Specialized Bibliography Series No. 14

Annotated Bibliography of

ICDDR,B Studies in Matlab, Bangladesh

Specialized Bibliography Series No. 14

ANNOTATED BIBLIOGRAPHY OF ICDDR,B STUDIES IN MATLAB, BANGLADESH

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CONTENTS

PREFACE

The **Specialized Bibliography Series** is a part of the larger effort to facilitate the exchange of information and to establish an information network in the field of diarrhoeal disease-related subjects -- an effort being carried out by the Diarrhoeal Diseases Information Services Centre (DISC) of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The present issue, the fourteenth of the series, includes citations of 567 papers and publications (364 abstracted) on ICDDR,B studies done in Matlab, Bangladesh. The **Annotated Bibliography of ICDDR,B Studies in Matlab, Bangladesh** was compiled from existing information available at the DISC of ICDDR,B, and it is possible that inadvertent omissions may have occurred.

We hope that the present bibliography will contribute towards generating greater interest and awareness on research done in Matlab, Bangladesh and the results obtained from these studies. Most of the published papers and publications, cited in this bibliography, are available from the DISC of ICDDR,B to interested persons/organisations for consultation and dissemination. We will consider this attempt successful if the bibliography serves the interests of the diarrhoeal disease researchers and practitioners, demographers, nutritionists, and other interested groups.

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The Editor-in-Chief would like to thank Dr Andrew Hall for his assistance in editing the *Introduction*. It draws heavily on the various PSCRL, CRL, and ICDDR,B Annual Reports, on "Cholera - The American Experience" by WE van Heyninger and John R Seal, and on unpublished papers provided by James Phillips and Vincent Fauveau.

Publication of this bibliography was made possible by a special grant from the Swiss Development Cooperation (SDC), Switzerland.

ANNOTATED BIBLIOGRAPHY OF ICDDR,B STUDIES IN MATLAB, BANGLADESH

SUBJECT INDEX

USER'S GUIDE

The **Specialized Bibliography Series** includes abstracts and citations of currently available literature from sources worldwide. The materials, cited in the "**Annotated Bibliography of ICDDR,B Studies in Matlab, Bangladesh**", are available at the DISC, ICDDR,B for consultation and dissemination. The working language used in the bibliography is English.

The bibliography is arranged in an author-alphabetic order, i.e. citations are arranged alphabetically by the first author and then by the title of paper. Most of the papers cited in the bibliography include abstracts (authors' abstracts, where available, were taken without any change). Whenever an abstract was prepared, every effort was made to include information, if available, on the scope of the paper cited, the study area, the age and number of the subjects studied, the time framework covered, new, improved or significant methods used and the findings and/or conclusions of the study.

An index to co-authors is appended at the end of the main text for easy search by co-authors' names. The numbers cited in the co-author and the subject indexes refer to the sequential numbers of the citations.

ANNOTATED BIBLIOGRAPHY OF ICDDR,B STUDIES IN MATLAB, BANGLADESH

Matlab – based Research: An Introduction

The foundation in December 1960 of the Pakistan – SEATO Cholera Research Laboratory (CRL), the predecessor of the ICDDR,B, came at the height of a renewed interest in cholera. That interest increased during the next decade and important developments in the understanding of the disease took place. In addition to the clinical, pathological, and microbiological research on cholera that was needed, those present at the opening conference of the CRL knew that a site for field testing of both new and existing vaccines was also required. Several conditions for adequate field trials of vaccines were set down: cholera had to be endemic in the area; the area had to be accessible so that long – term follow – up studies could be undertaken; there had to be laboratory facilities for identifying cholera in patients with diarrhoea and the studies had to be well conducted, with samples properly randomised and only proven cholera cases considered.

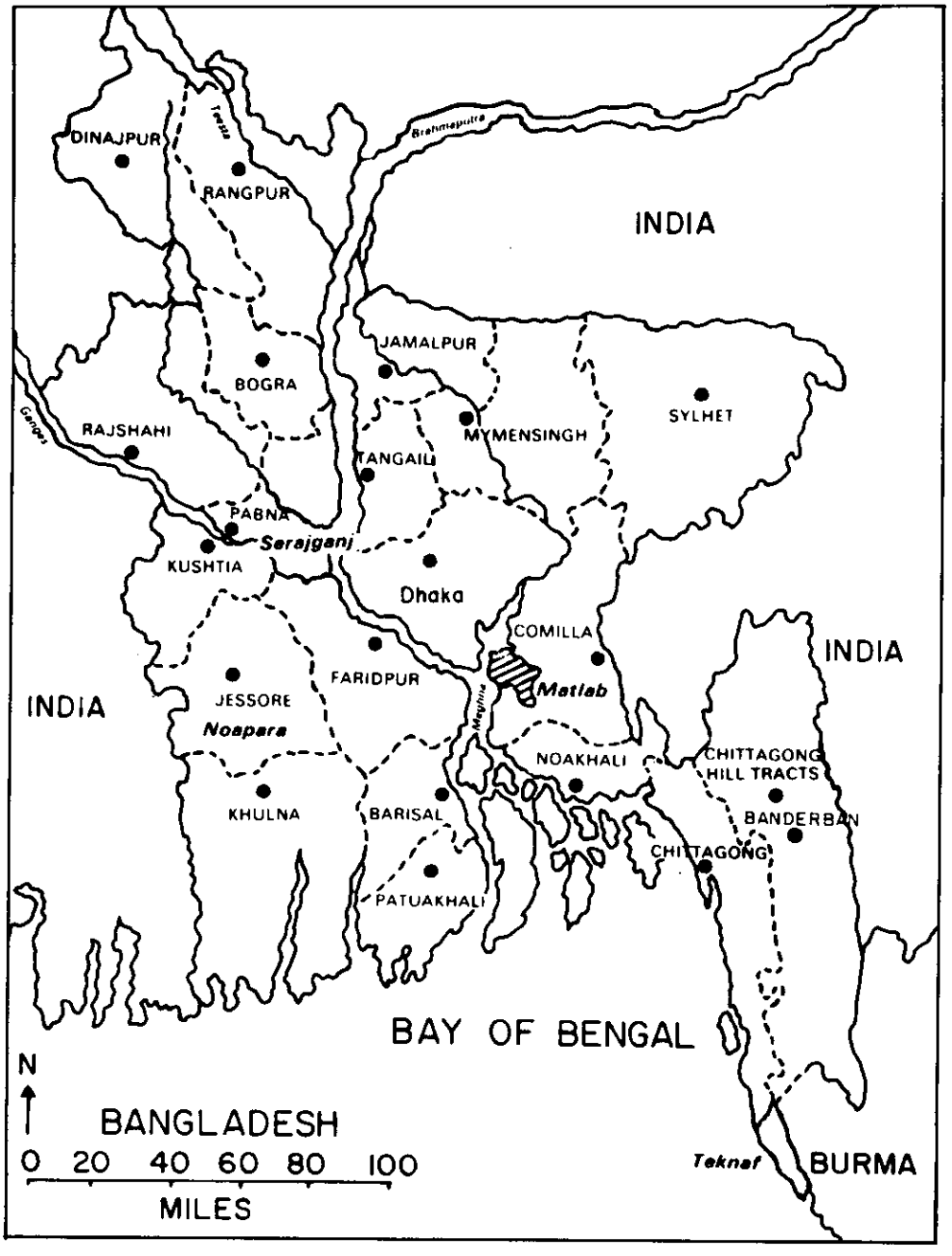
In 1963 the Director of the CRL, Abram Benenson, together with Robert Oseasohn and AKM Fahimuddin, made numerous trips by boat to find a suitable location for these field trials. Several villages wanted nothing to do with cholera research, while others hoped for the economic advantages which participation might bring. Finally a group of 23 villages were chosen in Matlab thana, then a subdivision of Comilla district. This area had a high prevalence of cholera, it was crossed by several rivers and canals making access easier, and it was densely populated so making field work more efficient. In addition, there had been a census of the villages during the smallpox eradication campaign in 1961 and the census cards were still available and easily updated. Each inhabitant was located again and given a number, and the first cholera vaccine trial was launched in November 1963. Little could the scientists involved imagine that research in the area would still be going on 27 years later, that the study area would have grown several times, that the research would become truly multidisciplinary, and that the body of knowledge gained from the Matlab area would require its own bibliography!

Matlab

Matlab is a large upazila, a subdivision of Chandpur district, with a population of about 400,000. (Until recent changes in the structure of local administration Matlab was a "thana" in Comilla district.) The area is a delta and is intersected by numerous canals and branches of two major rivers, the Meghna and the Gumti. During the monsoon most of the land is flooded. The climate is subtropical and the Tropic of Cancer passes through the area.

About 85% of the population is Muslim, and the remainder mostly Hindu. There are on average between five and six people in each family and each family typically owns a one or two – room house, with a dirt floor and with walls and roof made of jute sticks, corrugated iron sheet, or thatch. Some households will have a separate shed, kitchen, or other out – building. Three to six families, usually related to each other, live around a common courtyard in a unit called a *"bari"*. Several *baris* form a village. Most villages are separated from each other by fields or water. The average village has grown in size from 1,200 people in 1963 to over 1,400 in 1990, although villages range in size from a few hundred people to well over two thousand.

Map of Bangladesh (showing location of Matlab)



Key: ▨ study area

The staple food of most Bangladeshis is rice, grown during the monsoon "*aman*" season. A second rice crop, or vegetable crop, is often possible during the winter "*boro*" season. Jute, the predominant cash crop in Bangladesh, is grown during the spring-summer season. Most employed people work in agriculture, either as owner-operator farmers, as sharecroppers, or as labourers, or as a mixture of these. Other important activities are fishing and small-scale trading. Matlab bazaar, the town containing the upazila headquarters, is the centre of regional government and contains a police station, a court, schools, health facilities, a post office, banks, markets, and crop storage facilities. Matlab bazaar is connected to the district capital, Chandpur, by a motorable road. Several smaller towns along the rivers are linked to Matlab bazaar by scheduled services of riverboats. Communication between villages is only possible by foot or by small, man-powered boats.

The Demographic Surveillance System

Although the population was enumerated from the beginning of the field trials in 1963, the registration of all births, deaths, and movements into and out of the area did not begin until the census of 1966. This census, conducted in 132 villages with a population of 112,000, marked the beginning of the Demographic Surveillance System. Shortly after the census, a field organisation was established to visit each household in the area once a week to record all vital events and send this information to Dhaka for tabulation. Since 1963, the number of villages in the area and the population under surveillance has varied greatly, as shown in Table 1. In addition, the organisation of the field operations, as well as that of the field staff itself, have been improved.

Table 1: – Characteristics of the Matlab Demographic Surveillance System population

Census date	Population (whole area)	Number of villages	Infant mortality rate	Crude death rate	Crude birth rate
1963	28,000	23	–	–	–
1966	112,000	132	110.7	15.0	47.1
1968	221,000	233	124.1	15.0	46.6
1974	264,000	228	137.8	16.5	42.9
1982	188,000	149	112.5	14.2	40.7
1988*	200,000	142	90.3	9.9	35.6

* no census was taken in 1988

Matlab Hospital

When the first cholera vaccine trial was begun in 1963, a field hospital was established in Matlab bazaar to provide diagnostic support to the researchers and treatment to the community. The hospital was established in a small tin hut with one physician and one nurse. The next year a former police barge, which had travelled up and down the river supporting the immunization teams, was anchored in Matlab and used as both a hospital and for staff housing. In 1966, the Upazila Health Complex was constructed by the government and included a two-storey wing for the CRL field hospital and administration.

These facilities gradually expanded over the next two decades. In 1990, a health research complex was built specifically for the ICDDR,B.

Over the last 25 years, the Matlab field hospital, in its various forms, provided free treatment to all members of the community suffering from diarrhoeal diseases, whether they occurred within or outside the surveillance area. The number of patients served each year is shown in Table 2. In addition to this medical service, the hospital provided facilities for clinic-based research and the laboratory necessary for clinical and field research. In 27 years, it has grown tremendously from Benenson's model which any Bengali physician could copy with the very simple means at his disposal.

Table 2: – Annual number of patients with diarrhoea seen at the Matlab treatment centre

Year	Patients	Year	Patients
1963	52	1977	17850
1964	804	1978	14685
1965	2219	1979	11469
1966	2469	1980	10987
1967	2822	1981	8820
1968	4676	1982	11051
1969	5786	1983	12648
1970	6658	1984	8195
1971	4174	1985	6539
1972	4085	1986	8988
1973	3496	1987	7259
1974	13645	1988	6782
1975	12513	1989	5317
1976	10399		
		Total	204388

Major studies and findings

Cholera vaccine trials

A number of major cholera vaccine trials have been conducted in Matlab over the years. These include:

1963
The first carefully controlled field trial of an injectable cholera vaccine, tested the standard whole-cell vaccine and found that it gave significant protection for about 2 years;

A second trial of the same vaccine showed that it was only effective for about 18 months after vaccination;

A test of a vaccine based on the endotoxin of the Ogawa serotype produced some immunity but only for about a year;

1966 – 1967
The effects of one and two doses of vaccine, given to children aged less than 14 years were tested, showing that children aged from 0 to 4 years benefited from two doses;

1968 – 1969
Testing separate monovalent vaccines seemed to show that immunity depended on the development of serotype – specific immunity, although this was later questioned;

1974
After several years of research in the US and the UK which resulted in the Wyeth toxoid vaccine, the largest and most rigorous field trial to date was carried out involving some 93,000 people; unfortunately, it only gave 40% protection which lasted only 9 weeks;

1985 – 1989
It took a number of years for the next vaccine to be developed. Finally, after further research on the molecular structure of cholera toxin, two vaccines – – one a combination of killed whole cells and the B – subunit of cholera toxin (WC/B), the other the killed whole cells alone (WC) – – both administered orally, were ready for field testing. Over a 5 – month period in 1985, some 63,000 people received three doses of vaccine or a placebo; both vaccines provided 57% protection after two years; some protection extends to the third year, but children aged less than five years had a lower rate of protection.

Research on Oral Rehydration Therapy (ORT)

Following the pioneering work by Robert A. Phillips, much of the early clinical work on oral rehydration was carried out in the Dhaka hospital of the CRL. Careful research indicated that an isotonic solution of glucose and electrolytes could at least reduce the amount of intravenous fluid required. The next step was to carry out field trials, first in the Matlab field station hospital. These tests, conducted during 1969, confirmed the previous findings. At this point a number of community studies were undertaken in Matlab to see how to take ORT to the patient. Could the solution be made from cheap, local ingredients? How could the ingredients be measured accurately, mixed and then stored safely? And how could the responsibility for diagnosis and therapy be transferred from the hospital physicians to paramedical staff, or even to the patient's mother?

A field study in 1976 – 1977 showed that there could be problems, such as elevated serum sodium levels, if an oral rehydration solution (ORS) was used unsupervised. Subsequent studies showed that female village workers, either DSS Community Health Workers or a trained woman in each *bari*, called the "*bari mother*," if carefully trained, could successfully mix and administer ORS. Recent studies have examined the knowledge, attitudes, and practices of mothers concerning diarrhoea and found that women are fairly knowledgeable about making ORS, but that problems may remain since many think that it is a medicine to cure diarrhoea.

Clinical Research

Complimenting the field studies conducted in Matlab, and serving as a bridge between the intensive clinical and laboratory research undertaken in Dhaka, has been the clinical research which has taken place in the Matlab hospital. These studies have included:

Drug trials:

drug trials of better treatments for diarrhoea and dysentery;

Search for pathogens:

continuing the search for the many still unknown causal agents in diarrhoea cases, by, for example, hospital surveillance for ETEC;

Diagnosis:

bringing diagnostic tools closer to the field, such as the research on household and neighbourhood contacts of rotavirus cases made possible when ELISA testing became available;

Surveillance:

treatment centre surveillance, through which age and seasonal patterns can be shown and changes in disease patterns, such as the 1973 shift from classical to El Tor cholera, identified;

ORS trial:

the successful hospital tests of sucrose-based ORT in rotavirus and other diarrhoeas which allowed the switch from glucose to sucrose-based ORT for all clinical and field treatment.

Epidemiology

Epidemiological studies in Matlab have focused on morbidity and mortality in the field, not in the hospital. As the Centre's 1976 Annual Report bluntly stated, "It is sobering to note only ten percent of diarrhoeal cases seek hospital-based medical attention in an area in which transportation and effective treatment is free." Examples of these studies include:

the 1976-1977 study of the *bari* where cholera patients lived. Of the 695 people in the 13 *baris* examined, 47 got cholera, virtually all by means of contaminated surface water (especially cooking water). It was also found that cooking water was contaminated before it entered the house and that people had a frequent exposure to low levels of *Vibrio cholerae*;

further studies of cholera showed how it is spread within families; the risk factors for cholera, such as blood group O, but not malnutrition, the protection offered by breast-milk, and the presence of salivary IgA;

complementing the hospital work, field research has helped to identify new pathogens, such as species of *Campylobacter*;

recent epidemiological studies which have looked at the risk factors for shigellosis and persistent diarrhoea.

Nutrition

Malnutrition is one of the many consequences of poverty. As such its causes and consequences are multidimensional; scientific activities at the Centre aimed at improving nutritional well-being have drawn on a variety of disciplinary skills. Because of their institutional comparative advantages, these studies have primarily been directed towards those aspects of malnutrition most closely related to diarrhoeal diseases. Among these studies have been:

a study of protein-energy malnutrition and subsequent risk of mortality which examined, during 1975-1976, 2,019 children aged 12-23 months in 86 villages. The death rate was 6 times greater among poorly nourished children in crowded households; "This is indicative of the improvement in mortality that may be achieved in this population simply with improvements in nutrition and socio-

economic conditions, in the absence of other health services."

a study of intra-family food distribution, feeding practices, and malnutrition, which intensively examined 120 households in 4 villages in terms of dietary intake, morbidity, and nutritional anthropometry. It found, among other things, that there was a sex bias in protein and energy intake at all ages;

several projects have looked into the interaction between diarrhoea, malnutrition, and growth; the nutritional advantages and anti-infectious properties of breast feeding; and the many important properties of vitamin A;

studies developing ways to evaluate nutritional status and interventions, such as the finding that measuring arm circumference is as good as measuring weight in predicting the risk of dying.

Population

Since the Centre's inception, population sciences have had a prominent position in its research activities. This originally arose out of the need to maintain demographic surveillance for large populations in Matlab to evaluate early field trials of cholera vaccines. More recently, the inclusion of population sciences as an area of research priority has stemmed from the recognition that morbidity is to a considerable degree shaped and conditioned by the broader social, cultural, and demographic environment of the individual. The resulting data which have been collected are unique within the developing world in terms of opportunities for research to understand the determinants of, and interrelationships between, demographic and health processes. This research can be grouped under these broad headings:

Fertility

much of the basic endocrinological research on breast feeding and the resumption of ovulation following birth is a direct result of several studies in Matlab. This work started in 1969 when it was conclusively shown that there is a relationship between stopping breast feeding and the resumption of menses. This was followed by work on the relationships between nutritional status and fertility, and on breast-feeding patterns in relation to postpartum anovulation. Examinations of other correlates of fertility, such as socio-economic status, season, and contraception, have also been carried out.

Mortality

beginning with the simple recording of deaths due to cholera, demographers have used data from Matlab to study the relationships between various factors contributing to mortality, such as age, gender, and socio-economic status, as well as various causes, particularly diarrhoea, measles, and maternal causes, and the effects of health care interventions (ORS, several MCH programmes, and even the serendipitous use of tetanus toxoid as a placebo during a cholera vaccine trial).

Methodology

using the Matlab framework, where all residents are carefully enumerated and where most ages are known (to researchers) with some precision, a number of important methodological studies have been carried out. These have examined simplified survey techniques for measuring fertility, lay reporting systems for obtaining information on the cause of death when no medical personnel are present at death, and techniques to obtain better pregnancy history data and age reporting.

Other topics

interesting studies on nuptiality, divorce, and migration have also been carried out using Matlab DSS data to better understand the social setting of the Centre's health, behavioural, and programmatic research.

Family Planning

The previous research on the determinants of natural fertility in Matlab, as well as the obvious need for a good family planning programme in Bangladesh and the availability of the DSS population framework for undertaking further investigations, led to the start of family planning research in Matlab. This work has evolved from a simple contraceptive distribution programme, through a Family Planning and Health Services Project, to the present Maternal and Child Health/Family Planning Project. These have made remarkable progress in family planning and in understanding its relationship with child survival:

Programmatic aspects of a service delivery system

the Matlab programme has demonstrated that maternal/child health and family planning programmes, if properly designed and implemented, will succeed even in difficult settings, such as Bangladesh. The projects have shown the importance of outreach activities and a female-based workforce; strong systems of record keeping and supervision; an emphasis on providing a broad range of contraceptive methods; an effective system of referral and medical support and emphasis on the quality of services.

The effect of successful family planning on maternal and child health

the fertility decline in Matlab brought about by the family planning projects has reduced maternal mortality rates; has reduced the crude death rate (by reducing the incidence of births); has not been associated with declines in infant mortality rates (since there are few high-risk short birth intervals due to the long duration of breast feeding in Matlab). There is evidence, however, that the fertility decline has reduced child mortality rates.

The effect of maternal and child health services on family planning

combining family planning with a package of MCH services contributes to the credibility of workers and to the effectiveness of family planning; but there is no evidence that adding additional MCH components will subsequently improve family planning; of great importance is the finding that mortality does not have to decline before the fertility effects of family planning services will be seen; family planning services are critical to producing fertility effects.

MCH interventions

Following more than a decade of increasing concern for all aspects of maternal and child health, the MCH-FP programme in Matlab was started in 1977. It has been a comprehensive programme involving health service implementation, demographic and morbidity surveillance, health service research, and epidemiology. The project population of almost 100,000 has received an increasing variety of health care services, with the aim of reducing maternal, infant, and child mortality rates and increasing the number of couples practising family planning. The package of services offered by female field workers and their clinical counterparts has been developed and expanded gradually to ensure that the workers are competent in the delivery of each service before another is introduced. Aside from the direct benefits of improved health services to the population

in the project area, the Matlab programme also provides lessons for health policy. Since 1982, there have been efforts to reproduce the services used in Matlab within a Government project located in another part of the Bangladesh, permitting research into ways the Matlab lessons can be implemented in the context of the National Health and Family Planning programme. Generally working in a 4-block experimental design framework, the following interventions have been tested in the MCH-FP programme:

1977 - MCH and FP intervention begins

1978 - IUD insertions added
- tetanus vaccine offered to pregnant women

1979 - oral rehydration therapy

1982 - tetanus vaccine offered to all women
- measles vaccine offered
- home insertion of IUD
- iron tablets provided to pregnant women
- training of traditional birth attendants
- 4 sub-centres opened to provide clinical services
- Community-operated treatment centres established

1985 - Safe delivery kits for pregnant women

1986 - full EPI (DPT, BCG, polio, measles)
- nutritional rehabilitation unit started
- vitamin A distribution

1987 - midwives located at sub-centres
- nutritional rehabilitation unit at sub-centres
- quality control of data collection

1988 - treatment of acute respiratory tract infections

1989 - community-based treatment of dysentery
1990 - quality of health care services emphasised

Conclusion

This Introduction has attempted to outline the context in which the studies listed in this Bibliography took place. Glancing at the table of contents or skimming through the abstracts will reveal the rich diversity of scientific investigation which has taken place since Oseasohn and Fahimuddin "discovered" Matlab on 4 October 1963. The 567 works listed below are a tribute to the hundreds of dedicated field workers, scientists, and support staff who have worked in Matlab for almost three decades.

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Editor-in-Chief
and
Dr Michael Strong
Project Director,
DSS, Matlab

ANNOTATED BIBLIOGRAPHY OF ICDDR,B STUDIES IN MATLAB, BANGLADESH

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"Vibriocidal and agglutinating antibodies in sera from acute cholera cases, normal residents of endemic and non - endemic cholera areas and maternal and cord blood were characterized by 2 - mercaptoethanol (2 - ME) sensitivity and density gradient fractionation. In acute cholera there was a rapid and parallel rise in whole serum and 2 - ME - resistant vibriocidal and agglutinating antibodies, peaking in 7 to 10 days, and then a parallel fall in titers in whole serum and 2 - ME - resistant antibodies. Density gradient studies confirmed this pattern, demonstrating the rise and fall of vibriocidal and agglutinating titers in both the IgM and IgG - IgA fractions. The apparent independence of the vibriocidal and agglutinating activity in the IgG - IgA fractions suggested that IgA as well as IgG might be contributing to the agglutinating titers. The presence of vibriocidal and agglutinating titers on admission in many adult cholera cases, coupled with a rapid rise in IgG antibody, indicates that this is a secondary response in individuals already primed by natural infection or cholera vaccine. Most residents of the endemic cholera area (East Pakistan) had high vibriocidal and agglutinating titers with activity in both IgM and IgG, in contrast to sera from residents of non - endemic areas (U.S.A. and Czechoslovakia) who had non - detectable or low titers with vibriocidal activity in most cases exclusively in IgM. Transplacental transfer of IgG vibriocidal antibody was demonstrated." (Authors' abstract)

004 Akbar J, Chakraborty J, Jahan N, Phillips JF, Satterthwaite AP. Dynamics of depot medroxyprogesterone acetate (DMPA) use effectiveness in the Matlab Family Planning Health Services Project. *In*: Proceedings of the Bangladesh Fertility Research Programme Seventh Contributors Conference, held in Dhaka, on 8 - 9 December 1982. Dhaka: Bangladesh Fertility Research Programme, 1983:379 - 408

"This report documents the levels of use effectiveness of DMPA over the 1977 to 1980 period of the Family Planning Health Services Project (FPHSP) that was initiated in October 1977. In this paper we present the continuation rates and net rates of termination according to first segment, first method and all methods criteria of DMPA. In all 4405 DMPA adopters at Matlab were given 3 month injection and subsequently 6 month injection. Life table methods show that continuation rates are higher by all criteria than corresponding rates among users of the Copper T IUD in Matlab. The authors note that a regimen of switching women temporarily to pills for regularization of menses and back to DMPA again accounts for this high use effectiveness. The field procedures in Matlab are reviewed and methods for dealing with minor complaints are discussed. Net termination rates show that their system maintains low rates of drop - out for menstrual problems and thus high overall effectiveness of DMPA. Implications for the national programme are discussed which included a recommendation to test field procedures for utilization of DMPA in the national programme." (Authors' abstract)

005 Ali MA, Huq A, Felsenstein A, Rahman R, Islam MS, Hossain KMB. Detection and isolation of *Vibrio cholerae* 01 from plankton by conventional culture method and indirect fluorescent antibody technique [abstract]., Bangladesh J Microbiol 1988;5(1):40

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009 Aziz KMA. Kinship in Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 228 p. (ICDDR,B monograph, 1)

010 Aziz KMA, Maloney C. Life stages, gender and fertility in Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1985. 231 p. (ICDDR,B monograph, 3)

"This pioneering study describes the psychological development and gender role expectations in the various life stages of an individual in Bangladeshi culture and relates these stages to sexual and reproductive behavior. The authors, both anthropologists, examined the topical life histories of 65 male and female respondents from 5 contiguous villages in Matlab Thana. These personal histories form the basis for chapters on stages of life, childhood and psychosexual development, adolescence and gender roles, adulthood and gender roles, sexual relations outside marriage, range of sexual behavior, and reciprocal relationships within the life cycle. Then, fertility is examined from an anthropological perspective in the final chapters on cultural factors and fertility, fertility control and the stages of life, traditional communication and knowledge of sex, and family life education. At least half of the life history respondents expressed support for family planning and modern methods. Maximum fertility is prevented in the 2nd half of women's reproductive years by traditional mechanisms such as self – restraint, absence of spouse, occasional abstention, and rhythm. The use of modern contraception is supported on the grounds of avoiding economic hardship, maintaining mental peace, and leading a happy life. The most useful approach for family planning field workers seems to be to get to know the men of the village in public places, then the older women, and finally the young women, establishing at each stage the confidence and fictive kinship relationship appropriate. In this way, communication is possible without challenging deeply rooted distinctions of gender roles and life stages." (POPLINE)

011 Aziz KMA. Marriage practices in a rural area of Bangladesh. J Indian Anthrop Soc 1978;13(1):29 – 40

"This paper has several distinctive features. Several dimensions of marriage practices in a rural area of Bangladesh are presented. These dimensions include universality and the extent of multiplicity of marriage, incest regulations, marital union between cousins, incidence of prepubertal marriages, rising age at marriage and widow remarriage. Two newer marriage practices are identified. The first was the rising age of female marriage, and the second was the growing acceptance of widow remarriage among the Hindus. Late menarcheal age in the study area was particularly important in view of the increasing preference for post – pubertal marriages. Hunt II (1976: JI57) noted that by not having the first baby until age 20 or later would significantly reduce maternal and infant mortality and morbidity, minimize population growth, and lead to improvement in the

quality of life for people everywhere. A moderate rise in the age at marriage of girls, however, may not effect the population growth dramatically since the fertility is also lower among very young wives. Postponement of marriage until puberty is likely to make the sexual union between marital partners more satisfying than the sexual union between a young man of approximately twenty years of age and a prepubertal girl. The change from prepubertal to postpubertal entry into conjugal sex life is likely to contribute to better adjustment between the married partners. The current prevalence of widow remarriage among the Hindus of the study area is likely to gain further acceptance in future, which may have a positive impact on population growth. Such acceptance of widow remarriage is likely to contribute favourably in socio-economic and psychosexual aspects of the widow's life." (Author's abstract)

012 Aziz KMA, Hossain SB. Patterns of death in rural Bangladesh during 1966-1971. Rur Demogr (Dhaka) 1974 Summer;1(1):27-33

"In 132 villages of rural Bangladesh a routine collection of mortality statistics by the Cholera Research Laboratory, Dhaka indicated a very high infant mortality rate and an excess female mortality above one year of age. On the average 12% of the new borns die by the end of the first year. Irrespective of males and females the death figures had a lower trend in the age group 5-44 years. In the 5-year study period there was a gradual trend to higher neo-natal mortality. A reverse trend in post neo-natal mortality was found. The female mortality rate exceeded the male rate by an average of 94% in the age group 15-24 years. An average of 41% excess mortality for females compared to males was found in the age group 1-4 years. There was a small but consistent excess in female mortality above 45 years of age. To solve the problems related to the stated patterns of mortality a multidisciplinary approach is needed." (Authors' abstract)

013 Aziz KMA, Chowdhury AKMA, Mosley WH. Population studies in rural East Pakistan. *In*: Proceedings of the CENTO Symposium on Demographic Statistics, Karachi, 5-12 Nov 1968. Ankara: Central Treaty Organization, 1968:135-44

014 Aziz KMA, Mosley WH, Fahimuddin M, McCormack WM, Islam MS. Present trends of birth and death in rural East Pakistan: a preliminary report [abstract]. *In*: Souvenir of the 5th Annual Medical Symposium, Karachi, 8-13 Aug 1966:38

015 Aziz KMA. Present trends in medical consultation prior to death in rural Bangladesh. Bangladesh Med J 1977 Oct;6(2):53-8

016 Aziz KMA. Present trends in medical consultation prior to death in rural Bangladesh [abstract]. *In*: Souvenir of the 5th National Conference of the Bangladesh Medical Association, Dhaka, 6-9 Jan 1977

017 Aziz KMA, Mosley WH, Fahimuddin M, McCormack WM, Islam MS. Present trends of birth and death in rural East Pakistan: a preliminary report. Pak J Fam Plann 1967;1(1):35-40

018 Bairagi R, Aziz KMA, Chowdhury MK, Edmonston B. Age misstatement for young children in rural Bangladesh. Demography 1982 Nov;19(4):447-58

"Age data for 3,393 children, six years of age and under, in rural Bangladesh are analyzed for the level and pattern of age misstatement. Random error, age heaping at whole years, and preferences for particular ages are found in the data. Variation in age reporting is discovered to increase monotonically with age. Systematic errors in age misstatement display modest overstatement for the first four years of life and more pronounced understatement for ages 4, 5, and 6. Age misstatement is examined for its effect on one indicator often used in nutritional surveillance -- weight-for-age of children. The impact of the various types of age misstatement (a) increases the difficulty of interpreting weight-for-age and (b) obscures accurate understanding of malnutrition

in Bangladeshi children." (Authors' abstract)

019 Bairagi R, Amin-ur-Rahman. Age reporting in rural Bangladesh. Rur Demogr (Dhaka) 1974 Summer;1(1):65-89

020 Bairagi R, Chowdhury MK, Kim YJ, Curlin GT. Alternative anthropometric indicators of mortality. Am J Clin Nutr 1985 Aug;42(2):296-306

"The ability of anthropometric indicators, weight-for-age, height-for-age, weight-for-height, weight velocity, and height velocity to discriminate mortality during a one-year period is examined for three time frames beginning in different seasons. Data on approximately 1,000 children of one to four years of age come from the Matlab, International Centre for Diarrhoeal Disease Research, Bangladesh. The indicators' mortality-discriminating power is assessed in terms of the magnitude of difference between the mean indicator values of living and dead children expressed in standard deviation units and of the maximum sum of sensitivity and specificity. The indicators' mortality curve by nutritional status shows the discriminating power visually; the *t* test indicates its statistical significance. Weight-for-age and height-for-age perform better than weight velocity and height velocity as discriminators of mortality during a one-year period. The ability of weight and height velocity to discriminate short-term mortality is examined by comparing the mean velocity of the last two bimonthly intervals of the dead children. Weight velocity is likely to be a good indicator of short-term mortality." (Authors' abstract)

021 Bairagi R, Chowdhury MK, Kim YJ, Curlin GT, Gray RH. The association between malnutrition and diarrhoea in rural Bangladesh. Int J Epidemiol 1987 Sep;16(3):477-81

"The interaction between diarrhoeal disease and nutritional status measured by anthropometry was investigated in approximately 1,000 children aged 1 to 4 years during April-December 1976 in a rural area of Bangladesh. Data on diarrhoeal disease were provided by the mothers interviewed at seven-day intervals. Weight and height data were collected bimonthly. Children classified using anthropometric criteria - weight-for-age, height-for-age, and weight-for-height - were prospectively evaluated for incidence and duration of diarrhoea during a short (two-month) period and a long (eight-month) period. Incidence of diarrhoea was not found to be related to nutritional status measured by any of the anthropometric criteria for any of the periods. But duration of diarrhoea was found to be related consistently to nutritional status measured by weight-for-age and weight-for-height. Diarrhoea in the short term affected weight increment in the short term, but not in the long term and did not affect height increment for any of these periods. Diarrhoea in the long term affected both weight increment and height increment in the long term." (Authors' abstract)

022 Bairagi R. A comparison of five anthropometric indices for identifying factors of malnutrition. Am J Epidemiol 1987 Aug;126(2):258-67

"Five anthropometric indices -- weight-for-age, height-for-age, weight-for-height, weight velocity, and height velocity -- are compared for identifying factors of nutritional status of children. Data come from Matlab, the field station of the International Centre for Diarrhoeal Disease Research, Bangladesh. Weights and heights on approximately 1,400 children aged 12-60 months were taken 11 times at two-month intervals. Dwelling floor space, a proxy for socioeconomic status, is considered a long-term factor; the 1974-1975 Bangladesh famine, a medium-term factor; and season, a short-term factor of nutritional status. The figures of the indices by socioeconomic status at different times show their power to identify the factors visually; the regression analyses test statistical significance of the factors; and the standardized regression coefficients provide relative power of the indices to identify the factors. Weight-for-age and height-for-age appear best for identifying long- and medium-term factors; weight velocity, for identifying short-term factors. Weight-for-height is third in identifying long- and medium-term factors, second for identifying short-term factors. Height velocity identi-

fies short-term factors only. The effect of short-term factors on height velocity appears approximately four months later than it appears on weight velocity. This study clarifies why certain indices do not predict mortality in this study population and others." (Author's abstract)

023 Bairagi R. Food crisis, nutrition, and female children in rural Bangladesh. Pop Dev Rev 1986 Jun;12(2):307-15

"This article assesses the effect of the 1974-1975 famine on sex-biased allocation of food among children aged 1-4 in Bangladesh. The study was conducted in 12 Matlab villages on 1400 children. Anthropometric indexes were used as a measure of nutrition, and floor space in each family's dwelling was used as an indicator of socioeconomic status. A sharp downward trend in malnutrition occurred over the study period with rapid seasonal fluctuation in indexes of weight-for-age and weight-for-height. The proportion of severely malnourished children was 68% higher in April-October 1975 than in April-October 1976. Data demonstrate negative effects of famine, low socioeconomic status, and female sex on nutrition, as effects of famine on female children and those of low socioeconomic status were more acute. Improvement in household resources raises nutritional status of all children, but benefits males more than females. Sex differentials in nutritional status were more marked among children of high socioeconomic status. It is important that those responsible for resource allocation in times of crisis ensure that famine relief reaches both male and female children; feeding at a relief center may be more effective than giving food to the family for home consumption." (POPLINE)

024 Bairagi R, Chowdhury MK, Phillips JF. A multivariate logistic regression analysis of childhood survival: the interaction of household economic status and nutritional status with sex of child. *In*: Edmonston B, Bairagi R, eds. Infant and child mortality in Bangladesh. Dhaka: Institute of Statistical Research and Training, University of Dhaka, 1982:97-110

025 Bairagi R. On components of variation of estimated weight velocity of children. J R Stat Soc (Ser C) 1986;35(2):178-82

"The variance of an estimator of weight velocity of a population of children is broken down into two components which depend on four parameters: variance of weight velocity in the population of children, measurement error variance in weight, sample size, and the time interval between two measurements for estimating weight velocity. The parameters are estimated using results from two experiments. An optimal design is identified." (Author's abstract)

026 Bairagi R. On validity of some anthropometric indicators as predictors of mortality [letter]. Am J Clin Nutr 1981 Nov;34(11):2592-3

027 Balk D, Faiz KK, Rob U, Chakraborty J, Simmons G. An analysis of costs and cost-effectiveness of the Family Planning-Health Services Project in Matlab, Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1988. 261 p.

028 Bangladesh: menstrual regulation performed by paramedics found safe. Int Fam Plann Persp 1980 Dec;6(4):151-2

"Reports on 2 studies of menstrual regulation, based on a group of 212 married women in the Matlab district of Bangladesh who had menstrual regulations performed between October 1977 and September 1978. The procedure was found to be as safe when performed by trained paramedical personnel as when performed by doctors. Contraceptive use was found to be high among women who have obtained the procedure; a substantial number of the women were found to be using menstrual regulation to delay rather than to terminate childbearing." (POPLINE)

029 Baqui AH, Yunus M, Zaman K. Community-operated treatment centres prevented many cholera deaths. J Diarrhoeal Dis Res 1984 Jun;2(2):92-8

"In December 1979, a community-operated Diarrhoea Treatment Centre was set up at Shataki, Matlab Thana, a rural area of Bangladesh. Over time, the Centre demonstrated that a community-operated centre could effectively handle the endemic patient load. Following the Shataki model, another community-operated centre was opened at Kalirbazar, Matlab Thana, in June 1982. In October 1982, a cholera outbreak was identified in Matlab and neighboring thanas (districts). With the onset of the epidemic, the catchment areas of the centres expanded, and between October and December about 2,000 patients were treated by these two centres. Despite increased severity and case loads, case fatality rates during the pre-epidemic and epidemic periods were almost equal. It was estimated that during the 1982 cholera epidemic, the two community-operated centres averted approximately 820-1,000 deaths. With the current state of knowledge, in the absence of primary prevention, establishment of community-operated treatment centres with provisions for intravenous fluids is highly effective in reducing mortality from cholera and other acute diarrhoeal diseases." (Authors' abstract)

030 Baqui AH, Zaman K, Yunus M, Mitra AK, Hossain KMB, Banu H. Epidemiological and clinical characteristics of shigellosis in rural Bangladesh. J Diarrhoeal Dis Res 1988 Mar;6(1):21-8

"Some epidemiological and clinical characteristics of 292 patients infected with *Shigella* spp in a sample of 2,635 diarrhoea patients are described. The sample consisted of every fifth of all patients who came for free treatment between May 1983 and April 1984 at the Matlab Field Hospital of the International Centre for Diarrhoeal Disease Research, Bangladesh. A little more than half of them belonged to the age groups of 1-4 years (31.3%) and 5-14 years (20.4%), and more than half (56.4%) were males. Of the 292 patients yielding *Shigella* spp in their stools, the predominating isolates were *Shigella dysenteriae* type 1 (181; 62%) and *S. flexneri* (79; 27.1%) respectively. Of the stool samples from 1,318 patients examined for *Campylobacter*, 148 (11.2%) were culture-positive for only *Campylobacter jejuni*. *Shigella* spp were isolated most frequently from patients aged 1-2 years (154/1000), and in patients aged 60 years or more (147/1000), and least frequently in children under one year of age (58/1000). Compared with the genus as a whole, *S. dysenteriae* type 1 was isolated most frequently in patients aged 5-9 years (94/1000) and 10-14 years (116/1000) and more frequently from males (8.4%) than from females (4.9%; $X^2 = 13.0$; $p < .001$). Two peaks of shigellosis were observed, one during June-September caused by *S. dysenteriae* type 1, and the other in December caused by S. *flexneri*. Blood was visible to the naked eye in 68% of the faeces positive for *Shigella* spp (in 87% of faeces positive for *S. dysenteriae* type 1) on culture, but in only 18% of samples showing *Entamoeba histolytica*, in 18% of samples positive for *C. jejuni* on culture and 12% of samples from the remaining patients. Stool samples positive for *Shigella* spp on culture were more often alkaline than those from patients yielding other pathogens (251/276 vs 1580/2052; $X^2 = 28.3$; $p < 0.001$). Patients infected with *S. dysenteriae* type 1 were more likely to have bloody stools than patients infected with other species of *Shigella* (150/181 vs 40/111; $X^2 = 77.8$; $p < 0.0001$). Patients with shigellosis less frequently presented with moderate-to-severe dehydration (53/292 vs 1182/2343; $X^2 = 108.9$; $p < 0.0001$), but required antibiotics more often (245/292 vs 1429/2343; $X^2 = 58.8$; $p < 0.0001$). Patients infected with *S. dysenteriae* type 1 required antibiotics more frequently than those infected with other species of *Shigella* (166/181 vs 79/111; $X^2 = 21.5$; $p < 0.001$). Salient findings, like the S. *dysenteriae* type 1 as the dominating isolate in place of S. *flexneri* observed earlier; two peaks of shigellosis, instead of one, known previously; similar value of the naked eye as well as the microscopic presence of blood in faeces as a diagnostic aid in shigellosis; antibiogram pattern of *Shigella* isolates, etc., including their implications, are discussed." (Authors' abstract)

031 Becker S, Hiltabidle H. Comparison of measures of childbearing: patterns by age and parity in Matlab, Bangladesh. Dhaka: International Centre for Diarrhoeal Disease

Research, Bangladesh, 1981. 23 p. (ICDDR,B working paper, 15)

"The patterns by age and parity of 7 measures of childbearing in the married female population of Matlab, Bangladesh are presented. All the measures reflect the high level of fertility in this population. The patterns of fertility rates and pregnancy prevalence were very similar. This was expected because of the functional relationship between incidence and prevalence. The usual increase with age and decrease with parity were evident for the 3 birth interval measures studied. However, contrary to expectations from theoretical work, the mean closed birth interval-birth was found to be greater than the mean closed birth interval-woman in nearly all age and parity groups. Except for fertility rate, all of the measures showed greater variability with age than parity. This agrees with results from other studies. For the interval measures the constancy with parity was due to the counterbalancing of a positive effect of age and negative effect of parity. Fertility was considerably lower in the Matlab population than in the Hutterite population of North America and birth intervals consistently longer. The very long interval of post-partum amenorrhea in the Matlab population serves as an explanation." (POPLINE)

032 Becker S, Razzaque A, Sarder AM. Demographic Surveillance System - Matlab. V. 8. Census update, 1978. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982. 31 p. (ICDDR,B scientific report, 55)

This is the 8th volume in a series of scientific reports presenting the annual results of the Demographic Surveillance System in the Matlab area (Bangladesh). The reduced surveillance area for 1978 was made up of 149 villages. Background of the surveillance system is provided in an introductory section. Other sections cover the methodology used in the reduced census and discuss the results. Appendices include copies of the household census form, the coding schemes, and the census results tabulated by village.

033 Becker S, Chowdhury A. Determinants of natural fertility in Matlab, Bangladesh. East Lansing, MI: Office of Women in International Development, Michigan State University, 1983. 27 p. (Working papers on women in international development, 40)

"In 1970 a one-year prospective study of birth interval dynamics for a group of 200 women in Matlab, Bangladesh was done. The present paper reports on an extended and enlarged study of natural fertility in the same area. During the prospective period of 52 months (1975-1980), 2300 women were asked each month about their reproductive status, presence or absence of the husband, family planning use, and breastfeeding practice. During the first year of the study, anthropometric measures were taken and blood specimens were collected for biochemical analyses of the nutritional status of the women. During the last year of the study when interviewer-respondent rapport was well-established, a question on intercourse frequency was added. These analyses of patterns in the components of the birth interval are an important step in understanding the intermediate fertility variables, provide insights into the reasons for less than maximum fertility in this population, and enable predictions of how fertility could change with changes in mortality and breastfeeding in Bangladesh." (Authors' abstract)

034 Becker S, Chowdhury A, