Date 31.12.79

[illegible] BOARD ON THE USE OF HUMAN SUBJECTS [illegible]

[illegible] Alauddin Chowdhury [illegible]

[illegible] 80-004 Supporting Agency [illegible] (IDRC)

[illegible] Interactions between Maternal Nutrition, [illegible]ality and Reproductive Process.

[illegible] status:
(✓) New Study
( ) Continuation with change
( ) No change [illegible] out rest of [illegible]

[illegible] to each of the following [illegible]

Source of Population: [illegible]

Yes ✓ [illegible]
Yes ✓ [illegible]
Yes ✓ [illegible]
Yes No [illegible]
Yes No [illegible]
[illegible] to subjects Yes No
Yes No
Yes No
[illegible] informed about [illegible] Yes No
[illegible] risks Yes No
Sensitive questions Yes No
Benefits to be derived Yes No
Right to refuse to participate or to withdraw from study Yes No
Confidentiality [illegible] Yes No
[illegible] treatment [illegible] are risks [illegible] involved in [illegible] procedure Yes No

5. Will signed consent form be required: [illegible]
6. Will [illegible] be taken to protect anonymity of subjects [illegible]
7. Check documents being submitted herewith to Board:
[illegible] (Indicate whether 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 [illegible] and right to refuse to participate or withdraw (Required)
[illegible] consent [illegible]
[illegible] Informed [illegible] for parent or guardian
✓ Procedure [illegible]
✓ [illegible]

* If the final [illegible] prior to [illegible] the following [illegible] should be included in the [illegible]:
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 [illegible] for review.

[illegible] approval of the Review Board on the Use of Human Subjects for any changes [illegible] and welfare of subjects before making such change.

Principal Investigator Trainee

80-004
Recd 2/1/80

SUMMARY

This is the analytical part of DNF study hence the study is entirely involved with computer data file, which were collected through another approved protocol. There is no risk of human subject, because it will be dealing with coded data where even name and address of the individual are also in coded form and not known to any investigator.

(a) Title: Interactions between Maternal Nutrition, Morbidity and Reproductive Process

(b) Principal Investigator: A.K.M. Nasiruddin Chowdhury, M.Sc.
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Mohakhali, Dacca 12, Bangladesh

Consultant: Sandy L. Huffman, D.Sc.
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Washington, D.C. 20.56
U.S.A.

(c) Starting Date: January 1, 1980

(d) Completion Date: 1st Phase December 1980
2nd Phase December 1981

(e) Total Direct Cost: US $ 52,287

(f) Availability of funds:

(g) Subcontractor Director's Remarks:

(h) Contractor's Remarks:

Abstract Summary: Interactions between fertility, health and nutrition have frequently been described, but the quantitative definition of these interactions requires further study. A longitudinal investigation involving 2,300 women in Bangladesh has been initiated to explore the relationships between nutrition,

health and fertility. The data base created by this study would provide a unique resource for the detailed definition of the effects of maternal factors such as age at menarche, nutrition status, morbidity, breastfeeding on the fertility and on reproductive health. The results would have implications for the definition of appropriate interventions for breaking the cycle in which high fertility may lead to malnutrition which, in turn, promotes high fertility through direct effects on worsening reproductive health. This protocol is the analytical part of DNF study protocol (No.77-027 of CRL 1975) mainly involving computer time and programmers, which was part of the original protocol.

(5) Reviews:

(a) Research Involving Human Subjects: _____

(b) Research Review Committee: _____

(c) Director: _____

(d) BMRC: _____

(e) Controller/General Manager _____

A. INTRODUCTION

The adverse effects of excessively high fertility on health and mortality are among the primary motivations for the implementation of population programs throughout the world. However, while there can be little doubt of the existence of significant interactions between fertility and mortality, the dynamics of these interactions lack adequate quantitative definition. One of the principal theorizations in regard to the association between fertility and mortality is the "child survival hypothesis". This theory suggests that high infant mortality will be associated with high fertility because of the desire of parents to replace children lost through infant death (replacement effect) or because of the anticipation of high childhood mortality (insurance effect). The theory that high infant mortality will be associated with high fertility is circular since high fertility itself may result in poor nutrition, poor health, and low infant survival. An understanding of the mechanisms involved in this circular pathway would suggest appropriate interventions for breaking this cycle of events.

The cycle might, in fact, be interrupted with improvements in infant nutrition leading to increased infant survival, longer breast-feeding, and through physiological mechanisms, reduced fertility (Mosley and Chen, 1976). Chowdhury, et al. (1976), have shown that since women who experience infant deaths have shorter birth intervals

because of the reduction in the length of postpartum amenorrhea. The often noted association of high parity with high frequencies of child deaths can be based primarily on this biological effect.

Although existing studies have described interrelationships between mortality and fertility, the mechanism by which these interactions occur needs further definition. Nutritional status has been shown to be one of the most important factors associated with high infant and child mortality (Puffer and Serano, 1973; Sommers, et al. 1975; Kilman and McCord, 1978; Chen, Chowdhury & Huffman 1980). Because of the impact of nutrition on mortality, it also may influence fertility as described by the child survival hypothesis.

Maternal nutritional status, through its influence on child nutrition, may also affect fertility. Maternal nutritional status is the principal factor influencing birth weight (National Academy of Sciences, 1970). Women who have higher pre-pregnant weights and higher weight gains during pregnancy are more likely to give birth to infants of normal birth weight. Low birth weight infants (less than 2500 grams) are at a much higher risk to mortality than infants of normal birth weight (Chase, 1973).

In addition to the effect of maternal nutrition on infant survival, the association between maternal age at child bearing and infant survival is well known. It has generally been found that the association between maternal age and infant mortality forms a J shaped distribution. Young women having higher rates of infant mortality, which decline among women aged 20 to 30 and then increase steadily for older women. Omran (1976), however, observed that among some cultures this direct relationship between maternal age and infant mortality was not consistent. He noted a relatively high risk associated with young maternal ages, especially among scheduled castes in India and rural and semiurban women in Turkey. He suggests that the unusual findings may have been due to higher risks of mortality among births occurring during the earlier cohorts when child mortality was higher, but states that it also may have, in part, been caused by the young maternal age itself. Hunt (1976) has summarized the literature on the health consequences on adolescent fertility and noted that the risk of mortality and morbidity are greater for adolescent mothers and their children than for women aged 20 and older.

Parity and the subsequent family size also appear to influence the survival probability of the children. Wyon and Gordon (1971) observed that as the family size increased in the Punjab, India, so did the risk of infection and subsequent levels of mortality.

Wray and Aguerri (1969) observed in Colombia that children of higher birth orders were more prone to protein calorie malnutrition. In a study designed to define the health risks associated with patterns of family formation, Omran (1976) found that when maternal age was controlled, low parity women had children who were taller, weighed more, and had higher hemoglobins. Among studies in Latin America, Puffer and Serano (1973) found that children of high birth ranks exhibited higher rates of mortality than those of lower birth ranks.

Another issue related to maternal fertility and its effect on infant nutrition, health, and survival status is the length of the interval between births. Omran (1976) observed that the risk of infant mortality was higher for births occurring within a 1 to 2 years interval than for those with a longer interval. In studies on Bangladesh, Swenson (1977) noted that as the length of birth interval increased, so did the probability of survival of the child. Wolfers and Scrimshaw (1975) noted among urban women in Ecuador that with short birth intervals, mortality increased. A study in Singapore (Martin, 1978) illustrated that children born after short birth intervals had lower mean birth weights. Mean heights and weights of the children at 9 years of age were also greater among those with intervals of 24 months or more, compared to those with intervals of less than 12 months. In a study in western Nigeria,

however, Doyle et al. (1978), found no strong trends between the length of the birth interval and infant survival. They explained this finding by the suggestion that there may have been adequate levels of nutrition and/or child care which obscured the adverse effects of short birth intervals seen in other studies.

