

Urban FP/MCH Working Paper No. 10

**An Evaluation  
of Community-  
based  
Nutrition  
Rehabilitation  
Centers**

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International Centre for Diarrhoeal  
Disease Research, Bangladesh

May 1993



**T**he International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) is an autonomous, non-profit organisation for research, education, training and clinical service. It was established in December 1978 as the successor to the Cholera Research laboratory, which began in 1959 in response to the cholera pandemic in southeast Asia.

The mandate of the ICDDR,B is to undertake and promote research on diarrhoeal diseases and the related subjects of acute respiratory infections, nutrition and fertility, with the aim of preventing and controlling diarrhoeal diseases and improving health care. The ICDDR,B has also been given the mandate to disseminate knowledge in these fields of research, to provide training to people of all nationalities, and to collaborate with other institutions in its fields of research.

The Centre, as it is known, has its headquarters in Dhaka, the capital of Bangladesh, and operates a field station in Matlab thana of Chandpur District which has a large rural area under regular surveillance. A smaller rural and a large surveyed urban population also provide targets for research activities. The Centre is organised into four scientific divisions: Population Science and Extension, Clinical Sciences, Community Health, and Laboratory Science. At the head of each Division is an Associate Director; the Associate Directors are responsible to the Director who in turn answers to an international Board of Trustees consisting of eminent scientists and physicians and representatives of the Government of Bangladesh.

The Urban Health Extension Project (UHEP) is a follow-on activity of the Urban Volunteer Program (UVP). In 1981, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) began training women volunteers in urban Dhaka in the use of ORS packets for diarrhoeal disease on the assumption that community women could play an important role in teaching others about the home treatment of diarrhoea with ORS. The United States Agency for International Development (USAID) began funding the project in 1986 with a mandate to provide primary health care services to the urban slums and conduct research on child survival related issues. There were additional support from other donor agencies. The project maintained two Nutrition Rehabilitation Centres with financial support from BADC. UHEP continues to focus on health and family planning issues of the urban slums with an overall goal to strengthen the ability of the government and non-governmental agencies to provide effective and affordable family planning and selected maternal and child health services to the urban poor through research, technical assistance, and dissemination of its research findings.

# **Urban Health Extension Project**

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## Foreword

I am pleased to release these reports on urban health and family planning issues which are based on the activities of the Urban Health Extension Project (UHEP). UHEP is a follow-on activity of the former Urban Volunteer Program, a pilot project funded by the United States Agency for International Development (USAID) with additional funding from other donor agencies. This particular study was funded by the Belgian Administration for Development Cooperation (BADC).

The poor health status and the health needs of the urban poor continues to be an important emerging public health issue in the Developing World. Bangladesh is no exception. Despite the constraints of poverty and illiteracy, there are proven strategies to provide basic health and family planning services to the urban poor. In Dhaka alone, aside from the Government health care facilities, there are numerous NGOs and private sector providers giving needed services to the urban population. The Centre's own Urban Health Extension Project continues to focus on the urban poor, especially the slum populations, in providing basic family planning and health services through outreach activities (viz. health education, ORS distribution and referral services to service points).

However, enormous challenges remain in providing an optimum level of services to the urban poor. The UHEP, with the support of the USAID, will focus on health and family planning services delivery strategies in reaching the needed services to the urban poor. We certainly look forward to learning more about the health and family planning needs of the urban poor, testing sustainable strategies and applying these proven strategies in collaboration with other partners in government, NGOs and the private sector.



Demissie Habte, MD  
Director

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Urban Health Extension Project (UHEP), ICDDR,B has been maintaining two Nutrition Rehabilitation Centres (NRC s) in the urban slum areas of Dhaka. This Working Paper is based on UHEP's experience from the NRCs. UHEP staff members and community volunteers are involved in the functioning and maintenance of the NRCs. Sincere acknowledgement is extended to them for their hard work and dedication.

Much effort has been put into the analysis and review of the information presented in this report. We would like to acknowledge the valuable input of the following individuals in this report.

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## **Summary**

The Urban Health Extension Project of the International Centre for Diarrhoeal Disease Research, Bangladesh (UHEP-ICDDR,B) evaluated two Nutrition Rehabilitation Centres (NRCs) in late 1992 which were operated by urban slum women, under ICDDR,B professional supervision.

An evaluation of the community-based NRCs was first conducted in 1985 to establish the effectiveness of the interventions in treating malnourished children from a community-based centre after 10 months of operation. The results were positive, however, as this evaluation was at the beginning of the program it was too early to evaluate the more long-term objectives of the NRCs for reducing malnutrition for children in the community, with community-based NRCs operating under routine (i.e., not special study) conditions.

The objectives of this evaluation were two-fold. The first objective was to evaluate the quality of the community-based NRCs by evaluating their effectiveness in treating malnourished children attending the centres. The second objective was to evaluate the effectiveness of the community-based NRCs as a program intervention for decreasing childhood malnutrition in the community.

A total of 254 children aged 6-59 months were admitted to the nutrition centres over a one-year period during 1989-1990, with 201 (79%) completing rehabilitation. Eighty per cent of these 201 children received their total rehabilitation therapy from the NRCs, and 20% re-

ceived inpatient medical and nutritional treatment from a referral centre in addition to the NRC rehabilitation. The children who received their total rehabilitation from the NRCs showed an average increase of 15.0% ( $\pm 5.4^*$ ) in their percentage of the reference median weight-for-height from admission to discharge (median days of attendance 25), with a mean percentage of the reference median weight-for-height on discharge of 83.5 ( $\pm 5.2$ ). Sixty-one percent of these children ( $n=102$ ) were followed-up at home for 12 months after discharge. Most children retained their improved nutritional status, showing an average increase of 28.2% ( $\pm 20.5$ ) in their percentage of the reference median weight-for-height 12 months after discharge, over that seen on admission to the program. The mean percentage weight-for-height at 12 months follow-up was 93.1% ( $\pm 14.1$ ). The results for the children who were referred to for inpatient nutritional rehabilitation were similar. Thus, it was concluded that the community-based NRCs operated by the trained local women and using locally available foods were able to improve the nutritional status of the children aged less than five years with moderate and uncomplicated severe malnutrition with sustainable results at 12 months after discharge.

