)	80/119	(67.2)	21/28	(75.0)	6/28	(21.4)
9–10	107/214	(50.0)	43/186	(23.1)	107/186	(57.5)	26/30	(86.7)	5/30	(16.7)
11–12	199/390	(51.0)	62/308	(20.1)	199/308	(64.6)	39/51	(76.5)	7/51	(13.7)
NERP round										
1 Jan 2000	77/116	(66.4)	15/98	(15.3)	77/98	(78.6)	7/15	(46.7)	6/15	(40.0)
2 Feb	212/394	(53.8)	72/322	(22.4)	212/322	(65.8)	43/54	(79.6)	25/54	(46.3)
3 Mar	163/365	(44.7)	45/296	(27.6)	163/296	(55.1)	36/47	(76.6)	7/47	(14.9)
4 Apr	115/261	(52.6)	46/197	(23.4)	115/197	(58.4)	32/37	(86.5)	4/37	(10.8)
5 May	123/234	(52.0)	49/202	(24.3)	123/202	(60.9)	25/35	(71.4)	4/35	(11.4)
6 June	157/302	(44.9)	53/245	(21.6)	157/245	(64.1)	28/36	(77.8)	0/36	(0)
8 Aug	44/98	(50.3)	10/75	(13.3)	44/75	(58.7)	11/16	(68.8)	2/16	(12.5)

a. #/n, no. present / no. enrolled, as %.

b. #/n, No. contributed / (no. in attendance plus no. who had NERP meal delivered), as %.

c. #/n, No. of children eating NERP meal at NERP center / no. of children who ate NERP meal, as %.

d. #/n, No. of meals at least one caregiver cooked / no. NERP days, as %.

e. #/n, No. of NERP sessions where message given / no. of NERP sessions, as %.

days than in subsequent NERP days (61.1% versus 43.2% to 51.0%, $p < .001$). Two communes had higher attendance than the other four (65.9% and 70.9% for communes 14 and 26 versus 38.1% to 44.8% for the others, $p < .001$). A few NERPs (7.9%; 19 of 240) had no children present. Curiously, despite the absence of children at these NERPs, about half the mothers contributed food (58%; 11 of 19) and helped prepare the meal (53%; 10 of 19).

Contribution of PD food

The daily food contribution was low overall (20.3%; 290 of 1428) of mothers contributing on the observation day). Stated another way, most NERPs (76.3%; 183 of 240) had at least one mother contributing on the observation day, but far fewer (26.3%; 63 of 240) had at least two mothers contributing. Contribution was higher during the third NERP round as compared to the other rounds (31.9% versus 13.3% to 24.3%, $p < .05$). Food contribution rates varied widely by commune (7.9% to 37.0%) and district (11.3% versus 29.5% for districts one and two, respectively, $p < .001$) without discernable relationship to ecology (fig. 1).

NERP meal eaten at center

Children were most likely to eat NERP meals at the NERP center (62.4%). The practice of eating at the NERP center varied across potential explanatory variables. For example, children in lowland commune 26 were 4.6 times (95% confidence interval: 2.9, 7.2) more likely to consume the NERP meal at the NERP center than counterparts from other communes. NERPs in district two again out-performed those in district one in providing center-based meals (67% versus 57.9%, $p < .001$). The January NERP round had the highest rate of children eating at the NERP center as

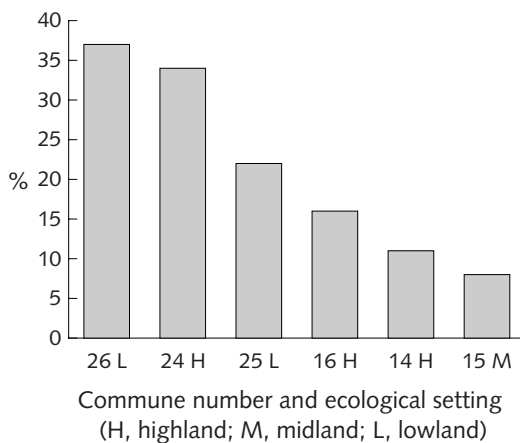


FIG. 1. Caregivers' contribution rates of PD foods to NERP sessions, by commune and ecological setting

compared to all other rounds (78.6% versus 58.4% to 65.8%, $p < .01$).

Food preparation

NERPs performed well overall in involving at least one caregiver in meal preparation (75.8%; 182 of 240). Communes 14 and 26 were far more successful than all other communes at enlisting caregivers to help with cooking (90.6% and 95.3% versus 58.3% to 82.1%; $p < .001$). The standard, meal preparation by "two caregivers at a time," was uncommon (7.1%; 17 of 240).

NERP message delivered

Health volunteers presented health messages on only 20% (48 of 240) of observed NERP days. Days one and two were more likely than days 11 and 12 to have had health messages given (36.7% versus 13.7%; $p < .05$); and messages were provided much more often at rounds one and two than at round eight (40% and 46.3% versus 12.5%; $p = .001$). In addition, NERPs in lowland hamlets presented messages more commonly than those in midland/highland hamlets (28.8% versus 11.5%, $p < .001$), and those in district one out-performed those in district two (23.1% versus 13.1%, $p = .063$).

Hygiene

Proper hygiene before meals and during feeding was consistently observed at NERP centers. Data collectors observed that most mothers washed their own hands (75.7% \pm 34.8) and their children's hands (81.6% \pm 33.9). Few mothers (6.4%) were observed to feed their children in an unhygienic way.

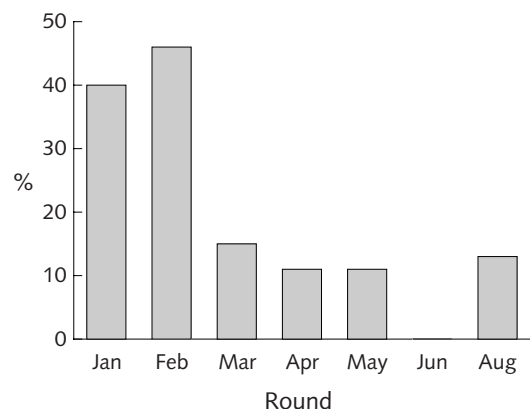


FIG. 2. NERP health message delivery versus NERP round

Figure 2 is not referenced in the text.

Growth monitoring

Health volunteers often (74.5%) weighed children at the beginning of NERP sessions. Children were weighed almost always (87.8%) before eating, consistent with the NERP protocol. Almost all (80.6%; 25 of 31) NERP sessions observed on day 12 included child weighing, and most of those weighings (92.0%; 23 of 25) occurred before the meal.

Discussion

We found mixed results when NERP implementation was compared to intervention design. Caregiver participation in cooking collective NERP meals was consistently high. Similarly, good hygiene behaviors were regularly observed. However, attendance rates at NERP sessions were not high, food was frequently delivered to families of malnourished children who stayed at home, the daily contribution of foods was less than optimal, and behavior change message delivery was quite low.

The “low attendance-good participation” NERPs were epitomized by absent children with present caregivers who contributed food and helped cook meals for home-delivery to these children. This pattern, most obvious when no children were present, occurred at all attendance rates, in all observed communes, and throughout the implementation period. We interpret this as a sign of conviction and support for the program, a phenomenon that should be further studied. We do not know how many of all NERP-eligible children were provided with NERP center meals at home, nor do we know how frequently each absent child received NERP meals. The interpretation would differ if most children received some meals at home or if most children attended all NERP sessions with only a few never attending a single session. Nevertheless, this unexpected change in implementation raises concerns. First, we do not know if absent children, in fact, received and consumed the extra meals. Second, children who received home meals did not benefit from interaction with other children, caregivers, or the health volunteer. Third, caregivers did not benefit from the social support, reinforcing norms, and increased self-efficacy often present at NERPs when caregivers feed their children together. On the other hand, it can be argued that home-delivery is better than no supplemental meal at all. The occurrence of meal delivery to the homes of malnourished children during all seasons and months suggests that neither ecology nor seasonal work demands completely explained the practice.

Most (90%) NERPs operated a system in which mothers cooked and contributed in turn, at variance to protocol. Health volunteers assigned caregivers specific days to both bring food and cook the NERP meal. Thus, the level of daily food contribution (a

caregiver-level indicator) was low despite high participation in cooking (a NERP-level indicator). While assigning food contributions and cooking to one or a few mothers makes logistical sense, circumventing the standard of daily contributions prevents caregivers from regularly “practicing the practice,” an important step in behavior change. Moreover, in about a quarter of observed NERPs, no mother contributed (23.8%), and no mother helped prepare food (24.2%).

NERP messages, intended to inform mothers about good caring, feeding, and health seeking practices, were rarely given at NERPs, perhaps because of their repetitive nature. When messages were presented, health volunteers repeated the messages from days one through six on days seven through 12 according to plan. Since most caregivers attended multiple NERPs (4.5, on average, by month six [12]), boredom with the six basic messages may have discouraged health volunteers from repeating them. Also, in the busy harvest season, mothers insisted that health volunteers let children eat immediately so they could leave for fieldwork without hearing messages. Because message delivery at best plays only a supporting role in the NERP’s behavior change approach, sub-optimal message delivery may not have greatly affected outcome. Practicing a message is more useful than talking about it.

The NERP iterations studied within the context of the ViSION project were atypical in one important way. NERPs usually only enroll children with WAZ less than -3 , but these communes had better than expected levels of child nutrition, which required adjusting the enrolment criteria to WAZ less than -2 . Caregivers of these moderately malnourished children (WAZ between -2 and -3) may have been less motivated than caregivers of severely malnourished children to faithfully attend NERPs, and health volunteers may have been less convinced of the need to rigorously implement NERPs according to standard.

Despite imperfect NERP implementation, participation in the CENP was associated with better dietary intakes [12], improvements in growth for younger malnourished children [13], and reduced rates of acute respiratory infections (ARI) [14]. Moreover, health volunteers developed confidence, and program mothers reported increased knowledge, confidence, and information sharing among their neighbors regarding childcare and feeding [15]. The NERP was key to the CENP impact given its participatory nature, hamlet level reach, 12-day duration, and monthly recurrence. The GMP may have had a NERP multiplier effect, a natural locus for NERP attenders to share their new knowledge and confidence [15].

How do these NERP findings shed light on specific CENP effects? Superficially, one could conclude that imperfect NERP implementation attenuated optimal program impact. Indeed, the impact of this CENP iteration was less than previously observed [16–18],

but the challenges were greater: the untested change to protocol (i.e., enrolling children between -2 WAZ and -3 WAZ, as well as those less than -3 WAZ), lower than expected levels of malnutrition, dispersed population, and varying political will by commune and district. The NERP quality in this “real life” effectiveness study may have been indistinguishable from prior iterations; however, comparative quality data from prior CENP implementations are lacking.

Exactly how the NERP helped to achieve certain CENP outcomes is speculative, but worth considering. Regarding the differential program effect on younger, more malnourished children [13], mothers of these children were likely more motivated both to attend NERPs and to consider behavior change than mothers of less malnourished children. Whether mothers of younger children had more time to attend NERPs than their counterparts with older children is less sure. Regarding the change in diet, such skills-building is the focus of the NERPs. While the common observation of meal home-delivery somewhat contradicts the doctrine of repeated practice for skills transfer, it may have helped adopting new behaviors in other ways. That is, key behaviors were tangibly “brought to caregivers’ doorsteps” for all family members to witness, i.e., a large serving size of a new recipe, perhaps seasoned with enthusiastic encouragement by the health volunteer or other caregiver. Moreover, when the child actually consumed this serving at home, the effect on the family would have been further magnified. Regarding the decrease in ARI (in spite of the NERP’s concentrated gathering of young children) [14], perhaps NERP hygiene messages and especially hand-washing practice reduced the spread of ARI. Perhaps some NERP absenteeism can be explained by mothers correctly keeping ill children at home, thereby reducing transmissibility. Regarding empowering health volunteers and caregivers, adopting new demonstrably effective behaviors is clearly a step toward taking control of the well being of one’s family and community [15]. Furthermore, implementing NERPs at variance to protocol may be an indicator of empowerment, that is, of local experimentation, adaptation, and improvement.

This research has limitations. Sampling was not always random, and some NERPs were over-represented. We did not use multi-variable analysis, which although necessary to identify complex statistical associations, was not required for a description of program quality accessible to programmers. Some indicators sacrificed usefulness for feasibility. For example, NERP message delivery was easy to measure, but of uncertain importance. Perhaps the health volunteers recognized that the messages were a distraction from the more important active learning and wisely

omitted them. On the other hand, developing a reliable indicator to capture participatory skills-transfer is a challenge. Obviously the presence of RTCCD field workers probably affected health volunteer performance; however, few of the indicators were directly in the health volunteers’ control except for message delivery and weighing. A carefully weighed design decision not to share the observations with the health volunteers or the CENP team allowed assessment of a typical NERP intervention (i.e., which lacked performance monitoring), but it prevented assessing NERP quality in response to feedback.

An important next step for research and program planning is to construct a single score that summarizes the quality of NERP implementation according to standard. A valid NERP score, and multi-variable analyses, are necessary to define both the predictors of NERP quality and associations between quality and program outcomes. Two additional areas need further investigation: the importance of daily food contributions versus a rotation and the delivery of food to the children’s homes versus mandatory center-based meal. These modifications may not be worse than the original design, and they may represent improvements by allowing greater compliance and permitting ill children to receive benefits.

In summary, many aspects of the NERPs were implemented according to design and were of high quality. Some aspects were either implemented differently than designed, or of poor quality, or both. We urge programmers to develop and apply simple quality indicators, perhaps like ours, to track and strengthen the implementation of this important intervention. We have no reason to believe that these NERPs were different from many previous NERPs. On balance, this evaluation gives us confidence that the NERPs were implemented in a way and with a high enough quality that many of the positive results we found on child growth, diet, and morbidity, and maternal and health volunteer empowerment in this study can be attributed to the NERPs.

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Empowerment in Rural Viet Nam: Exploring changes in mothers and health volunteers in the context of an integrated nutrition project*

Julia L. Hendrickson, Kirk Dearden, Helena Pachón, Nguyen Hoi An, Dirk G. Schroeder, and David R. Marsh

Abstract

Empowerment is often cited as a fundamental component of health promotion strategies. Anecdotes suggest that Save the Children's integrated nutrition project empowers local women and health volunteers. The aim of this research was to document the degree to which this is being accomplished. Using qualitative methodologies, we conducted a cross-sectional assessment to compare self-reported changes in identified empowerment domains among 17 program health volunteers and 20 mothers involved in a child nutrition intervention and among five Women's Union leaders and five mothers in a non-intervention comparison commune. Intervention mothers reported increased knowledge, confidence, and information sharing about child-care and feeding, while non-intervention mothers reported minimal changes in these domains. Both intervention health volunteers and non-intervention Women's Union leaders expressed improvements in knowledge, confidence, and relationships with community members. In this study we found that the relative increases in empowerment were greater for mothers than for health volunteers. Intervention mothers reported more sharing of information on child

relationships with community members than Women's Union leaders. The increased information sharing has positive implications for spread of key messages to families that did not directly participate in intensive feeding and the sustainability of the intervention's impact. Future research should focus on developing culturally specific concepts of empowerment to better understand the effects of empowerment efforts. This study's identification of empowerment domains will inform future empowerment studies in Vietnam.

Key words: empowerment, positive deviance, child nutrition, nutrition education, health volunteers, Viet Nam

Introduction

Empowerment is often cited as a fundamental component of strategies to improve the complex and inter-related causes of child malnutrition [1]. Viet Nam has one of the highest rates of child malnutrition in the world** [1–3]. To address this problem, Save the Children Federation/US (SC) uses a positive deviance (PD) approach to *empower* communities to rehabilitate malnourished children through their community empowerment and nutrition program (CENP) [4].

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Mention of the names of firms and commercial products does not imply endorsement by the United Nations University. *care with neighbors. Health volunteers developed closer*

* The ViSION (Viet Nam study to improve outcomes in nutrition) project evaluated the implementation and impact of an integrated nutrition program on the nutritional status, morbidity, diet of, and care for children 5 to 25 months old at baseline in rural Viet Nam, through a partnership among Save the Children/US (Hanoi and Westport, Conn., USA), the USAID-funded LINKAGES Project (Washington, D.C.), Emory University's Rollins School of Public Health (Atlanta, Ga., USA), and the Research and Training Center for Community Development (Hanoi).

** Between 39% and almost 50% of children under-five years old are stunted and underweight, (underweight-weight for age with a less than -2 Z score).

While the term empowerment has become popular in the fields of public health and community development, there is no single accepted definition of its meaning [5]. The World Health Organization (WHO) incorporates the concept within its philosophy of “enabling people to increase control over, and to improve, their health” [6]. Empowerment has been defined as a process by which individuals or communities gain mastery over their lives [7]. The breadth of definitions is an acknowledgement that empowerment is a dynamic and contextually based phenomenon for which a single definition or set of outcomes may not be appropriate [7]. The interconnectedness and synergy between multiple levels of empowerment (e.g., individual and community) adds complexity to the concept and further supports the need for context specific analysis [5, 8].

A single definition of empowerment is elusive, in part because the meaning of the root word, *power*, is difficult to understand outside a social context [9]. In Viet Nam, for example, the concept of power invokes a negative sense of individual decision-making or control at the expense of the group. In this case, a positive notion of empowerment is only understood within the context of the family or community, not as an individual phenomenon alone. To explore empowerment changes within a particular context, several studies have used context-specific empowerment domains as proxies to assess an intervention’s empowerment effect [10–12].

PD can be most simply defined as “success in spite of hardship.” Within the context of SC’s CENP program in Viet Nam, the PD approach was used to identify PD families, resource-poor families who have thriving well-nourished children [13]. Through PD inquiries, community members and program staff interviewed identified PD families to understand how they kept their children well nourished. Locally selected health volunteers (health volunteers) are critical to the success of the program. During 12-day nutrition education and rehabilitation program (NERP) sessions with caregivers of malnourished children, health volunteers promoted the locally identified child-care and feeding practices learned from local PD families. Health volunteers also monitored the growth of commune children, visited caretakers’ homes to encourage them to adopt PD behaviors, and reported program progress to the rest of the community.

Although the CENP effort had been found to positively impact child nutrition [14], its effect on empowerment had yet to be studied. This article compares self-reported changes in empowerment domains among health volunteers and mothers participating in the CENP with Women’s Union (WU) leaders and mothers in a non-intervention commune.

Methods

Study site and subjects

This study was conducted in two phases between June and August 2000. Phase I consisted of in-depth interviews with Vietnamese development professionals in Hanoi to identify empowerment domains to be explored in Phase II. These domains included access to resources, knowledge/education, confidence, decision-making, participation in social activities, community support/relationships, community problem-solving and community reaching-out-to-others for help.*

In Phase II, we conducted semi-structured interviews in three communes in northwest Viet Nam—An Dao, Phu Nham, and Phu Khanh. We randomly selected one CENP intervention commune and a comparison non-intervention commune from 12 communes participating in the ViSION project’s evaluation of the CENP [15]; the second intervention commune was chosen based on its demographic similarity and geographic proximity to the “empowerment” study area. The socioeconomic and nutritional characteristics of the CENP communities have been described in detail elsewhere [MISSING REF NUMBER].

Subjects from the CENP intervention communes included 17 health volunteers and 20 mothers of children under three who attended at least one NERP session. In the comparison commune, we interviewed five Women’s Union leaders and five mothers of children under three. Women’s Union leaders in Viet Nam implement government programs at the local level including credit schemes and family planning [16]. Hamlet-level Women’s Union leaders are elected by local union members. More than 50% of Vietnamese women over 18 years of age belong to the union and most of the 11 million members are rural women between the ages of 30 and 50 [17].

We chose Women’s Union leaders as a comparison group because most of the CENP health volunteers were also leaders in the union, and we wanted to measure increases in empowerment due to involvement in the CENP over and above that which may result from being a union leader. Sixteen of the 17 health volunteers in this “empowerment” study also worked as leaders in the Women’s Union. All the health volunteers in the two intervention communes were interviewed except for one who was ill. Two methods were used to select mothers for the study. Either a mother volunteered at a NERP session and was interviewed at the NERP location, or a health volunteer asked a mother to participate and we interviewed her in a health volunteer’s home or

* Description of methods from Phase I in Hendrickson J. Empowerment in Vietnam: Exploring changes in mothers and volunteers—unpublished master’s degree thesis. Emory University, Atlanta, Ga., USA, 2001.

at the community center. Twice, the original mother selected by a health volunteer was not available to be interviewed, and the health volunteer asked a different mother to participate.

Instrument development

The principal investigator developed the data collection instruments with input from individuals experienced in qualitative research in Viet Nam. Senior Vietnamese SC staff also reviewed the question guides and provided valuable feedback on content and cultural appropriateness. The guides were translated into Vietnamese and translated back into English for SC staff to check for accuracy. After pre-testing, we made further modifications to improve comprehension.

Semi-structured field guides were used to inquire about changes in the lives of health volunteers and mothers since the start of the intervention six months earlier. We focused the field guide questions on changes in three of the identified empowerment domains: decision-making, community support (relationships with other community members), and confidence. We selected these key empowerment domains based on discussions with SC staff and other researchers familiar with the CENP. Knowledge, also a key domain, will be assessed in other ViSION project reports. We asked a fixed list of open-ended questions about these domains, followed by probes. To gather information on changes in other areas, we asked health volunteers to explain, "How has your life changed since you became a health volunteer?" and we asked mothers to explain how their lives had changed since attending the NERP, followed by probes. In the comparison commune, we slightly adapted questions to refer to changes in Women's Union leaders' lives since becoming leaders, and we asked mothers about life changes in the last six months. We used six months as a timeframe because at the time of the interviews, the CENP had been active for about this amount of time.

Socio-demographic characteristics included age, years of education, and socioeconomic status. A family's socioeconomic status was determined through self-identification as "hungry," "poor," "enough food," "better off," or "rich" [15].

Data collection

The principal investigator worked with a research assistant/translator who had previous experience conducting in-depth interviews regarding maternal and child health in Viet Nam. The assistant conducted all interviews in Vietnamese, each lasting approximately one hour. Before each interview, the assistant explained the research goals to the participant and obtained consent for interview participation and audiotaping. We tape-recorded all the interviews and took notes in case

of recording failure. The principal investigator and assistant translated interview notes and checked them against recordings for accuracy and completeness at the end of each day. To further check translation accuracy, a bilingual Vietnamese sociologist in Hanoi transcribed 10 tapes verbatim. We found few differences between these transcripts and the translations conducted by the assistant and the principal investigator in the field.

Data analysis

We entered English translations of interview narratives into Word and Excel (Microsoft Corporation, Redmond, Wash., USA) for analysis. Results were analyzed in two ways. The first involved reading through all the interviews several times and identifying, coding, and compiling key words and phrases by themes. We then reviewed each theme and divided it further into key domains. We entered the results by theme, and by domains within themes, into a Microsoft Word document. The second method involved reviewing narratives and grouping responses from different respondents in an Excel document and analyzing them for common themes. Each method resulted in similar findings. The principal investigator reviewed observations, preliminary findings, and key interpretations with the assistant, a Vietnamese sociologist, to assure cultural accuracy and reach interpretive consensus.

Results

Demographics

Health volunteers were somewhat younger, less educated, and less economically well off than the comparison Women's Union leaders. Intervention mothers were somewhat older than, but of similar educational and socioeconomic background, compared to comparison mothers (tables 1 and 2).

Intervention communes: health volunteers

Changes in four domains emerged from the health volunteer interview narratives: knowledge, confidence, relationships with community members, and a sense of satisfied contribution (table 3). We had specifically asked about two of these domains in the interview guides: relationships with community members and confidence. The other themes emerged when asked, "How has your life changed since you became a health volunteer?" and "What things do you feel more able to do since you became a health volunteer?"

Although the volunteers were not specifically asked about knowledge they gained from the intervention, the domain of increased knowledge was one of the most prominent when describing changes in their lives.

TABLE 1. Socio-demographic s of health volunteers and Women's Union leaders

Variable	Intervention communes Health volunteers <i>n</i> = 17 (%)	Comparison commune Women's Union leaders <i>n</i> = 5 (%)
Age (yr)		
Range	31–54	40–48
Mean	38.2 (6.3)	41.4 (7.2)
Education		
Incomplete junior high school	5 (29)	1 (20)
Complete junior high school	9 (53)	1 (20)
Incomplete senior high school	2 (12)	2 (40)
Complete senior high school	1 (5)	1 (20)
Socioeconomic status		
Poor	2 (12)	0 (0)
Enough food	13 (76)	2 (40)
Well off	2 (12)	3 (60)

Health volunteers are community empowerment and nutrition program health volunteers.
SD in parentheses.

TABLE 2. Socio-demographics for participant mothers

Variable	Intervention communes Mothers ^a <i>n</i> = 20 (%)	Comparison commune Mothers ^b <i>n</i> = 5 (%)
Age (yr)		
Range	22–36	22–33
Mean	27.7 ± 5.4	26.6 ± 5.8
Education		
Complete elementary school	1 (5)	0 (0)
Incomplete junior high school	13 (65)	3 (60)
Complete junior high school	5 (25)	2 (40)
Incomplete senior high school	0 (0)	0 (0)
Complete senior high school	1 (5)	0 (0)
Socioeconomic status		
Poor	7 (35)	2 (40)
Enough food	13 (65)	3 (60)
Well off	0 (0)	0 (0)

a. Mothers of children under three years old who had attended at least one NERP session.

b. Mothers of children under-three years old.

“Knowledge” appeared 89 times in the transcripts of 17 health volunteers. Volunteers described how their new knowledge affected not only their ability to care for children in the NERP sessions, but for their own children as well.

Many volunteers' testimony showed that increased knowledge was related to two other domains, increased confidence and satisfaction from making a contribution to their community. Health volunteers expressed greater confidence in their ability to care for children and teach other mothers how to do so. They indicated these changes came from seeing children in NERP sessions gain weight and mothers learn the PD child-

care and feeding lessons [15]. One health volunteer explained,

Before I didn't know exactly which foods available in our commune were good for children. Now I feel confident when I tell mothers which foods to feed their children. They don't have to be afraid.

In a few cases, the CENP health volunteers also expressed greater confidence in other areas of their lives, including taking care of their own families and participating in community activities. For example, one volunteer said,

Because I have a chance to have training in the program and talk to many people I'm sure about my knowledge. Now, I feel more confident when I attend any commune activity.

All of the health volunteers interviewed reported that relationships were "closer" between the volunteers and community members, especially the mothers of young children attending NERP sessions. One participant who had been a Women's Union leader for many years explained,

...everyone is friendlier to me. When I go out in the commune, people ask me if the children have gained weight. The relationship is closer. I know that they care about me and care about the program.

Three of the 17 participants also mentioned how becoming closer to other women through the program influenced their work in other community activities. One explained,

I think when I became a health volunteer it made my work in the Women's Union easier because now I am closer to the other women.

A fourth domain that emerged from the volunteers' narratives was the sense of satisfaction and happiness women expressed in connection with the program. This satisfaction was most often expressed in terms of contributing to improving the lives of the mothers and children in their community, as well as in their own family. One volunteer offered,

We are happy because we're healthier than before. My children are well and can eat much more than before. We are healthier and stronger, and I know how to make my life better.

Another volunteer spoke about the importance she felt in contributing to the future of her community. She said,

I think of the children's future. When they grow up, they can become good members of society, so I have to try to do it.

Only one participant indicated any change in community or household decision-making.

Comparison commune: Women's Union leaders

Results from interviews with Women's Union leaders were similar to those of the CENP health volunteers. The union leaders described changes in knowledge,

confidence, a sense of satisfied contribution, and community relationships (table 4). However, unlike the health volunteers, the union leaders also mentioned changes in household decision-making since becoming a Women's Union leader.

Four of five Women's Union leaders mentioned increased knowledge as a result of their participation as a leader. Increased knowledge in these narratives focused on how to improve a family's economic condition, a major concern of most study participants. When asked how her life had changed since becoming a union leader, one participant explained,

[There are] many changes in my family. For example, because I have more knowledge on how to raise pigs or chickens, my economic condition has improved.

The Women's Union leaders also expressed gaining confidence through their roles as leaders. One said,

I feel more confident when I do some things now. When I want to do some 'big' things I feel surer. When I want to buy or decide something in the family with my husband, I feel more confident.

Like the health volunteers, the Women's Union leaders expressed satisfaction from making a contribution to their community. All of the union leaders interviewed discussed their interest in wanting to help other women in their commune and their happiness that they were able to improve the economic condition of other families, as well as their own. Changes in community relationships differed between health volunteers and Women's Union leaders. The CENP volunteers mentioned "closer" relationships with mothers due to frequent contact with them. The Women's Union leaders stated that they felt more trusted and respected in the commune now that they were leaders. Changes in decision-making also differed between health volunteers and Women's Union leaders. While only one health volunteer mentioned any change, four of the five union leaders said they now made more decisions in their households.

Intervention communes: mothers of children under three

Changes in three domains emerged from the mothers' interviews: knowledge, confidence, and information sharing (table 3). Mothers were specifically asked about two of these areas, changes in information sharing and confidence.

While mothers were asked about decision-making, none expressed any change. Changes in knowledge emerged from questions, such as, "How has your life changed since attending the NERP?" "What do you feel more able to do now than you did six months ago?" and "How did your child become healthier?" Mothers

TABLE 3. Changes in empowerment domains self-reported in field interviews

Domains identified by Vietnamese key informants in Hanoi (Phase I)	Domains from interviews with health volunteers	Domains from interviews with comparison commune Women's Union leaders	Domains from interviews with intervention mothers	Domains from interviews with comparison commune mothers
Access to resources	NA	Increased economic status	NA	NA
Knowledge/education	Increased	Increased	Increased	Increased for one
Confidence	Increased	Increased	Increased	Increased for one
Decision-making	Increased for one	Increased	No change	No change
Participation in social activities	Increased for three	No change	No change	No change
Community support	Closer relations with community members	Increased respect	NA	NA
Community solves their own problems	NA	NA	NA	NA
Community reaches out to others for help	NA	NA	NA	NA
Other	Increased sense of contribution and satisfaction	NA	Increased sharing advice	NA

NA, not applicable; no mention of concept.

were asked about changes in sharing information as an indicator of changes in knowledge and confidence.

New knowledge was the most often mentioned domain in the mothers' narratives, and many explained that their children were healthier in part because of this. One mother explained,

Before I felt that my child was malnourished, but I didn't know how to help him. Around me was a lot of food like shrimp and crab, but I didn't know it was good for my child. The health volunteer showed me how to cook [these foods].... Now when I catch a crab or snail, I can cook this for my child. My child is healthier due to the knowledge [I gained].

CENP mothers interviewed also reported gaining confidence in what to feed their children after attending the NERP. One mother said,

I learned from the program which foods are good for my child. Now I know how to put a lot of different foods together at each meal. I feel more confident because I understand better.

According to the mothers' reports, acquiring new knowledge also led to increased sharing of information on child feeding with other community members. The majority of mothers said that before the intervention they did not give advice on child feeding. One mother explained,

When I was working in the field, someone asked me about how to take care of children. But I said I wasn't sure about how to make the child gain weight.

When asked if they gave any advice recently, more than half of the women responded that they could now give advice. Knowledge and confidence led to information sharing. One mother claimed,

Now it's changed very much. When I take care of my child at the program, everyone sees that my child is stronger and they ask me how I cook and take care of my child. I tell them everything I learned in the program.

Two mothers also explained that their knowledge from the program had also helped them change the opinions of their husband and parents-in-law. One described it this way,

Before this program, I couldn't change the opinion of my parents, because the elders always thought crab and snails were not nutritious. So when I attend this program, I learn about nutritious food and can explain it to my parents.

Comparison commune: mothers of children under three

Mothers in the comparison commune reported few changes. In terms of changes in knowledge or confidence, only one mother, a 33 year-old member of the Women's Union, reported feeling more confident to feed her child because of knowledge on child nutrition she had gained from Women's Union meetings. When asked how they learned what foods to feed

their children and how to care for their children, most comparison mothers reported that they “learned by themselves” or received information from the Women’s Union or health center. None of the mothers reported that they had given advice on child-care or feeding to other mothers.

Discussion

This study used in-depth qualitative methods to identify key domains of empowerment in Viet Nam and to document changes in domains among the CENP health volunteers and mothers. While both participant mothers and volunteers involved in the CENP reported increases in certain empowerment domains, the relative increases were greater for mothers than for health volunteers.

Findings from health volunteers

This study suggests that health volunteers’ participation in the CENP resulted in changes in their knowledge, confidence, relationships with community members, and sense of satisfied contribution. While the reported changes in knowledge and confidence mostly related to child-care and feeding, several health volunteers also said they felt more confident participating in other community activities.

Although the key informants in Phase I did not specifically identify sense of contribution as a domain of empowerment, underlying all identified domains was the notion that individual empowerment in Viet Nam is “good” only when pursued for the benefit of the individual in addition to the family and community. In Vietnamese culture, emphasis is often placed on the well-being of the family and community above the individual [18], and empowerment outside of that context invokes a sense of individual decision-making at the expense of the group. Thus, the empowerment in a Vietnamese context is generally regarded as positive only when it benefits the family and community, along with the individual.

Women’s Union leaders in the comparison commune reported changes in knowledge, confidence, and a sense of contribution similar to the CENP health volunteers. Both groups also reported changes in their relations with community members. These similarities suggest that it is the act of becoming and participating as a community leader, either as a health volunteer in the CENP or a leader in the Women’s Union that results in “empowering” changes. Other studies have similarly found that participation in community activities can empower participants by providing the opportunity to develop self-efficacy or self-esteem [5, 6, 10, 12, 19], learn and practice new skills [10, 11, 20], gain information, help others, and increase one’s social support network [21].

However, changes in decision-making varied between health volunteers and the comparison Women’s Union leaders. Only one of 17 health volunteers reported any change in household decision-making, but four of five Women’s Union leaders reported increased participation in household decision-making since becoming a leader. This difference may be that Women’s Union leaders learn from the union not only how to mobilize and teach women to feed and care for children, but also how to improve their family’s economic condition. The former is the accepted role of women in Viet Nam [22], but the latter may have more impact on decision-making with husbands and family elders. Recent studies in Viet Nam found a shift toward more equitable household decision-making in the families of women who participate in development credit interventions [22].

Attitudes towards community relationships also varied. Women’s Union leaders reported noting greater respect from community members, but not the increased closeness reported by the health volunteers. One health volunteer, who was also a Women’s Union leader, explained that this difference was due to the greater amount of time health volunteers spent with mothers compared to typical union leaders’ activities. These results suggest that health volunteers were able to build closer relationships with community members through their CENP activities than through their Women Union activities or compared to their Women’s Union leader counterparts. The significance of close relationships with community members is reflected in the importance of sense of community and community support found in empowerment studies [7, 10–12, 23].

Findings from mothers

Mothers who had participated in NERP sessions were more likely to report increased knowledge and confidence in child feeding and care practices and increased sharing of advice with others as compared to comparison mothers. While increased sharing of advice was not originally identified as an empowerment domain, it illustrates the mothers’ increased confidence and knowledge about child-care and feeding, as well as community support. These results are relevant not only in terms of the CENP’s empowerment impact, but also in terms of sustainability. As mothers gain knowledge and confidence, they may pass their knowledge along to other community members not directly targeted by the intervention.

In addition to sharing information with neighbors, two CENP mothers explained that their increased knowledge from the program helped them change the opinions of their in-laws who objected to feeding children crabs and snails, two locally identified “good” foods. This represents a significant step for a mother

who may not regularly participate in household decision-making about food.

In contrast, comparison mothers reported almost no changes associated with any empowerment domains. None reported giving advice to women in their hamlet on child feeding or care, and only one reported greater knowledge and confidence about child care than she had six months earlier. This lack of reported change among women in the comparison commune suggests that increases in the empowerment domains in the intervention mothers were due to participation in CENP activities rather than societal influences associated with economic reforms, mass media campaigns, and the like.

The changes reported by CENP mothers appear consistent with empowerment at the individual level. Narrowly defined, individual empowerment is similar to the development of self-efficacy [5, 6, 10, 12, 19]. CENP mothers did not report greater confidence or ability to address other obstacles that they had identified as relevant to child health, such as poverty and lack of time. However, most reported greater knowledge and confidence to address immediate causes of child malnutrition, such as inadequate dietary intake [1].

The multiple levels of empowerment in terms of a continuum from personal change through community action to social/political action have been discussed elsewhere [24]. In the case of the CENP, a mother's success in rehabilitating her child through her knowledge and actions is likely an individual level empowering experience, which in turn led to increased personal confidence and information sharing with others.

This study had a number of limitations. It is possible that the 20 mothers interviewed differed from other CENP mothers. However, there were no apparent differences in responses between mothers whom we selected ($n = 6$) and those selected by the health volunteers ($n = 14$). The relationship between participation and empowerment could be confounded by age, marital status, or other factors correlated with being a health volunteer or a Women's Union leader. For example, the somewhat better education and economic status of Women's Union leaders versus health volunteers may have limited the empowerment possibilities for the health volunteers. However, past research found that the relationship between participation and empowerment remained after age and socioeconomic status were controlled [20]. Incomplete or biased recall might have influenced responses about events that

had occurred six months or several years prior to the interview. In some respects, the study is biased against detecting change among the health volunteers. In addition to the differences in socioeconomic status between health volunteers and Women's Union leaders noted above, the comparison union leaders reported changes occurring over several years while health volunteers reported on changes only in the previous six months. Finally, many health volunteers were already Women's Union leaders so detecting incremental changes may have been difficult. Overall, this limitation makes the health volunteer findings all the more robust.

In summary, this study found that participation of mothers and health volunteers in the CENP resulted in changes in several empowerment domains. While there is little doubt that empowering community health workers and participants will lead to better outcomes, few programmers know if their empowerment efforts actually work. Specific to the ViSION study, we were most encouraged to find that participant mothers commonly share information with neighbors and are more confident to implement new child feeding and care strategies. This may well be an important mechanism through which PD-informed interventions lead to better and sustainable health outcomes. Future research should focus on developing culturally specific understanding and measurement approaches of how and to what degree empowerment can be achieved in a given program. Such tools will ultimately lead to more efficient use of resources and more effective interventions.

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Caregiver styles of feeding and child acceptance of food in rural Viet Nam*

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Abstract

Style of child feeding may be an important determinant of child nutrition and health outcomes. Responsive feeding refers to the level and kind of interaction between caregiver and child that lead to a positive feeding experience, adequate dietary intake, and enhanced developmental opportunities. Responsive feeding behaviors may include active physical help and verbalization during feeding, role-playing, persistence, and positive feeding strategies. The aim of this study was to investigate styles of feeding among Vietnamese children 12 or 18 months of age from a rural province in northern Viet Nam. Forty child/mother pairs were videotaped during two, two-hour feeding episodes. Caregiver and child behaviors were coded at the level of the "intended bite" as observed through the videotape analysis of feeding episodes to assess caregiver behavior and the child's interest and acceptance of food. We found it feasible to use videotape and the modified coding and analysis scheme, originally developed for work in Peru, in Viet Nam. In Viet Nam, caregivers provided physical help to eat nearly all of the time in the younger children, and about 70% of the time among 18 month olds. Caregivers verbalized during only 30% of intended bites, and only half of these verbalizations were responsive in tone or words. Positive caregiver behaviors were significantly associated with higher child's acceptance of food,

while non-responsive feeding behaviors were associated with child rejection of food. Future analyses of this data set will evaluate the degree to which an integrated nutrition program positively modified caretaker behaviors. More research is needed to demonstrate the relationships among the promotion of responsive feeding behaviors, acceptance of food, and improved nutrition and health status of children.

Key words: nutrition and care, infant feeding, diet, parental feeding styles, Viet Nam

Introduction

Child malnutrition, a major public health problem in developing countries, is usually attributed to growth faltering, which is primarily a consequence of repeated infectious episodes and inadequate nutrient intakes. Infants are often fed diets that are low in nutrient quantity and quality, and interventions have generally focused on improving complementary feeding diets that are appropriate to the setting [1].

Recently, however, there has been considerable interest in the role of styles of child feeding as an important determinant of dietary intake, child nutrition and health outcomes [2–5]. The UNICEF conceptual framework [4] suggests that care and feeding, in addition to food security, health care services, and a healthy environment, are critical for children's survival,

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* The ViSION (Viet Nam study to improve outcomes in nutrition) project evaluated the implementation and impact of an integrated nutrition program on the nutritional status, morbidity, diet of, and care for children 5 to 25 months old at baseline in rural Viet Nam, through a partnership among Save the Children/US (Hanoi and Westport, Conn., USA), the USAID-funded LINKAGES Project (Washington, D.C.), Emory University's Rollins School of Public Health (Atlanta, Ga., USA), and the Research and Training Center for Community Development (Hanoi).

growth, and development. This is particularly relevant in resource-poor settings, where enhanced care giving behaviors can optimize existing food sources.

Feeding behaviors cluster in patterns that represent an overall feeding style and these behaviors are often embedded in “cultural ethnotheories” of parenting and care [6]. For example, in Peru, where caregivers offer little physical help to eat and rarely verbally encourage their child to eat during a feeding episode, there is a strong belief system that children ‘know’ how much they should eat and/or that in order to be independent and autonomous, it is important that they self-feed at an early age [7].

Three caregiver styles have been conceptualized by Birch and Fisher [8]: controlling, laissez-faire, and responsive. In a highly controlled style of feeding, the caregiver has the intention to control when and how much the child eats, either through dietary restriction or overfeeding. This style of feeding has been observed in the United States and has been associated with pediatric obesity risk [9, 10]. At the opposite end of the continuum, caregivers may provide little physical help or encouragement to eat, and this feeding style may be based on cultural beliefs that children know when and how much they should eat or that children should develop independent feeding styles at an early age [7]. This “laissez-faire” or passive style describes low levels of caregiver-child interaction during feeding episodes. The caregiver may not understand or respond to her child’s cues of hunger or satiety clearly, and this may be particularly maladaptive when children have low appetites and reject food [11, 12]. Responsive (or active) feeding refers to the level and kind of interaction between caregiver and child that leads to a positive feeding experience, adequate dietary intake, and enhanced developmental opportunities. Responsive feeding behaviors may include active physical help and verbalization during feeding, role-playing, persistence, and positive feeding strategies. Indeed, the UNICEF care and nutrition conceptual framework encourages active feeding as a programmatic emphasis to improve child nutrition [4].

To investigate feeding styles of rural Vietnamese caregivers for their young children, we conducted an observation study using a coding scheme developed and tested in Peru [7, 13]. This study was conducted within the context of a large randomized intervention trial, the ViSION (Viet Nam study to improve outcomes in nutrition) project [14]. The specific aim of this paper is to report on the feasibility of the videotaping, coding and analysis scheme within the Vietnamese context and to examine the association between feeding style and child acceptance of food. Future analyses with a larger sample will examine the effects of the intervention on feeding style and dietary intake.

Study sample

The study was conducted among children 12 or 18 months of age in northern Viet Nam. We coded the findings using 80 videotapes of snack and lunchtime feeding episodes of 40 children (20 males and 20 females) and their caregivers. These observations represent a subset of the children in larger study as well as the total number of tapes obtained as described here.

Of the 240 children who participated in the larger ViSION project, we only attempted to videotape about half of these due to resource and timing constraints. Of 119 children selected for video observation, six were observed only once and 10 children were not observed due to refusal to participate or scheduling difficulties. Thus, 103 children and their mothers were successfully videotaped twice for two hours each for a total of 206, two-hour tapes. For the analysis, we selected a subset of 80 tapes (40 children). During the coding process, 12 tapes (six children) were excluded because of the inability to consistently observe both the caregiver and child during the feeding episodes; these were replaced by a tape randomly selected from those remaining.

The final sample for this analysis thus includes 40 children, 37 of whom have one lunch feeding episode and three of whom have two feeding episodes available on the two tapes, for a total of 43 feeding episodes. All 40 children were observed during the main afternoon mealtime; 29 of those had both the main mealtime and snack; whereas, 11 children were observed only during the main meal and not during a snack.

Methodology

Children were videotaped in their homes during snack and meal feeding episodes. We video-recorded two, two hour-segments of care timed around a child feeding. Subjects were videotaped on two different days seven days apart. We used a DCR-TRV103 Sony Digital Handycam Camcorder (Sony Corporation, Tokyo) with two one-hour tapes per encounter. The two-person field team consisted of a photographer and a minute-by-minute activity recorder to facilitate reviewing the video. Field workers encouraged routine activity, including instructions to the mother to avoid changes in the usual feeding. If the caregiver-child pair became physically separated beyond the camera frame, we videotaped the child. The camera operator attempted to film the faces of both caregivers and child at all times.

The observational videotape data were subsequently coded using the strategy developed previously [7, 13]. Caregiver and child behaviors were coded at the level of the “intended bite” as observed through the videotape analysis of feeding episodes. An intended bite is

operationalized as the unit of analysis when food was brought up to the child's mouth (either by the caregiver or the child) with the intention of it entering the mouth for consumption, whether it was consumed/swallowed or not. For example, intended bites may include a caregiver who offers food to a child who subsequently rejects it, a child who lifts food toward her mouth but puts it down before it enters her mouth, or the child who rejects food by spitting it out. This frame-by-frame coding scheme was previously tested for reliability in Peru [7] and is particularly feasible when coding videotape data, since the coder can stop, rewind, and restart the tape as necessary. Data codes included the duration of the feeding episode, the type of preparation and consistency of each food offered, the number of intended bites, the feeder identification, the utensils used, the distance between the child and the caregiver, the position of the caregiver in relation to the child, physical and verbal help offered to the child, and the interest of the child in the food or bite.

The coding scheme for the caregiver and child observations during feeding were as follows. *Physical help* was defined as: 0, no help offered; 1, facilitated feeding or directly helped; 2, used physical pressure; or 3, forced the child to consume the bite through physical action. *Child interest* in the food was coded as: 1, child eagerly accepted food by leaning forward, opening mouth, reaching for hand or spoon of feeder; 2, passively accepted the food (not eagerly); 3, accepted the food, then subsequently rejected it; 4, rejected the food, then accepted it; or 5, completely rejected the food. *Verbalization* of the caregiver was defined as: 0, no verbalization; 1, positive verbalization; 2, "mechanical" verbalization ("open your mouth" or "eat"); or 3, verbal order or threat ("eat or...!").

We coded the caregiver behavior and child acceptance (or rejection) of food. In this analysis, we coded caretaker and child. The unit of analysis was the level of the 'intended' bite, but not the order. The results should thus be interpreted as correlations between caretaker behavior and child acceptance or rejection of food.

Coding the video observations to try to determine the causal sequence of which came first, e.g., positive caretaker verbalization or child acceptance, requires more complex coding methodology and will be undertaken at a future date.

All videotapes were coded by one observer (PBH), under the training and supervision of one of the authors. The data were analyzed using Stata [15], which permitted tests of proportions. A level of $p = .05$ was considered significant. The unit of analysis is at the level of the intended bite, as described above, and includes both snack and lunchtime feeding episodes.

Results

The methodology developed in Peru to evaluate feeding styles was easily adapted for application in Viet Nam. In both settings, the use of a video camera in a home environment was acceptable and response bias (while not formally tested in Viet Nam) did not seem problematic. In comparing the two cultures, Vietnamese caregivers were more likely to sit with their children and verbalize during feeding episodes than rural Andean mothers in Peru, and were similar in their level of verbalization to urban Peruvian mothers [7].

Among 12 month-old children, the main feeders were the mother (52%), the grandmother (23%), a sister (16%), the child herself (3%), the father (4%), and others (2%). For children in the 18-month age group, the main feeders were the mother (38%), the child herself (35%), the grandmother (14%), the father (10%), and others (3%).

Feeding duration in the Viet Nam study varied widely (range 1 to 49 minutes) but was uninfluenced by breastfeeding during the episode (median duration = 19 vs. 20 minutes, for 12 month and 18 month old children, respectively (table 1). There were no significant differences in duration of feeding in the younger or older children.

Children 12 months of age were more likely to

TABLE 1. Inter-quartile, mean, standard deviation, and range of duration of feeding episodes by age groups

Duration of feeding episode	Age group (mo)	Total feeding episodes	Mean (minutes)	SD	Range		Inter-quartile		
					Minimum	Maximum	25%	50%	75%
Duration of meal-feeding episode with breastfeeding	12	32	16.9	12.8	2	49	6	16.5	24.5
	18	30	17.3	13.1	1	48	4	17	26
Duration of meal-feeding episode without breastfeeding	12	21	22.0	12.0	3	49	15	19	30
	18	22	22.6	11.4	4	48	15	20	31
Duration of breastfeeding during the meal feeding episode	12	11	6.9	5.9	2	19	3	5	10
	18	8	2.7	1.5	1	5	1.5	2.5	4

be fed semi-solid puddings, porridges, or noodles, while older children were more likely to be served rice (table 2). Overall dietary variety and micronutrient quality appeared limited among this sample, even among older children, with rice as the main ingredient in the majority of food items (rice, porridge, pudding). However, these data do not reflect complete recipes or

ingredients of the offered dishes, and we do not have quantities of foods for conducting nutrient analyses specific to these feeding observations. Information on dietary intakes of these same children based on detailed 24-hour recalls for other days are presented elsewhere [16].

We assessed caregiver physical help to eat by whether children accepted or rejected bites of food (table 3). The data show that younger children almost always received physical help to eat, while 18 month old children fed themselves about 70% of the time. Younger children who were coded as accepting food had caregivers who were more likely to have offered help, but the opposite occurred with the older children. This may be due to children rejecting help because they want to feed themselves. The use of physical pressure or force feeding (negative, non responsive feeding behaviors) were significantly associated with child rejection of food, except among 12 month old children for pressure.

Caregivers usually provided no verbalization to the child during feeding (70% and 69% of intended bites) for 12 month and 18 month old children, respectively. When verbalization did occur (30% of intended bites), it varied according to whether or not the child accepted or rejected the food (table 4). Rejecting intended bites was more often associated with negative or threatening verbalizations than among non-rejecting bites. For caregivers of both 12 month and 18 month old children, positive verbalization occurred more often among children who were coded as accepting food, and this association was much stronger among the 18-month-old children.

TABLE 2. Food served during child feeding episodes

Food served child during feeding episode	Age group	
	12 mo n = 640 (% of bites)	18 mo n = 710 (% of bites)
Porridge (whole rice cooked with water)	37.2	34.0
Rice noodles	21.2	8.9
Pudding (ground rice, cooked with water, may include added salt or sugar)	19.5	7.9
Rice (plain)	10.8	35.9
Milk or milk products	3.0	0.0
Water	2.2	1.8
Fruit	2.0	7.3
Vegetables	2.0	1.6
Breastmilk	1.7	1.1
Potato/bread/cassava (other starchy food)	0.2	1.0
Biscuit/cookie/candy	0.2	0.1
Meat/fish	0.0	0.1

Table 3. Caregiver’s physical action to help the child eat or drink by interest of the child to eat and age

Caregiver’s physical action to help the child eat or drink	Age group					
	12 mo			18 mo		
	Child accepted food (% of bites) n = 431	Child rejected food (% of bites) n = 198	Test of proportions p value	Child accepted food (% of bites) n = 568	Child rejected food (% of bites) n = 148	Test of proportions p value
No physical help offered	2.3	0	0.03	29.0	0	< .001
Facilitated the feeding process or directly helped the child (positive behavior)	84.5	73.7	0.001	63.2	72.9	.02
Used physical pressure, including pressing down the spoon in the child’s mouth or restraining the child lightly to facilitate eating (negative behavior)	9.9	11.1	0.70	4.2	13.5	< .001
Force fed the child (negative behavior)	3.2	15.2	< 0.001	3.5	13.5	< .001
Total	100	100		100	100	

TABLE 4. Type of verbalization by caregivers, interest of child to food, and age (among 30% of bites when any verbalization was observed)

Type of verbalization given by caregiver	Age group					
	12 mo			18 mo		
	Child accepted food (% of bites) <i>n</i> = 121	Child rejected food (% of bites) <i>n</i> = 65	Test of proportions <i>p</i> value	Child accepted food (% of bites) <i>n</i> = 157	Child rejected food (% of bites) <i>n</i> = 56	Test of proportions <i>p</i> value
Positive verbalization	55.4	40.0	.05	47.8	19.6	< .001
Mechanical, direct comments to eat (negative verbal)	43.8	58.5	.06	51.6	71.4	.01
Order or threaten (negative verbal)	0.8	1.5	.65	0.6	8.9	.001
Total	100	100		100	100	

Discussion

We have presented an observational methodology that examines the dyadic nature of child feeding and child acceptance of food through videotape assessment in the home environment. The use of videotaping equipment within the home environment and the observational methodology was generally well accepted by caretakers and children. Less than 10% of the caretakers refused to participate. While we could not conduct a formal validation of this methodology, anecdotal reports by experienced field workers suggested that caretakers and children behaved similarly as they do when not being observed or videotaped. Future analyses will compare results from the second observation with that of the first, conducted approximately seven days earlier, to assess potential initial discomfort and alteration in behaviors.

The majority of caregivers in Viet Nam physically help their children to eat, particularly when children are 12 months old, when they are still learning how to manipulate food, taste, chew, and consume a wider diversity of foods. There was an association between child rejection of food and negative feeding behaviors (pressure and force). Positive verbalization was associated with higher rates of acceptance of food, particularly among older children. Mechanical or threatening verbalization was associated with higher rates of rejection. While more work is required among the larger sample, our data suggest that when caregivers do exhibit responsive feeding behaviors (e.g., non pressuring or forceful behaviors) and positive verbalization to the child, acceptance of food is higher. If caregiver behaviors are causal, this may increase their dietary and nutrient intake.

Verbalization during feeding episodes has been positively associated with dietary intake and child development [17], yet during more than 70% of the feeding episodes no verbalization was observed. When

caregiver verbalization did occur (among 30% of the observations), more than half were coded as negative—with the caregiver either talking mechanically or giving a direct order. The strong statistical association in our data between positive verbalization and child interest or acceptance of food (particularly among the older children) suggests that simple program messages that encourage caregivers to softly, patiently, and positively talk to their children about their food intake during feeding could have a positive impact on child dietary intake, particularly in settings where anorexia and growth faltering are a major child nutrition problem.

These preliminary findings from this observational study of feeding styles provide insight into the mechanisms for how the community empowerment and nutrition program (CENP) intervention evaluated through the ViSION project resulted in improved dietary intakes and growth among young children. The videotape results provide evidence that Vietnamese mothers are generally active or responsive in their feeding style rather than passive or *laissez-faire*. With information and tips on the use of novel foods garnered through the nutrition education rehabilitation program (NERP) sessions or their neighbors that attended them, there is evidence that caretakers would actively utilize these improved practices and foods when feeding their children. Future analyses will examine the impact of direct participation in the NERPs on feeding style and the relationship between feeding style and dietary intakes and growth in this population.

A key limitation of the current analysis is that we did not code the videotapes in such a way that we could analyze the sequence of caretaker versus child actions. The findings are thus correlations of behaviors at the bite level and should be interpreted cautiously due to potential problems with “reverse causality.” We cannot be sure of the direction of effects between child and mother in this initial analysis. It is clear that caregiver and child feeding is dyadic. Nevertheless, the strong

associations between the negative behaviors we coded (pressure, force, and negative verbalizations) and child rejection of food suggest caregivers are responding to their child's rejection of food and not the other way around. These are similar to patterns we have observed in several other settings [7, 12, 13, 18].

In the Andes of Peru [7], the highlands of Guatemala [19], urban Nicaragua [18], rural Nigeria [7], and rural Mali [11], among other settings, it is common for children to reject food that is offered, particularly in settings with a high burden of morbidity [12, 20]. What appears to vary across cultures is how caregivers respond to their children's acceptance or rejection of food. Nigerian mothers exhibit outright force-feeding styles to ensure their infants consume what is offered [7, 21]. In rural Peru and Guatemala, caregivers are extremely *laissez-faire* in their feeding style, but do provide more physical and verbal encouragement when their children reject food, as observed in Viet Nam. The Vietnamese mothers in this sample are more mechanical in their verbalization during feeding style, but may become forceful and even 'threatening' in their tone when children reject food. Again, we cannot be certain that our results are in most cases not due to

reverse causality (i.e., children who are more accepting of their food encourage responsive feeding behaviors by their caregivers), and this will be examined through our subsequent analysis.

International programs are already encouraging responsive or active feeding as part of complementary feeding counseling [4], with the assumption that positive caregiver feeding behaviors will result in improved dietary intakes and nutrition of children. We believe that there is a growing body of literature that supports this approach, but more research is needed to evaluate how promotion of specific responsive feeding messages can lead to caregiver behavior change and improvements in child dietary intake and nutrition in different sociocultural settings.

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Work outside the home is the primary barrier to exclusive breastfeeding in rural Viet Nam: insights from mothers who exclusively breastfed and worked

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Abstract

This study assessed barriers to exclusive breastfeeding in rural Viet Nam and identified how a few mothers were able to exclusively breastfeed despite barriers. A cross-sectional quantitative and qualitative assessment was carried out among 120 mothers of infants less than six months old in northern Viet Nam. Only 24% of the mothers exclusively breastfed. Adjusting for infant's age and who attended delivery, the risk of not exclusively breastfeeding was 14.0 times greater for women who had returned to work than for women who had not. Exclusively breastfeeding mothers (n = 4) who worked differed from other mothers in important ways. They all felt they had enough milk, all knew the appropriate time to introduce foods and liquids, and most were supported in their breastfeeding decisions by commune health workers and family members. This research suggests strategies that can be implemented now to increase exclusive breastfeeding in rural work environments. These include improving knowledge about the introduction of water and semi-solids, addressing perceptions of milk insufficiency, securing support from others, and presenting mothers with options for exclusively breastfeeding, even when they work outside the home.

Key words: positive deviance, breastfeeding, behavioral determinants, Viet Nam Background and rationale

Breastfeeding is critical for sustaining the health and well-being of newborns and infants. Infants who are properly breastfed grow better and experience less sickness and fewer deaths than infants who are not breastfed [1–4]. In Viet Nam, the causes of growth faltering are poorly documented but are likely to include inadequate breastfeeding. The 1997 demographic and health survey conducted in Viet Nam [5] indicated that exclusive breastfeeding rates for infants less than 2 months old, 2 to 3.9 months old and 4 to 5.9 months old were 53.5%, 8.6%, and 1.3%, respectively. Little is known about the barriers to practicing optimal breastfeeding behaviors in Viet Nam [6]. In industrialized countries, work outside the home is a key barrier to breastfeeding. Numerous studies indicate that women who return to work in the first year postpartum stop breastfeeding sooner than women who do not [7–10]. In developing countries, less is known about how work—especially work outside the formal sector—affects breastfeeding practices, including exclusive breastfeeding [11–13].

Since 1990, Save the Children Federation/US has implemented nutrition programs in Viet Nam reaching more than 2,000,000 individuals. These programs have used the “positive deviance” approach to reduce severe childhood malnutrition by approximately 75% [14, 15]. “Positive deviants” (PD) are resource-poor, well-nourished children. Save the Children identifies PDs through growth monitoring and, through positive deviance inquiries (PDI) learns how the parents of PD children are able to keep their children well-nourished in spite of tremendous poverty. Volunteers and health staff promote good behaviors identified during positive deviance inquiries among caretakers of malnourished children. Two-week sessions are held in health volunteers' homes or community facilities to allow mothers to practice such locally identified PD behaviors as feeding children shrimp and crabs, giving them greens taken from local paddies or bought cheaply at local markets, active feeding, and clipping children's finger-

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nails and washing their hands to reduce the spread of disease. While this approach has been highly successful, PD has not yet been used to prevent malnutrition by improving feeding and child care practices during early infancy. This paper describes formative research, carried out to document existing knowledge, attitudes, and practices related to early initiation of breastfeeding as well as exclusive breastfeeding. It also explores the possibility of using the positive deviance approach to identify options and strategies for improving breastfeeding practices.

Methods

This cross-sectional quantitative and qualitative assessment was carried out in three phases. The first phase took place in late November and early December of 1999, a period when maternal labor demand was expected to be low. The second phase occurred in June, 2000, when demand for women's labor was expected to be higher. Because the actual amount of time women spent away from home as well as overall results for each phase were similar, data from both phases were combined. Phase II results are reported only when they differed considerably from phase I. Both phases took place in rural northern Viet Nam, two hours northwest by car from Hanoi. Based on findings from this study, in October of 2000 we carried out additional formative research (phase III) in a province in north central Viet Nam, an area approximately eight hours south of Hanoi by car. Formative research was designed to guide Save the Children's work before pilot-testing a project integrating breastfeeding with on-going maternal and child health programs, using the positive deviance approach.

As part of this study, 60 women (10 each from six communes) were interviewed in phases I and II. All six communes were participating in a larger prospective study of the impact of Save the Children's program on nutritional status, which included intervention and comparison communes. Phase I data collection preceded Save the Children's programmatic work in the area but phase II began after program start-up. Even so, breastfeeding was not yet an explicit focus of Save the Children's work. The breastfeeding study included communes with a mixed ecology (lowland, midland, and highland) with women coming from the Kinh (majority) ethnic group.

Women were randomly selected to participate in the breastfeeding study from a list, provided by commune authorities, of all mothers with children less than six months of age. If the selected mother was not home at the time of interview, the mother living closest to the randomly selected mother was chosen to replace her. Only five of the 120 mothers (4% of the total) were

replaced because of unavailability. The final sample for phase I included 60 mothers of infants less than six months of age. The sampling strategy for phase II was identical to phase I and also included 60 mothers.

Phase III formative research included a series of focus groups with mothers of infants less than six months of age, husbands, parents, and parents-in-law. Research during phase III went beyond an exploration of knowledge, attitudes, and practices to negotiate with groups of mothers options for exclusively breastfeeding their infants. During group sessions, mothers were presented with alternatives for exclusively breastfeeding, even if they worked far from home. Options included returning from work, taking the infant to work, expressing milk so that other caregivers could give it to the infant while the mother was away, and wetnursing.