Although these broad factors have been associated with risk of mortality (i.e. maternal age, parity, and birth interval), the mechanisms by which these factors operate have yet to be clearly delineated. Studies have illustrated that, in general, the larger the family size, the poorer the child grows and the more prone he or she is to malnutrition and infection (Omran, 1976). Whether this is caused by biological mechanisms or socio-cultural factors needs to be discerned since the policy implications differed, depending on the impact of each of these.

The relationship between nutrition and fertility and their association with health outcome can be discussed in the framework of segments of the reproductive span and the spacing of pregnancy within the reproductive period. There is much evidence suggesting that there is an association between nutritional status and onset of menarche (Tanner, 1968; Frisch, 1972; Zacharias et al. 1976). Our own studies in Bangladesh have illustrated that nutrition appears to play a determining role in the onset of menarche, with well

nourished girls reaching menarche at an earlier age than poorly nourished girls. These studies illustrated an average age of menarche of about 15-16 years for rural Bangladeshi girls (Chowdhury et al. 1977). We mentioned earlier the effect of early childbearing on maternal nutritional status, as well as infant survival. However, there is an inadequate understanding of the processes involved in the timing of first conception. The interval between menarche and first conception may be an important determinant of outcome of the first pregnancy, and also may initiate a lifetime pattern. Koontz (1977) studied the effects of the interval between menarche and concpetion among urban black teenagers and found that there was no effect on the outcome of pregnancy. However, there have been no studies to date on this issue in developing countries where detrimental effects may be greater than that observed in the U.S.A.

Within the reproductive span, fertility is determined by the spacing of pregnancies. Any given pregnancy interval is composed of three parts: (1) period of temporary sterility (postpartum amenorrhea), (2) the time between the onset of postpartum menses and live birth conception (menstrual interval), and (3) the duration of gestation. Our previous work in the Matlab area of Bangladesh has pointed to the extended length of postpartum amenorrhea in this rural area (Chen et al. 1975; Huffman et al. 1978a). In studies

as defined by a wealth indicator, had an influence on infant nutritional status, it did not seem to affect maternal nutritional status. This finding needs to be explored further and we hoped to do this in the present study. We did observe that women of higher socioeconomic status, and this, of course, has significant implications for infant nutritional status. Our findings point to an association between breastfeeding patterns and infant nutritional status, women with malnourished infants suckling more often than those with better nourished infants.

This study provides some initial insight into the association between nutrition and fertility. This proposal examines some of the specific issues related to infant health, nutrition, and survival in association with maternal health and nutrition. The goal of this research is to ascertain at which point interventions are most likely to have success in breaking the cycle of high infant mortality and high fertility. We will specifically examine the issue of early childbearing in relation to the onset of menarche. In Bangladesh, women generally do not marry until menarche. However, marriage soon follows the onset of puberty, implying that menarche may precipitate marriage. The dynamics of this process need to be assessed with regard to timing of the first birth and the eventual outcome of pregnancy. We will also explore the interrelationships

between birth spacing on infant and maternal nutrition controlling maternal age and parity.

6. SPECIFIC AIMS

In order to examine the effects of fertility on maternal and child health and nutritional status and vice versa, this study will compare biological and social characteristics of women according to their fertility experience. An assessment of the influence of an early age of childbearing on maternal and infant health and nutrition will be specifically explored. The influence of reproductive health and maternal nutrition, on fertility and vice versa will be assessed.

The following specific hypotheses are to be tested:

1. Maternal nutritional status is associated with
   a) age at first childbearing
   b) length of menstrual interval
   c) length of postpartum amenorrhea
   d) outcome of pregnancies
2. Association of maternal morbidity, reproductive health (fetal and neonatal deaths as well as birth weight) length of breastfeeding and socioeconomic status with these four above factors.

3. Association of high fertility with maternal malnutrition, poor reproductive health.

These three hypothesis may be in cyclical phenomenon making both maternal and child health situation worse.

METHODS OF PROCEDURE

Study Design

The proposed study is composed of two sections. The first will assess the effect of age of puberty, and early childbearing on maternal nutritional status, infant nutritional status, outcome of pregnancy, infant survival, and infant growth among approximately 500 maternal-infant pairs. Sociocultural factors affecting early age of marriage and early age of childbearing will also be examined.

The second section will evaluate the effects of various levels of fertility among older women on the maternal nutrition, morbidity and reproductive health and vice versa. In this section we will be able to differentiate effects of age, parity and spacing on the outcome variables for about 2,200 women.

Data Collection

Data for this study will be drawn from information collected from two sections of a study entitled, "Determinants of Natural Fertility," conducted by the Cholera Research, Laboratory (CRL) in

Matlab, Bangladesh. The CRL has maintained a field hospital and research station serving 265,000 residents in this rural area of Bangladesh since 1963. A registration system for births, deaths and and migrations has been in operation since 1966.

The section of the Determinants of Natural Fertility Study entitled, "Birth Interval Dynamics, Part I" was initiated in November 1975 among approximately 2,200 married women aged 15-49 years in thirteen villages of Matlab for 30 months. At monthly intervals women were questioned with regard to menstrual and pregnancy status, familiar morbidity, breastfeeding behaviour, husband's absence, and use of contraception. (The questionnaire used is illustrated in Appendix 1.) Heights, weights, and arm circumferences of women and their youngest children were taken. For the first year, bimonthly samples of blood were collected for measurements and examination of hemoglobin, total proteins, and albumin. As women migrated into the study area and as young girls married, they were entered into the study. Women who were found to be ill were examined and treated by a physician with reports completed on each illness. For each of the women complete pregnancy histories are available from Demographic Surveillance System.

The second section of the study on"Determinants of Natural Fertility, Part II" was an investigation of factors associated with the onset of menarche. In March 1976, over 1,000 females aged 10-20

residing in three of the thirteen villages described above were interviewed as to whether menarche had occurred and if so, when, age at marriage, interval between menarche and marriage, and interval between menarche and conception (Appendices 2 and 3). All females who had not yet married were followed at monthly intervals with anthropometric measurements taken until they were married or until the termination of the study in September 1977. As women married, they were enlisted within the study of "Birth Interval Dynamics, Part III". For approximately 500 women, information on age of menarche, menarche to marriage interval, and menarche to conception interval is available. For half nutritional status at onset of menarche is available. The mothers of the respondents were also interviewed to obtain information on the respondent's birth rank, season of birth, and family size (Appendix 4). Data collected in 1970-71 (Sommers, et al. 1975), on child nutritional status in relation to mortality allows an assessment of the nutritional status during childhood of about 100 of the women in the menarche study.

The data base for the assessment of nutritional status and growth of children consists of only body weights made at monthly intervals. Weight of infants were obtained beginning at the first monthly visit following birth and monthly thereafter. Weights of the child were measured by a portable beam balance scale with light on no clothes.