When evaluated as a program intervention for decreasing malnutrition in the community, however, NRCs were found to have minimal impact. A cross-sectional survey of children in the catchment areas during 1991 continued to show high levels of acute malnutrition (10-14% of the children were below 80% of the reference median weight-for-height), despite the fact that these NRCs had been in operation at these locations

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\* One standard deviation

for 3-5 years. The lack of impact at the community level may be attributable in part to the low coverage rate. Twenty-six percent of the children estimated to be malnourished in the catchment areas for the NRCs attended the NRCs, with 20% of these children dropping out. A higher drop out rate from the program was seen for girls than for boys (24% compared to 17%), which followed documented preferential treatment received by the boy children in Bangladesh for health and nutrition.

To improve the effectiveness of community-based nutritional rehabilitation as a program intervention for decreasing levels of malnutrition, the coverage rate for malnourished children must be increased and/or the educational messages need to be disseminated in an effective manner to help prevent new occurrences of malnutrition in the community.

As the community-based NRC was a low technology program with non-professional staff managing the therapy day to day, it is expected that the same results for individual children, but a higher coverage rate and lower drop out rate, might be achieved from a home rather than centre-based nutritional rehabilitation program. While a home based rehabilitation program would continue to require some professional input for training and for checking the quality of treatment, it should be able to adequately manage 60 to 80% of the malnourished children in the community.

# **I. Description of Nutrition Rehabilitation Centres**

## **A. Background**

The UHEP trains and supervises Urban Volunteers -- women from the slum areas -- who provide basic health education for nutrition, immunization, family planning, and management and prevention of diarrhoea. In addition to providing health education, the volunteers are trained to refer persons requiring health services relating to these subjects to the appropriate service providers.

In response to community requests as well as documented levels of malnutrition in the urban slum areas, the UHEP introduced community-based Nutrition Rehabilitation Centres (NRCs), staffed by local women, who were already Urban Volunteers, for the management of moderately and uncomplicated severely malnourished children from the slum areas. The operating guidelines for these centres were based on those which had been documented by the UHEP as effective, during an evaluation conducted in 1985.<sup>1</sup>

Two centres were opened -- one each in Lalbagh in 1986 and Mirhazirbagh (Demra *thana*) in 1989 -- in collaboration with local community leaders. The local communities formed Community Nutrition Councils (CNCs) and donated the physical facilities for the operation of the NRCs. The CNCs agreed to be responsible for the maintenance and

security of the buildings. The UHEP was responsible for the day-to-day management of the NRCs which included personnel, food, and technical support. Each NRC had the capacity to serve a maximum of 25 malnourished children at a time.

All of the urban volunteers received training in identification of malnourished children by signs and symptoms, and were instructed to refer malnourished children to the centres. Prior to the establishment of the NRCs, the Urban Volunteers had received training for providing nutritional education to mothers of moderately malnourished children and to recognize and refer severely malnourished children to intensive rehabilitation centres (Child Nutrition Unit, Save the Children, UK).

## **B. Centre Operations**

Five Urban volunteers were selected to work at each centre, and received two months additional training as well as a monthly stipend for working at the centres. An assistant nurse was hired as the technical supervisor for the NRC day-to-day activities, visiting each centre two to three times weekly. The total NRC program was managed by a physician who also made weekly visits to provide medical treatment as well as supervision.

The five local staff for each centre were trained to each assume a specific task for the NRC. These jobs included:

- Supervision of the centre activities and provision of medical treatments according to an established protocol. Treatment was given by the NRC staff for diarrhoea, upper respiratory infections, ear infections, scabies, and worms. More serious illnesses were seen and treated by the doctor during weekly visits or were referred to other facilities.
- Provision of health education and stimulation through play activities and songs. Health education focussed on causes of malnutrition, weaning practices, breastfeeding, prevention of vitamin A deficiency, prevention and management of diarrhoea, immunization, birth spacing and family planning, and general hygiene and child care issues. Visual aids were used, and the participation of the mothers or attendants was encouraged.
- Preparation of food and provision of cooking demonstrations, encouraging active participation from the mothers.
- Anthropometric measures (weight-for-length or weight-for-height; arm circumference) and record-keeping
- Home follow-up for discharged children or children who were absent for more than three days.

The NRCs opened at 8:30 AM and closed at 4:30 PM.



## B1. Dietary Treatment

Dietary treatment consisted of three meals and two snacks each day, prepared from low cost and locally available foods. The diet included\*:

Shak-parata	:	1 average parata (100 gm)	= 250 kcal
Pulses (lentils)	:	100 gm cooked pulses	= 240 kcal
Halwa	:	100 gm cooked halwa	= 200 kcal
Khichuri	:	100 gm cooked khichuri	= 110 kcal
Chop (potato)	:	50 gm cooked chop	= 140 kcal
Muri-mua	:	100 gm cooked mua	= 430 kcal

Children who received only milk at home (particularly children below one year of age) received a mixture of milk powder with oil and sugar (1 kcal/ml, from 100-150 ml/kg five to six times daily) for their initial feeding. Gradually, the other NRC foods were introduced for children above five months of age.

## B2. Medical Management

Routine medical treatment consisted of ensuring the children were fully immunized (using nearby government or NGO facilities), provision of

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\* Shak-parata is a bread made of green leafy vegetables, wheat flour, and oil. Halwa is a porridge made of wheat flour, pulses, molasses, and oil. Khichuri is green leafy vegetables, rice, pulses, potatoes and pumpkins, and oil cooked together. Chop is potato and wheat flour cooked together. Muri-mua is puffed rice, peanuts, and molasses cooked together.

anti-helminths, multi-vitamins, and a single high dose of vitamin A on admission (100,000 iu for infants six to eleven months of age, and 200,000 iu for children above one year). Antibiotic treatment was provided if necessary by the NRC supervisor following the written protocol.

### **B3. Catchment Area**

The catchment areas for the centres were defined as slum households within 30 minutes walking distance of the NRC, although any children who were eligible for treatment and came to the centres were admitted. Urban volunteers worked in some, but not all of the slum areas within the catchment areas.

### **B4. Admission Criteria**

Malnourished children from 6 to 59 months of age (with an emphasis on children aged less than 36 months) were admitted to the NRC. Malnourished was defined as having a mid-upper arm circumference (MUAC) below 120 mm or a weight-for-height 60-79% of the National Centre for Health Statistics (NCHS) reference median weight-for-height. Complicated and severely malnourished children (those below 60% of the reference median weight-for-height, those with a MUAC less than 90 mm, or those with pitting oedema), as well as children who did not gain weight or were suspected of having tuberculosis (i.e. they had not improved with three weeks of therapy), were referred to the Nutrition Rehabilitation Unit of Save the Children, United Kingdom (SCF-UK), which has an in-patient intensive feeding and medical service. Children with serious illnesses or other medical problems were referred to Dhaka Shishu Hospital, the local

children's hospital. Children with dysentery and severe dehydration were referred to ICDDR,B. Referred children were followed-up weekly by the NRC staff who visited the referral site to ensure that the referral was followed through by the guardian. They also encouraged them to return to the NRC after discharge to complete rehabilitation (if still necessary) and for home follow-up.

### **B5. Discharge Criteria**

The discharge criteria was that children must have achieved at least 80% of the reference median weight-for-height and be gaining weight regularly, have a good appetite, be infection free, and must not have oedema. A minimum of three weeks participation was desired for all children regardless of weight gain. This was to increase the effectiveness of health education.

### **B6. Follow-up**

Children who were discharged were followed-up at home for one year, with visits being made at one, two, three, six, and 12 months. The NRC worker brought the child to the centre for measurement of MUAC, weight and height at each follow-up visit. At that time, medical treatment was given or referrals made if required. A growth chart, with education regarding the card and general nutrition and health care, was provided to the mother at each follow-up visit.

## **II. Evaluation of Effectiveness of Nutritional Rehabilitation Centres in Treating Malnourished Children**

### **A. Methodology**

Data were collected by the NRC staff who were supervised by the assistant-nurse/supervisor as well as the physician in charge. Periodic checks were made on the accuracy of the anthropometric measures, and medical checks were made weekly by the physician. The data were collected primarily by the NRC staff member who had been selected for the role of a measurer. When that staff member was not present, another staff member collected the information.

Data were collected on all children who were referred to and received initial screening at the NRCs. Admission weight, height, MUAC, sociodemographic and household information, and medical problems were recorded. Weights were taken every alternate day and changes in medical conditions were recorded as noticed by the centre staff as well as by the physician during weekly visits.

Length was measured using a length board with measurements to the nearest 0.5 cm. Weight was taken to the nearest 100 gm using a salter scale. MUAC was measured using the TALC MUAC tapes.

Field follow-up data consisted of visiting the home to provide health education and assess the child's condition. The child was then brought to the NRC for measurement of MUAC, weight, height, and treatment of medical problems. The assistant nurse/supervisor periodically supervised the field follow-up visits and accuracy of the data being collected.

The nutritional status of the children was calculated using the CDC Anthropometric Software Package<sup>2</sup> which computes the percentage of the NCHS reference median values for weight-for-height and weight-for-age for each child, by sex and age.

## **B. Description of Study Population**

A total of 257 children were enrolled in the Mirhazirbagh and Lalbagh NRCs from May 1990 through April 1991. These children fulfilled either the MUAC or percentage of the reference median weight-for-height criteria for admission to the NRC. Three children were excluded from this analysis due to data errors (the recorded admission weight or height was in error). Thus, 254 children in total were included in this analysis.

While Lalbagh admitted a higher percentage of children aged less than two years (50% compared to 60% for Mirhazirbagh Centre), the difference in the mean nutritional status at admission, when controlling for age through stratification, was not significant. As both centres operated

under the same guidelines and the same supervisors, the data from the two centres were combined for analysis and evaluation.

Fifty-two percent of the patients were female and 48% male. Twenty-five percent were between 6-11 months of age, 46% between 12-23 months, and 29% were 24-59 months of age (Table 1). Almost half (49%) of the children were the fourth or higher birth order in their family. The majority (91%) of the mothers of children who were admitted had no education; only 8% had received 1-5 years of schooling.

There was no significant difference in nutritional status by sex at the time of admission. A comparison of the nutritional status on admission by age also showed no significant differences in the average percentage of reference median weight-for-height (Table 1).

**Table 1. Children Admitted to NRCs by Age Group and Percentage of Reference Median Weight-for-height**

Age (in months)	Number	Percentage	Mean % Weight-for-height ( $\pm 1$ SD)
6-11	64	25	73.5 ( $\pm 5.2$ )
12-23	117	46	72.2 ( $\pm 5.4$ )
24-35	48	19	69.1 ( $\pm 5.1$ )
36-47	20	8	72.0 ( $\pm 3.3$ )
48-59	5	2	73.5 ( $\pm 2.3$ )
Total	254	100	71.9 ( $\pm 5.3$ )

Of the 254 children admitted to the NRCs, 3% were less than 60% and 5% were greater than 80% of the reference median weight-for-height (Table 2).

**Table 2. Percentage of Reference Median Weight-for-Height on Admission**

Percentage of Reference Median wt/ht	Number	Percentage
<60	8	3
60-69	73	29
70-79	160	63
80+	13	5
Total	254	100

As per the centre guidelines, the children who were less than 60% of the reference weight-for-height were referred to the intensive feeding centres. The children admitted with more than 80% of the reference median weight-for-height had MUAC below the admission criteria (all were below 11.6 cm MUAC).

Illnesses which were identified at some point during the rehabilitation included diarrhoea (67% of the children), dysentery (5%), and lower respiratory tract infection (15%). In addition, upper respiratory infections (91%), skin infections (33%), and stomatitis (24%) were commonly diagnosed.

Eighty-one children (32%) were referred to other facilities for the treatment of diseases (severe diarrhoea or dysentery being the most common), for the management of complicated and severe malnutrition, or sent home due to contagious diseases (Tables 3 and 4). The guardians of those children who were sent home collected a daily supplement from the NRC until the child was not contagious and could attend the onsite feeding. The age and sex of the referred children were proportionally similar to all admissions.

There was no significant difference between the referral rates of male or female children or referral rates by age group, although the trend was that more younger children were referred.

**Table 3. Reasons for Referral**

Reasons for Referral	Number	Percentage
Diarrhoea/dysentery	20	24
Lower respiratory tract infection	3	4
Measles	1	1
Suspected tuberculosis	2	2
Severe malnutrition; oedema; not gaining weight	41	49
Other illnesses	16	19
Total illnesses referred*	83	100

\* 81 different children were referred to for 83 different illnesses



**Table 4. Referral Site**

Referral Site	Number	Percentage
Save the Children Fund (CNU)	51	61
Shishu Hospital	7	8
ICDDR,B	14	14
Home (during infectious period)	9	9
Other	2	2
Total number of referrals*	83	100

\* Total 81 individual children were referred 83 times.

From the 81 children who were referred for treatment, 23 (28%) were not taken for referral by their guardians, but instead continued to attend the NRC. This included two children who were requested to accept the take home supplement and stay at home due to contagious illness. Reasons most often given for refusing referral were distance to the site and refusal to go to an inpatient centre. Often there was no one who could stay with the child at the referral site. There was no significant difference in refusing referral by the sex or age of the child. Seven children (9% of the referrals) received outpatient treatment for their illness and continued to attend the NRC. Thus, 31 (38%) of those children who were referred actually continued treatment from the NRCs, seven (9%) took food from the home-based program at the NRC and later rejoined the NRC onsite feeding, and 44 (54%) went to inpatient treatment centres.

Of the total 254 children admitted to the NRCs, 53 (21%) did not complete rehabilitation (drop out), 201 (79%) completed rehabilitation, and 161 received their total rehabilitation from the onsite feeding program at the NRC. The other 40 children who completed rehabilitation received part of their treatment from inpatient facilities or participated in the home-based program until their contagious disease was cured. These 40 children returned to the NRCs for follow-up after rehabilitation (Table 5).

**Table 5. Final Status of Admissions**

Status	Number of Children		
	Total	Subtotal	Itemized
<b>COMPLETED REHABILITATION</b>	201		
■ Mostly at NRC		161	
- Never Referred			139
- Referred but Refused Treatment			15
- Received Outpatient Treatment			7
■ Mostly Outside NRC		40	
- Inpatient Treatment			34
- Home-based Treatment			6
<b>SYSTEM DROP-OUTS</b>	53		
■ Never Referred (NRC Drop-out)		34	
■ Referred*		19	
<b>Total</b>	<b>254</b>		

\* May have completed referred treatment, but did not return to NRC enrollment

Children were considered drop outs if a) they were referred to another facility and did not complete treatment, b) they were not found for follow-up after discharge from the referral site, and c) if they stopped attending the NRC before three weeks of treatment or before they had reached an acceptable discharge weight-for-height. This criteria was not rigidly followed. If a child was improving and had attended the NRC for close to three weeks they were sometimes discharged if the guardian insisted.

Of the children who dropped out of the rehabilitation program, 40% were male and 60% female. There were no significant differences between those who dropped out and those who completed their nutritional rehabilitation with regard to age, nutritional status on admission, or referral status. While there was no significant difference between the nutritional status of male and female children on admission, a larger percentage of female children (24% of female admissions) dropped out than of male children (17% of male admissions). The median number of days of attendance at the NRC prior to dropping out was lower for the females than the males (5 compared to 10 days) (Table 6). The drop out rate was also higher for older children, although this was not statistically significant.

**Table 6. Children Admitted to NRC Who Dropped Out of Program**  
(n=254 Original Admissions)

Sex	Number of children dropping out	Admission % wt/ht ( $\pm 1$ SD)	Admission % wt/age ( $\pm 1$ SD)	Mean # ( $\pm 1$ SD) of days attended NRC [Median]
Male	21 ( 40%)	71.0 ( $\pm 5.0$ )	52.0 ( $\pm 8.0$ )	13.3 ( $\pm 11.3$ ) [10]
Female	32 ( 60%)	71.6 ( $\pm 6.3$ )	52.2 ( $\pm 9.2$ )	8.3 ( $\pm 8.4$ ) [5]
<b>Total</b>	<b>53 (100%)</b>	<b>71.4 (<math>\pm 5.8</math>)</b>	<b>52.2 (<math>\pm 8.7</math>)</b>	<b>10.3 (<math>\pm 9.9</math>)</b> <b>[7]</b>

Note: Male/female differences in admission weight-for-height or weight-for-age not statistically significant (2-tailed t test).

### C. Outcome of NRC Intervention

161 (63%) of the children admitted to the NRCs received their total rehabilitation from the onsite feeding program at the NRCs. The average percentage of the median weight-for-height for these children was 72.7% on admission and 83.5% on discharge, with the children showing an average increase of 15% in their percentage of the reference median weight-for-height from the time of admission to the time of discharge (Table 7). As would be expected, the children who had lower nutritional status at the time of admission showed a higher percentage increase in their percentage of the reference median weight-for-height at the time of discharge.

The average percentage of reference median weight-for-age was 51.5% on admission and 58.0% on discharge, with the children showing a 13% increase in their percentage of the reference median weight-for-age over that seen at the time of admission (Table 7).

**Table 7. Nutritional Status for Children Receiving All of Their Rehabilitation from NRCS (n=161)**

Nutritional Indicator	Male Mean ( $\pm 1$ SD)	Female Mean ( $\pm 1$ SD)	Total Mean ( $\pm 1$ SD)
Weight-for-height at admission*	72.6 ( $\pm 4.4$ )	72.8 ( $\pm 4.9$ )	72.7 ( $\pm 4.6$ )
Weight-for-height at discharge*	83.1 ( $\pm 5.4$ )	83.9 ( $\pm 4.9$ )	83.5 ( $\pm 5.2$ )
Proportional change in % weight-for-height from admission to discharge**	+14.7 ( $\pm 5.3$ )	+15.4 ( $\pm 5.5$ )	+15.0 ( $\pm 5.4$ )
Weight-for-age at admission*	51.1 ( $\pm 6.5$ )	51.9 ( $\pm 7.4$ )	51.5 ( $\pm 7.0$ )
Weight-for-age at discharge*	57.4 ( $\pm 7.0$ )	58.7 ( $\pm 7.8$ )	58.0 ( $\pm 7.4$ )
Proportional change in % weight-for-age from admission to discharge**	+12.6 ( $\pm 5.5$ )	+13.5 ( $\pm 5.4$ )	+13.0 ( $\pm 5.5$ )

Note: Median not presented as mean-median differences were very small.

\* Percent of the NCHS reference median value.

\*\* Mean proportional change =  $\frac{\sum \frac{d-a}{a}}{n}$ , where a=% of reference median at admission, d=% of reference median at discharge, and n=number of children.

The average number of days in attendance at the NRCs for children completing rehabilitation was 27.8 days (Table 8). The average number of days absent from rehabilitation was 3.7 days. There were no significant differences between the average admission or the average discharge weight-for-height between male and female children who received their treatment at the NRCs.

