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Principal Investigator: Maureen Black Trainee investigator (if any): _____

Application No: 77-021 Supporting Agency (if Non-CRL): Funds Applied

Title of study: Widow's Status Project status: Yes
Child Development in Bangladesh
 New Study
 Continuation with change
 No change (do not fill out rest of form)

Circle the appropriate answer to each of the following (If Not Applicable write NA):

1. Source of Population:
 - a) Ill subjects Yes No
 - b) Non-ill subjects Yes No
 - c) Minors or persons under guardianship Yes No
 2. Does the study involve:
 - a) Physical risks to the subjects Yes No
 - b) Social risks Yes No
 - c) Psychological risks to subjects Yes No
 - d) Discomfort to subjects Yes No
 - e) Invasion of Privacy Yes No
 - f) Disclosure of information possibly damaging to subject or others Yes No
 3. Does the study involve:
 - a) Use of records (hospital, medical, death, birth or other) Yes No
 - b) Use of fetal tissue or abortus Yes No
 - c) Use of organs or body fluids Yes No
 4. Are subjects clearly informed about:
 - a) Nature and purposes of study Yes No
 - b) Procedures to be followed including alternatives used Yes No
 - c) Physical risks Yes No
 - d) Sensitive questions Yes No NA
 - e) Benefits to be derived Yes No
 - f) Right to refuse to participate or to withdraw from study Yes No
 - g) Confidential handling of data Yes No
 5. Will signed consent form be required:
 - a) From subjects Yes No
 - b) From parent or guardian (if subjects are minors) Yes No
 6. Will precautions be taken to protect anonymity of subjects: Yes No
 7. Check documents being submitted herewith to Committee:
 - Umbrella proposal - Initially submit an overview (all other requirements will be submitted with individual studies).
 - Protocol (Required)
 - Abstract summary (Required)
 - Statement given or read to subjects on nature of study, risks, types of questions to be asked, and right to refuse to participate or withdraw (REQUIRED)
 - Informed consent form for subjects
 - Informed consent form for parent or guardian
 - Procedure for maintaining confidentiality
 - Questionnaire or interview schedule *
- * If the final instrument is not completed prior to review, the following information should be included in the abstract summary:
1. A description of the areas to be covered in the questionnaire or interview which could be considered either sensitive or which would constitute an invasion of privacy.
 2. Examples of the type of specific questions to be asked in the sensitive areas.
 3. An indication as to when the questionnaire will be presented to the Board for review.

I agree to obtain approval of the Review Board on Use of Human Volunteers for any changes involving the rights and welfare of subjects before making such change.

Maureen Black Principal Investigator
 _____ Trainee

Received 1/17/79
77-021

SECTION I - RESEARCH PROTOCOL

- 1) Title: Nutritional Status and Child Development in Bangladesh.
- 2) Principal Investigator: Maureen Black
- 3) Starting Date: January 1, 1978
- 4) Completion Date: June 30, 1979
- 5) Total Direct Cost: One Year \$ 30,218 Total \$ 43,125
- 6) Abstract Summary:

Nutritional deprivation is a severe medical problem in developing nations and may have both immediate and long-term effects on physical growth. However, the relationship between nutritional status and other areas of development has not been well documented.

In this study physical, neurological, sensorial, cognitive, emotional, and social development will be investigated among rural and urban children of varying nutritional statuses over a one year period. Thus, it will be possible to establish specific developmental norms for children and to identify developmental areas that appear to be closely associated with nutritional status. From these findings comprehensive intervention and evaluation programs can be designed to focus on areas of development that appear most vulnerable to nutritional deprivation.

- 7) Reviews:
 - a) Research Involving Human Subjects: _____
 - b) Research Committee: _____
 - c) Director: _____
 - d) BMRC: _____
 - e) Controller/Administrator: _____

SECTION II - RESEARCH PLAN

A. INTRODUCTION

1. Objective: The relationship between nutritional status and physical growth has been well documented; however, relationships between nutrition and other areas of development, including neurological, sensorial, cognitive, emotional, and social development, remain controversial. The objectives of the proposed research are: 1) to identify the developmental changes that accompany medical recovery from an acute state of nutritional deficiency and 2) to assess the rate and sequence of growth and development in both well nourished and chronically undernourished young children.

2. Background: The reduced weight (wasting) and reduced height (stunting) commonly seen in nutritionally deficient children provide strong evidence both for the immediate and longlasting effects of inadequate nutrition (Waterlow & Rutishauser, 1974). Moreover, investigators have begun to explore associations between impairments in physical growth and impairments in other areas of development, particularly neurological development and mental ability. Differences in learning capacity have been reported between well nourished and poorly nourished children (Cravioto & Robles, 1965; Monckeberg, 1968) and several authors (Cravioto, Delicardie, & Birch, 1966) have suggested three possible connections between nutritional status and learning ability:

1. Children who are malnourished may have permanent central nervous system damage which impairs their ability to learn.
2. Children who experience severe acute episodes of malnutrition may lose learning time while they are recovering from their malnutrition.
3. Children who suffer from malnutrition may have their development interrupted at vulnerable points such that they are unable to resume an orderly sequence of growth.