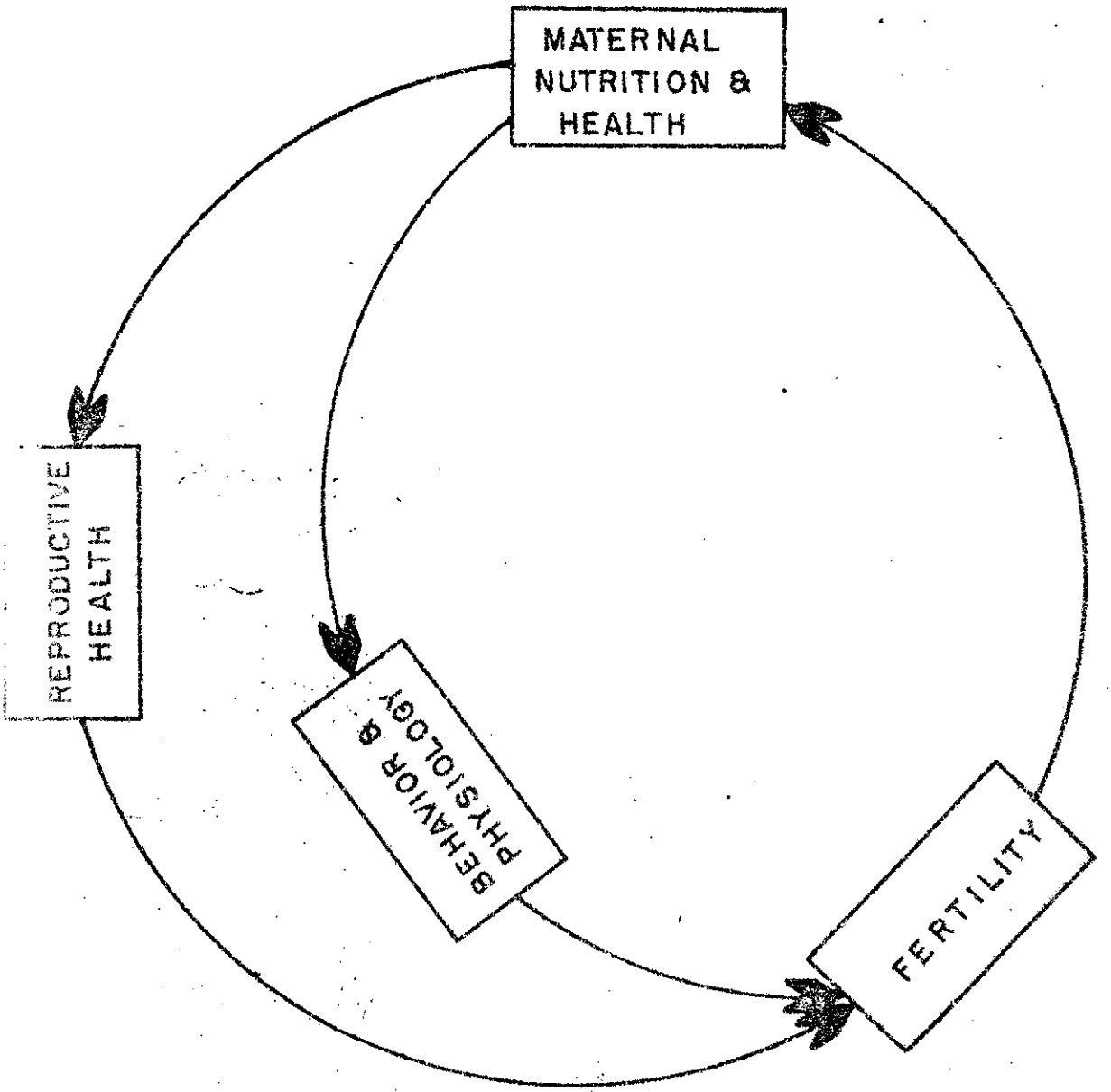
Evaluation of the nutritional status of young women and mothers is based on the same anthropometric measurements. Weight was measured by a portable beam balance scale: height and arm circumference were measured by the same equipment and techniques used for older children.

Analytical Frame work

An woman during her reproductive life are at risk to morbidity and changes in her nutritional status for various reasons. These maternal health variables may effect reproductive process and reproductive health of the woman. Frequent conceptions of a woman in turn effect her maternal as well as reproductive health. These cyclical phenomenon of maternal health status and natural reproduction may be presented as in Figure 1.

The models are based on the idea that a woman will bear a child in a particular time period is a function of both physiological and behavioral factors. Her reproductive capability can be viewed as a random process of three sequenced and probably independent events such as (1) conceptions, (2) termination of pregnancies and (3) resumption of ovulatory cycles. The expected probability of the these events occurring in any time period is a function of age, health and nutritional status, previous reproductive experiences, interval since last event, lactation pattern. Again the behavior of

Figure 1



Analytical framework

the woman in respect of time and frequency of intercourses are also determined by her health and nutritional factors which may unconciously effect her reproductive process.

The reproductive health,--which will be defined here as ratio of (1) live births to pregnancies and (2) living children to children ever born--is assumed to be related with health and nutrition of mother. Moreover, the fetal deaths may lead to more frequent conceptions, and the child deaths may shorten the length of post-partum amenorrhea, resulting to a high fertility which in turn effect the maternal health and nutrition.