There was also not a significant difference in the number of days males and females attended the NRCs when controlling for the percentage of the reference median weight-for-height on admission (Table 8). There was, however, a significant difference in the number of days of attendance when evaluated by the percentage weight-for-height at the time of admission ( $p < 0.001$ ) when controlling for sex. Children admitted at lower percentages of the reference median value had significantly longer lengths of stay in the NRCs than those admitted at higher percentages weight-for-height.

**Table 8. Average Length of Stay in NRC for Children Receiving All of Their Rehabilitation from NRCs**  
(n=161)

Mean % Weight- for-Height on Admission	Duration of Stay in NRC in Days					
	Male		Female		Total	
	N	Mean ( $\pm 1$ SD) [Median]	N	Mean ( $\pm 1$ SD) [Median]	N	Mean ( $\pm 1$ SD) [Median]
60-69	20	36.6 ( $\pm 12.6$ ) [33.0]	21	29.4 ( $\pm 9.3$ ) [27.0]	41	32.9 ( $\pm 11.5$ ) [31.0]
70-79	58	26.4 ( $\pm 11.5$ ) [22.0]	52	25.9 ( $\pm 8.1$ ) [23.5]	110	26.2 ( $\pm 10.0$ ) [23.0]
$\geq 80$	4	22.5 ( $\pm 3.7$ ) [21.0]	6	26.7 ( $\pm 8.9$ ) [22.5]	10	25.0 ( $\pm 7.3$ ) [21.5]
Total	82	28.7 ( $\pm 12.3$ ) [25.0]	79	26.9 ( $\pm 8.5$ ) [25.0]	161	27.8 ( $\pm 10.6$ ) [25.0]

Two-way ANOVA: Sex = Not significant

Mean % wt/ht at admission = Significant ( $p < 0.001$ )

## D. Outcome of Follow-up after Discharge

Of the 161 children who received their total rehabilitation at the NRCs, 87% were followed at home for at least one month after discharge, and 61% were followed-up at 12 months after discharge (Table 9). Loss to follow-up was most often due to the family moving away from the area, either temporarily, or permanently.

**Table 9. Follow-up Status of Children Discharged from NRC**  
(n=201)

Category for child	Total Rehabilitation at NRC		Part of Rehabilitation at other Facility		Total No. of Children Rehabilitated	
	n	%	n	%	n	%
Discharged	161	100	40	100	201	100
1-month follow-up	140	87	31	78	171	85
3-month follow-up	124	77	29	73	153	76
6-month follow-up	99	61	24	60	123	61
12-month follow-up	102	63	20	50	122	61

Children who were followed-up for the 12 months after discharge (122) showed an average increase of 15% of their percentage of the reference median weight-for-height when comparing discharge and admission percent weight-for-height. This improvement was maintained at one month after discharge, increased to 20% by the follow-up visit at six months after discharge, and to 28% by the 12 month follow-up visit (Tables 10 and 11).



**Table 10. Percentage of Reference Median Weight-for-Height at Time of Follow-up for Children Followed-up 12 Months after Discharge**

Admission % weight-for- height		Mean % of Reference Median Weight-for-height ( $\pm 1$ SD)				
		No.	Discharge	3 Months after Discharge*	6 Months after Discharge	12 months after Discharge
<60	NRC	0	0	0	0	0
	Refer	1	67.5 ( - )	59.1 ( - )	67.6 ( - )	80.0 ( - )
60-69	NRC	25	79.4 ( $\pm 2.1$ )	79.8 ( $\pm 9.9$ )	84.1 ( $\pm 8.8$ )	90.1 ( $\pm 13.1$ )
	Refer	9	79.5 ( $\pm 3.7$ )	82.0 ( $\pm 12.2$ )	84.9 ( $\pm 7.6$ )	90.4 ( $\pm 10.1$ )
70-79	NRC	69	84.2 ( $\pm 4.2$ )	88.5 ( $\pm 8.6$ )	88.7 ( $\pm 11.7$ )	94.5 ( $\pm 14.6$ )
	Refer	10	83.5 ( $\pm 4.3$ )	86.4 ( $\pm 8.0$ )	92.7 ( $\pm 10.8$ )	97.2 ( $\pm 14.4$ )
$\geq 80$	NRC	8	90.5 ( $\pm 1.7$ )	88.3 ( $\pm 6.2$ )	84.8 ( $\pm 5.8$ )	89.8 ( $\pm 11.7$ )
	Refer	0	0	0	0	0
Total	NRC	102	83.5 ( $\pm 4.6$ )	86.3 ( $\pm 9.5$ )	87.3 ( $\pm 10.8$ )	93.1 ( $\pm 14.1$ )
	Refer	20	80.9 ( $\pm 5.3$ )	83.0 ( $\pm 11.4$ )	87.7 ( $\pm 10.8$ )	93.3 ( $\pm 12.7$ )

NRC=Children receiving total treatment from NRC.

REFER=Children receiving part of their treatment from another facility or from home.

- \* Only 88 of the 102 children who were followed-up at 6 and 12 months were measured at three months follow-up. The average weight-for-height was essentially the same, however, when the 102 children were compared with the 88 at 6 and 12 months.

**Table 11. Proportional Change in Nutritional Status (% of Reference Median Weight-for-Height) for Children Followed-up 12 Months after Discharge**

% Weight-for-Height on Admission	Proportional Change in Weight-for-Height from Time of Admission to:					
	No.	Discharge Mean ( $\pm 1$ SD)	3 Months after Discharge Mean ( $\pm 1$ SD)	6 Months after Discharge Mean ( $\pm 1$ SD)	12 Months after Discharge Mean ( $\pm 1$ SD)	
<60	NRC	0	0	0	0	0
	Refer	1	23.8 (----)	8.4 (-----)	23.8 (----)	46.5 (-----)
60-69	NRC	25	19.2 ( $\pm 4.8$ )	19.7 ( $\pm 14.1$ )	26.2 ( $\pm 12.8$ )	35.1 ( $\pm 19.3$ )
	Refer	9	19.8 ( $\pm 8.1$ )	23.2 ( $\pm 16.3$ )	27.7 ( $\pm 9.6$ )	36.3 ( $\pm 16.6$ )
70-79	NRC	69	13.7 ( $\pm 4.3$ )	19.3 ( $\pm 12.1$ )	19.6 ( $\pm 14.9$ )	27.8 ( $\pm 20.4$ )
	Refer	10	11.9 ( $\pm 5.9$ )	15.5 ( $\pm 8.3$ )	23.7 ( $\pm 13.0$ )	30.2 ( $\pm 19.9$ )
$\geq 80$	NRC	8	11.2 ( $\pm 3.1$ )	8.5 ( $\pm 7.5$ )	4.2 ( $\pm 6.2$ )	10.5 ( $\pm 14.5$ )
	Refer	0	0	0	0	0
Total	NRC	102	14.9 ( $\pm 5.0$ )	18.4 ( $\pm 12.6$ )	20.2 ( $\pm 14.8$ )	28.2 ( $\pm 20.5$ )
	Refer	20	16.1 ( $\pm 7.9$ )	18.6 ( $\pm 12.8$ )	25.6 ( $\pm 11.0$ )	33.8 ( $\pm 17.9$ )

NRC=Children receiving total treatment from NRC.

REFER=Children receiving part of their treatment from another facility or from home.

$$\text{Mean proportional change} = \frac{\sum \frac{f-a}{a}}{n},$$

where: a=% of reference median at admission

f=% of reference median at follow-up

n=number of children

While there was an increase in the mean percentage weight-for-height for both males and females who were followed-up at one month, three months, six months, and 12 months after discharge, a review of individual children showed that 65 of the children (40% of the discharges from the NRC rehabilitation) had decreased in percentage weight-for-height from the time of discharge to the first month follow-up, although most remained at above 80% of the reference median weight-for-height.

Twenty-one (17%) of the children who were followed-up remained below 80% of the reference weight-for-height at three months after discharge. The others had regained to above 80% of the reference weight-for-height. A major clinical finding in the children who remained below 80% weight-for-height at the three months follow-up was lower respiratory tract infection (33%) and diarrhoea with or without lower respiratory tract infection (19%). The others had other illnesses (skin infection, dysentery, etc). All of these children received medical treatment from the NRC during the follow-up, with severe cases being referred to other facilities for more intensive treatment. Of these 21 children, three were subsequently readmitted within the study period and one readmitted one year later (2.5% readmission rate). In addition, two of the children themselves were readmissions from a previous NRC admission. By the six-month post-discharge follow-up visit, six of these children were lost to follow-up and nine remained below 80% weight-for-height but the guardian refused readmission (usually citing inability to spend full days away from the house another time). Four of the children remaining below 80% weight-for-height, however, were increasing in their percentage weight-for-height. Three of the 21 children had improved to above 80%

(and maintained this at 12 months follow-up), and as mentioned above, three of the 21 children were readmitted. There were no significant differences by sex or age for the children who remained below 80% weight-for-height.

For the referred children who returned to the NRC for follow-up (n=40), 78% were followed-up at home for at least one month after discharge, 60% for six months, and 50% for 12 months. These children showed a pattern similar to that seen in the children receiving total treatment from the NRC during follow-up. While their average percentage improvement in weight-for-height was larger than that of the children who were rehabilitated only at the NRCs, the difference was not significant (Tables 10 and 11). A significantly higher number of these children fell to below 80% weight-for-height at three months follow-up (38% compared to 17% for children receiving all of their rehabilitation from the NRCs). The illnesses and reasons for refusal to be readmitted were similar to those described for the children who had received all of their rehabilitation from the NRCs.

By the follow-up visit at 12 months after discharge, 13 (13%) of the children who had been completely rehabilitated at the NRCs were below 80% weight-for-height, and three (15%) of the children who had been referred as a part of their treatment were below 80% weight-for-height. This gave an overall figure of 13% recurrent malnutrition in the 122 children who were followed-up for 12 months after discharge.

## **E. Discussion**

The improvement in nutritional status followed expected patterns for nutritional rehabilitation.<sup>1</sup> Proportional increase in percentage weight-for-height showed an inverse relationship with the weight-for-height upon admission (correlation -0.48,  $p < 0.001$ ). The majority of the children improved and maintained the improvement in weight-for-height after discharge. Thus, levels of nutrition above 80% of the reference median weight-for-height were maintained upon return to the normal home environment for 80% of the children followed-up at three months after discharge and for 87% who were followed-up at 12 months after discharge ( $n=122$ ).

The high percentage of children (39%) lost to follow-up by 12 months after discharge is not surprising, given the high levels of mobility in the slum population.<sup>3</sup> There was no significant difference in the admission or discharge nutritional status of the children who were followed-up and those who were lost to follow-up, although there may have been differences in family stability and/or socioeconomic condition which would make the lost to follow-up children at higher risk for recurrent malnutrition. Thus, the recurrent malnutrition rate at 12 months after discharge of 13% for those children receiving all of their rehabilitation from the NRC (and 15% for those who were referred) may not be representative of the outcome for the children who were lost to follow-up.

The children admitted to the NRCs were representative of the urban slum population with regards to sex and age composition for levels of malnutrition documented in the community.

The Bangladesh Bureau of Statistics 1989-1990 survey results showed that female children tended to be slightly more malnourished than male children. The Urban Surveillance System (USS) of the UHEP at ICDDR,B has also documented higher levels of malnutrition in girls in the urban slum population. In a survey of urban slum children done during July-September 1991, 17.4% of the females were below 80% weight-for-height in contrast to 14.8% of the males.<sup>4</sup> The USS data also showed that a larger percentage of children aged less than two years were malnourished than those who were between 3 - 5 years of age. More female children were admitted to the centre and the largest percentage of the admissions were below two years of age.

The high percentage of children who were fourth or higher in birth order is also consistent with findings elsewhere of risk for malnutrition.<sup>5</sup>

The USS has shown 87% of the women of childbearing age have no formal education, while 10% have between 1 - 5 years of schooling.<sup>3</sup> Thus, the mothers of the malnourished children were representative of the mothers from urban slums with respect to education.

## **F. Conclusion**

Nutritional Rehabilitation Centres, operated in the community and by community women, which have home follow-up after discharge and technical backup for medical treatment, can be effective in providing a sustainable improvement in the nutritional status of moderately and severely malnourished children. The community women effectively identified malnourished children requiring referral for treatment, provided the necessary rehabilitation, and the necessary follow-up with a completed rehabilitation rate of 80%. They had an overall success rate in maintaining acceptable levels of nutrition after discharge in over 80% of the children discharged from nutritional rehabilitation.

### **III. Effectiveness of Nutritional Rehabilitation Centres as a Program Intervention to Decrease Levels of Malnutrition in Community**

Evaluation of the NRCs as a program intervention requires not only an evaluation of the impact of the program on individual children, but also evaluation of the impact of the program on levels of malnutrition in the communities, cost effectiveness of the program, and a review of issues relating to community support and participation which would contribute toward sustainability of the intervention.