Retrospective research and ethical considerations have made it difficult to test these hypotheses and many researchers have turned to animal models.

In a series of animal studies Dobbing (1964, 1974) has argued that nutritional deprivation during the neurological growth spurt leads to permanently reduced brain size and deficient myelination. Winick (1968, 1974) has reported similar findings from brains of infants who died of severe malnutrition. However, the attempts to document associated changes in learning have been less conclusive. Not only do animals with a history of nutritional deprivation respond differentially to food (Barnes, Neely, Kwong, Iabadau, & Frankova, 1968; Levitsky & Barnes, 1970), but they apparently become hypersensitive to aversive

stimuli (Levitsky & Barnes, 1970). These behavioral changes restrict the use of reinforcers to assess learning potential and the proposed association between nutritional deficiency, neurological impairment, and learning remains clouded.

Nevertheless, the changes in responsiveness to environmental stimuli displayed by previously nutritionally deprived animals may have a significant impact on hypothesis relating nutritional deprivation to developmental changes in children. For example, several authors (Frankova, 1974; Frankova & Barnes, 1968) have demonstrated that previously nutritionally deprived animals are less explorative and less active than well fed animals, unless they are placed in a stressful situation, in which case they are highly active (Frankova & Barnes, 1968; Zimmermann et al., 1972). Furthermore, prior to weanling, poorly nourished animals have few social encounters (Frankova, 1974; Zimmermann et al., 1974) and after weanling, their social interactions are dominated by aggressive responses (Frankova, 1974; Zimmermann et al., 1974). The abnormal social interactions of poorly nourished animals may begin with abnormal maternal interactions since mothers who are not well nourished are less nurturant toward their offspring than their well fed counterparts (Slob, Snow, & Nastris, 1973). Similarly,

poorly nourished weanlings are small and likely to remain inactive, demanding little interaction from their mothers. These findings, plus those that demonstrate the synergistic relationship between nutrition and environmental stimulation (i.e. stimulation appears to alleviate some of the severe consequences of nutritional deprivation) (Elias & Samonds, 1977), suggest that nutritional deprivation may influence an organism's ability to interact successfully with the surrounding environment. Such a hypothesis is much more complex than one relating nutritional deprivation to intellectual impairment through neurological damage and consequently warrants a comprehensive assessment of developmental changes in nutritionally deprived children rather than an assessment limited to learning ability.

Malnourished children have been described as lethargic and unresponsive (Birch, 1972) and probably do lose learning time while they are recovering and suffer from a disruption to their normal developmental pattern. However, the longterm consequences of the hiatus in their growth are unknown. Nevertheless, researchers who have generated longitudinal data on specific aspects of development, rather than cross sectional data on general indices of mental ability seem more able to address the three hypotheses regarding developmental changes posed earlier (Cravioto et al., 1966; Yarbrough,

Lasky, Habicht, & Klein, 1974).

Research on the relationship between nutritional status and development has been further complicated by the cultural components of the problem. Not only is nutritional deprivation more prevalent among lower socioeconomic groups than among middle and higher socioeconomic groups, but it is also more prevalent in developing nations, than in industrial nations. Thus, it is mandatory to have culture free assessments of development that address specific hypotheses regarding nutritional status and growth (Yarbrough et al., 1974). In addition to physical status, researchers have begun to focus on specific areas of child development and data are available in at least four areas:

1. Sensory integration. Birch and Lefford (1963) developed an assessment of intersensory integration in which children are presented shapes in two of three modalities (visual, tactile, and kinesthetic) and asked to judge if the shapes are the same or different. The ability to process input simultaneously from several sources is a prerequisite for reading (Birch & Belmont, 1964) and several researchers have reported that children with histories of nutritional deprivation have difficulty with intersensory discriminations (Cravioto, 1968;

Champakam, Srikantia, & Gopalan, 1968; Klein, 1975; Yatkin & McLaren, 1970).

2. Exploration. Children learn about their environment through the dual processes of assimilation and accomodation (Piaget, 1965). During assimilation children incorporate environmental input into their existing mental structure and during accomodation children change their mental structure to incorporate novel environmental influences. However, both processes require children to actively explore their environment. Reduced activity and attention have been widely reported findings among nutritionally deprived animals and children and may explain some of the apparent deficits in mental ability. For example, rather than general learning deficits, nutritionally deprived children may be withdrawing from their environment and temporarily inattentive to all external demands.

3. Reciprocity. From birth mothers and their infants build a reciprocal system of interaction in which each response becomes a stimulus for further action (Bell, 1971). For example, children who are lethargic and unable to suck will not stimulate the release of milk from their mother's breasts and will therefore receive less milk than more active children. The conceptualization of children

as controllers of their environment enables exploration of the antecedent conditions of nutritional deficiency without viewing nutritional status solely as a causative agent. In other words, researchers are asking if it is possible to predict nutritional deficiency prior to its occurrence (International Union of Nutritional Sciences Report, 1977).

Waldrop and Bell (1966) developed a family size and density (FSD) score based on number of children, span in months between births, and months to next oldest sibling. The FSD was an accurate predictor of food intake and correlated positively with lethargy and negatively with sucking and crying, suggesting that closely spaced children are less interactive with their surroundings. Furthermore, Pollitt (1973) has suggested that mothers react adversely to lethargic offspring by inhibiting their own interactions toward their children. In Calcutta, Graves (1976) observed mother-child interactions between well nourished and poorly nourished (but not hospitalized) children age 7-18 months. Not only were the poorly nourished children more lethargic and more likely to remain close to their mothers, but mothers were significantly less responsive to their poorly nourished offspring. These findings

illustrate the interplay of nutrition and social interaction patterns and may provide inferences on intervention patterns. If, for example, there is less reciprocity among poorly nourished children and their mothers, would efforts to increase their reciprocal interactions through stimulation to the child and education to the mother have an effect on feeding patterns?

4. Maternal Factors. Birch (1972) has suggested that nutritional deficiency is part of a medical social chain of events that originates in the childhood of the mother. Since adequate nutrition during childhood is necessary for proper formation of the pelvic region for childbearing, women with a history of nutritional deprivation may have a reduced efficiency for producing healthy children. Likewise, women who did not receive proper food during their own childhood may have inadequate knowledge of nutritional requirements for their children. If mothers play such crucial roles in controlling the nutritional status of their children, then effective treatment and preventive programs should have a large focus on maternal health and education. However, there are currently no data in Bangladesh relating either developmental or maternal factors to nutritional status.

3. Rationale: Nutritional deprivation is a severe medical problem among children in Bangladesh; however, the relationship between nutritional deficiency and normal child development is unknown. Findings from other areas of the world have shown that nutritional deprivation is a social issue affecting both current functioning and parenting for subsequent generations (Birch, 1972). Therefore, attempts to alleviate nutritional deprivation must extend beyond provision of food or money to include changes in education, attitudes, and habits (Jelliffe & Jelliffe, 1972). However, with no knowledge of the developmental changes that accompany medical recovery from severe nutritional deprivation or of the rate and sequence of growth and development among children of varying nutritional status, comprehensive evaluations of nutritional programs cannot be complete.

Currently there is a unique opportunity to gather data on the relationship between nutritional status and child development in three settings in Bangladesh. The Children's Nutritional Unit (CNU), sponsored by Save The Children Fund, maintains a hospital in Dacca for children with severe malnutrition (third-degree - 60% below standard weight for age, Gomex et al., 1955) and an outpatient clinic for children with less severe nutritional deprivation. Children admitted to the hospital remain approximately 8 weeks, until their weight/

age reaches 90% of the local standard weight for age. During this period of inpatient medical recovery, biweekly assessments of factors such as strength, sensory integration, cognition, interpersonal relations, and exploration would yield a descriptive progression of developmental changes.

Less than two miles from CNU is the Children's Health Center, a clinic sponsored by the Community Health Research Association and run by Dr. Muttalib. Children from birth through adolescence are seen during regularly scheduled visits (every six months for children over three years of age) and longitudinal data on their medical status (including height and weight) are maintained. The families attending the Children's Health Center (CHC) pay a nominal annual fee and represent a wide socioeconomic range of health concerned families. By gathering developmental data for at least one year on a sample of urban children whose medical history is known, a range of developmental norms for an urban health concerned population can be established.

In Bangladesh approximately 92% of the population live in rural areas. Meheran is a village in the Comilla District and is part of the Cholera Research Laboratory's field surveillance area. For the past several years Dr. M. Khan has been gathering anthropometric data on the Meheran children between birth and 10 years of age.

These data could be used to divide children into two groups - poorly nourished (but not hospitalized) and well nourished. By gathering the same developmental data as gathered from the urban population, not only will rural/urban comparisons be possible, but also developmental comparisons as a function of nutritional status.

The data from these three sources will form a descriptive baseline for the relationship between nutritional status and child development in Bangladesh. Once these data are available, subsequent research can be designed to assess the effectiveness of various intervention programs on children's growth and development.

B • SPECIFIC AIMS

1. To establish normative data on a comprehensive index of child development for children under the age of 6 years representing 3 populations:
 - 1) urban children from health concerned families;
 - 2) rural well nourished children;
 - 3) rural poorly nourished children.

2. To identify the sequence of developmental changes that accompany medical recovery from acute episodes of malnutrition.

5. To identify social, biological, or nutritional factors associated with longterm developmental improvement or repression following acute episodes of malnutrition.

C. METHODS - CHILDREN'S NUTRITIONAL UNIT

Subjects

The study population will include 60 children (30 males and 30 females) between the ages of 6 and 48 months admitted for inpatient treatment of marasmus or marasmus/kwashiorkor at CNU (third-degree nutritional deprivation - below 60% weight for age). Many of the children admitted to the hospital have secondary infections, particularly diarrhea or respiratory illnesses; however, no children will be included in the study who have more severe secondary complications (e.g., blindness). Children with tuberculosis may be included, but if their rate of development differs from children without tuberculosis, they will be analyzed separately. Since the design includes three and six month follow-ups, children in the study population must reside in Dacca.

Design

Children will be selected for inclusion in the study at admission and if parent permission is granted, developmental assessments will be administered twice a week throughout the hospital course, in addition to a battery of nutritional and medical assessments. Initially the assessments will be primarily observational (see Assessments section) and

involvement will be increased as recovery occurs. At discharge a battery of developmental and nutritional assessments will be done involving both the mother and child. This battery will be repeated once three months after discharge and again six months after discharge.

Data Collection

The observations and assessments will be administered by two graduates from Dacca University - either from the Psychology Department or from the Occupational and Physical Therapy Department. Following an extensive training period in which they will be taught both to administer the assessments and to analyze the resulting data, they will begin data collection (see attached schedules).

Assessments

The developmental variables associated with recovery from an acute state of nutritional deprivation include physical capacity, attention and activity level, cognitive and perceptual development, personal-social responsiveness, and independence in daily living activities. During the training phase of the project a hierarchy of items from each category will be organized into a brief, yet comprehensive assessment.

Throughout the course of hospitalization the following medical and nutritional data will be gathered:

1. Complete anthropometrics (height, weight, head circumference, and skin fold thickness) done twice weekly.

2. Total proteins and hematocrit done weekly until there is no edema and then every two weeks.
3. Clinical Recovery Form, a record of current clinical status (e.g., edema, skin condition, liver condition, etc) completed at least twice weekly.

These data will also be gathered at discharge and at the two three-month follow-up dates. In addition, the follow-up assessments will include an entire child development battery:

1. General development. The Denver Developmental Screening Test (DDST) provides a general index of development in four areas - personal-social, fine motor, language, and gross motor. It is an easily administered, widely used screening test applicable to all children under the age of six years. Thus, the establishment of local norms would greatly facilitate future child development research in Bangladesh.
2. Physical status.
 - a. Muscle testing - a standard procedure to determine the strength in each muscle group.
 - b. Grip strength - an objective measure of hand and forearm strength obtained by squeezing a dynameter.
 - c. Range of motion - a standard procedure to identify the range of movement in each muscle group.

3. Attention, activity, and exploration. An observation procedure in which children are placed on a mat with novel objects (blocks and clay) is currently being pilot tested with the collaboration of two faculty members from the Dacca University Psychology Department. The procedure may be used with children of all ages and yields data on the children's attentiveness, level of activity, and variety of exploration.
4. Cognitive ability.
 - a. For children under 30 months of age the Bailey Test of Infant Development will be administered. The Bailey is a widely used assessment that yields both a motor and mental score, thus providing more than an index of cognitive development.
 - b. For children over 30 months of ages several sub-tests of the Weschler Preschool and Primary Scale of Intelligence (WPPSI) will be administered. The WPPSI provides an assessment of cognitive ability among preschool children, with a particular focus on performance ability.
5. Sensory Integrative ability.
 - a. For children below 30 months the Uzgiris-Hunt Infancy Scale, based on Piaget's stage of sensori-motor development will be used. This assessment includes six ordinal scales:

- 1) visual pursuit and object permanence;
- 2) means for obtaining desired environmental events;
- 3) vocal and gestural imitation;
- 4) object relations in space;
- 5) operational causality;
- 6) schemes for relating to objects (Uzgiris & Hunt, 1975)

b. For children beyond 30 months several assessments of sensory integrative ability will be administered:

- 1) Birch & Lefford's (1963) procedure for comparison of visual, tactile, and kinesthetic input.
- 2) Auditory and visual discrimination tests (e.g. digit recall, embedded figures, etc.) and several sensory integrative subtests from the Southern California Sensory Integrative Test Battery (e.g. bilateral integration of body, imitation of postures, orientation in space, etc.)

6. Reciprocity. A 5 minute observation of mother-child interaction will be done to identify the degree of reciprocity between the mother and child and to assess the mother's instructional style. Specific scoring criteria will be developed to identify factors such as child's level of activity, mother's responsiveness, child's responsiveness, etc. (see Graves, 1976). Mothers

will be shown a simple task to teach their children and the tester will observe and score the interaction.

7. Maternal history and child rearing. Maternal height, weight, head circumference and skin fold thickness will be taken as a general index of past and present nutritional status. A questionnaire will also be orally administered to all mothers with items including:

- 1) Mother's history (education, occupation, size and spacing of family, etc.)
- 2) Father's education, occupation and material holdings.
- 3) Current family size and spacing
- 4) Independence training and responsibility expectations of the child.
- 5) Child's social maturity in family and community.

Analysis

The initial analysis of the inpatient data will be descriptive and frequency data for scores on the developmental assessments will be tabulated by age and nutritional status (defined by anthropometric data). From the frequency data a series of chi squares will be done to determine significant differences in developmental performance as a function of age and nutritional status. If electronic data processing facilities (computer) are available to store and process data, then a series of correlations will be done comparing

scores on developmental assessments with one another and with age and nutritional status. Thus, associations between performance on several developmental tests, age, and nutritional status may be more clearly defined. Furthermore, through factor analysis it may be possible to identify clusters of developmental scores that occur together during the recovery process. If path analysis is available, then the most frequent trends in developmental recovery may also be identified.

After children have been discharged then it may be possible to use developmental performance as an independent variable and divide children into three groups: 1) those whose developmental status improves after discharge, 2) those whose developmental status remains the same, and 3) those whose developmental status regresses. Thus it may be possible to look for group differences either in social structural variables, nutritional variables, biological variables, or the recovery process itself that may be associated with longterm developmental status. Additionally, the longterm developmental status of these children may be compared with children of the same age from the Children's Health Center and Meheran.

Schedule

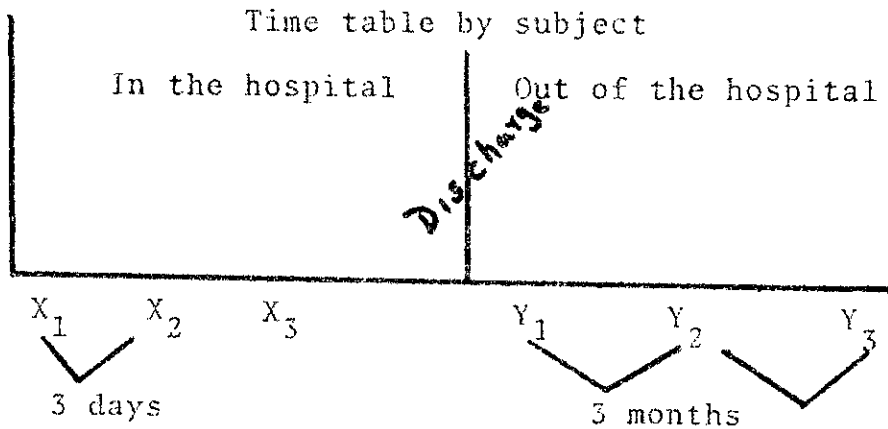
January - April 1978

1. Train local graduates in data collection, data tabulation and initial analysis.

2. Pilot test materials.

May 1978 - March 1979

1. Gather data
2. Initial tabulation.



X_1 - in hospital evaluation

Y_1 - discharge and follow-up evaluation.

April - July 1979

1. Complete data analysis training.
2. Analyze data.
3. Write report.

METHODS - CHILDREN'S HEALTH CENTER (CHC)

Subjects

One hundred forty (140) children from ages 0 through 6 years (20 per age) will be randomly selected from the files at CHC, such that girls and boys are equally represented. The children in the sample population must live in Dacca and not suffer from any severe illnesses.

Design

Once parent permission is granted children will be scheduled for two testing sessions covering a one year period (one session every six months). Newborns will be added at 6 month intervals thus, the design yields both longitudinal and cross sectional data. Parents will be sent reminders to bring their children to the clinic and a nominal incentive will be provided.

Data Collection

As with the CNU phase of the project, all data will be gathered by local graduates of Dacca University, trained in the administration of child development assessments. Although formal training is not scheduled to begin until January 1978 (see CHC schedule), two former students have been awarded fellowships through the Dacca University Grants Commission and are involved in a pilot project at CHC.

Assessments

The child development battery will include the same nutritional and developmental subtests that will be administered during the follow-up at CNU. Thus, the CHC children may serve as a control of health conscious urban families for the nutritionally deprived children seen at CNU.

Analysis

The data may be analyzed by grouping developmental scores both by age and by nutritional status. Chi square analyses

could then be done to identify significant differences in performance. Furthermore, using age and nutritional status as the independent measures, scores of the CHC children could be compared with scores of the CNU children, considering both single scores and rate of change. On the other hand, if developmental status is used as an independent measure, the two populations could be compared in terms of social structural variables, nutritional variables or biological variables.

Schedule

January - April 1978

1. Train local graduates in data collection.
2. Pilot test materials
5. Randomly select sample population and schedule appointments.

May - July 1978

1. Gather initial data

August - November 1978

1. Train in data analysis.
2. Analyze data.
3. Initial report.
4. Schedule second appointments.

December 1978 - February 1979

1. Gather second data

March - June 1979

1. Analyze data.
2. Second report.
3. Plan for subsequent research.

METHODS - MEHERAN

Subjects

Based on historical anthropometric data, the children below age six included in the CRL sample in Meheran will be separated into a poorly nourished group and a well nourished group. From each group 140 children representing ages 0 through 6 years will be randomly selected, such that an equal number of girls and boys are represented.

Design

The design is identical to that of the CHC urban population, such that assessments will be scheduled in specific three-month blocks (see Meheran schedule). Data will also be gathered by local graduates who will be trained in the same assessments as previously mentioned.

Analysis

The primary independent variables will be nutritional status (defined by nutritional history) and age. A series of chi squares will be done to identify differences in developmental performance and rate between the groups. Since the same assessments have been used in all three components of the project, data from the three components may be scaled and

compared. Thus, geographic background, nutritional status, age, nutritional history, or social background may serve as independent variables for comparison of developmental status.

Schedule

January - April 1978

1. Train local graduates in data collection.
2. Pilot test materials.

May - July 1978

1. Gather initial data

August - November 1978

1. Train data analysis
2. Analyze data
3. Initial report

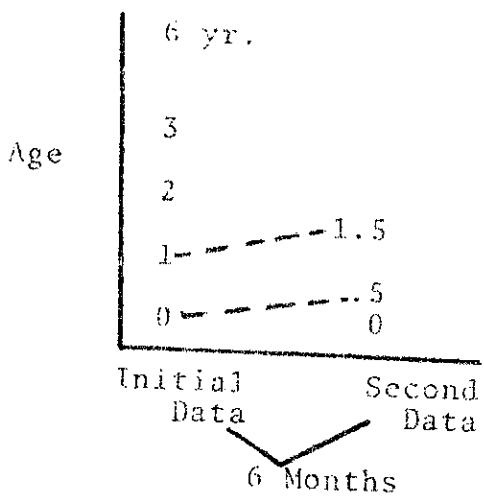
December 1978 - February 1979

1. Gather second data

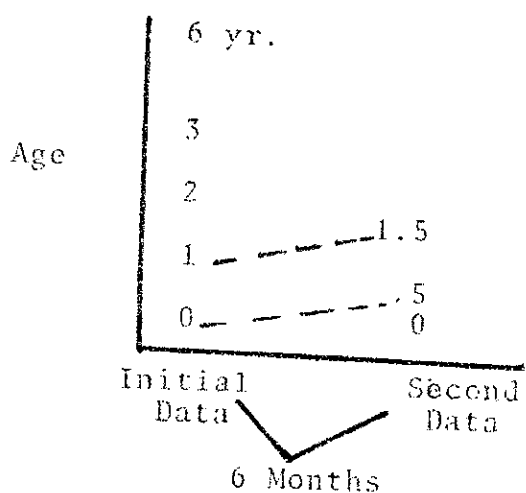
March - June 1979

1. Analyze data
2. Second report
3. Plan for subsequent research

Poorly nourished



Well nourished



D. SIGNIFICANCE

The primary significance of this project is the establishment of local norms for a comprehensive index of child development for both rural and urban populations. Child development is a broad term encompassing growth in a variety of areas and the proposed battery of assessments includes physical status, attention, exploration, cognitive ability, social maturity, mother-child reciprocity, and a questionnaire on historical and social structural variables. Thus, subsequent descriptions of child development in Bangladesh can focus on specific issues, rather than global generalities.

Once developmental norms are established, then research can be directed toward the relationship between various environmental factors and those norms. This project represents an initial attempt to define the relationship between nutritional status and child development in Bangladesh, studying not only those children who suffer an acute episode of malnutrition (CNU children) but also those who are chronically poorly nourished (poorly nourished group at Meheran). Inferences can be made both on the immediate relation between severe malnutrition and development and on the longrange relation between chronic undernutrition and development. The findings will serve as a data base for intervention studies by targeting the most vulnerable areas of development and identifying the social, and nutritional factors associated with developmental growth or retardation. Thus, future intervention projects may be

more specifically designed to focus on local variables associated with developmental status. Similarly, baseline data and locally administered assessments will be available to evaluate the effectiveness of future projects.

This project includes in-depth training for six graduates of the Dacca University. Throughout the course of the project the trainees will learn to administer a comprehensive battery of children assessments, analyze their results and write several reports. Since the project will be conducted in several phases (see schedules), the data analysis and report writing will be an ongoing part of the project, rather than a final task. The expertise that these trainees will gain should enable them to generate future projects, particularly using the data that have been generated. Thus, there will be six local psychologists or therapists with skills to evaluate the relationship between subsequent intervention projects and child development in Bangladesh.

FACILITIES REQUIRED

1. Office Space.
 - a. My home is available for training, data analysis, report writing, etc.
 - b. Children's Nutrition Unit.
Office space for two people
January 1978 - June 1979
Testing area for same time period.

- c. Children's Health Center
Office space for two people
January 1978 - June 1979
Testing area for sime time period.
- d. Meheran - Office, living, and testing space
for two people. May - July 1978 and
December 1978 - February 1979.
2. Laboratory space - already exists.
3. Hospital Resources - none required.
4. Animal resources - none required.
5. Logistical support - transport between Dacca and
Meheran approximately every two-
weeks May - July 1978 and
December 1978 - February 1979
6. Major items of equipment - none required.
7. Other - none required.

COLLABORATIVE ARRANGEMENTS

The Co-investigators represent a variety of areas and include:

- 1) Dr. M. Khan, Cholera Research Laboratory.
- 2) Dr. T. Jackson, Children's Nutrition Unit.
- 3) Dr. K. Brown, Children's Nutrition Unit.
- 4) Dr. M. Muttalib, Children's Health Center.

- 5) Dr. S. Zaman, Dacca University, Psychology Department.

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SECTION III - BUDGET

A. DETAILED BUDGET

1. PERSONNEL SERVICES

| <u>Name</u> | <u>Position</u> | <u>%</u> | <u>Annual Salary</u> | <u>Project Requirements</u> | |
|---------------|--------------------|-----------|----------------------|-----------------------------|----------------|
| | | | | <u>TAKA</u> | <u>DOLLARS</u> |
| Maureen Black | Investigator | 80% | \$ 15,000 | - | 12,000 |
| M. Khan | Co-investigator | Voluntary | | | |
| T. Jackson | " | " | | | |
| K. Brown | " | " | | | |
| M. Muttalib | " | " | | | |
| S. Zaman | " | " | | | |
| To be named | Trainee | 100% | Tk. 14,400 | 14,400 | |
| " | " | " | " | 14,400 | |
| " | " | " | " | 14,400 | |
| " | " | " | " | 14,400 | |
| " | " | " | " | 14,400 | |
| " | " | " | " | 14,400 | |
| " | Secretary | " | " | 14,400 | |
| " | Key Punch Operator | 10d | Tk. 11,448 | 440 | |
| " | Computer Programs | 15d | Tk. 42,000 | 2,423 | |
| " (Matlab) | Field Assistant | 50% | Tk. 16,056 | 8,028 | |
| Sub Total: | | | | 111,691 | 12,000 |

2. SUPPLIES AND MATERIALS

| <u>Items</u> | <u>Unit Cost</u> | <u>Amount Required</u> | |
|----------------------------------|------------------|------------------------|--------|
| Biochemical tests for | | | |
| serum solids & hematocrit | Tk. 0.25 | 1750 | 438 |
| Paper, pencils, clip boards etc. | | | 4,500 |
| Wooden toys locally made | | | 1,500 |
| Mats | Tk. 50/00 | 3 | 150 |
| Miscellaneous materials | | | 4,500 |
| to construct test packets | | | |
| Supplies to set up household | | | |
| for 2 people while in | | | |
| Meheran 6 months | | | 2,750 |
| Sub Total | | | 13,838 |

Project Requirements
TAKA DOLLARS

EQUIPMENT

| <u>Items</u> | <u>Unit Cost</u> | <u>Amount Required</u> | | |
|---|------------------|------------------------|-------|-------|
| Typewriter | \$ 250 | 1 | | 250 |
| Calculator | \$ 75 | 1 | | 75 |
| Filing Cabinet | Tk. 1,100 | 1 | 1,100 | |
| Denver Developmental Screen Test | \$ 35 | | | 35 |
| Dynamometer | \$ 80 | 3 | | 240 |
| Bailey test of infant development | \$ 160 | 1 | | 160 |
| Weschler preschool & primary Scale of Intelligence | \$ 170 | 1 | | 170 |
| Skin fold calipers | \$ 45 | 3 | | 135 |
| Scales | \$ 50 | 3 | | 150 |
| Resource books | | | | 250 |
| | | | | |
| | | Sub Total: | 1,100 | 1465 |
| | | | ===== | ===== |

PATIENT HOSPITALIZATION - None required

OUTPATIENT CARE - None required

CRL TRANSPORT

| | |
|---|--------|
| Dacca/Matlab/Dacca (45 trips @ Tk. 300 round trip) | 13,500 |
| Speedboat 90 hours @ Tk. 98.84 per hour | 8,896 |

Sub Total: 22,396
 =====

TRAVEL AND TRANSPORTATION OF PERSONS

| | |
|--|--------|
| Local Travel - Follow-up visits | 3,000 |
| Local Travel (Tk. 100 per month per trainee) | 7,200 |
| International Travel (attendance at professional meeting) | 2,000 |
| Per diem (14 days @ \$ 36 per day) | 504 |
| | |
| Sub Total: | 10,200 |
| | ===== |
| | ===== |

Project Requirements
TAKA DOLLARS

8. TRANSPORTATION OF THINGS

Import of supplies (25% of \$ 1,465)

366

Sub Total:

366
 =====

9. RENT, COMMUNICATION & UTILITIES

Postage

1,500

Telephone - none

Rent

CNU (Tk. 1500 per month)

1,800

CHC (Tk. 1500 per month)

1,800

Meheran - none

Sub Total:

37,500
 =====

10. PRINTING AND REPRODUCTION

Reproduction, publication figures

7,500

Sub Total:

7,500
 =====

11. OTHER CONTRACTUAL SERVICES

Computer time (6 hr. at Tk. 600/hr)

3,600

Payment of participants

6,000

Sub Total:

9,600
 =====

12. CONSTRUCTION - none

Total Tk. 213,825 \$ 16,335

(Tk. 15.4 = \$ 1.00) (Conversion \$ 13885)

Dollar Total 30,218.

B. BUDGET SUMMARY

| | Year 1 | | Year 2 * | |
|---------------------------------------|-------------|----------------|-------------|----------------|
| | <u>TAKA</u> | <u>DOLLARS</u> | <u>TAKA</u> | <u>DOLLARS</u> |
| 1. Personnel Services | 111,691 | 12,000 | 55,846 | 6,000 |
| 2. Supplies | 13,838 | - | 6,919 | - |
| 3. Equipment | 1,100 | 1,465 | - | - |
| 4. Patient Hospitalization | - | - | - | - |
| 5. Outpatient Care | - | - | - | - |
| 6. CRL Transport | 22,396 | - | 11,198 | - |
| 7. Travel & Transportation of Persons | 10,200 | 2,504 | 5,100 | - |
| 8. Transportation of Things | - | 366 | - | - |
| 9. Rent, Communication & Utilities | 37,500 | - | 18,750 | - |
| 10. Printing | 7,500 | - | 3,750 | - |
| 11. Other Contractual Services | 9,600 | - | 4,800 | - |
| 12. Construction | - | - | - | - |
| | <hr/> | <hr/> | <hr/> | <hr/> |
| | 215,825 | 16,335 | 106,363 | 6,000 |
| | <hr/> | <hr/> | <hr/> | <hr/> |
| | \$ 13,883 | | \$ 6,907 | |

(Tk. 15.4 = \$ 1.00) Total Project \$ 43,125

* Year 2 includes only 6 months.

ABSTRACT

Relationship Between Nutrition and Child Development

From this study we will identify the relationship between varying degrees of nutritional status and a battery of child development assessments among both urban and rural children in Bangladesh. Furthermore, we will document the relationship between developmental and medical recovery from acute episodes of malnutrition. Children under age 6 years will be selected from the Children's Nutritional Unit, Children's Health Center, and Meheran. Similar assessment procedures will be used, including anthropometrics, serum solids and hematocrit, and a range of child development indices. By studying well fed children as well as poorly nourished and acutely malnourished children, over at least one year, the relationship between progression of developmental changes can be illustrated.

- 1) Since the principal issue involves the relationship between nutrition and developmental status, the study population must include children of several ages.

- 2) The child development assessments include naturalistic observation, task performance, and parental questionnaire and present no risks to participants. Furthermore, any child or parent who does not wish to participate will be permitted to withdraw from the study. A finger tip blood specimen, tested for serum solids and hematocrit, is part of a routine clinical evaluation and presents no risk.

- 3) There are no risks, therefore, this section is not applicable.
- 4) Confidentiality of the participants will be ensured by assigning each child an identifying number. Thus, names will appear only on the initial data collection forms. These forms will be kept in a locked file in the custody of the principal investigator and their use will be restricted to those directly concerned with the project. Published data will not identify individuals by name or description and after the study has been completed, the data will be destroyed.
- 5) A signed consent will be obtained from the parent of each child participating in the study. The consent form will be printed in English and Bengali and will be read to those unable to read. It will include a) the nature and purpose of the study, b) the procedures to be used, c) the potential risks, d) the benefits to be derived, e) the right to refuse to participate and f) the confidential handling of the data.
- 6) An interview of approximately 20 minutes will be conducted with each mother. The interview will be private and will be conducted in the testing area used at Children's Nutrition Unit, Children's Health Center, or Meheran.

- 7) Since the testers collecting the data have a background in child development and are familiar with the developmental assessments, they may provide suggestions to parents on beneficial things to do with their children. Furthermore, the assessments are administered in a game-like manner and children usually enjoy the attention and playful interaction.

The future benefit of this study is to increase the understanding of a potential relationship between nutrition and child development in Bangladesh. Such findings will permit more comprehensive intervention programs to be designed, coupled with comprehensive assessment procedures. Thus, nutrition may be considered in the social context in which it occurs, rather than only a Medical or economic context.

- 8) The study requires the use of medical records of the three test locations.

PARENT PERMISSION FORM

We are from Dacca University and are studying the relationship between nutrition and behaviour in young children. We are trying to find out if children who appear well fed behave differently from children who do not appear well fed. Furthermore, if there are differences, we want to find out specifically what kind of differences occur. We will talk to mothers and children and ask the children to play some games with us.

You can ask any questions you want and you are not required to take part in the study. The information collected will not be given to anyone other than yourself, and the researchers who will combine it with information from other families.

I understand the study on Nutrition and Child Development and I agree to participate.

Name of Parent

Name of Child

Address

Date