

Two-year evaluation of a nutritional rehabilitation (mothercraft center)

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SUMMARY

A two year evaluation of the effectiveness of a Nutritional Rehabilitation (Mothercraft) Center in rural Haiti was made. The village with a center was compared with a very similar village having no center in terms of food and nutrient intake as revealed by dietary surveys and anthropometric surveys of their pre-school child populations. Biochemical and anthropometric changes in children attending the center were also determined, and these were compared with simultaneous changes in matched pairs of children in the same village but not attending the center. The center was judged to be making a useful contribution to local nutritional problems both in the improvement in children at the center and more important in a gradually improving nutritional picture in the community as a whole.

INTRODUCTION

As a means of nutritional education of peasant mothers Nutritional Rehabilitation or Mothercraft Centers have been launched in several Latin-American countries. Their effectiveness in combatting malnutrition is largely speculative. Unpublished assessments vary from unqualified enthusiasm to skepticism.

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One such center was established in the village of Fond Parisien, Haiti in 1964. For the first two years of operation its effectiveness was assessed by following a number of parameters, a neighboring and very similar village, Ganthier, being studied similarly as a control.

A variety of estimates of a center's usefulness can be used. Among these, tests of mothers' knowledge of child feeding and child care seem to us least valuable. We have preferred instead to use measures of (a) changes in the health status of the children in the centers, (b) changes in the health of all children in the community as a whole, and (c) changes in the food habits of the community at large. This preference stems from the fact that new knowledge of child feeding may or may not be put into practice at home. Changes in the food habits of the community and the health of its children on the other hand, should indicate an effective center provided other conditions have not changed.

This report describes our attempts to evaluate the impact of the center in Fond Parisien largely in terms of community responses. It is clear that in two years the impact of the center on the community though detectable has been limited. In our opinion the experience makes it clear that a well-run center is a fruitful venture, but that in impoverished areas economic and sometimes educational and cultural conditions require amelioration before the full benefit of the Rehabilitation Center can be had.

METHODS

Operation of the Center

Because the name Rehabilitation Center has been applied to a variety of programs it is essential that the organization of this one be understood. It has been described in detail by Beghin *et al.* (1). The particularly salient features are the following.

The center operates six days per week handling about 30 youngsters 1 to 6 years of age. Each group of children is selected on the basis of percent standard weight, edema, and angular lesions and remains intact for a four month period. At the end of that time the group is discharged and all children in the community are reexamined to select the next

or dietician, there being no public health services available in the community.

The Communities

The village in which the center is located, Fond Parisien, and the one serving as a control, Ganthier, have been the subject of numerous dietary and clinical surveys (2, 3, 4, 5, 6). These papers may be consulted for additional background. They are separated by about 8 kilometers in the arid eastern end of the Cul du Sac in central Haiti. The control village, although similar, was perceptibly superior in the general health of its children (see Tables 7, 9, 11 and 12), and in its food patterns (see Tables 5 and 6). Both communities have a police post, a rural school of very limited facilities, and both are lacking in any functional health services. The control village does have a church, while there is none in the village where the center functions. There is only very limited commerce or other communication between the two villages. The control village has a rudimentary political system centered around the mayor, but the village with a center is essentially unstructured politically.

Evaluation Measurements

In determining the response of children attending the center and control groups regular observations were kept of age, sex, weight, height, skinfold thickness, arm circumference, total serum proteins, serum albumin, carotene, vitamin A and hematocrit (1, 2, 6). In certain instances, information was also obtained on the incidences of easily pluckable or depigmented hair, angular scars and lesions of the lips, and edema.

Careful dietary surveys were conducted in both villages before opening the center in 1964 and at annual intervals in 1965 and 1966. The survey procedures were described in detail previously but were essentially those used by I.N.C.A.P. (7, 8).

RESULTS AND DISCUSSION

In addition to study of the control village, an added element of control was possible when the first group of children was selected for participation in the center's activities. Pairs of children matched for age, sex, and percent standard weight

group. Three or four mothers stay at the center all day on a rotating basis. In this way each mother is taught approximately once per week. Only local market foods are used and the food-fuel expenditures are restricted to 9 cents per child per day because this is about the average amount of money spent in the village for food and fuel. The menu cycles are prepared ahead of time by the dietician of the Bureau of Nutrition in the Department of Public Health. Typical nutrient consumption is shown in Table 1.

TABLE 1

CONSUMPTION OF NUTRIENTS BY CHILDREN ATTENDING A REHABILITATION CENTER (AVERAGE PER CHILD PER DAY)

Nutrient	Daily Consumption
Calories	1290 (114 cal/kg)
Protein, g	49 (4.2 g/kg)
Animal protein in %	14 g
Calcium, mg	910
Iron, mg	19
Vitamin A, I. U.	2430
Thiamine, mg	1.2
Riboflavin, mg	1.5
Niacin, mg	13.6
Ascorbic acid, mg	52.6
Food-fuel costs, daily per child	9 cents

The center is a simple village home rented for the purpose. The kitchen facilities are like those available to any mother in the village there being no electricity, running water or gas and no baking facility. This simplicity is employed in order that what is taught may be practical. The center is run by a sub-professional young woman who lives there and who has had only brief training in nutrition and child care. She has only the help of a household servant. This training usually involves 20-30 lectures plus a month's field experience under an experienced supervisor. The overall operating budget is about \$2000.00 per year. Supervision after the first few weeks consists of approximately weekly visits by either a physician

or dietician, there being no public health services available in the community.

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RESULTS AND DISCUSSION

In addition to study of the control village, an added element of control was possible when the first group of children was selected for participation in the center's activities. Pairs of children matched for age, sex, and percent standard weight

were set up. One member of each pair was admitted to the center and the other served as a control living at home as usual.

Table 2 summarizes the performance of these groups over the first four months, the statistical analyses of these data appearing in Tables 3 and 4. The results in Tables 2 and 3 are representative of the performance of all subsequent groups in that there was rapid improvement in the serum protein picture, eventual response in the percent standard weight, height and internal arm circumference. Changes in skinfold thickness and hemotocrit were not generally seen. If anything, hematocrit values tended to fall slightly, and the cause of this change is not known. From data in Table 4 it is clear that children in the center, although initially indistinguishable from their matched pairs on any basis of comparison, showed significant improvement in their blood protein picture and in percent standard weight and internal arm circumference.

The responses of children in the center could have been more dramatic if more food had been given (see Table 1) and if general medical care such as deworming had been practiced. These two aspects of the program were employed in order to keep the feeding in harmony with local food budgets and in order to be sure that mothers did not interpret their children's improvement as being caused by medicine rather than food.

Dietary survey data for the two communities in 1964, 1965 and 1966 are summarized in Table 5. Initially in almost all regards the control village appeared to be slightly better than the village in which the center was established, the differences being particularly evident in calories, animal protein, calcium, and vitamin A. Only for thiamine and riboflavin intake did the control village seem inferior. Food-fuel expenditures were 25% higher in the control village.

After one and two years, the picture in the control village showed a depression in food-fuel expenditures and in vitamin A intakes. Other changes were small, however, with the exception of some improvement in protein intake.

In contrast to this relatively stable food situation in the control village marked by some deterioration in the food supply, the village with the center showed marked improvements. Caloric intake rose about 25%. Animal protein intake nearly

TABLE 2

PERFORMANCE OF CHILDREN ATTENDING A REHABILITATION CENTER COMPARED TO MATCHED PAIRS
NOT ATTENDING
(average values)

OBSERVATION	CONTROLS ¹		CHILDREN IN CENTER				
	start	4 mo.	start	1 mo.	2 mo.	3 mo.	4 mo.
Total serum protein (g/100 ml)	6.67	7.05	6.51	7.13	7.00	7.24	7.24
Albumin (g/100 ml)	3.52	3.80	3.42	3.94	3.96	4.07	4.15
Albumin (percent)	52.5	54.0	51.8	55.4	56.5	56.0	57.5
Hematocrit (percent)	36.8	35.0	36.3	34.9	34.4	34.3	33.9
Skinfold thickness (mm)	6.5	6.7	6.3	—	—	—	5.9
Internal Arm Circumference (cm)	11.9	11.9	12.1	—	—	—	12.6
Percent Standard Weight	67.2	65.7	69.2	—	—	—	72.6
Height (cm)	0.91	0.94	0.92	—	—	—	0.96

¹ Controls and experimental groups consisted of 30 children each.

TABLE 3

STATISTICAL SUMMARY OF PERFORMANCE OF CHILDREN ATTENDING A REHABILITATION CENTER

O B S E R V A T I O N	S T A T I S T I C A L S I G N I F I C A N C E ¹ O F C H A N G E A F T E R			
	1 mo.	2 mo.	3 mo.	4 mo.
Total serum protein	**	n. s.	**	**
Total albumin	*	**	**	**
Percent albumin	n. s.	**	**	**
Hematocrit	**	**	**	**
Skinfold thickness	—	—	—	n. s.
Percent standard weight	—	—	—	**
Internal arm circumference	—	—	—	**
Height	—	—	—	**

¹ *, $p < 0.05$; **, $p < 0.01$; n. s., difference not significant.

doubled, and calcium intake rose nearly 30%. The only serious deterioration was in vitamin A intake. These changes occurred in spite of no change in food-fuel expenses. They are the kind of community food-habit response one would hope to see in a village where a center was having an impact.

As would be expected the vitamin A problem was immediately dealt with by introduction of the highly colored varieties of sweet potatoes. This kind of information from the dietary survey convinces us that as a means of evaluation of centers dietary surveys have particular value, for we would not otherwise have anticipated development of the vitamin A problem.

TABLE 4
STATISTICAL SUMMARY OF CHANGES OVER FOUR MONTH PERIOD IN CHILDREN ATTENDING A REHABILITATION CENTER COMPARED TO MATCHED PAIRS NOT ATTENDING THE CENTER

Observation	Statistical Significance ¹ of difference	
	before start of center	after 4 months
Total serum protein	n. s.	*
Total albumin	n. s.	**
Percent albumin	n. s.	*
Hematocrit	n. s.	n. s.
Skinfold thickness	n. s.	n. s.
Internal arm circumference	n. s.	**
Percent standard weight	n. s.	*
Height	n. s.	n. s.

¹ *, $p < 0.05$; **, $p < 0.01$; n. s., difference not significant.

It is of some interest to examine the change in food habits associated with these changes in nutrient intake. The key data are seen in Table 6. Protein intake in the control village rose slightly, and this can be seen to reflect slightly increased consumption of fish and milk. In the village with a center, however, continued emphasis was being placed on dried beans, fish from the nearby lake, and goats milk as protein sources. The dramatic response of the community to this educational effort is apparent. The changes in cereal consumption reflect primarily fluctuations in local crop yields.

TABLE 5

DIETARY SURVEY SUMMARY FOR VILLAGES WITH AND WITHOUT REHABILITATION CENTERS DURING FIRST TWO YEARS OF CENTER OPERATION (INDIVIDUAL DAILY AVERAGES)

NUTRIENT	VILLAGE WITHOUT CENTER			VILLAGE WITH CENTER		
	1964	1965	1966	1964	1965	1966
Calories	1570	1440	1580	1360	1550	1635
Protein, g	36	43	46	32	42	46
Animal protein, g	9.0	5.3	12.9	3.6	6.3	6.8
Fat, g	42	37	37	44	35	35
Carbohydrate, g	271	239	278	237	277	294
Calcium, mg	239	225	275	158	237	214
Iron, mg	12	14	12	10	27	14
Vitamin A, I.U.	2150	1290	1250	1220	1220	780
Thiamine, mg	1.0	1.0	1.0	3.5	1.9	1.3
Riboflavine, mg	0.6	1.8	0.6	1.6	0.7	0.6
Niacin, mg	8.2	10.9	9.0	7.1	10.6	10.1
Ascorbic acid, mg	40	30	45	38	43	48
Food-plus-fuel expenditures, cents	10	9	9.5	8	8	8

TABLE 6

CHANGING FOOD INTAKE PATTERNS IN VILLAGES WITH AND WITHOUT REHABILITATION CENTERS
(g per person per day)