Under these hypotheses the models will be interpreted according to the following equations:

$$E(t) = f[N(t), \Delta N(t), R(t-1), B(t), I(t)] \quad (1)$$

$$R(t) = f[N(t), \Delta N(t), B(t), \sum_{i}^{t-1} I(t-i)] \quad (2)$$

$$N(t) = f[\sum_{i}^{t-1} I(t-i)] \quad (3)$$

Where

E(t) is the probability of the events (conception, pregnancy, termination, or resumption of ovulatory cycle) of women in the time period t,

$N(t)$ is the nutritional and health status of women in time t,

$\Delta N(t)$ change in nutritional and health status of women during time t-1 and t,

$R(t-1)$ reproductive health of the women upto the time t,

$B(t)$ breastfeeding pattern at time t,

$I(t)$ open interval to time t,

$\sum_{i}^{t-1} I(t-1)$ experienced intervals of all events upto time t.

However, the difficult task is the measurement of these variables controlling the time trend and the seasons.

Data Analysis

Analysis of nutritional status and growth in infants and children will be made using the National Center for Health Statistics (NCHS) reference population recommended by the National Academy of Sciences (1974) and by Waterlow, et al. (1977). Using this reference population, the percent of median and standard deviation score of each child will be calculated for weight-for-age, weight-for-height, and height-for-age. Cross tabulation of weight-for-height and height-for-age values will be used to distinguish chronic malnutrition (stunting) and acute malnutrition (wasting) (Waterlow, 1972). Arm circumference for age will be calculated using the Tanner reference population and arm circumference in centimeters will be used as a nutrition status indicator in

children 1-4 years old. Anthropometric values obtained at age 1 month, 6 months, 12 months, and at yearly intervals thereafter, as well as growth rates between these intervals, will be used to characterize child nutrition status.

Analysis of nutritional status in post-menarchial women will be made using weight, height, and arm circumference values directly. Mothers' "postpartum" nutritional status will be determined by averaging the weight, height, and arm circumference values taken at the second and third monthly visits postpartum, in order to allow time for physiologic readjustment to non-pregnant status. Nutrition status at menarche and at conception will be determined by averaging anthropometric values from the monthly visit immediately before and after the start of menstruation and the first missed period, respectively.

The data analysis design will consider, both health and nutritional status of women and of children as dependent variable and fertility as independent variable and for the reverse phenomenon, reproduction as dependent variables and maternal nutrition and reproductive health as independent variable with a view to examine the cyclical relationship. Because this is a longitudinal study the analysis will be time related. Such as dependent variable at time 't' will be evaluated by the independent variables as existed inbetween time period (t-1) and t.

The following variables will be considered for analysis:

1. Age
2. Onset of menarche
3. Menarche to conception interval
4. Birth interval components
5. Nutrition status and nutritional change at onset of menarche
6. Nutrition status and nutritional change at resumption of menses
7. Nutrition status and nutritional change at conception
8. Nutrition status and nutritional change at pregnancy termination
9. Breastfeeding
10. Reproductive health
11. Morbidity
12. Socioeconomic status
13. Other behavioral variables
14. Season

Socioeconomic status, and season have been included as independent variables since these factors may affect the

nutritional status of mothers and children and, therefore, their possible effects need to be taken into consideration in the analysis.

The analysis will employ bivariate and multivariate frequency distributions of the dependent variable with the independent variables, followed by multiple regression analysis to control more independent variables.

The data will be analyzed separately for first conceptions and for each subsequent conception. The analysis will be carried out for the approximately 2,200 women for whom menarchial age is not consistently available. This additional analysis will, consequently, not consider variables 1-3 (maternal age at menarche, nutrition status at menarche, and menarche to conception interval).

If adequate data on contraceptive usage is available, it will also be examined to assess its association with improvements in nutritional and health status.