#### **A. Impact on Malnutrition in Community**

Results from a 1991 survey conducted by the UHEP in the slum areas of Dhaka showed that an estimated 16% of the children from six months to five years of age were below 80% of the reference median weight-for-height. When the data for the households within the catchment areas of the NRCs were analyzed separately, it showed an average of 12% of the children below 80% weight-for-height. While the better nutritional level seen in the NRC areas compared to the general USS slum population is significant ( $p < 0.005$ ), this cannot necessarily be attributed to NRC impact as there is no comparison data to determine the levels of malnutrition prior to the opening of the NRCs. Even if the better nutritional status was due to the NRC intervention, a continued level of malnutrition of



12% of children below 80% of the reference median weight-for-height is extremely high for areas which have been served by NRCs for three to five years.

## **B. Coverage and Attendance**

Our assessment of the NRCs showed that poor coverage, either through lack of identification of malnourished children, lack of referral, or lack of attendance, and a 20% drop out rate were the main elements contributing to continued high levels of malnutrition, despite the presence of NRCs in the community.

It was estimated that approximately 6,140 children aged less than five years lived within the catchment areas for the two centres. Using the USS 1991 nutritional surveillance data for the areas around the NRCs, an estimated 737 (12%) of the children should have been eligible (i.e. below 80% of the reference median weight-height) for rehabilitation from the centres.\* Thus, if all admissions were from the catchment areas, an estimated 34% of the eligible children from the catchment areas actually attended the NRCs over the year. The children from the catchment areas, however, comprised only 76% of the admissions to the NRCs. The remaining 24% of the children attending the NRCs were from outside the catchment areas, referred by enthusiastic volunteers or mothers who had

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\* Assuming 12% of the children were below 80% weight-for-height, from the USS 1991 survey for the areas around the NRCs.

attended the NRC with their child. Thus, in fact, only 26% of the children estimated as malnourished within the catchment areas attended the NRCs over the year and 20% of these dropped out prior to completing rehabilitation.

The drop out rate of 21%, while high, is not unusual. The drop out rates at this level or higher have been documented in other nutritional rehabilitation programs.<sup>6,7,8,9</sup> The reasons which were given for the children in this study dropping out included:

- The family moved back to the village (41%)
- Distance (13%)
- Working mother, sick mother, or no one could accompany the child to stay in the NRC (29%).

The larger percentage of the female children, who dropped out of the program and the shorter mean number of days of attendance for the females prior to dropping out compared to the male children, is consistent with findings regarding less use of health services by females or for female children in Bangladesh.<sup>10</sup>

## **C. Cost**

An analysis of cost per child showed that the average cost of treating a child for an average of four weeks in the NRC plus the home visits for follow-up was US\$ 104.<sup>11</sup> This does not include the additional cost for rehabilitation which was incurred by children attending referral facilities. Thirty-one percent of the children had these additional costs. In addition, for the 2.5% of the children who were readmitted, the cost would be double.

Using this as a baseline, the question must be raised if a higher percentage of children could be reached with more impact on levels of malnutrition in the community for the same (or less) cost, using alternative program interventions.

## **D. Community Participation**

In the urban slum areas of Bangladesh, it is not realistic to expect the community to financially support major programs without external funding.\* Community participation could be expected, however, for building maintenance and repair, raising awareness of the activities of the NRCs, participating in identifying children requiring treatment at the

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\* One local committee has approached the UHEP to take over the NRC, however, they are looking for donor funding as they do not feel that they can maintain the program with community resources.

NRCs, and working on community strategies which would enable mothers to attend the NRCs for the course of treatment for their children.

One of the objectives in operating the community-based NRC was to involve the community, and to determine if community support could maintain such a centre. While more evaluation and analysis needs to be done in this regard, the experience of the UHEP is that community support for the centre, while the UHEP has been maintaining the day-to-day operation, has been very positive verbally, but has not been shown when inputs (maintenance and repair, security, participation in the program) have been requested.

## **E. Discussion**

Some reasons for continued high levels of community malnutrition in the Dhaka slums targeted by UHEP may include:

- Lack of identification of malnourished children and/or lack of attendance at the centres
- Drop out from the NRC program after identification and receiving some treatment
- Lack of maintenance of improvement in malnutrition after discharge

It would appear that one obvious reason for continued high levels of malnutrition in the community around the NRCs is that many of the

children are not reached by the program. Those children who are reached and who attend the NRCs show improvement in their nutritional status which is sustained after discharge back into the community.

The urban volunteers only work in small pockets within the NRC catchment areas, so self-referral and community participation in motivating attendance are important aspects of coverage. The lack of identification of malnourished children and lack of motivation for them to attend the NRCs may reflect a general unawareness in the community of signs of malnutrition in children and the need for intervention, as well as a lack of awareness of the NRC activities. In addition, anecdotal evidence is that there are mothers who do not attend the centres even if they know of them and would like care for their children. Reasons given are similar to the reasons for drop out from the program, with the major factor being problems which occur when they are required to spend all day away from home.

A dissemination of lessons learned in the NRCs by the mothers, which would be expected to prevent malnutrition as more mothers participate in the NRC program and then return to their communities, is not apparent. Rather, the program appears to have an impact on the individual child only. Further studies would need to be conducted to determine if change in nutrition practices prevented malnutrition in other children of the same households which attended the NRCs.

The problems seen with low coverage and the reasons for low coverage are not unique to this particular setting or type of nutritional

rehabilitation program. Reports by Smith<sup>9</sup> and Godfrey<sup>7</sup> show that low coverage as well as high drop out rates are an issue for many onsite nutritional rehabilitation as well as supplemental feeding centres. The disruption to families and lack of a caretaker at home for the house or for other children are often cited as reasons not to attend onsite feeding.

Drop out rates over 20%, although seen elsewhere, are high. In addition, although children were to stay in the program until they were 80% of their reference median weight-for-height and met the other specified criteria, the reality was that some left early. Fifty-five (34%) of the children were discharged at below 80% of their reference median weight-for-height. The majority of these, however, were borderline cases which were above 80% when the NRC staff calculated the percentage weight-for-height manually. Reasons for dropping out or requesting early discharge were complaints by the mother that she could no longer attend the centre, often citing time, logistic constraints, employment, and need to care for other children at home.<sup>9</sup> In the urban slums of Dhaka approximately, 34% of the women are employed, either inside or outside their homes.<sup>3</sup> Thus, the need to stay at a centre for several weeks becomes an economic burden.