FOOD	VILLAGE WITHOUT CENTER			VILLAGE WITH CENTER		
	1964	1965	1966	1964	1965	1966
Meat	28	25	28	14	13	11
Liver	0.15	0.26	0.32	—	0.73	—
Fish	5.6	3.2	8.3	2.8	8.4	12.7
Milk	69	89	85	23	58	36
Fat and oil	28	49	24	29	22	24
Mature beans	58	62	58	47	59	73
Green beans	1.9	1.2	12.0	3.1	11.6	4.5
Rice and products	66	45	51	46	42	49
Corn and products	84	200	123	78	82	103
Millet and products	51	16	30	59	109	93
Sweet potato, yellow-red	17	—	—	9	—	—
Sweet potato, white	12	39	52	35	45	97
Green plaintain	27	27	40	21	6	16
Avocado	21	6	9	18	9	8
Mango	0.1	1.2	2.4	4.1	16.5	5.8
Sugars and syrups	41	45	33	15	13	19

TABLE 7

DETERIORATION OF PERCENT STANDARD WEIGHT OF CHILDREN IN CONTROL VILLAGE AND VILLAGE WITH CENTER BEFORE OPENING CENTER

AGE INTERVAL	CONTROL VILLAGE				VILLAGE WITH CENTER			
	90-100%	75-89%	60-74%	<60%	90-100%	75-89%	60-74%	<60%
0-5 months	75	13	13	0	100	0	0	0
6-11 "	48	36	16	0	57	43	0	0
12-17 "	14	50	29	7	0	88	13	0
18-23 "	11	67	17	6	40	20	40	0
2-3 years	18	56	16	11	8	54	38	0
3-4 "	9	48	28	15	55	45	0	0
4-5 "	8	35	30	18	33	33	22	11
5-6 "	4	46	46	4	0	67	33	0
6-7 "	0	23	69	8	0	25	75	0

In examining the anthropometric data for the control village and the village with a center it was vital to be sure that the age distribution of the children comprising all samples be the same. The reason is made clear by the data in Table 7. These data embrace all available pre-school children in both villages. A steady deterioration in the percent standard weight is clear as the age increases. As a consequence any group heavily weighted with older children would suffer in comparison with a younger group.

To avoid this bias all groups compared in terms of percent standard weight were equally weighted with subjects of each age group as shown in Table 8. Here it can be seen that although group sizes varied, the age distribution of the groups was equalized.

TABLE 8

**AGE DISTRIBUTION OF CHILDREN FROM CONTROL VILLAGE
AND VILLAGE WITH A REHABILITATION CENTER**

Age Interval in years	NUMBER OF CHILDREN			
	CONTROL VILLAGE		VILLAGE WITH CENTER	
	1964	1966	1964	1966
0 - 1	16	14	48	48
1 - 2	22	21	62	62
2 - 3	18	17	54	54
3 - 4	18	16	54	54
4 - 5	17	17	41	51
5 - 6	10	9	30	30

As a further precaution against sampling biases only data from children whose mothers were present for both the 1964 and the 1966 surveys were used, thereby assuring that there were neither geographic nor economic differences in the samples for the two years. The status of such groups before opening the center is shown for both villages in Table 9. By all

TABLE 9

COMPARISON OF CHILD POPULATIONS OF CONTROL VILLAGE AND VILLAGE WITH A CENTER
(AVERAGE VALUES) BEFORE OPENING CENTER

AGE INTERVAL	PERCENT STANDARD WEIGHT		SKINFOLD THICKNESS		EXTERNAL ARM CIRCUMFERENCE		MUSCLE ARM CIRCUMFERENCE	
	Control	Center	Control (mm)	Center (mm)	Control (cm)	Center (cm)	Control (cm)	Center (cm)
0 - 5 months	112	97	8.5	6.5	13.5	12.2	10.8	10.2
6 - 11 "	92	86	8.8	6.9	15.1	13.4	12.3	11.8
12 - 17 "	80	80	5.7	6.1	14.0	13.9	12.2	11.9
18 - 23 "	82	80	6.2	6.6	14.2	13.7	12.2	11.6
2 - 3 years	80	79	6.3	7.8	13.4	14.3	12.0	11.9
3 - 4 "	90	77	7.4	7.4	15.8	14.7	13.4	12.4
4 - 5 "	82	77	5.0	7.9	14.3	15.0	12.7	12.5
5 - 6 "	78	74	4.1	5.9	15.0	15.0	13.7	13.1
6 - 7 "	72	68	5.1	4.7	14.6	15.1	13.0	13.5

parameters the children in the control village were slightly better off than those in the village with a center. This situation pertains throughout the preschool year.

TABLE 10

PERCENT STANDARD WEIGHT AND ARM MEASUREMENTS OF CHILDREN IN CONTROL VILLAGE COMPARED TO VILLAGE WITH A CENTER (AVERAGE VALUES)

PARAMETER	Control Village		Village with Center	
	1964	1966	1964	1966
Percent Standard Weight	84.06	80.42	80.35*	79.77
Skinfold Thickness, mm	6.14	6.70	7.00**	7.04
Arm Circumference, cm	14.43	14.19	14.30	14.04
Muscle Circumference, cm	12.59	12.09	12.14**	11.84

* $p < 0.05$ in comparing Control Village and Village with Center.

** $p < 0.01$ in comparing Control Village and Village with Center.

All other comparisons of villages show no significance.

Examining the data in Table 10 makes it clear that the general worsening economic situation was expressed in the control village by dropping values for percent standard weight, arm circumference, and muscle circumference. Of interest in terms of the effectiveness of the center is the fact that although the village with the center was initially significantly worse than the control village by most parameters, the situation was not so two years later. In other words, it would appear that operation of the center prevented the worsening of the food situation that occurred in the control village — that mothers there were getting more nutrient per dollar than they had previously. This, too, is the kind of change that would be expected of a successful center.

The incidence of selected nutritional deficiency symptoms can be seen in Table 11. The general picture is of some im-

TABLE 11
 FREQUENCY OF SYMPTOMS OF MALNUTRITION AMONG CHILDREN
 IN VILLAGES WITH AND WITHOUT REHABILITATION CENTERS
 (PERCENTAGES)

Description	1964	1966
Number of children, control	62	70
with center	230	244
Easily Plucked hair, control	8.1	5.7
with center	10.9	4.5
Angular scars and lesion, control	3.2	1.4
with center	3.4	6.6
Edema, control	0	2.8
with center	5.5	2.5
one or more symptoms, control	11.3	8.6
with center	16.5	12.7

TABLE 12
 NUTRITIONAL CHARACTERISTICS OF CHILDREN WHOSE MOTHERS
 ATTENDED A REHABILITATION CENTER COMPARED TO CHILDREN
 OF MOTHERS NOT ATTENDING SUCH A CENTER

Description	Year	
	1964	1966
Mothers Attended Center		
Number	153	122
Percent Standard Weight	77	76
Skinfold, mm	6.9	6.8
External Arm Circumference, cm.	14.0	13.9
Muscle Arm Circumference, cm	11.8	11.7
Mothers did not Attend Center		
Number	201	264
Percent Standard Weight	85	80**
Skinfold, mm	7.2	7.1
External Arm Circumference, cm.	14.9	14.3*
Muscle Arm Circumference, cm	12.6	12.0**

* $p < 0.05$; ** < 0.01

provement in both villages except that the incidence of edema rose in the control village and fell to less than half in the village with a center.

Another comparison that can be made is that of the status of children in the community having a center whose mothers attended the center with children whose mothers did not. Such a comparison is shown in Table 12. Here it is clear that between 1964 and 1966 the children in families whose mothers attended the center had about the same status both years. In contrast children from families whose mothers did not attend the center slipped in every parameter studied. This forces us to the same conclusion as the intervillage comparison — that operation of the center enabled the mothers to hold their own against a worsening economic situation.

RESUMEN

Dos años de evaluación de un centro de rehabilitación nutricional

Se efectuó durante dos años un estudio sobre la efectividad de un centro de rehabilitación de niños y educación nutricional de madres en un área rural de Haití. Se compara el pueblo donde funciona el centro con uno similar donde no existe y se estudia el consumo de alimentos y nutrientes mediante encuestas, determinando medidas antropométricas en la población pre-escolar. Además, se estudiaron algunos cambios bioquímicos y antropométricos en los niños que atendieron el centro, comparándolos con los valores correspondientes determinados en niños de la misma edad y localidad, pero que no atendieron el centro.

Se concluye que el centro aportó una contribución útil para resolver los problemas nutricionales locales, al mejorar el estado nutricional de los niños que atendieron al centro y también, más importante aún, por su efecto beneficioso sobre el cuadro nutricional general dentro de la comunidad al difundir los conocimientos adquiridos por las madres.

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