

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

U. Agnes Trinh Mackintosh, David R. Marsh, and Dirk G. Schroeder

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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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 (n = 46)	Comparison commune (n = 25)	p 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.

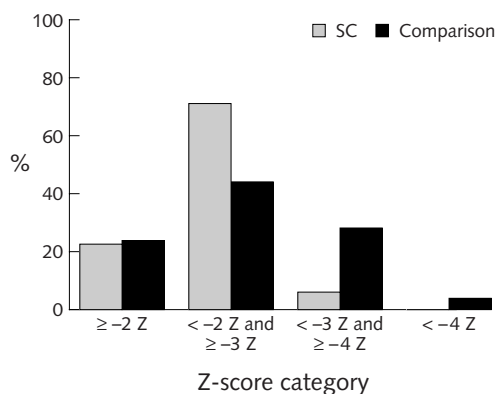


FIG. 1. Nutritional status of older children by study group

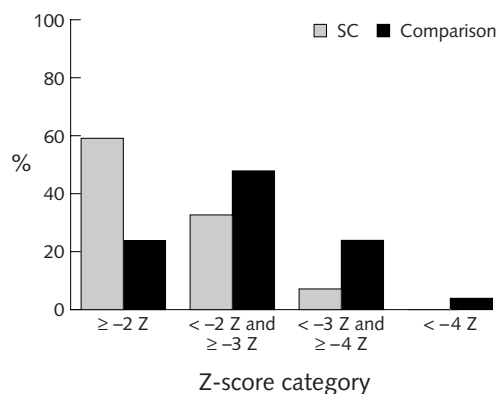


FIG. 2. Nutritional status of younger children by study group

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;

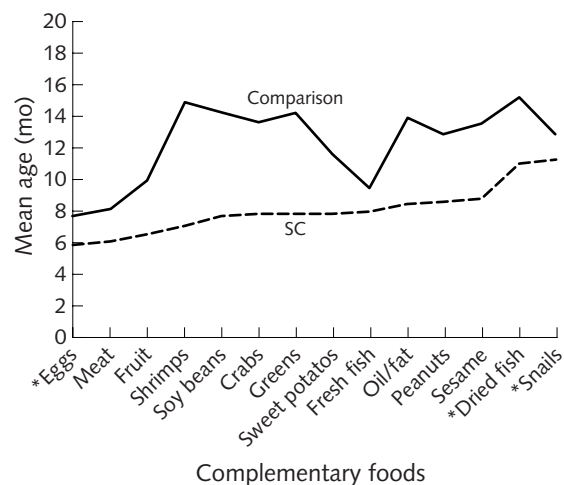


FIG. 3. Mean introduction age of complementary foods among SC and comparison communes

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 feeding (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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