It would appear that in Dhaka, in addition to general problems with attendance, the difference in drop out rates for male and female children indicates that there is a selection process. More inconvenience may be tolerated for the rehabilitation of male children than for female children.

The economic cost per child, the social cost, in terms of disruption of the family, as well as the coverage achieved in the community for malnourished children are issues to be considered when a centre-based nutritional program is implemented. The demonstrated effectiveness of low technology nutritional rehabilitation programs such as these (for the children who attend) raises the question of the necessity of uncomplicated moderately or severely malnourished children actually staying in a centre for feeding and the necessity of daily contact with trained staff.

## **F. Conclusion**

The NRCs as they currently operate require low levels of technical staff and only weekly professional input. Yet children who participate in the program have shown sustained improvement in nutritional status up to one year after discharge. The effectiveness of these centres, however, as a program intervention to decrease malnutrition in the community is limited due to low coverage. In addition, there is no evidence to show that education imparted through the centres is helping to prevent the development of malnutrition in children within the catchment area.

## **IV. Recommendations for Future Research**

Varied approaches to addressing moderate and severe malnutrition in children have been advocated and implemented in developing countries. These have ranged from inpatient hospitalization for treatment by skilled professionals, to home-based nutritional rehabilitation.<sup>12,13,7,14</sup>

Evaluations of these programs have addressed issues, such as impact of the program on the level of nutrition of individual children, the sustainability of the improvement after discharge from the program, overall program sustainability, and the impact of the nutritional interventions on prevention of malnutrition in communities as a whole. Conclusions have generally outlined advantages and disadvantages within these different programs with an awareness that different situations warrant different approaches. While inpatient programs have shown good success in rehabilitating severely malnourished children, evaluations have often pointed out the weaknesses inherent in using acute care inpatient facilities for nutritional rehabilitation. These include a high cost per child, low coverage of the population, as well as concerns that lessons learned in hospitals are not necessarily transferable to the home setting.<sup>15,12,16</sup> While there is an awareness that many malnourished children have concomitant medical problems which require professional diagnosis and treatment, there is equal acknowledgement of the benefit of providing nutritional rehabilitation as close to the home setting as possible.<sup>6,13</sup>

For the purposes of addressing malnutrition in the slums of Dhaka, several factors should be considered.



1. NRC program, using low technology and low levels of professional input was able to successfully rehabilitate 60% of the children who attended the program, with the trained community women providing medical treatment using protocols, with only weekly supervision by a physician. The 20% of the children who had serious medical complications were successfully identified and referred to the existing facilities which were provided at high levels of technical expertise to manage children requiring skilled professional care.
2. The most severe levels of malnutrition (i.e. less than 70% of the reference median weight-for-height) constitute only 1% of the slum children.<sup>4</sup>
3. The major weaknesses identified in the low technology NRCs were the lack of coverage and the 20% drop out rate. The reasons for these may include lack of community awareness of malnutrition, and lack of community and family support for the centre-based program. This translated into a lack of the support at home which would allow a guardian to spend full days away from home for the nutritional rehabilitation.

To increase the coverage of malnourished children by nutritional intervention activities, the effectiveness of a home-based nutritional rehabilitation program could be investigated. There are indications from other programs using home-based nutritional rehabilitation that they can be effective. These programs have recognized the need to decrease

problems found with coverage and compliance for onsite rehabilitation centres<sup>6,17</sup>, but have also acknowledged the limitations of the programs for the management of 'complicated' children.<sup>7,18,19</sup>

The referral services which are needed for complicated malnourished children already exist in Dhaka, and have been used successfully by the NRCs. Thus, there is no need, in the Dhaka setting, for the home-based program to conduct all levels of rehabilitation. Depending on the final model, a home-based rehabilitation program can include weekly centre-based activities for medical assessment and group education, a supplement which is provided to the mother weekly, with the major part of the program being home follow-up.

High levels of chronic malnutrition are seen in Bangladesh (42.3% of the urban children were found to be below 60% weight-for-age<sup>20</sup> and in the children at the NRCs (an average weight-for-age of 58% upon discharge (Table 9)). A home-based nutritional rehabilitation program would hopefully expose a larger percentage of the total population, who might not be acutely malnourished, but are chronically malnourished, to the nutritional education and changes in feeding practices which would be taught. This would be particularly important at the household level, where fathers and/or mother-in-laws may be the principal decision-makers regarding purchasing of food and feeding habits. Ojofeitimi<sup>21</sup> raised this issue when studying the knowledge and perceptions of fathers regarding the causes and management for childhood malnutrition in Nigeria.

It could logically be hypothesized that with home-based nutritional rehabilitation, the sustainability of the nutritional status achieved under supplementation would increase and the incidence of malnutrition in the community decrease. The intervention would be carried out in the normal environment of the child, where behavior changes required for improved nutrition might be more sustainable.

Thus, a home-based nutritional intervention program would be a logical next step in addressing interventions which not only manage malnutrition, but are also better structured to prevent it.

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## ICDDR,B Endowment Fund

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Each year, ICDDR,B treats over 70,000 patients attending its two hospitals, one in urban Dhaka, the other in rural Matlab. Though they are planted in Bangladeshi soil, they grow because of the dedication of thousands of concerned people throughout the world. The patients are mostly children with diarrhoea and associated illnesses and the services are offered free to the poorer section of the community.

Since these services are entirely dependent on financial support from a number of donors, now we at the ICDDR,B are establishing an entirely new endeavour: an ENDOWMENT FUND. We feel that, given securely implanted roots, the future of the hospitals can confidently depend upon the harvest of fruit from perpetually bearing vines.

To generate enough income to cover most of the patient costs of the hospitals, the fund will need about five million US dollars. That's a lot of money, but look at it this way:

**JUST \$150 IN THE FUND WILL COVER THE COST OF TREATMENT FOR ONE CHILD EVERY YEAR FOREVER !**

We hope you will come forward with your contribution so that we can keep this effort growing forever or until the world is free of life-threatening diarrhoea. IT IS NOT AN IMPOSSIBLE GOAL.

For more information please call or write to:  
Chairman, Hospital Endowment Fund Committee  
GPO Box 128 - Dhaka, 1000, Bangladesh

Telephone: 600-171 through 600-178  
Fax: (880-2)-653116



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