In order for the infant to be considered currently exclusively breastfed, the infant had to be breastfeeding at the time of interview and not receiving any plain water, sugar water, juices, or other liquids, cow's milk, tinned milk, or infant formula, semi-solid or solid foods, or any other substance in the previous 24 hours [16, 17]. In addition, the child could not have been fed by a bottle with a nipple in the previous 24 hours. Unless otherwise indicated, "exclusive breastfeeding" refers to the prevalence of exclusive breastfeeding as measured by 24-hour recall (not breastfeeding practices in the previous week or since birth). "Returned to work" meant the mother had begun working outside the home two or more hours per day—with or without pay—after the birth of the child.

The data collection instruments used for this study were developed by a team of individuals with expertise in qualitative methods and reviewed by senior staff from Save the Children Federation/US. After pre-testing, instruments were modified to make them more culturally appropriate and understandable. About two-thirds of all questions to mothers were open-ended. The instruments included questions about breastfeeding knowledge, attitudes, and practices, advice from others about breastfeeding, perceived milk insufficiency, perceptions about whether an exclusively breastfed child can be well-nourished, factors encouraging or discouraging women from exclusively breastfeeding, care and feeding of the child when the mother is away, and options for promoting exclusive breastfeeding. All interviews were tape recorded. Five interviewers with previous experience conducting in-depth interviews about maternal and child health in Viet Nam were selected and trained. Once collected, qualitative data were transcribed, translated, and entered into the Microsoft Excel spreadsheet program verbatim.

Table 1 provides a theoretical framework for analyzing data in accordance with the positive deviance approach. In table 1, women are categorized according to outcomes and barriers. Rows indicate whether

TABLE 1. Analysis of results using the positive deviance approach

Barrier	Outcome	
	Not exclusively breastfeeding	Exclusively breastfeeding
Yes	A	B
No	C	D

or not mothers are exposed to barriers to exclusive breastfeeding. Columns represent practice of an optimal behavior, in this case, exclusive breastfeeding. Barriers include mothers' return to work outside the household, making it more difficult for her to exclusively breastfeed. Using this example, the cells are as follows: group A—women who were not exclusively breastfeeding and had returned to work postpartum; group B—women who were exclusively breastfeeding and had returned to work; group C—women who were not exclusively breastfeeding and had not yet returned to work; and group D—women who were exclusively breastfeeding and had not yet returned to work

Using Save the Children's framework, positive deviants are individuals from group B (women who exclusively breastfeed even though they work outside the home). Group C represents "negative deviants," those with low risk and a negative outcome. Groups A and D are women with a high risk and a negative outcome and a low risk and positive outcome, respectively. The focus of analyses is on group B—mothers who had returned to work outside the home yet had found a way to continue exclusively breastfeeding.

Qualitative data were sorted by breastfeeding status and work and women were compared across groups to determine similarities and differences with respect to knowledge, social support and other facilitators, and barriers to exclusively breastfeeding. Quantitative data were entered into EpiInfo (Centers for Disease Control and Prevention, Atlanta, Ga., USA), then exported to SPSS (SPSS Inc., Chicago, Ill., USA). Quantitative analyses were used to compare mothers who exclusively breastfed and mothers who did not. Chi-squares and odds ratios were calculated for key variables. Sociodemographic variables and factors found significant in bivariate analyses were included in logistic regression equations to identify the most parsimonious model for predicting exclusive breastfeeding.

Results

Mothers in this sample were young (25 ± 4.0 years old) and educated (all had completed at least five years of schooling). Fifty-three percent of infants in phase I and only 28% of infants in phase II were male.

Breastfeeding behaviors and categorization of respondents

All 120 women had breastfed in the previous 24 hours. However, only 24% exclusively breastfed the previous day (see table 2). Rates of exclusive breastfeeding for phases I and II were 28% and 20%, respectively.

Comparing mothers who exclusively breastfed and those who did not

Sociodemographic background

There were no significant differences between non-exclusively breastfeeding mothers and women who exclusively breastfed with respect to a wide range of sociodemographic variables, including child's sex, housing construction, availability of a toilet or latrine, and ownership of a variety of possessions.

Early initiation of breastfeeding

Thirty-five percent of all mothers put their babies to the breast within one hour of birth. Mothers who exclusively breastfed were no more likely to initiate breastfeeding in the first hour after delivery (31% vs. 36% for non-exclusively breastfeeding mothers; $p = .607$, by χ^2). However, they were more likely to give nothing to eat or drink besides breastmilk shortly after birth (69% vs. 45%, $p = .025$, by χ^2). Only one woman from group B (exclusively breastfeeding and returned to work) gave honey; the rest gave nothing else to eat or drink shortly after birth. Women from groups A, C, and D gave honey, sugar water, another woman's breastmilk, powdered milk, lemon juice, and licorice. Mothers from groups A, B, C, and D mentioned that health workers, doctors, and the media had influenced their decision about when to start breastfeeding.

Factors affecting exclusive breastfeeding

Sixty-four percent of mothers had returned to work

TABLE 2. Exclusive breastfeeding according to 24-hour recall, by work status

	Not exclusively breastfeeding		Exclusively breastfeeding		Total		<i>p</i> (for χ^2)
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Returned to work postpartum	73	95	4	5	77	64	< .001
Had not yet returned to work	18	42	25	58	43	36	
Total	91	76	29	24	120	100	

outside the home two or more hours per day after their children were born (table 2). Of those who returned to work, 45% did so when infants were less than two months of age. Work outside the home (usually on rice paddies owned by the husband's extended family) was an important deterrent to exclusive breastfeeding ($p < .001$, by χ^2) (table 2). Five percent of women who had returned to work postpartum exclusively breastfed as compared with 58% of mothers who had not yet returned to work. The risk of not exclusively breastfeeding was 25.4 times greater for women who had returned to work than for women who had not.

Factors in addition to work also influenced exclusive breastfeeding in the previous 24 hours. In particular, the following women were significantly more likely to exclusively breastfeed: women who had nurses, midwives, or assistant doctors in attendance at delivery, mothers of younger infants, and women who felt they had sufficient milk for their infants (table 3).

Socioeconomic status could potentially confound the relationship between presence of health personnel at delivery and exclusive breastfeeding status. However, mothers delivered by nurses, midwives, and assistant doctors were not significantly different with respect to a wide range of socioeconomic variables.

In addition to nurses' presence at delivery, according to responses from open-ended questions, mothers who exclusively breastfed at the time of interview were also more likely than mothers who did not to mention that nurses had advised them to put the child to the breast shortly after delivery (53% vs. 46%). With respect to infants' age, no mother with a child 4 to 5.9 months of age exclusively breastfed.

Results from logistic regression analyses are presented in table 4. Three factors significantly predicted whether mothers exclusively breastfed: whether a nurse, midwife, or assistant doctor was in attendance at delivery, age of the infant, and the mother's return

TABLE 3. Factors influencing exclusive breastfeeding according to 24-hour recall

	Exclusively breastfeeding	Not exclusively breastfeeding	<i>p</i> (for χ^2)
	(<i>n</i> = 29) %	(<i>n</i> = 91) %	
Gave birth:			
At home	14	18	.633
At a facility	86	80	
Elsewhere	0	1	
In attendance at delivery:			
Husband	62	71	.342
Parents	48	55	.531
In-laws	55	62	.542
Other relatives	79	86	.411
Doctor	10	12	.799
Nurse/midwife/assistant doctor	97	74	.008
Age of infant (mo)			
0-1	83	10	< .001
2-3	17	36	
4-5	0	54	
Mother feels she has sufficient milk to feed her child	100	86	.031
Mother feels child can be well-nourished if given only breastmilk for the first 4 months of life	79	59	.061

TABLE 4. Results of logistic regression, factors significantly associated with exclusive breastfeeding according to 24-hour recall

Variable	Estimate	SE	<i>p</i>	Odds ratio	95% confidence intervals
Nurse, midwife, assistant doctor in attendance at delivery	2.309	1.173	.049	10.1	1.0, 100.4
Age of infant (mo) (0-2 vs. 3-5)	2.071	.673	.002	7.9	2.1, 29.7
Mother returned to work since the birth of her infant	2.640	.667	< .001	14.0	3.8, 51.7
Intercept	-5.610	1.586	< .001		

to work. Other variables that were entered into logistic regression models and found insignificant included whether the mother felt she had enough milk, the total number of children the mother had, the mother's age and years of schooling, the child's sex, and roof, wall, and floor construction of the home. According to odds ratios, presented in table 4, mothers without a nurse at delivery were 10.1 times (95% C.I. 1.0, 100.4) as likely as mothers who had been attended to by nurses not to have exclusively breastfed in the previous 24 hours. Likewise, women who had returned to work were 14.0 times (95% C.I. 3.8, 51.7) as likely as mothers who had not to fail to exclusively breastfeed. Because confidence intervals were large, results need to be interpreted cautiously.

Table 5 lists categories of open-ended responses mothers gave about what they thought made it easy to exclusively breastfeed. Facilitators that mothers mentioned the most were considered of high importance. Most mothers in groups A and C (not exclusively breastfeeding) and all mothers in groups B and D (exclusively breastfeeding) felt they had enough milk to feed their infants. Most mothers from groups A through D also cited numerous reasons they knew they had sufficient milk, including full breasts, plenty of milk "coming down," and the ability to satisfy infants' appetites. In addition, most mothers in all groups knew the nutritional benefits of breastmilk and many were able to name specific nutrients in it. Mothers who exclusively breastfed (groups B and D) were far more

likely to indicate that commune health workers' advice influenced their decision to exclusively breastfeed. Several also mentioned that they had time at home or worked close to the house.

Table 6 lists barriers to exclusive breastfeeding. Concern about mothers' work outside the household was common in all groups. While at least some mothers from groups A, C, and D indicated that women who did not get enough nutrients would not produce sufficient milk, no mother from group B indicated mothers' nutrient intake would affect milk quality and quantity. Mothers in phase II were also asked whether they received support from others to continue eating as well during lactation as they did during pregnancy. Regardless of whether women exclusively breastfed, most mothers indicated that husbands and in-laws supported an improved diet up to about three months postpartum. However, several women indicated that while mothers generally ate well in the first month after delivery, thereafter, if economic conditions did not improve, their diets deteriorated.

At least some mothers from groups A, C, and D (but none from group B) indicated that "eating something unsuitable" could compromise the quantity and quality of breastmilk. Unsuitable products included unripe bananas, beans, insecticides, and antibiotics. Additionally, non-exclusively breastfeeding mothers (groups A and C) frequently indicated that mothers' bodies did not support exclusive breastfeeding. Two barriers that were mentioned in this regard were mothers' menstrual

TABLE 5. Facilitators to exclusive breastfeeding

	Exclusively breastfeeding (<i>n</i> = 29)	Not exclusively breastfeeding (<i>n</i> = 91)
High importance	Sufficient milk to feed infant Breastmilk is nutritious	Sufficient milk to feed infant Breastmilk is nutritious
Medium importance	Encouragement of commune health workers	
Low importance	Encouragement of in-laws Advice not to give water	Encouragement of commune health workers Encouragement of in-laws

Table 6. Barriers to exclusive breastfeeding

	Exclusively breastfeeding (<i>n</i> = 29)	Not exclusively breastfeeding (<i>n</i> = 91)
High importance	Work outside the home Poor maternal diet	Work outside the home Poor maternal diet
Medium importance	Mother eats something unsuitable	Mother eats something unsuitable Mother's body does not support exclusive breastfeeding
Low importance	Mother is ill Mother's body does not support exclusive breastfeeding Mother does not breastfeed enough	Mother is ill Mother does not breastfeed enough

periods and milk glands that did not produce enough breastmilk.

Introduction of water, semi-solids, and solids

Mothers from group B felt that the appropriate time to give the child water was from four to six months. Mothers from groups A, C, and D indicated that the child should start receiving water at a variety of ages ranging from less than one month to six months. At least one mother from groups A, C, and D (but not B) felt that water was needed “after eating flour-water mixture,” “to clean the mouth after breastfeeding,” or “to avoid asthma and coughing.” Mothers from group B indicated that the best age to start giving semi-solid foods was four to six months. Mothers from groups A, C, and D responded from one to six months.

Options for increasing exclusive breastfeeding

Returning from work or taking the child to work

Five percent of exclusively breastfeeding mothers and 55% of women not exclusively breastfeeding indicated that in the previous 24 hours they spent time away from their infants. Husbands and in-laws were the most common source of childcare for women who spent time away from home. Few mothers felt they could remain at home for the first six months of their infants' lives.

In phase II, mothers who worked outside the home were asked an open-ended question to determine whether they thought it possible to come home to breastfeed. While many said no (“it is too far,” “my supervisor doesn't permit it,” “it takes too much time,” and “I have too much work to do”), a number of women said they could come home. In fact, some mothers returned home every two or three hours to breastfeed. Most mothers indicated it was not possible to take their infants with them to work: “the field is too far away,” “the child may get too much sun,” “nobody does that,” “there is no place for my child,” “pesticides in the field may be harmful for the child,” and “there is no one to care for the child.”

Expressing milk

Regardless of breastfeeding status, most women thought expressing milk (and in particular, storing it) for the baby to use later was not good. One mother said “expressed milk is not hygienic” and another indicated she “preferred to breastfeed the baby directly.” A number of mothers thought “[expressed] milk would be cold and the child wouldn't like it.” Others said “expressed milk becomes sour and causes diarrhea” and “nobody does it in the countryside.” Those favoring milk expression and storage suggested that “I often express milk and leave it at home,” “expressed breastmilk is good; it's better than other foods,” it is “better

than sugar water,” it is “better than formula,” “I gave it to the first child and he ate it,” “it will keep,” and it is “good to express but I need to re-warm the milk before giving it to my child.”

Wetnursing

Generally, mothers from all groups had negative impressions about wetnursing. While a few viewed wetnursing as “good” and said there was “nothing to worry about,” others said it was “not as good as breastfeeding directly,” it was “harmful to the child,” “the child is not used to strangers,” “others' milk does not have enough nutrients and my child may get diarrhea,” and “I am reluctant to ask for help and would rather give formula.” No mother mentioned HIV/AIDS as a deterrent to wetnursing.

Results from formative research (phase III) confirmed findings from phases I and II that exclusive breastfeeding was not widely practiced in this rural, north-central province and work outside the home and poor maternal diets were key barriers to giving only breastmilk. With respect to options mothers in phase III were willing to try to exclusively breastfeed, a few mothers who worked near their homes felt they could return home frequently enough to breastfeed their children. Most mothers showed interest in expressing and storing their milk but felt they needed scientific evidence that unrefrigerated breastmilk would keep for up to eight hours, even in a tropical climate. Once assured, they committed to expressing and storing their milk.

Discussion

Northern Viet Nam provides a culture that is generally supportive of breastfeeding. All mothers in this study had breastfed in the previous 24 hours, most felt they had enough milk to feed their infants, most knew the signs of sufficient milk, and most were acquainted with the nutritional benefits of breastmilk. However, in this study of women with infants zero to six 6 months of age, only 24% of women exclusively breastfed their infants in the 24 hours prior to interview. While breastfeeding is known to benefit the infant, numerous studies [18] associate exclusive breastfeeding with the greatest reductions in infant morbidity and mortality. It should be noted that at the time this research was carried out, the Government of Viet Nam recommended exclusive breastfeeding up to about four months (now changed to include exclusive breastfeeding up to about six months). It is thought that the previous policy contributed to low rates of exclusive breastfeeding beyond four months in this sample.

Women's return to work in the first months postpartum—a common practice in this part of Viet Nam—was a major deterrent to exclusive breastfeeding. Five

percent of women who had returned to work postpartum exclusively breastfed as compared to 58% of mothers who had not yet returned to work. Results from logistic regression suggest that the negative impact of work on exclusive breastfeeding persists, even after controlling for the age of the infant. While it is not surprising that work outside the home deters women from exclusively breastfeeding, the strength of this relationship—even in a rural setting—is remarkable.

How, then are some women able to exclusively breastfeed even after returning to work? This study suggests that mothers from group B (the positive deviants) differed in important ways from mothers who did not exclusively breastfeed or who breastfed but did not work outside the home. In particular, none of the mothers from group B gave prelacteals. All four group B mothers felt they had enough milk to feed their infants. None were concerned that their own nutritional status would affect either the quantity or quality of their milk. No one from group B indicated that “eating something unsuitable” would compromise the quantity and quality of their breastmilk. Additionally, group B mothers knew the appropriate time to introduce water and semi-solid foods and were supported in their decisions by commune health workers and family members. Furthermore, none had been advised to give water after the child ate flour-water mixture or breastfed.

Mothers who are able to successfully negotiate a later return to work and remain at home to exclusively breastfeed represent a second set of positive deviants. However, in this sample, no mother exclusively breastfed and remained at home longer than three months postpartum.

With respect to study limitations, it is unlikely that interviewer bias affected results from this research as data collection procedures were carefully standardized during interviewer training and practice in the field. Additionally, it is possible, though not likely, that mothers who were not available for interview differed from those selected to replace them. In fact, only 4% of the sample was replaced. Save the Children’s programs in study communes after phase I data collection may have influenced breastfeeding rates in the area, but this also seems unlikely given the decline in breastfeeding rates and the lack of explicit programmatic focus on breastfeeding. This study’s strengths include the use of qualitative and quantitative methods to cross-check and elucidate findings as well as formative research to test program strategies. The study described here is one of the first in Viet Nam to measure exclusive breastfeeding using internationally accepted standards.

While a growing body of literature focuses on the infant feeding choices of women who work outside the home, most studies focus on paid employment, often in the formal sector. Even so, results from this study are consistent with other research findings that

mothers who work far from home and for long periods of time are considerably less likely to breastfeed. For example, using retrospective data in Thailand, Yimyam and Morrow [19] found that the resumption of paid employment generally had negative effects on breastfeeding rates and duration. Most women who worked outside the home for a long period or had shift jobs gave up breastfeeding altogether within one month after returning to work [19]. Our findings were also consistent with results from a study by Rea et al. [20] who reported low rates of exclusive breastfeeding among Brazilian women who had resumed employment. A study in rural Sichuan, China [21] identified barriers to breastfeeding that were similar to the ones we describe, including mothers’ perceptions that they do not have sufficient milk and lack of support from families, places of employment, and health systems.

In economies such as Viet Nam’s, it is likely that the demand for women’s time away from home will increase. With even greater frequency, Vietnamese mothers will be faced with difficult decisions about how to balance their productive and reproductive roles, and in particular, how to feed and care for their infants while they are away. This study identifies knowledge and social support as key enablers of exclusive breastfeeding among working mothers. Programs should improve knowledge about the introduction of water and semi-solids, address perceptions of milk insufficiency, secure support from others, and present mothers with options for exclusively breastfeeding, even when they work outside the home.

Globally, breastfeeding advocates have encouraged policies allowing for longer maternity leave, day-care at workplaces, and breaks for nursing. While each of these advances can facilitate exclusive breastfeeding, it is not likely that in rural Viet Nam such policies will be enacted and implemented in the near future. This study describes one approach—group-level, negotiated behavior change—that can be implemented now to bring about improvements in breastfeeding practices, including exclusive breastfeeding. This research also represents an important departure from previous positive deviance programming which focuses on complementary feeding when children are about six months of age and older. Focusing on optimal breastfeeding and including pregnant mothers and infants less than six months of age in programs provides an opportunity to not only rehabilitate malnourished children but to prevent malnutrition from occurring in the first place.

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Identification of model newborn care practices through a positive deviance inquiry to guide behavior-change interventions in Haripur, Pakistan

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A positive deviance (PD) inquiry identifies uncommon, model practices that a follow-on program can spread. PD has been used to rehabilitate malnourished children, but not for improving newborn health. Save the Children Federation/US (SC) conducted newborn PD cycles in communities (total population about 5,000 each) in two project areas in Haripur District, Pakistan among Afghan refugees and among local Pakistanis. Each PD cycle included planning, community orientation, situation analysis, PD inquiries, and community feedback with action planning. PD inquiries were in-depth interviews to identify uncommon behaviors among surviving asphyxiated newborns, thriving low birthweight babies, surviving newborns who had danger signs, and normal newborns. The Afghan caregivers showed better use of services and some household practices than their Pakistani counterparts, consistent with duration of SC presence (15 years vs. 18 months, respectively). The practices of both groups for clean delivery, thermal control, immediate and exclusive breastfeeding, and fathers' involvement were weak. But PD individuals, families, and/or birth attendants modeled good maternal care and immediate, routine and special newborn care. Communities enthusiastically committed to change behavior and form neighborhood support groups for better newborn care, including a demand for hygienic delivery. The PD approach for the newborn is more complex than for child nutrition. Yet this pilot-test proposed a conceptual framework for household newborn care, suggested tools and methods for information gathering, identified PDs in two settings of different risk, galvanized SC staff to the potential of the approach,

mobilized communities for better newborn health, and drafted a newborn PD training curricula.

Key words: newborn care, maternal care, positive deviance, birth asphyxia, cord care, low birthweight, Pakistan

Background

Positive deviance (PD) is an approach to mobilize communities for behavior change. It rests on the observation that in most communities throughout the world, the uncommon behaviors of a few successful positive deviant (PD) individuals enable them and their families to find more effective solutions to pervasive problems than their neighbors with whom they share the same, or worse, resource base. A PD inquiry rapidly identifies, at low cost, with the community, those uncommon practices linked to a good outcome that a follow-on program can help spread more widely in the community. Save the Children/US (SC) has extensive experience with the PD approach in child nutrition [1–5] and preliminary experience in pregnancy outcomes [6].

Pakistan has an infant mortality ratio of 95/1000 live births [7] of which two-thirds is composed of neonatal mortality. Typical of many developing country settings, neither Pakistan's safe motherhood nor child survival programming has yet to focus on the newborn. Indicators for perinatal health are low and include low birthweight (25%), exclusive breastfeeding (16% 0–3.9 months), antenatal care (30%), tetanus toxoid coverage (58% TT-2), and delivery by a trained birth attendant (18%) [8]. Community verbal autopsy studies* [9–12] and facility-based studies [13–17] suggest that the main causes of newborn deaths are birth asphyxia, sepsis, prematurity, and tetanus, with low birthweight as a

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* Aga Khan Health Services Northern Areas and Chitral. Annual report January–December 1999.

contributing factor.

Save the Children/US (SC) has two large health programs in Haripur District in Pakistan's North-West Frontier Province: Primary Health Care* for 120,000 Afghans in Haripur and Ghazi Refugee Camps and Reproductive Health** for all 700,000 Pakistanis in the district. The Afghan program has supported SC to provide direct maternal and child health services for 15 years. Relevant local perinatal health indicators are good, including use of antenatal care (75%), clean delivery (70%), and postnatal care (60%) (personal communication, T. Ihsan, 2001). The Pakistani program is 18 months into a 3-year government health service support program for safe motherhood, family planning, and sexually transmitted infection treatment through health system strengthening, training, community mobilization, and behavior change. Baseline perinatal health indicators included delivery by a skilled attendant (37%) and tetanus coverage (57% TT-2) (personal communication, A Bari, 2001).

SC launched two global efforts in 2000, the saving newborn lives initiative*** [18] and the positive deviance initiative [19]. We pilot-tested the PD approach for newborn care in Pakistan to inform PD methods and to assess the suitability of the approach for improving household newborn care practices.

Methods

Haripur District (total population 700,000) is 80 km northwest of Islamabad in the North-West Frontier Province. The population is predominantly Hindko-speaking and rural (88%). Haripur District is home to 120,000 Afghan refugees in 11 settlements. In each study site we sought a total population of 5,000 with approximately 50 infants less than three months of age. We selected the contiguous Pakistani agricultural villages of Kholian, Dobandi, and Bagra (estimated total population 6,000) in Bagra Union Council, 7 km east of Haripur City. In the refugee camp, we selected Camp Five of Basic Health Unit Four (estimated total population 5,000 Pashto speakers), 10 km west of Haripur City.

A coordinating team and two field teams conducted this six-day PD cycle (see below) in each site between January 29 and February 6, 2001. The two field teams were comprised of male and female SC staff who lived and worked close to the PD sites and were skilled in community mobilization and qualitative methods. Local community members interested in the process

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** Funded by the Royal Netherlands Embassy.

*** Funded by the Bill & Melinda Gates Foundation.

provided assistance in scheduling meetings, acted as local guides, and participated in information gathering.

The PD cycle had five steps: planning, community orientation, situation analysis, PD inquiry, and community feedback with action planning. *Planning* oriented the field teams to the PD concept; re-emphasized the community's central role, clarified terminology for "newborn" in four languages, and planned community orientation. Separate *community orientation* sessions for 20 to 50 men and women at each site reviewed SC's work, stated the purpose of the visit (to explore the health of small babies), introduced the PD concept, assessed the community's interest, explored local terminology for "newborn" and common newborn problems, causes, and potential solutions, and planned next steps. The teams introduced the PD concept interactively. For example, villagers made a "hamlet" of five upper (*pucca*) and five lower (*katcha*) class houses, each represented by a brick or dirt-clod, respectively, beneath which unobserved facilitators placed sketches of well- or malnourished children. Other community members lifted up each house. Upon discovering a well-nourished child from a poor household, villagers assented both that this did occasionally occur locally and that the good outcome resulted from "special practices" within the poor family.

The *situation analysis* or "community diagnosis" described community normative newborn care practices. We developed and trained the field teams to use semi-structured interview guides for families (mothers, mothers-in-law, and fathers), sibling caregivers, *dais* (traditional birth attendants), and focus group discussion guides for mothers-in-law and fathers (table 1). Teams used word-of-mouth, birth registries at Afghan basic health units), and *dais* to identify newborns. A SC field worker conducted interviews in the local language. A pair of SC field workers conducted group discussions, one facilitating and one transcribing. Key topics explored were behaviors related to pregnancy, labor,

TABLE 1. Situation analyses by method and community

Inquiry	Pakistani			Afghan
	Bagra	Kholian	Dobandi	Camp Five
FGD, father				2
FGD, mother-in-law	1			1
IDI, father	1	2	3	1
IDI, mother	3	2		5
IDI, sister caregiver				1
IDI, <i>dai</i>	2			3
Total	7	4	3	13

FGD, focus group discussion; IDI, in-depth interview.

and delivery; details (elements, sequence and timing) of immediate newborn care; routine care; appearance of “healthy newborn;” terms for and description of newborn illnesses; home care and care seeking; and trends in newborn health. The coordinating team organized normal practices in a matrix (table 2) that included

prenatal, labor and delivery care, and immediate, special and routine newborn care through day 40. We used 40 instead of 28 days to mark the end of the newborn period since it was meaningful to the community, coinciding with the end of the isolation of mother and newborn. We defined “norm” upon finding consistency

TABLE 2. Situation analysis: Pakistani and Afghan

Concept	Pakistani	Afghan	Difference ^a
Antenatal care			
Birth preparedness	No	Yes	X
Antenatal care	By untrained provider; not considered important by community for health of newborn	By trained provider; not considered important by community for health of newborn	X
Tetanus toxoid	Yes	No	X
Pregnancy diet	No change	No Change	
Clean delivery	Plastic to protect environment; no hand washing	Plastic to protect environment; hand washing by trained attendant	X
Place of delivery	<i>Charpoy</i> (traditional bed)	Floor	
Trained attendant	Not recently	Yes	X
Immediate newborn care			
Room warmed	Yes	Yes	
Baby's placement	Floor	Floor	
Baby dried	Not immediately	Not immediately	
Baby wrapped	Loosely at first	Snugly at first	X
Cord tying and cutting	Tied once with thread; [milked?] toward baby; cut with bamboo; held by assistant after placenta delivers	Tied thrice; cut with new blade by mother after placenta delivers	X
Cord dressing	Initially with <i>desi ghee</i> (clarified butter)	Initially with <i>desi ghee</i> (clarified butter)	
Washing	<i>Dai</i> washes baby, removing vernix	Baby not immediately washed in winter/rainy weather; mother-in-law washes baby on day 2 or 3	X
<i>Azan</i> (prayer)	Senior male relative (not father) briefly administers <i>azan</i> prayer	Usually mullah administers <i>azan</i> (prayer) which may take several hours to arrange	X
<i>Ghutti</i> (liquid pre-lacteal concoction)	<i>Ghutti</i> administered with or without saliva of respected person; bottled <i>Ghutti</i> sometimes given	<i>Traditional home-made ghutti</i> not given; rather purchased bottled <i>ghutti</i> (herbal extract) given 2 or 3 days to purge gut	
Colostrum	Discarded	Fed to baby	X
Breastfeeding	Commences at hour 2, day 2	Commences at 1 to 2 hours	X
Special newborn care			
Response to apnea	None; believed baby to be dead	None; believed baby to be dead	
Recognize low birth-weight	Yes, <i>khas batचे</i> (weak and small)	Yes, <i>khas batचे</i> (small newborn)	
Illness recognition	Recognize <i>kabud-i-laban</i> (cyanosis), a danger sign, and pneumonia, fever, jaundice, and <i>sarishma</i> (translation unclear)	Recognize <i>kabud-i-laban</i> (cyanosis), a danger sign, and pneumonia, fever, jaundice, and <i>golai</i> (a fatal skin infection); apply ash to infected cord	
Care-seeking	Baby, not mother, brought to private practitioners by father, mother, sister	Baby, not mother brought to private practitioners by father, mother, sister	
Supplement	Buffalo milk common; water	Cow and buffalo milk common for “breast-milk insufficiency;” water	

continued

TABLE 2. Situation analysis: Pakistani and Afghan (continued)

Routine care			
Immunization	No	Yes	X
Vital registration	No	Yes	
Mother-baby contact	Limited, even discouraged	?	
Paternal involvement	Not for the first three days; thereafter for first son	Not for the first three days; thereafter for first son	
Mother's postpartum diet	Almonds and <i>kawa</i> (green tea); restricted intake during 40-day seclusion	More food than usual before and after birth by not high quality (no eggs or chicken); little water after birth (enlarged abdomen causing infection of internal wounds)	
Ceremony for baby	Day 7: naming, shaving, circumcision	Circumcision awaits spring; carried out by barber	
Ceremony for mother	Day 40: ritual bath signaling re-entry into society; she leaves for her mother's house	Day 40: respected, but mother may start household chores after <i>wara chilla</i> ("small 40-day period," i.e., 7 days)	

a. Most important differences between Pakistani and Afghan settings.

among different interviews, earlier formative research*, and field team knowledge.

The *positive deviance inquiry* (PDI) obtained details about model care provided for PD cases as defined by either health status or behavior (fig. 1). Common causes of newborn mortality and community input defined these outcomes. Those based on PD health status were thriving newborn (alert, gaining weight) at age 7 to 40 days; non-breathing newborn successfully resuscitated and currently age two days to 1 year; low birthweight (LBW) baby successfully growing at age 40 days or more; or an infant currently age 10 days to six months who had a likely skin or cord infection (newborn danger signs of redness, purulent discharge, and/or fever), which was recognized and treated appro-

priately. PD behaviors included mouth-to-mouth resuscitation and immediate or exclusive breastfeeding, among others. In the local context, breastfeeding began within three hours of birth, and exclusive breastfeeding did not preclude giving *ghutti* (a prelacteal feeding, often honey, sometimes with saliva) in the first hours of life if the infant was breastfed thereafter without supplementation. The field teams sought PDs from high-risk settings to enhance the uptake of desired behaviors in future programming. We defined risk according to socio-economic status and case-specific factors.

The coordinating team developed five questionnaires for the PD inquiries, one for each health status and a generic one for behavioral outcomes. Topics included behaviors related to pregnancy, labor and delivery, newborn resuscitation, immediate care, nutrition, temperature control, infection control, emotional care, maternal care, and infection recognition, and care giving. We encouraged informants to demonstrate specific behaviors with a locally made newborn

* Khadduri R, Marsh DR, Rasmussen B, Bari A, Nazir R, Darmstadt GL, Household knowledge and practices of newborn and maternal health in Haripur District, Pakistan, Unpublished document, 2002.

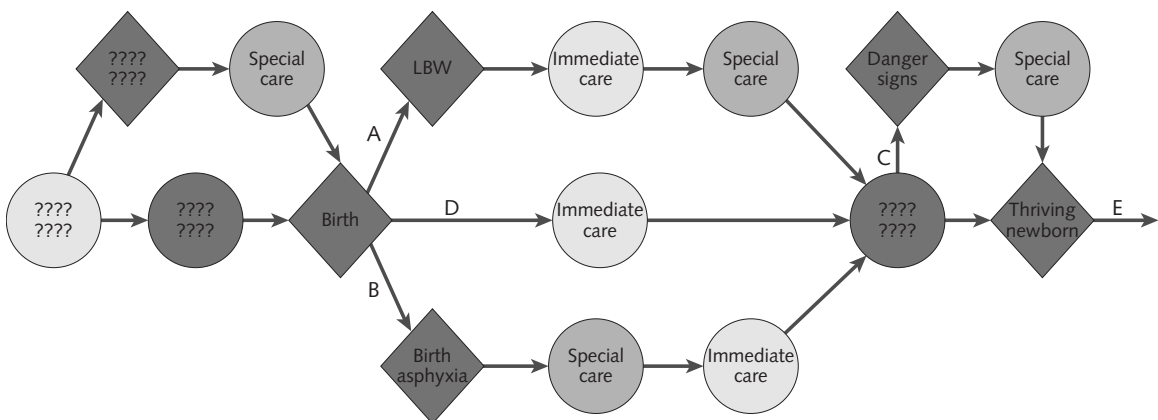


FIG. 1. Pathways for newborn survival. Case definitions for positive deviant newborns: thriving former low birthweight newborn (AE), thriving infant formerly with birth asphyxia (BE), thriving infant formerly with danger signs (CE), or normal throughout (DE)

doll with a detachable cord and placenta. Interviewers sought the enabling factors for selected PD behaviors, such as beliefs about good outcomes from performing the behavior and bad outcomes from not performing the behavior, facilitators and barriers, advisers for and against, and beliefs characterizing doers versus non-doers of the behavior [20]. The teams analyzed the PD inquiries, identifying by consensus those uncommon behaviors and enabling factors that likely explained the PD result.

The field teams facilitated *community feedback and action planning* separately for men and women at each site. Each Pakistani and Afghan meeting of 30 to 45 community members reviewed the PD concept, reassessed the community’s interest, reviewed the week’s work, reported the PD findings, and planned next steps. In advance the coordinating team placed written PD behaviors in a cardboard box decorated as a “village house.” Participants reached through “the door,” read a paper, and sparked a general discussion. A community member facilitated the action plan.

Results

The results are three-fold: the process of the PD cycle, the findings from the inquiries, and the community mobilization that the cycle stimulated.

PD cycle process

The coordinating and field teams maintained an ambitious schedule. Uncertainty characterized each step for each field team since they had no experience with PD, and the coordinating team had no experience applying it to newborn health. The attention of the coordinating team was divided between two field teams. Key methodological steps (i.e., PD case definition) were iteratively refined with experience. The coordinating team rapidly drafted a battery of questionnaires without adequate time to train users and to pilot-test them. Extensive after-hours briefings did not permit complete analysis of all inquiries due to the richness of the findings and the enthusiasm of the field teams’ participation.

Situation analysis and PD inquiry findings

Field teams conducted 13 situation analysis inquiries in the Afghan and 14 in the Pakistani communities, respectively (table 1). Not surprisingly the behaviors identified in the situation analyses from the two communities were similar, but not the same (table 2). More Afghans tended to receive antenatal care including tetanus vaccination and to have birthing plans. Birth attendants reportedly washed their hands more commonly in the Afghan camp. Cord care and initial

washing of the newborn may have been better among Afghans while the more rapid Pakistani administration of *azan* (prayer) may have been more beneficial to focus attention on the infant’s immediate care. On the other hand, Afghans reported more optimal immediate and exclusive breastfeeding, immunization, and vital registration.

Field teams conducted five PD inquiries in both settings (table 3). The coordinating team relaxed the age parameters for case definitions to ease PD identification. PD individuals from both communities included mothers, mothers-in-law, and fathers, and, in the Afghan camp, *dais*. We found PD behaviors in both communities for antenatal, delivery, immediate, special, and routine newborn care (table 4). Some model behaviors (i.e., tetanus vaccination among Afghans) were not PD since they were already norms. On the other hand, we included some imperfect PD behaviors (i.e., antenatal care from an untrained *dai* and plastic covering during delivery to protect the environment, not the mother) since they seemed potentially modifiable steps towards model practices.

Not surprisingly, PD individuals often demonstrated an array of PD uncommon behaviors and other good, more common behaviors. A Pakistani case illustrates several potential PD behaviors (underlined> and the determinants of a specific behavioral outcome, exclusive breastfeeding. An unemployed father from Dobandi had a 45-day old infant girl, his third child. His wife obtained two antenatal check-ups and tetanus toxoid vaccination. He insisted that she *increase her diet during pregnancy* “to get a healthy baby and ensure the life of the mother.” He *arranged 10,000 Rupees* so that “in danger I can go to the hospital.” Late in pregnancy he purchased *desi ghee* (clarified butter) and almonds for the mother’s postpartum nutrition. “If her food is good, her baby will be healthy.” A *dai* delivered his wife

TABLE 3. Positive deviance inquiries by topic and community

PD case	Pakistani			Afghan
	Bagra	Kholian	Dobandi	Camp Five
Apneic newborn				1
Low birthweight	1	2		1
Infection				
Thriving				2
Specific behaviors				
Exclusive BF	2		1	1
Resuscitation			1	1
Cord Care			2	2
DS Recognition				
Birth plan				
Total individuals ^a	5			5

BF = breastfeeding; DS = danger signs.

a. Some identified PD cases fulfilled more than one case definition.

TABLE 4. Positive deviance behaviors among Pakistanis and Afghans

Concept	Pakistani	Afghan
Antenatal care		
Birth preparedness	Husband collected 10,000 rupees during pregnancy for delivery emergency Husband obtained car when the mother went into premature labor	Mother prepared her own delivery kit, and mother-in-law arranged a new plastic sheet and clean cotton sheets
Antenatal care	Husband asked dai to see his wife in her ninth month although she was well	No example found
Tetanus toxoid	Mother went for antenatal and tetanus toxoid injection	No example found
Pregnancy diet	Husband increased the food of the mother during pregnancy, especially in the last 2 months (×2)	Mother given diet of chicken and eggs before and after birth
Delivery		
Clean delivery	Family placed plastic under the mother for delivery	Mother-in-law washed hands with soap before and after cutting cord Mother-in-law put new plastic sheet and clean cotton sheets on floor for delivery
Immediate care		
<i>Room warmed</i>	No example found	The room was kept warm at all times, especially if the newborn was low birthweight
Baby's placement	The family hand-stitched a <i>gadeila</i> (small mattress), a clean and warm surface for baby immediately following delivery.	No example found
Baby dried and wrapped	No example found	Immediate thermal care: dai cleaned the baby dry with a cloth and wrapped it in warm clothes.
Cord tying and cutting	Husband gave the <i>dai</i> a clean blade	Mother-in-law cut cord cleanly with son's new razor blade (purchased from bazaar)
Cord dressing	Nothing immediately applied on the cord	No example found
Washing	No example found	Mother decided not to wash or bathe newborn for several days after birth in cold climate
Ghutti	No example found	Mother did not give ghutti (prelacteal) or green tea, despite dai encouraging her to give <i>ghutti</i>
Breastfeeding	A sick and premature baby was exclusively breast-fed; two small newborns were exclusively breast-fed except for ghutti in the first hours. Mother-in-law promoted breastfeeding: "The baby has no disease in the mother's womb, so milk is safe since it is from the mother's body."	Mother exclusively breastfed. "Exclusive breastfeeding means the temperature of milk is the same all the time. It prevents illness and makes bones strong and fills the bones."

continued

at home on the *charpoy* (bed) cutting the cord with a *new razor blade* that he had purchased for the occasion. The *dai* and the family *applied nothing to the cord*, and it dried in three days. The baby was given *ghutti* (prelacteal feeding) "because of our culture" within two hours of delivery followed by breastfeeding. The

father "made a fuss to *keep the house warm*," wrapping the baby in blanket, socks, and a hat and burning gas and charcoal at night, because two babies in his community died of pneumonia in the last year. He "*played with his daughter*" one hour daily. He registered her birth with the Union Council Secretary to obtain a

TABLE 4. Positive deviance behaviors among Pakistanis and Afghans (*continued*)

Special care		
Response to apnea	No example found	A <i>dai</i> used mouth-to-nose resuscitation, blowing air through the newborn's nose
Recognize low birth-weight	Father saw his son was <i>khas bathe</i> (weak and small), requiring special care: extra wrapping and changing diapers and exclusive breastfeeding.	No example found
Illness recognition	Family recognized danger signs in a premature baby (stopped sucking, could not lay down, and painful to touch rib-cage).	No example found
Care-seeking	Family of newborn with danger signs took the baby to a private doctor. The mother-in-law did not agree with the diagnosis (<i>hasba</i>), so the family took the baby to another doctor.	Father asked a skilled health provider to examine his newborn daughter who started breathing after she was resuscitated.
Routine care		
Supplement [per table 2 this should be in special care section]	Husband says that giving other food to the baby requires a bottle that might make the baby sick.	Mother frequently breast-fed newborn because she was not producing much milk, and did not supplement with cow or buffalo milk as most mothers do. (2 examples)
Paternal involvement	Father made a fuss to keep his baby warm. Father played with his baby for one hour in the evening (even though female). Father registered his baby at the Union Council to facilitate obtaining a birth certificate, school admission.	Father actively involved with baby girl when home. Father interacted with small newborn daughter, and looked after the other children to give the mother some rest.
Mother's postpartum diet	Father increased the quality and quantity of mother's diet and made her unavailable to the rest of the household so that she could care for the baby. (2 examples)	Both before and after birth her diet was rich in chicken and eggs.

birth certificate. *Breastfeeding had been exclusive* without any water because “mother’s milk is healthy and good for the health of the baby. If we gave other foods, we would have needed a bottle that would make the baby ill because of germs. The baby would be weak if we didn’t breastfeed.” A cousin exclusively breastfed, and her child was fine. He had heard messages about exclusive breastfeeding from television and “reading.” No one advised to the contrary.

Community mobilization

The Afghan Refugee community understood positive deviance (*musbat amaal*). They identified PD behaviors that were new to most of them, and were encouraged to learn that some were already practicing them: “Though we did not know, we are very proud of these Afghans who practice good behaviors that most of us were unaware of” (Afghan male refugee, community feedback session). Men eagerly shared this information with their family members and neighbors at funerals, births, and social visits. Afghan women showed great interest to adopt exclusive breastfeeding and appropriate cord care and to seek delivery assistance from *dais*

who know how to resuscitate a non-breathing newborn. They formed seven women’s groups to discuss neonatal care at monthly meetings without requesting help from SC. One woman said, “I am going to write to my daughter-in-law in Afghanistan about this.”

The Pakistani male and female community members observed that the behaviors were, in fact, not new to them; yet, they admitted that the behaviors were not commonly practiced. Men publicly committed to improve key household behaviors, and women committed to demand clean delivery from local birth attendants and to form neighborhood (*mohalla*) women’s groups to encourage this, again without SC assistance. Within days, one Pakistani family for the first time used a new razor blade, as opposed to a bamboo stick, to cut their newborn’s cord and refrained from dressing the cord, based on the community feedback.

Discussion

The two communities were different, one a refugee camp, the other a long-established agricultural community. The refugee population benefited from 15

years of free preventive antenatal care, including tetanus toxoid vaccination, free delivery kits (since 1996), a prenatal counseling unit, and a network of efficient and trusted female health workers trained by SC. In contrast, SC's Haripur District reproductive health program started 18 months ago, and had not yet fully reached every village within the large district, including the intervention villages. Moreover, the support program provides no direct services. The situation analyses and the PD inquiries for the two settings reflected these different programmatic contexts. The PD inquiry results were similar for exclusive breastfeeding practices, prevention of hypothermia, involvement of the father in delivery and neonatal care, and clean cord care. They differed concerning *dai* practices since SC trained most Afghan *dais* whereas none of the Pakistani *dais* had been trained recently. The Afghan PD inquiry identified as PD behaviors mouth-to-mouth and mouth-to-nose resuscitation and cutting of the umbilical cord while the placenta was still in the womb. The Pakistani PD inquiry identified some PD delivery practices that involved the mother-in-law or the father, i.e., cutting the cord with a new blade and the protective maneuver of placing the newborn on a cushion rather than on the floor.

The rationale for this simultaneous, two-site pilot-test was to gain experience in a new approach, not to closely examine subtle differences between the sites. Yet the similarities, as well as the differences, support the validity of the approach (table 2). Moreover, the 21 Pakistani cases reported by Khadduri et al.* were consistent with many of our findings, for example, knowledge but not practice of clean delivery and cord care, knowledge and practice to maintain newborn's warmth, incomplete response of *dais* to non-breathing newborns, knowledge of, without timely response to, danger signs, and universal prelacteal feeds (*ghutti*) with delayed initiation of and uncommon exclusive breastfeeding. Although some of the same individuals were data collectors for both studies, most team members were not. Moreover, the community input and vetting minimized bias. Also, we discovered localized differences (i.e., use of a bamboo stick to cut cord in Bagra village) not noted in the case series.

The community mobilization was impressive. It occurred despite the accelerated schedule of the pilot-test and the resulting incomplete involvement of the community in each PD cycle step. Moreover, it occurred in Pakistani villages not yet mobilized by and linked to SC's district reproductive health program. The identified next steps seemed feasible, i.e., modest

and consistent with existing social structures. Finally, no community requested assistance from SC.

The pilot study yielded important lessons for future newborn PD applications, especially regarding definition of community, PD case definitions, and significance of PD outcome. Regardless of sample size requirements, initial focus should be at a small scale in a community with moderate or better organization. A demonstrably successful pilot program can later be replicated for scale. Pre-cycle planning must stress community involvement with a preparatory time-line with steps to specify community members' roles (mobilizer, guide, small group facilitator, etc.). PD case definitions generally "worked" in that field teams found examples of each, once age criteria were relaxed. On the other hand, the validity of reported conditions, behaviors, and enabling factors, especially over time, is unknown. Studies validating household behaviors through direct observation and re-interview after several months are needed. Regarding the significance of a PD outcome, the coordinating team repeatedly stressed to field teams that a PD result did not guarantee a surviving, thriving child; rather it increased the chances of it.

A comparison between the PD cycle for newborn health and for child nutrition further highlights some methodological points. *Community selection* involves definitional, epidemiological, and organizational parameters. PD communities for nutrition are defined as meaningful social units, not according to estimated sample size requirements as in Haripur. The level of the community's child nutrition problem must justify the effort, a quantitative assessment of which must be feasible. Accepted methods for assessing the level of newborn ill health do not exist. Our assumption that the newborn problem existed was inferred from national estimates and district studies that have uncertain applicability to specific villages.

The *situation analysis* for PD nutrition is quantitative and qualitative, each supporting the other. Local health system reviews and even cemetery inspections can round out the picture. The newborn situation analysis, although benefiting from the earlier case series, was entirely qualitative. Graveyards were hamlet-based, small, and generally unrevealing. The local health system in the Pakistani community was unlikely to provide insight since it provided no newborn care. The *outcome* for PD nutrition is quantitative and readily measurable: nutritional status as defined by weight-for-age. Outcomes for newborn PD, to date, are a mix of reported health status and behaviors, measured with difficulty from multiple informants, at least the mother, the mother-in-law, and the birth attendant. The validity of reported events and practices is uncertain although consistent information from multiple informants can be reassuring. PD nutrition uses the UNICEF "care" framework [21] as a *cause-effect model*.

* Khadduri R, Marsh DR, Rasmussen B, Bari A, Nazir R, Darmstadt GL, Household knowledge and practices of newborn and maternal health in Haripur District, Pakistan, unpublished document, 2002.

To date, no widely accepted model exists for newborn survival. A PD cycle addressing multiple outcomes is likely to require a complex model, and we propose one here which we have further refined [22].

PD identification for nutrition is straightforward: good nutritional status in spite of risk for the good outcome, usually lower socioeconomic status. Additional selection criteria control for common confounding variables (i.e., rich uncle, first born, or “scavenging personality”). Identification, risk, and criteria for newborn PD are complex. Cases are difficult to find, and risk will vary by outcome. PD inquiry *tools and methods* are well known for nutrition [12]. Well-tested newborn care assessment tools are needed. Finally, regarding a PD-informed *intervention*, PD nutrition projects involve caregivers repeatedly practicing PD behaviors with their peers and observing their children gaining weight. On the other hand, the newborn period is brief and secluded, and most PD behaviors are preventive without a visible outcome. Newborn PD interventions await further experience.

Not surprisingly, the PD approach is complex, in part because it accomplishes so much: community mobilization, fact-finding, and behavior change. As in other settings, the approach catalyzed communities to find viable solutions from within to solve some of their problems. The “facts” found were science-based model behaviors, recognized by the community as true, but

uncommon. The behavior change continues to play out, but involves shifts in internal determinants (knowledge, recognition that norms may not be healthy) as well as decisions to do things differently next time and to tell others to do likewise. Governments worldwide recognize the need to involve communities as full partners for the improved health and survival of women and children. The PD approach provides those communities with a vision of that possibility, a voice to express it, and the confidence to pursue it.

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What influences health behavior? Learning from caregivers of young children in Viet Nam

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Abstract

Globally, the caregiving behaviors that contribute to good nutritional status are well understood; but it is not clear why some caregivers perform these behaviors while others do not. This formative qualitative research was designed to improve understanding about what distinguishes caregivers who practice optimal behaviors from those who do not. This study is a one-time, cross-sectional baseline assessment of factors that affect nutrition-related behavior change. It took place in a rural northern province in Viet Nam. One hundred caregivers of children 6 to 17.9 months of age from five communes were interviewed. None of the five communes were included in the larger prospective study designed to test the impact of the community empowerment and nutrition program (CENP). Four behaviors were examined: feeding the child “positive deviant” foods, feeding the child during diarrheal episodes, washing the child’s hands, and taking the child to the health center when ill. Results indicate that for all four behaviors, favorable social norms distinguished those who practiced each behavior from those who did not. Positive, reinforcing beliefs and attitudes were important determinants of every behavior except handwashing.

Likewise, self-efficacy differentiated doers from non-doers for all behaviors except feeding during diarrheal episodes. Findings from this research suggest that fathers and in-laws of non-doers are more likely to fail to advise mothers about infant feeding and health than they are to provide negative advice. By discovering what distinguishes those who practice optimal behaviors from those who do not, researchers, program planners, and others are better equipped to develop targeted interventions that lead to positive behavior change.

Key words: Behavioral determinants, positive deviance, infant feeding, norms, attitudes, elicitation procedures, Viet Nam

Background and rationale

Viet Nam has some of the highest rates of childhood malnutrition in the world. In a 1998 national survey of children under five years of age, 39% were underweight for their age, 34% were stunted (low height-for-age), and 11% were wasted (low weight-for-height) [1, 2]. Inadequate breastfeeding and complementary feeding and poor hygiene are likely major contributors to malnutrition in Viet Nam. Globally, the caregiving behaviors that contribute to good nutritional status of children less than five years of age include, among others, early initiation of breastfeeding, exclusive breastfeeding for the first six months of life, appropriate and timely introduction of complementary foods, immunizations, the proper management of childhood illnesses including acute respiratory infection (ARI) and diarrhea, good hygiene, and birth spacing. It is well known that practicing these behaviors can lead to improved nutritional status and health; however, in most settings, it is not clear why some caregivers perform these behaviors while others do not. The purpose of this qualitative research is to understand—through the use of elicitation procedures—how caregivers who practice “positive deviant” behaviors differ from those

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who do not. The current study is part of a larger prospective, randomized intervention trial, which tracked 240 children in program and comparison communities [3]. This study is based on the premise that the more program planners understand the determinants of caregivers' behaviors, the more likely they are to design and implement interventions capable of changing those behaviors on a large scale.

Program

This study was carried out in a rural northern province in Viet Nam, in preparation for the implementation of Save the Children Federation's programs. Save the Children Federation rehabilitates malnourished children using a "positive deviance" approach [4]. Work outside the home is the primary barrier to exclusive breastfeeding in rural Viet Nam based on insights from mothers who exclusively breastfed and worked. Since 1990, Save the Children Federation/US has used positive deviance among more than 2,500,000 individuals in Viet Nam to reduce severe childhood malnutrition by approximately 75% [5, 6]. "Positive deviants" are well-nourished children from resource-poor households. Save the Children Federation's program identifies positive deviants through growth monitoring of all children less than five years of age, then helps other parents learn how the parents of positive deviant children are able to keep their children well nourished in spite of tremendous poverty. Parents are taught new caregiving skills using hands-on practice in local homes. Through in-home interviews with parents of positive deviant children, local community health volunteers and local health staff identify those behaviors that improve children's nutritional status and health despite poverty. By definition, positive deviant behaviors are those that are practiced by a few individuals in the community, and that contribute to the health of the child. After volunteers, health staff, and caregivers identify commune-specific positive deviant behaviors, volunteers use rehabilitation sessions to encourage caregivers of malnourished children to adopt these practices. These two-week sessions, held in health volunteers' homes or in kindergartens, educate caregivers and promote such locally identified behaviors as feeding children shrimp and crabs, giving them greens taken from local paddies or bought cheaply at local markets, clipping children's fingernails, and washing their hands to reduce the spread of disease.

During the course of the program, improvements in children's nutritional status have been rapid and long lasting. In a recent study [7], children who participated in Save the Children Federation's positive deviance program were significantly better nourished than children who did not, two years after Save the Children Federation left the program area. In addition, younger siblings

were significantly better nourished than the younger siblings of children from comparison communities even though they had not directly participated in the program, suggesting that parents not only successfully rehabilitated malnourished children but that they continued to practice healthy behaviors after Save the Children Federation left the community.

Behavior-change theories

There are numerous theories that provide guidance about the factors that potentially influence behaviors. These include the health belief model [8, 9], the theory of reasoned action [10], Bandura's social cognitive learning theory [11, 12] and others. While differences exist among theories, common factors are evident, including attitudes about the behavior itself; subjective norms; and self-efficacy. Attitudes in turn are influenced by the positive and negative consequences caregivers think may result from performing the behavior. In that regard, theory suggests that people will have favorable attitudes toward the behavior if the outcome of performing the behavior is considered positive and performing the behavior will lead to the expected outcome. With respect to norms, caregivers are potentially influenced by individuals they consider important. Caregivers' behaviors are likely influenced not only by what others expect them to do but also by their motivation to comply with others. Self-efficacy is the belief in one's own capability to perform a given behavior, even in the face of difficulties.

Methods

This paper describes one approach to theory-based behavior change research known as elicitation procedures. Elicitation procedures rely on qualitative methods to better understand the determinants of behaviors and to identify which determinants are the most appropriate to target in subsequent interventions. Elicitation has been used in other settings to examine such health-related behaviors as condom use among young adults in the United States [13]. This study is a one-time, cross-sectional baseline assessment of factors that affect nutrition-related behavior change. It took place in a rural province in northern Viet Nam, approximately two hours by car from Hanoi. As part of this study, 100 caregivers from five communes were interviewed. "Communes" are administrative units used by the Government of Viet Nam. The communes in the study province have on average about 5,200 inhabitants, typically made up of 12 hamlets (or villages) of 90 to 100 families each. The communes were included in the study because of their geographic dispersion and because of similarities they shared

with communes where Save the Children Federation generally works: poor, low- or midland ecological regions with high rates of malnutrition. Communes scheduled to participate in the prospective intervention trial were excluded from the sampling frame. Twenty primary caregivers with a youngest child between 6 and 17.9 months old were randomly selected from rosters maintained by local commune-level officials from each of the five communes. Rosters were checked for accuracy by the research team.

Because Save the Children Federation's programming had not yet begun in this province, four positive deviant behaviors were selected to represent the behaviors often identified during positive deviance inquiries in similar settings in other provinces. Senior staff at Save the Children Federation identified frequent positive deviant behaviors that had a known link to health status based on research and experience. Results from instrument pre-testing suggested that some behaviors—such as immunizing children—were nearly universal. Because positive deviance excludes universal or nearly universal behaviors, immunization and other common behaviors were dropped from the study. By definition, all behaviors needed to include an action, a time frame, an object, and a context. Definitions for the four positive deviant behaviors were:

- » Feeds child positive deviant foods: at least 2 to 3 times a week, caregivers feed child at least one nutritious food that neighbors sometimes or almost never feed their children.
- » Feeds child during diarrheal episodes: continues to give the child the same amount or more foods and liquids when child has diarrhea (3 or more loose or watery stools in the last 24 hours).
- » Washes child's hands: washes child's hands with water before every meal (but does not necessarily use soap).
- » Takes child to health center when ill: goes with the child to the health center when the child is ill (not necessarily restricted to the last illness episode).

In addition to information about whether or not caregivers practiced each of the four positive deviant behaviors, the field guide included questions about sociodemographic characteristics as well as open-ended questions. Open-ended questions included caregivers' perceptions of advantages and disadvantages of practicing each behavior, source and strength of advice about the behavior, what makes it easy or difficult to engage in the behavior and caregivers' perceptions about how able they feel to practice the behavior even in the face of difficulty. Information about co-residence with in-laws was also collected. To ensure that questions were linguistically and culturally appropriate, the field guide was translated into Vietnamese by the senior Vietnamese researchers on the project and reviewed by all interviewers. The research team spent one day pre-testing the field guide. Pre-testing occurred in a

neighboring commune in the same district where elicitation procedures took place. Respondents for pre-testing were selected from government rosters of 6 to 17.9 month old children living in the commune. Analyses conducted as part of a separate prospective study conducted in the same district indicated that government rosters were complete and accurate. Pre-testing took place as part of training, just prior to data collection. The modified field guide was back-translated into English to ensure that the Vietnamese translation preserved the intent of the questions in English.

The two senior Vietnamese researchers identified eligible mothers and their children. Five interviewers with experience conducting in-depth interviews about maternal and child health in Viet Nam were selected and trained over a period of six days. In the last week of September and the first week of October, 1999, the interviewers administered semi-structured questionnaires to caregivers in their homes and recorded their responses, verbatim, on the survey instrument. Most interviews lasted 45 minutes to one hour. Interviews were not tape-recorded.

Once collected, textual data were translated into English and entered verbatim into EpiInfo (Centers for Disease Control and Prevention, Atlanta, Ga., USA). English was used so that the Vietnamese and American researchers could compare coding and interpretation. Data were then exported to an Excel (Microsoft Corporation, Redmond, Wash., USA) spreadsheet where responses were sorted, categorized, and coded, depending upon the type of response caregivers gave. Categories were developed directly from caregivers' responses. The Excel spreadsheet (with coded categories) was then exported to SPSS (SPSS Inc., Chicago, Ill., USA). SPSS was used to calculate frequencies and percents for coded responses as well as close-ended questions from the field guide. SPSS was also used list the actual text of each respondent, thereby preserving the meaning of what had been said. Social norms were scored on a 7-point scale ranging from 1 (very strong negative advice to practice the behavior) to 7 (very strong positive advice). Likewise, self-efficacy was scored on a 7-point scale ranging from "very sure I am unable to practice the behavior" to "very sure I am able to practice the behavior." Because the self-efficacy queries were linked to questions about difficulties practicing positive deviant behaviors, only those individuals who expressed at least some difficulty were asked how able they felt about engaging in such behaviors.

The process researchers used to identify positive deviant behaviors was not the same as the approach Save the Children Federation program staff usually use. Save the Children Federation identifies positive deviants through growth monitoring and wealth ranking [14]. It uses focus groups to establish community norms about feeding, caring and health-seeking behaviors. During focus groups, Save the Children Federation

asks community members about foods that are known to be nutritious but that are given by only a few parents. On the other hand, researchers used in-depth interviews with caregivers to determine whether or not they practiced a given positive deviant behavior. Caregivers were not interviewed on the basis of a positive outcome (adequate nutritional status). Unlike positive deviance, there was no attempt to distinguish between those who were poor and those who were not. Consequently, the number of doers (people who practiced an optimal health behavior) in this research overestimates the number of positive deviant caregivers.

Results

While in-depth interviews contained a limited number of questions about the sociodemographic characteristics of the sample, it is possible to broadly describe and compare those who did and did not practice a given behavior. Doers and non-doers were similar with respect to mother's age and social class as well as child's sex and number of siblings (table 1). However, caregivers who fed their children positive deviant foods (nutritious food that neighbors sometimes or almost

never feed their children) were more likely than caregivers who did not give positive deviant foods to come from higher social classes.

Feeds child positive deviant foods

More caregivers (69 of 100) fed their children positive deviant foods ("doers" of this behavior) than non-doers (31 of 100). The most common positive deviant foods were eggs, fish, animal fat, meat, and tofu.

Beliefs and attitudes

When asked about the positive consequences associated with feeding children such foods, doers considered positive deviant foods to be nutritious and healthy, to aid child development, to ease digestion, and to help avoid diseases (table 2). Responses did not differ markedly by food type.

While some doers and non-doers said positive deviant foods "ease digestion," others indicated these foods were difficult to digest, especially if given in "large" quantities (table 3). Regarding other undesirable consequences associated with giving children positive deviant foods, both doers and non-doers worried about disease transmission, especially through pork. It should be noted that at the time of interview, there was an epidemic of foot-and-mouth disease transmitted from infected pigs to humans. Doers and non-doers were also concerned about pesticides and about the over-consumption of foods such as animal fat, which was often associated with diarrhea.

Social norms

About one-third of doers and two-thirds of non-doers said no one gave them advice about what to feed their children. Parents of the husband, the child's father, and mother's parents were all common sources of advice for doers about feeding positive deviant foods. Doers received advice that was strongly or very strongly supportive of giving positive deviant foods. Doers' mean score on a 7-point scale was 6.3. On average, the advice non-doers received was neutral (4.0).

Facilitators and barriers

Doers reported having an easier time than non-doers accessing positive deviant foods. Doers lived near markets, had family members who provided positive deviant foods, or grew these foods themselves. Thirty-nine percent of doers' responses and 23% of non-doers' answers indicated there was nothing that made it difficult for them to give positive deviant foods. Doers and non-doers who expressed challenges said it was hard to buy positive deviant foods and that they were difficult to prepare. However, non-doers also cited lack of support from in-laws and problems digesting the food as additional barriers.

TABLE 1. Key sociodemographic characteristics (%) of doers and non-doers

	Doers (%)	Non-doers (%)
Feeds child positive deviant foods		
Male	45	55
Only child	42	58
Mother 30 years old or more	28	23
Self-reported social class: medium-high or high***	44	29
Feeds child during diarrheal episodes		
Male	41	52
Only child	48	45
Mother 30 years old or more	26	27
Class: medium-high or high	44	35
Washes child's hands		
Male	48	48
Only child	46	48
Mother 30 years old or more	29	23
Class: medium-high or high	45	32
Takes child to health center when ill		
Male	50	45
Only child	47	48
Mother 30 years old or more	28	23
Class: medium-high or high	40	38

*** $p < .001$.

TABLE 2. Perceived advantages of feeding child positive deviant (PD) foods

Doers (<i>n</i> = 69)			Non-doers (<i>n</i> = 31)		
Feeding my child PD foods...	<i>n</i>	%	Feeding my child PD foods...	<i>n</i>	%
Is nutritious Provides vitamins, child is healthy Good for child's bones Enough nutrients Has more protein than meat Has a lot of fat/lard so child will be fat Has a lot of calcium A lot of vitamin A in yolk	57	46	Is nutritious Eggs contain protein Has more protein than meat Has vitamins	21	54
Is healthy Child becomes healthy and intelligent Child plays more Child looks pink (PD food) is healthy for adult so it must be healthy for children too	17	14	Is healthy Child becomes healthy Children who eat lizard all look healthy	4	10
Aids child's development Child grows fast Child will be bright Child can walk faster	11	9	Aids child's development Child grows faster Child can walk sooner	5	13
Eases digestion	10	8	Eases digestion Easy to eat and swallow Good for digestion	2	5
Helps keep the child cool	9	7	Helps keep the child cool	3	8
Helps avoid diseases Will not get diseases that can be transmitted through meat Child has not had diarrhea since started eating rice flour with animal fat/lard No risk of pesticide poisoning	5	4			
Other Full child will sleep well It is made from fish so better than salt Reduces perspiration Easy to prepare Lightens complexion	5	4			
Improves appetite Child does not have good appetite without fat/lard	4	3			
Is easy because child likes these foods Mother thinks it is nutritious because child likes it	2	2			
Do not know	2	2			
None	1	1	None	4	10
Total responses	123		Total responses	39	

TABLE 3. Perceived disadvantages of feeding child positive deviant (PD) foods

Doers (<i>n</i> = 69)			Non-doers (<i>n</i> = 31)		
Feeding my child PD foods...	<i>n</i>	%	Feeding my child PD foods...	<i>n</i>	%
None	34	49	None	8	23
May make my child sick May make fever worse May get diseases from pigs May get diarrhea if fat/lard is not fresh May have pesticides Not good if child has sores in mouth	18	26	May make my child sick Salted peanuts cause dry throat, coughing Some diseases can be passed from pigs to human Fat/lard attached, child may have diarrhea May have lots of pesticides	13	37
Makes it difficult to digest Difficult to digest if child eats more than one egg a day Child cannot digest if she eats too much crab	7	10	Makes it difficult to digest Not good for digestion if he eats too often	5	14
Other Child is not fat Resistant to medicines if child is sick	4	6	Other Bile is bitter and poisonous	3	9
Do not know	3	4			
Is not nutritious Not enough nutrition if child eats it alone and too much	2	3	Is not nutritious	1	3
Can make my child too cold/hot Can get hot inside if child eats too much	1	1	Can make my child too cold/hot Child may get "cold" inside and diarrhea	3	9
Does not agree with my child Child does not want to eat much	1	1	Does not agree with my child	1	3
			Is difficult because my child is small Child is too small to get peanuts	1	3
Total responses	70		Total responses	35	

Self-efficacy

Results presented in table 4 indicate that 93% of doers felt sure or very sure they were able to feed their children positive deviant foods in spite of difficulties.

Feeds child during diarrheal episodes

There were 27 caregivers who continued to give as much or more foods and liquids during diarrhea as when the child was healthy. Seventy-one did not and 2 were not sure.

Beliefs and attitudes

Doers of this behavior felt that feeding children as much or more foods and liquids during diarrhea helped avoid dehydration, gave children the nutrients they needed, and kept children healthy. Only one doer mentioned anything negative about feeding children the same amount or more during diarrhea (food is difficult to digest). In contrast, among the 71 non-doers, 76 responses suggested negative consequences about feeding the child as much or more than usual. A major-

ity of non-doers felt that some types of foods—including animal fat, fish, fruits, vegetables, eggs, sugar, and "cold" foods—should be avoided because they aggravated diarrhea. Lard and fish were seen as potentially damaging to children's intestines. Some non-doers also felt that children could not eat or digest as much or more foods and liquids while suffering from diarrhea.

Social norms

Health workers, doctors, father's parents, and the media all frequently advised doers about the amount of foods and liquids that should be given to children suffering from diarrhea. Most non-doers received no advice. Two-thirds of those advising doers about how much to feed during diarrhea were strongly in favor of giving as much or more than usual. Half of non-doers received very strong positive advice. Mean scores for doers and non-doers were 6.2 and 4.9.

Facilitators and barriers

There was nothing in particular that made it easy for doers and non-doers to feed as much or more

Table 4. Caregiver’s perception of ability to practice healthy behaviors (self-efficacy)

	Doers		Non-doers	
	n	%	n	%
Feeds child positive deviant foods				
Very sure she is unable	1	1	2	6
Sure she is unable	1	1	18	58
Somewhat sure she is unable	1	1		
Somewhat sure she is able	2	3	1	3
Sure she is able	21	31	1	3
Very sure she is able	42	62	9	29
Feeds child during diarrheal episodes				
Very sure she is unable	1	7	11	28
Sure she is unable			16	40
Somewhat sure she is unable	1	7	2	5
Somewhat sure she is able	1	7	3	8
Sure she is able	10	67	6	15
Very sure she is able	2	13	2	5
Washes child’s hands				
Very sure she is unable			1	3
Sure she is unable			12	39
Somewhat sure she is unable			6	19
Somewhat sure she is able			8	26
Sure she is able	7	50	4	13
Very sure she is able	7	50		
Takes child to health center when ill				
Very sure she is unable			3	13
Sure she is unable			4	17
Somewhat sure she is unable			1	4
Somewhat sure she is able	2	7	3	13
Sure she is able	18	64	11	46
Very sure she is able	8	29	2	8

during diarrheal illness. What made it difficult to feed more? For most doers, nothing. But for some doers and non-doers, children’s crying and lack of desire to eat prevented them from feeding more. Non-doers also reported that the time needed to prepare foods and negative advice from a variety of sources made it difficult for them to feed their children sufficient quantities.

Self-efficacy

Results presented in table 4 refer to those caregivers who reported difficulties feeding during illness episodes. Eighty percent of doers and 20% of non-doers felt sure or very sure they could feed as much or more during episodes of diarrhea. Mean scores for doers and non-doers were 5.5 and 2.9, respectively.

Washes child’s hands

Fifty-six caregivers washed children’s hands with water before every meal; 44 did not.

Beliefs and attitudes

Doers washed hands to avoid bacteria, worms, diseases, itches, and infections; and to keep children clean and healthy. A few doers felt washing hands would help keep children cool and make them feel comfortable, help create a good appetite, and “assure” the mother. Like doers, non-doers felt that handwashing would help avoid diseases and infections. Only three of the 56 doers could think of anything negative about washing children’s hands. Their concerns included the fear that children might get cold and that soap might damage children’s thin skin. Like doers, most non-doers could not think of reasons not to wash children’s hands.

Social norms

The most commonly cited individuals giving doers advice about handwashing were paternal grandparents, “nobody,” and children’s fathers. Non-doers mentioned “nobody” as the most frequent source of advice. Seventy percent of all doers’ advisors gave very strong advice in favor of handwashing. Fifty-five percent of those advising non-doers offered similarly strong support. However, 27% of doers and over half of non-doers received no advice whatsoever.

Facilitators and barriers

Doers were able to wash hands because water was available, they had family support, their children liked water and handwashing was an existing habit (table 5). On the other hand, almost half of all non-doers’ responses suggested there was nothing that made handwashing easy (table 6).

Self-efficacy

Fourteen of the 56 doers and 31 of the 44 non-doers expressed difficulties washing hands. Among those expressing difficulty, doers were more likely to be sure or very sure they could wash their children’s hands in spite of challenges (100% vs. 13%). Mean scores were 6.5 and 3.5 for doers and non-doers, respectively.

Takes child to health center when ill

Sixty of the 100 caregivers interviewed reported taking their children to the health center when they were ill.

Beliefs and attitudes

The positive consequences doers and non-doers most commonly cited for taking the child to the health center were that the practitioner was professional and knowledgeable and that the child could get the exams, diagnosis, treatment, and medicines needed. Doers

TABLE 5. Factors that made it easy to wash child's hands with water before every meal

Doers (<i>n</i> = 56)			Non-doers (<i>n</i> = 44)		
Washing my child's hands...	<i>n</i>	%	Washing my child's hands...	<i>n</i>	%
Is easy because water is available Water source next to house Mother gets up early to boil water every day Hot water available so child also washes in winter	25	29	Is easy because water is available Well in front of house Warm water available in winter	6	13
Is easy because the family supports it Father helps to get water Older children can help washing Paternal grandmother can help Everyone in family tells mother to do so	15	17	Is easy because the family supports it Paternal grandparents can help Older child can help washing hands Many people can help	8	18
Is easy because my child likes the water Child likes playing with the water	13	15	Is easy because my child likes the water Child likes playing with water Child is not afraid of water	4	9
Is already a habit Habit of making warm water to wash child's hands	11	13	Is already a habit	2	4
None	10	11	None	21	47
Other Mother is assured when child is clean Mother stays at home Gives child 2–3 baths/day Simple Does not need a lot of water	9	10	Other Clean, helps avoid diseases Convenient	2	4
Does not take much time	4	5			
			Do not know	2	4
Total responses	87		Total responses	45	

felt health professionals' enthusiasm was a plus. Doers mentioned they felt "assured," "the health center is nearby," "almost everyone goes there," and "the child recovers faster." Non-doers were more likely than doers to mention that there were no favorable consequences associated with taking their children to the health center. Twelve of 40 non-doers felt there was nothing good in doing so, compared to one of 60 doers.

Responses from doers (77%) and non-doers (40%) suggested there were no negative consequences associated with taking children to the health center. Some doers and non-doers mentioned delays seeing the doctor, practitioners' lack of experience, misdiagnosis, and mistreatment as negative consequences that happen when sick children go to the health center. Doers and non-doers expressed fear that their children could get sicker on the way to the health center. One mother indicated the child would "get worse on the way there if it is raining." Another said her son's fever would worsen on the way if it was windy. Non-doers also cited a lack of medicine and equipment, bad diagnoses, and the availability of alternative remedies as reasons not to go to the health center.

Social norms

The most commonly cited individuals giving doers advice about taking the sick child for treatment were the child's father and paternal grandparents. However, about 18% of the time doers received advice from no one, and 29% of the time non-doers received advice from no one. Eighty-one percent of all advice to doers and 42% of all advice to non-doers was very strongly supportive of taking children to the health center. Only 4% of advice to doers and 6% of advice to non-doers was against taking sick children to the health center. Mean scores for doers and non-doers were 6.8 and 6.1, respectively.

Facilitators and barriers

Doers found it easy to take the sick child to the health center because they lived close to the health center and because health care professionals were "qualified." Non-doers mentioned these factors as well, though less frequently than doers. Twenty-one percent of responses from non-doers (as compared to 6% from doers) indicated there was nothing that made it easy for them to take their children to the health center when sick. What

TABLE 6. Factors that made it difficult to wash child’s hands with water before every meal

Doers (n = 56)			Non-doers (n = 44)		
Washing my child’s hands...	n	%	Washing my child’s hands...	n	%
None	42	74	None	9	19
I am very busy Busy with rice field Have no time	5	9	I am very busy Busy with work in the field and taking care of many children Maternal grandmother keeps child but cannot wash his hands	18	38
I have to boil water/it is difficult to access water Have to get water from maternal grandparents’ house Need hot water in winter	5	9	I have to boil water/it is difficult to access water Water source is very far Have to get water from a well while still holding child Have to ask neighbor for water	6	13
Child dislikes it Child cries when his hands are taken out of the water	3	5	Child dislikes it	2	4
Takes time	2	4	Takes time	1	2
			Do not know	2	4
			Is not a habit	3	6
			Other Mother forgets When mother’s younger brother feeds child, he does not remember to wash hands Afraid child will get cold	7	15
Total responses	57		Total responses	48	

made it difficult to take children to the health center? For some doers, it was the cost of services (in particular, medicines) and difficulty getting to the health center. Even so, about half of all doers’ responses suggested there were no difficulties taking the child to the health center. Twenty-three percent of responses from non-doers indicated no difficulties. Like doers, non-doers faced difficulty paying for services and transporting children.

Self-efficacy

Ninety-three percent of doers and 54% of non-doers expressing difficulties taking children to the health center felt sure or very sure they could do so in spite of these difficulties (table 4). Thirty percent of non-doers felt sure or very sure they were unable to take their children to the health center.

Additional analyses

Additional analyses were conducted for the four positive deviant behaviors. Separate analyses about who provided negative advice to caregivers suggest that collectively, doers receive very little negative counsel about practicing any of the four positive deviant behaviors:

across all four behaviors, doers received negative advice five times (three times from the child’s grandparents, once from a neighbor and once from a friend). Non-doers were discouraged from practicing the four behaviors a total of 33 times. The most frequent sources of negative advice, in order, were grandparents (accounting for about half of all negative advice), health workers, the elderly, and other family members.

From a research and programmatic standpoint, it is of interest to know whether a few individuals practice multiple positive deviant behaviors or many individuals practice a few such behaviors. Nearly all individuals engaged in at least one positive deviant behavior. About one-third of caregivers practiced a single positive deviant behavior. A little more than half practiced two or three behaviors, and 10% engaged in all four positive deviant behaviors.

It is also important to determine whether doers clustered in certain communes. Additional analyses suggest that caregivers from one commune were significantly more likely to practice multiple positive deviant behaviors (p values for Tukey’s honestly significant difference test comparing the high scoring commune to the two lowest scoring communes were .032 and .015, respectively). The mean number of positive deviant behaviors

caregivers practiced in each of these communities was 3.6, 2.5, and 2.4, respectively. An examination of the statistical association between behavioral outcomes suggests that only feeding child positive deviant foods and handwashing were correlated; there were no associations between any other behaviors.

Discussion

Results from this study were used to develop a quantitative index that measures the impact of behavioral determinants—including knowledge, beliefs and attitudes, norms and self-efficacy—on nutrition behaviors. Questions about beliefs and attitudes, including the one below, were developed to evaluate the strength of the caregiver's belief that practicing the behavior would lead to the stated consequence. The construction of questions was based upon the language doers used to describe the consequences of engaging in positive deviant behaviors.

Feeding my child eggs once a day will help my child grow healthy fast.

very likely ___:___:___:___:___:___ very unlikely

Fixed-item questions to gauge social norms were developed using a two-part question. The first asked about whether an individual important to the mother believed she should practice the behavior and the second part asked how strongly the mother felt about following the advice of the individual.

My mother-in-law thinks I:

___ should feed child the same amount when he/she has diarrhea

___ should not feed child the same amount when he/she has diarrhea

When it comes to how much I feed the child when he/she has diarrhea, I:

want to do ___:___:___:___:___ do not want to do what my mother-in-law says

Self-efficacy was measured by naming something non-doers cited frequently as a barrier to adopting a positive deviant behavior and by asking how able the person felt she could practice the behavior in spite of the specific barrier.

Parents in this area tell us that it is difficult to wash children's hands before every meal because parents and grandparents are busy. How able are you to wash your child's hands before every meal, even when you are busy with other work?

very sure I am able ___:___:___:___:___ very sure I am unable

Conclusions

This qualitative research identified factors that distinguish caregivers who practice optimal behaviors from those who do not. The findings suggest that with the exception of giving positive deviant foods, doers are not necessarily privileged in ways that might keep others from adopting the same behaviors.

Results indicate that for all four behaviors, favorable social norms distinguished those who practiced each behavior from those who did not. Positive, reinforcing beliefs and attitudes were important determinants of every behavior except handwashing. Likewise, self-efficacy differentiated doers from non-doers for all behaviors except feeding during diarrheal episodes.

Beliefs and attitudes

Results from this study were clear and consistent: doers were able to identify many benefits of feeding positive deviant foods, taking children to the health center, and feeding as much or more during diarrheal episodes. Non-doers rarely mentioned a single advantage of doing so. In future programming, health volunteers may be able to allay non-doers' concerns that positive deviant foods are difficult to digest (especially in large quantities) by continuing to use group-based rehabilitation sessions to demonstrate that children are capable of eating and digesting large quantities of positive deviant foods. Non-doers' concerns that certain foods—including fat, fish, fruits, vegetables, eggs, and "cold" foods—aggravate diarrhea may also be countered by demonstrating that it is possible to give larger quantities of food without increasing diarrhea. Testimonials from doers may also ease non-doers' concerns. Emphasizing what makes it easy to wash children's hands—including the observation that many children enjoy playing with water—can lead to greater adoption of consistent handwashing practices before meals.

Social norms

Social norms were an important determinant of all four positive deviant behaviors. It is often assumed that husbands and in-laws negatively advise mothers who do not practice optimal caregiving behaviors. Findings from this research suggest that fathers, in-laws and others are more likely to fail to advise mothers about infant feeding and health than they are to provide negative advice. It may be that like mothers, other family members need to "see" the benefits of feeding positive deviant foods, washing children's hands before meals, and so on. Explicit programmatic efforts to include husbands and in-laws are likely to contribute to a supportive atmosphere for practicing such behaviors.

Facilitators and barriers

In general, doers were more likely than non-doers to identify a variety of factors that facilitated practicing positive deviant behaviors and less likely to name barriers to engaging in positive deviant behaviors. Improved access—to positive deviant foods, to clean water, and to health centers—contributed to doers' ability to practice positive deviant behaviors. Doers were also more likely than non-doers to mention support from in-laws and others for practicing the behavior.

Self-efficacy

Non-doers' self-efficacy is likely to be greatest when their beliefs and attitudes are largely favorable, when others—including in-laws and fathers—actively encourage them to practice such behaviors, and when they witness the changes resulting from adoption of positive deviant behaviors.

Results from this study suggest that in Viet Nam, program implementers should target in-laws and husbands to improve advice-giving about health behaviors. Non-doers' concerns about practicing positive deviant behaviors might be effectively allayed through group-

based interaction and testimonials from mothers who already practice such behaviors. Non-doers' belief in their own capability to practice positive deviant behaviors may be the greatest when their beliefs and attitudes are largely favorable and when others actively encourage the adoption of new health practices.

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The positive deviance approach: Challenges and opportunities for the future

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Abstract

The positive deviance (PD) approach offers an alternative to needs-based approaches for development. The “traditional” application of the PD approach for childhood malnutrition involves studying children who grow well despite adversity, identifying uncommon, model practices among PD families, and designing an intervention to transfer these behaviors to the mothers of malnourished children. A common intervention for child malnutrition, the so-called “hearth,” brings mothers together to practice new feeding and caring behaviors under the encouragement of a village volunteer. Hearths probably work because they modify unmeasured behavioral determinants and unmonitored behaviors, which, in turn, result in better child growth. Some health outcomes require a better understanding of behavioral determinants and are not best served by hearth-like facilitated group skills-building. We propose testing “booster PD inquiries” during implementation to confirm behavioral determinants and efficiently focus interventions. We share early experience with the PD approach for HIV/AIDS and food security. The attributable benefit of the PD approach within a program has not been quantified, but we suspect that it is a catalyst that accelerates change through the processes of community attention getting, awareness raising, problem-solving, motivating for behavior change, advocacy, and actual adopting new behaviors. Program-learners should consider identifying and explicitly attempting to modify the determinants

of critical behavior(s), even if the desired outcome is a change in health status that depends on multiple behaviors; measure and maintain program quality, especially at scale; and creatively expand and test additional roles for PD within a given program.

Key words: positive deviance, asset-based development, behavioral determinants, program quality, program scale

Introduction

Community health programs frequently have a “needs-based” approach, which relies on scientific methods or dialogue to identify what a community lacks (or needs) for better health. Interventions based on the findings of needs-based inquiry can fail because local populations are unable to obtain or maintain what has been identified as missing. The growing awareness of the limitations of needs-based approaches to improve people’s health and well-being has sent the development community in search of new models.

“Assets-based” approaches like positive deviance (PD) offer an alternative. Related methods, strategies, and approaches include appreciative inquiry [1] and assets-based community development [2, 3]*, among others. As a group, they capitalize on a type of “resilience” [4, 5]—not necessarily “bouncing back from hardship” [6] or “growing stronger through disruption” [7], but thriving “in a hostile environment [8].” The key advantage of assets-based approaches is that they focus on *what resources the communities or families already have* that can be leveraged to improve health, rather than what they do not have. Non-governmental

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* Mathie A, Cunningham G. From clients to citizens: asset-based community development as a strategy for community-driven projects. Occasional paper, synergos.org/globalphilanthropy/02/abcdoverview.htm.

organizations,* USAID cooperating agencies** [9], and corporations [10, 11], among others, have shown interest in the PD approach as a promising innovation that capitalizes on solutions that already exist.

What is positive deviance?

Positive deviance in health and development means that some people exhibit good outcomes “against the odds.” Within the international health community, the PD approach has been most commonly applied to “the study of children who demonstrate above-average growth in impoverished environments” [12]. Over the past decade, programmers have integrated PD-informed programs into a number of large-scale multifaceted interventions [13, 14]. Save the Children’s (SC) community empowerment and nutrition program (CENP) in Viet Nam [15] is one example of these.

The PD approach defies simple classification. It guides formative research through the positive deviance inquiry (PDI), mobilizes communities through active participation, reflection, and planning, and changes behavior through the transfer of skills through encouraging target audiences to model PD practices.

* Nutrition Working Group, Child Survival Collaborations and Resources Group (CORE). Positive deviance/hearth: a resource guide for sustainably rehabilitating malnourished children. Washington, D.C.: in preparation for publication.

** The use of the positive deviance approach in community nutrition, Arlington, Va., USA and Hanoi, Viet Nam: the BASICS-II Project and Save the Children Federation/US, 2002 (orientation videotape).

Traditionally, the objective of the PDI has been to identify the specific practices that, in spite of harsh conditions (e.g., poverty), allowed one group (i.e., the positive deviants) to have better outcomes than the majority. These practices may be well-known “emphasis” behaviors [16] (i.e., exclusive breastfeeding) or local adaptations of key behaviors (i.e., pureed shrimps and crabs for 9 to 12 month old children as high-quality complementary foods). In the next section we describe the importance of clearly defining the outcomes and mechanisms when using the PD approach and show how these may differ when the PD approach is applied to new areas outside of child growth.

Three sequential groups of determinants describe the causal pathway to desired health: risk factors, enablers, and behaviors (fig. 1). Risk factors, the most common underlying determinants, are often socioeconomic conditions that are not easily or quickly modifiable. Enablers are determinants of behavior, such as knowledge, skills, confidence, norms, or availability of time or necessary commodities. Behaviors are evidence-based practices associated with better health and survival. Health status is usually measured by indicators of morbidity, mortality, or fertility. Few programs have attempted to measure all of the steps in this causal pathway. For example, SC found that PD-informed interventions improved child nutritional status even though the program did not monitor or evaluate behavior change [17–19]. This “traditional” application of PD (fig. 1, row 1) involved identifying low socioeconomic status families with well-nourished children (i.e., “PD families”), conducting PDIs to determine the

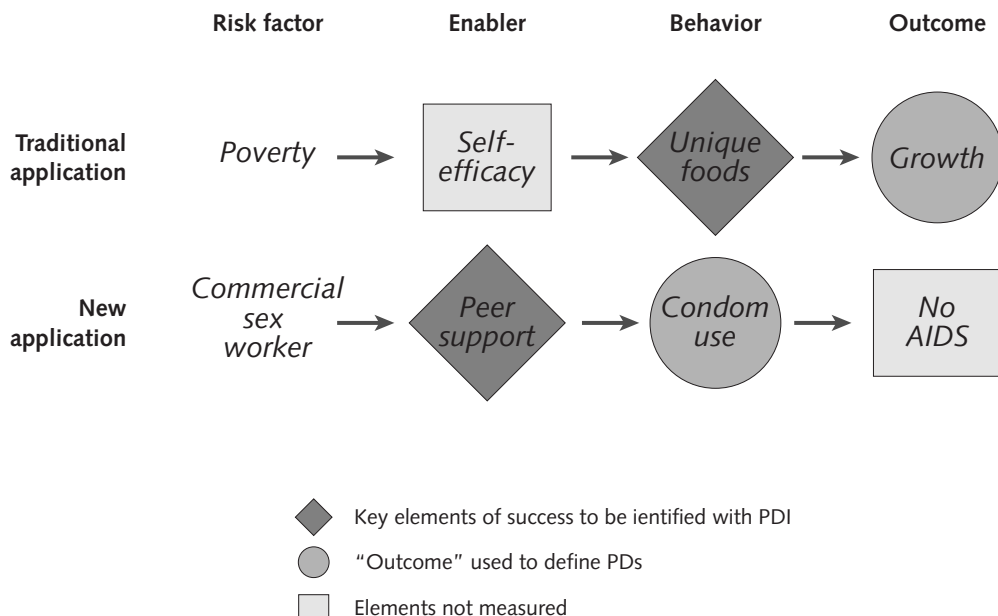


FIG. 1. Illustrative comparison of “traditional” and new positive deviance applications

likely behaviors responsible for the child's good growth, using these behaviors to inform behavior change interventions that included skills transfer, and monitoring the growth of the community children. This approach neither assessed enablers nor monitored behaviors.

Beyond nutrition

The encouraging results in applying the PD approach to child growth [17–20] have prompted applications of PD to other programming contexts, including newborn care in Pakistan [21], breastfeeding in Viet Nam [22], and birth outcomes in Egypt [23]. The potential to apply PD to areas outside of nutrition has prompted a review of the method to better understand what the PD approach is, what it does, and how it works. If PD is to be used successfully in other health and non-health settings, the development community should strengthen the conceptual underpinnings of the approach, particularly by looking at not only outcomes, but also at behaviors and what influences them, examine issues related to quality at scale in PD program replication, and clarify and possibly expand the role of PD within programs. The purpose of this paper is to begin to address these issues and provide a glimpse into fresh PD applications.

Behavioral determinants

Health status rests on behavior. Indeed, every public health intervention has one or more behavioral components. To date, traditional PD-informed programs have focused on a health status outcome, i.e., better child growth. Measuring levels of morbidity, such as the proportion of children who are malnourished, has advantages and disadvantages. Advantages include that it is the “bottom line” that will gain the attention of policy makers and donors, that it can sometimes be more confidently measured than intermediate behavioral outcomes, such as reported practices, that nutritional status, especially growth, represents the final common pathway of many, complex, inter-related phenomena, and that this utilitarian perspective does not risk discouraging useful traditional practices that programs aiming to modify specific behaviors might jeopardize.

To date, the traditional PD approach has promoted multiple behaviors, which, though not monitored, likely result in a readily measurable health status change, i.e., weight gain in a malnourished child. PD findings can support programs in various ways, including refinement of current activities, informing an intervention specifically to promote the discovered skills (i.e., hearth [9, 20, 24]^{B,C}), or even advocacy. The PD approach for nutrition often uses a hearth activity to rehabilitate malnourished children. However, the PD

approach does not require a hearth, nor does a hearth require the PD approach. Hearth involves groups of caregivers who practice skills and master active feeding, meal planning, food preparation, food handling, and hygiene facilitated by volunteer trainers and each other. The apparent success of the PD-hearth combination [17–20] may thus be due to providing opportunities for caretakers to observe each other practice new behaviors, which actually help their children gain weight. In this way, caregivers establish new norms (e.g., “Look how much my baby can actually eat, I didn’t think his stomach was that big!”), boost each other’s confidence through directly observing improved child mood and growth, and gain new skills and knowledge. Hearths may have succeeded in part because the children received more food, but the sustained impact [19] that has been found with these programs suggests that caretakers continued to practice improved behaviors even after the formal gatherings ceased.

Disadvantages of focusing solely on growth, morbidity, or mortality outcomes, however, include unhealthy practices may be over-looked or even affirmed (i.e., the well-nourished infant who has yet to fall ill despite bottle and cassava feeding), morbidity may be more difficult to reliably measure than behavior, some inevitable health outcomes (e.g., AIDS-related illness or death) may not be immediately evident despite years of unhealthy behavior and missed opportunities for intervention, and some programs for extremely high risk individuals (e.g., low birthweight newborns) will lose credibility given the inevitable death of some despite optimal practices.

The rationale to focus on behaviors rather than health status as the outcome of interest is, thus, strong. This approach varies from the traditional PD application in that it involves identifying high-risk individuals who practice certain behavior(s) (and perhaps high-risk individuals who do not), conducting in-depth PDIs to learn what enables these “doers” to practice optimal behavior(s) (and possibly what barriers impede their “non-doer” counterparts), and using these insights to develop interventions (often hearths) that help their neighbors adopt the new behavior(s); and monitoring levels of reported behavior(s) (fig. 1).

The hearth approach, however, is not feasible or ideal for all health outcomes. On one hand, their facilitated group-learning format is a powerful means to simultaneously modify likely determinants of several non-sensitive behaviors that caregivers will practice repetitively at home. On the other hand, it may not apply to brief “demographic moments” (i.e., the immediate newborn care period), to one-time behaviors (i.e., timely vaccination), or to sensitive topics (i.e., family planning). For many non-nutrition PD applications, practitioners must better understand behavioral determinants and consider a range of program design options. For exam-

ple, PD as applied to condom use (fig. 1, row 2) seeks behavioral results, assuming an association between improved behavior and better health status.

Two approaches to program design are possible. One can provide direct opportunities to develop self-efficacy [25], a key determinant of behavior, or one can identify specific determinants and tailor an intervention. The former approach rests on the observation that at least three conditions promote self-efficacy (personal communication, P. Engle, 2001): persuasion that one can perform a behavior, vicarious experience of success, and positive feedback for performance. The PDI discovers examples of vicarious success. If the follow-on program capitalizes on this by providing more success plus gentle persuasion and positive feedback, this may suffice for achieving many health outcomes. Acting one-self into a new way of thinking may be easier than thinking one-self into a new way of acting.

The second program design approach calls for a detailed understanding of enablers to design an effective intervention. This could be accomplished through more in-depth PDIs that compare doers and non-doers among the same high-risk group perhaps using “elicitation procedures” [26, 27] or through “booster PDIs,” (see below) currently being pilot-tested by SC in Pakistan for newborn care.

In traditional applications of PD, there is just one PDI—during the initial program design. Programs focusing on a specific behavior as the end-point may benefit from repeating the PDI. These so-called “booster PDIs” are on-going inquiries into the enabling factors that allowed individuals participating in a PD-informed program to change their behavior. The primary aims of booster PDIs are to confirm the enablers, identify new enablers, and increase the efficiency of interventions by supporting the most relevant enablers. Programmers must be realistic, however. Booster PDIs could become labor-intensive, requiring not only on-going PDIs but also home visits and behavioral surveillance to identify new adopters of the behavior. On the other hand, informal identification (i.e., not surveillance-based) of a few new adopters (i.e., over a brief time period in a limited location) may suffice.

Quality at scale

Another area to strengthen is the monitoring of PD-informed program quality. Prospective studies of the CENP in Viet Nam documented uneven implementation quality [28, 29]. A quality monitoring system with data gathering, review, and response would have led to stronger hearth sessions and probably even better program outcomes in the studied program.

Defining “quality indicators” is clearly a critical step for scaling up any model since quality is often jeopard-

ized as scale increases. Recently, the BASICS II project evaluated the scaled-up PD nutrition program in Viet Nam [30]. Overall, the program was deemed a success in terms of reaching over two million people, but the evaluation showed that the quality of interventions decreased as the program expanded beyond the initial districts. The review noted one gap in particular: “lack of a mechanism, including indicators, to assess training quality, the central function of the scaling-up process.” Assessing both the cost-efficacy of the original PD model and the cost-effectiveness of scaled-up models is important. The latter ratio may change unpredictably due to offsetting trends in both costs and effects. For example, some local program costs will rise in proportion to the number of beneficiaries, while other costs will rise less rapidly due to economies of scale (a trained district management team can oversee implementation in additional communes without retraining). Although program effectiveness risks attenuation due to the challenge of assuring program quality at scale, it may, in fact, be more effective once a critical mass (a “tipping point” perhaps) of the population has adopted a new behavior. An important cost determinant in all such calculations is the ideal quantity of labor-intensive activities such as the PDI, booster PDI, PD-informed behavior change events, and PD-informed community mobilization sessions. On nearly untapped application for the PD approach, advocacy, can potentially reach many at low cost (see below).

Role of positive deviance

No paper in this supplement isolated the contribution of PD to programmatic outcomes. We are unaware of any evaluations designed to compare near identical projects, one with and one without the PD component. Thus, the quantitative attributable benefit of the PD-related activities remains unknown. However, anecdotes from advisors, managers, field workers, and beneficiaries insist that PD “works.”

One can comment, however, on aspects of the role of PD-related activities within the ViSION project [28]. An evaluation [29] of the quality of the CENP implementation revealed that training for the PD inquiry was complete in theory, but its implementation was imperfect in applying household selection criteria, duration, and data gathering methods. Moreover, delivery of health messages informed by the PDIs was low, but time spent demonstrating, as opposed to talking about, behaviors was most likely well spent [28]. On balance, the full potential of PD was unlikely achieved in this iteration.

Moreover, the CENP was designed with only a modest role for PD from the outset, limited to PDIs at the commune level to identify model behaviors that

informed (along with other UNICEF messages) health behavior change activities. If PD is truly a dynamo of change, more ambitious roles seem justified. These could include more baseline PDIs, PDIs exploring behavioral determinants [26], PDIs with larger samples [22], more creative use of PD individuals, culture permitting, booster PDIs to study new adopters, and advocacy, among others. Admittedly, PDIs are relatively expensive in time, but one wonders how generalizable a given PDI is. More inquiries and/or contact with model PD families and caretakers would likely both improve the quality of the findings and mobilize more community members. Some cultural groups discourage individual recognition either positively or negatively. When appropriate, programs should explore PD individuals or families playing public roles to encourage the adoption of model behavior. Short of enlisting the individuals themselves, specific case histories could prove motivating. The booster PDI has been elaborated above.

An underutilized role for the PD approach is advocacy by the PD individuals themselves. The Center for Population and Development Activities (CEDPA) used this approach for experimental work against female genital cutting (FGC) in Egypt. They reported a 100% increase in advocacy skills among 40 members of partner non-governmental organizations, identification of over 100 PD individuals (fathers, mothers, girls, and clergy), and most importantly the eradication of the practice in two villages over the following two years.* Moreover, most PD individuals initiated advocacy activities in their neighborhoods through peer education or presenting their testimony at community awareness meetings. Two factors together enabled PD adults to refrain from FGC: the negative psychological impact of the practice (i.e., the daughter's sense of betrayal and loss of trust in parents) and the successful search for validation of personal conviction by medical or religious figures. This advocacy effort ultimately reached a national audience when a young circumcised PD girl told, on national television in 2000, how she successfully implored her mother not to circumcise her younger sister and urged her girlfriends to do likewise.

Thus, the role of PD in social and behavior change remains incompletely exploited and understood only in part. The best opportunities to study the PD-informed program might occur where the role of PD is creatively pushed, where the implementation is strengthened (i.e., an efficacy, not an effectiveness, study [31]), and where multiple roles can be assessed. Such PD roles could include, among others, gathering information through the PDI, catalyzing and focusing community

attention through its novel premise, stimulating self-reliant problem-solving, changing behavior, interpersonal and community advocacy, and mobilizing communities in a sustained way through the preceding plus demonstrable results.

New contexts

In addition to the nutrition and newborn applications of PD reported in this supplement, SC is expanding PD work in other new technical areas.

HIV/AIDS

In Viet Nam, SC/US and a local non-governmental partner conducted a workshop in Lang Son in January 2002 to train 11 peer educators and to conduct a PDI to inform HIV/AIDS programming [32]. Of the 11 peer educators, some living with HIV/AIDS, six had been or currently were commercial sex workers (CSW), and five had been or currently were injecting drug users (IDU). The CSW peer educators identified PD behaviors from five CSWs, such as successfully negotiating condom use by telling clients that she was concerned about the customer's family getting ill, and if no condom were readily available, telling the customer that she wanted to put on something more attractive for him, while requesting that a co-worker go to the pharmacy and buy condoms. IDU peer educators also identified PD behaviors from six IDUs including: bending the needle after use to prevent re-use and sniffing the drug rather than injecting if no clean syringe were available. Both groups agreed that these behaviors could be shared with and adopted by their larger communities. The IDU peer educators agreed to follow-on group meetings, and CSW peer educators stated that they would share the PD strategies and behaviors through role play with others. Although preliminary, this initial PDI suggests that the approach applies to this programmatic context because there are successful behaviors to control HIV/AIDS that already exist within high-risk groups, and persons at risk could profit if given an opportunity to practice the requisite skills.

This example illustrates a modification of stratification by risk, in that programmers did not seek "high-risk individuals." Rather, they assumed that every member of the CSW and IDU communities was vulnerable. The aim was not to identify practices from these communities that could be transferred to low risk settings as in PD for nutrition where practices from worse off PD families can, in theory, be easily adopted by better off neighbors. Indeed, illicit drug practices are unlikely relevant to low-risk groups. On the other hand, strategies for consistent condom use might have wider applicability although crafting an acceptable strategy for low-risk groups using insights from CSWs gives one

* Final end of project report from Prowid (promoting women in development), CEDPA, Cairo, 1999.

pause. Importantly, although this pilot PDI identified helpful strategies and confirmed that model practices do occur among these groups, *enablers* of the given behaviors remain incompletely understood.

Food security

SC will apply PD to addressing food insecurity in both Africa and Latin America. PD will inform behavior change communication strategies encompassing both nutrition and food security through examining food availability, access, and utilization. In Mozambique SC uses good nutritional status (height-for-age Z score) of children under 36 months of age to identify a food secure family. The teams use PDIs to examine intra-household food distribution, diversity of food consumption, caring and coping strategies in response to economic shocks, and practices to avoid or greatly reduce the “hungry season.” Preliminary work indicates that household behaviors can be adopted to diminish the hungry season and enhance food availability (i.e., increasing food reserves and storage techniques), to optimize food access and production (i.e., focus on drought-resistant crops), and to encourage better food utilization (i.e., adding PD foods, such as crushed peanuts and cashews, to the traditional weaning foods, like

cassava or maize porridges and banana). Challenges to using PD in this context include addressing issues of donated foods and chronic, rather than acute, malnutrition.

Conclusion

The PD approach to improving health and development outcomes continues to gain interest and application. Our experience and that of others support the utility of PD-informed programs in new settings. As we have presented above, however, application of PD to new domains requires a clear understanding of the key conceptual elements, namely risk, enablers, behaviors, and outcomes. Before initiating a PD-informed intervention, we encourage program designers and theorists to reach agreement on how the elements of the behavior(s) and/or outcome(s) that they seek to modify fit within this framework.

We have identified a number of questions related to PD-informed programs for both programmers and researchers (table 1). These issues can be grouped according to the conceptual basis for the PD approach, role of PD in PD-informed programs, and the quality at scale. Indeed, future pilot-tests would do well to

TABLE 1. Current positive deviant (PD) issues for programmers and researchers

Programmers	Researchers
Conceptual basis of PD	
What is the desired outcome: health status or behavior? Will enablers be measured? Who will measure enablers? What comparison will be made: PD vs. “community norms” or PD vs. high-risk non-doer? Will high-risk doers be chosen from the target population (as in PD/nutrition) or will the whole target population be high-risk (as in PD/HIV)? What behavioral or other outcomes are amenable to a hearth-like approach?	How does PD differ from resiliency and other assets-based approaches to development? What is the ideal sample size for various PDI comparisons? How valid and generalizable are PDI findings? What is the relative efficiency of interventions stressing self-efficacy without a detailed understanding of behavioral determinants vs. interventions tailored to a detailed understanding of determinants?
Role of PD	
What range of roles for PD will be considered? Is a role for PD individuals or identified PD cases feasible? What intensity of PDIs is affordable? Are booster PDIs feasible? Who will do them? For repeated interventions (like hearths), how can message boredom be avoided?	Does PD work? When and under what circumstances? How does PD work? How does PD compare with other assets-based approaches in achieving various outcomes? What is the cost-effectiveness of various intensities of PDI? What criteria justify applying PD? What is the cost-effectiveness of PD-informed population-level advocacy vs. community-level interventions?
Quality and scale	
How will performance-based standards be assured? What indicators of quality will be used? What system will be devised to measure and respond to quality indicators? As the training cascade lengthens with increasing scale, what core quality approaches will be stressed?	What approaches to quality are most cost-effective? What is the association between quality and scale? What is the ideal intensity of PD activities within a homogeneous population?

continue a partnership among programmer-learners, epidemiologists, and behavioral scientists. We urge them to evaluate and document novel implementations of PD so that we may continue to learn about and strengthen this approach.

In summary, use of the PD approach remains promising. While this approach is certainly not necessary to affect behavior change, we suspect that its most important role may be that of a catalyst that initiates, or possibly accelerates, social and behavioral change through the processes of community attention getting, awareness raising, problem-solving, motivating

for behavior change, and the actual adopting new behaviors. The approach may well evolve as a standard component of effective health and development programming in the future.

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