D. SIGNIFICANCE

Policy Relevance

Given the present social and economic conditions of the country, major fertility decline in Bangladesh are unlikely within the next 10-15 years (Aethur and McNicoll, 1978). Although

the costs of high fertility are extensive, the use of family planning methods in Bangladesh has been shown to be minimal, even when contraceptive supplies are widely available without cost. Continuation rate for all methods of family planning in a rural area of Bangladesh which was involved in a house-to-house distribution program of non-clinical methods of contraception, were 18% after 3 months, and 13% after one and one-half years (Osteria, et al. 1978). Because of this minimal use of fertility control techniques, an understanding of the health, nutritional mechanisms influencing natural fertility is essential for any program of development assistance. The implications of this work spread by beyond Bangladesh to other areas of the world where contraceptive usage is minimal and natural fertility mechanisms predominate.

The proposed study does not directly examine the "child survival hypothesis". Rather, it explores factors which directly influence child survival (reproductive health). If, indeed, parents do maintain high fertility because of the perceived high rates of child mortality, then factors influencing mortality, such as child health and nutrition, need to be understood because of their eventual effects on fertility.

Dissemination of Findings

The importance of this work is, of course, based on the eventual implementation of policy by health and development planners. Therefore, a primary concern of such research is the dissemination of findings to policy makers through appropriate mechanisms. The ICDDR,B has a publication series in which principal works emanating from the ICDDR,B are distributed throughout Bangladesh to professionals involved in program implementation as well as other researchers. Our findings would be initially published in this form. We would also present findings to Bangladeshi professionals through national conferences and in private discussions with policy makers. In order to disseminate the findings to other health professionals outside Bangladesh, we would present findings at international congresses and also expect to publish in international journals. Since this study has implications for countries similar to Bangladesh who have minimal levels of contraceptive usage, the importance of disseminating findings outside Bangladesh is paramount.

Time Table of Data Analysis

Data analysis of this study involves two data sets (1) Menarche file and (2) Birth Interval file

(1) Menarche file:	Cleaning editing	Nov-Dec	1979
	Tabulation	Jan-Feb	1980
	Analysis	Mar-May	1980
	Reports and Technical Papers	Jun-Aug	1980
*(2) Birth Interval file	Cleaning editing	Nov-Dec	1979
	Tabulation	Jan-Apr	1980
	Analysis	May-Aug	1980
	Reports	Sep-Dec	1980
	Technical papers	Jan-Dec	1981

E. FACILITIES REQUIRED

Office space only.

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*A copy of appropriate data can be given to Dr. Stan Becker for his seasonality study only.

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SECTION III - BUDGET

A. DETAILED BUDGET

					Project Requirements	
1. PERSONNEL SERVICES		Percent of effort		Annual		
Name	Position	or number of days		Salary	TAKA	DOLLARS
Dr. Alauddin Chowdhury	Investigator	80%	$	19,500	-	31,200
Mr. Ataur Rahman	Programmer	50%	$	2,200	-	2,200
				Sub Total	-	33,400
2. SUPPLIES AND MATERIALS						
Items						
Ballpen, pencil, papers etc.					1,500	-
				Sub Total	1,500	
3. CRL TRANSPORT						
Mileage-Dacca						
200 miles (approx.)					2,800	
				Sub Total	2,800	
4. TRAVEL AND TRANSPORTATION OF PERSONS						
International Travel						
Transport (Pop. Asoc. of America meeting in 1981)					-	2,000
Per Diem					-	600
Transport (consultant visit to Dacca)					-	2,000
Per Diem					-	3,000
				Sub Total		7,600
5. RENT, COMMUNICATIONS & UTILITIES						
Postage, Rent etc.					15,000	
				Sub Total	15,000	
6 PRINTING AND REPRODUCTION						
Special Reproduction, Publication Costs & Xerox Costs					100,000	
				Sub Total	100,000	
7. OTHER CONTRACTUAL SERVICES						
Computer time					50,000	
				Sub Total	50,000	

B. BUDGET SUMMARY

	Category	Year 1 TAKA	Year 1 DOLLARS	Year 2 TAKA	Year 2 DOLLARS
1.	PERSONNEL	-	16,700	-	16,700
2.	SUPPLIES	1,500	-	-	-
3.	CRL TRANSPORT	1,400	-	1,400	-
4.	TRAVEL PERSONS	-	5,000	-	2,600
5.	RENT/COMMUNICATION	-	-	15,000	-
6.	PRINTING/REPRODUCTION	500	-	99,500	-
7.	CONTRACTUAL SERVICE	25,000	-	25,000	-
	TOTAL	28,400	21,700	140,900	19,300
	TOTAL $	23,593		28,694	
	GRAND TOTAL $	52,287			

Conversion Rate $ 1.00 = Tk.15.00

APPENDIX 1

BIRTH CONTROL DYNAMICS-2

VILLAGE _____ BARI _____

NAME _____ CENSUS NO. _____

PERIOD COVERED, FROM _____ TO _____

Event during the Period Covered	Other Details if Yes	Code
1. Menstruation? No DK Yes	_____ (Date, Days)	
2. Pregnant? No DK Yes	_____ (Date, Days)	
3. Preg. Termi. ? No DK Yes	_____ (LB, SB, MIS, Sex, Date)	
4. Breast Feeding? NO Yes	_____ (Days, Date)	
5. Supplementation ? No Yes	_____ (Days, Date, Type of food)	
6. Husband away ? No Yes	_____ (Days, Date)	
7. Practicing F.P.? No NR Yes	_____ (Days, Date, Method)	
8. Illness ? No Yes	_____ C? _____ (Days, Symptoms) /No/Yes/NR/	
9. Break-through Bleeding? No Yes	_____ (Days, Date)	
10. Husband illness? No Yes	IC? _____ /No/Yes/NR/	
11. Child Death ? No Yes	_____ (Sex, Date, Age)	
12. Absent ? No Yes	_____ (with or without husband)	
13. Changed M. Status ? No Yes	_____ (Kind, Date)	
14. Height _____ Weight _____	Arm Circum _____	
15. Blood sample collected Yes/No	Hct. _____ Protein _____	
16. Name of the worker _____	Date _____	

APPENDIX 2

MENARCHE STUDY I

I.D. Number _____

Census Number _____

Name _____

Bari _____

Head of Family _____

Date of Interview _____

Absent

1 2 3

Moved out _____ Reason _____

Married ? _____

Date of Marriage _____

Menarche _____

Date of Onset _____ Age at Onset _____

Last Menstrual Period

	•																		

• Menses B=Breakthrough Bleeding

_____

Date Started _____ # of days _____

Weight _____

Height _____ + 40 cm = _____

Arm Circumference _____

_____ _____ _____

_____ _____ _____

APPENDIX 3

MENARCHE STUDY II

MOTHER'S QUESTIONNAIRE

I.D. Number _____

Census Number _____ Child's Census Number _____

Name _____ Child's Name _____

Bari _____

Head of Family _____

Date of Interview _____

1. Number of Living Children _____

2. Number of children born alive now dead _____

3. Parity _____

4. Birth Bank _____

5. Season of Birth _____

Grisho (summer) _____

Borsha (monsoon) _____

Sarat (post monsoon) _____

Hemanta (autumn) _____

Shith (winter) _____

Boshonto (spring) _____

6. Month of Birth _____

APPENDIX 4

MENARCHE STUDY

I.D. No. _____ Census No. _____ Age _____ Birth Rank _____ Religion _____ Season _____

Variable No.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Date of Interview	Absent	Marital Status	Menarche	Date of last menstrual period	No. of days	Break thru bleeding	Weight	Height	Arm circumference	Weight for Height	Weight for Age	W_1H3	%Fat	

MENARCHE STUDY

I.D. No._____ Census No._____ Age ____ Birth Rank_____

Mother's Census No. _____ Age ___ IC ___ BAND ___ P____

Day of birth _____ Month _____ Year _____ Season ____ Relig on ___

Socio-economic date

Father's education _____

Mother's education _____

Father's occupation _____

Receives remittance _____

Owns radio _____

Owns watch _____

Owns hurricane _____

Owns lep _____

Composite code _____

Number of cows _____

House size _____

School attainment _____

Presently attends _____

Date of marriage _____

Time between menarche and marriage _____

Date of onset of menarche _____

Age at onset _____

_____ _____

_____ _____

_____ _____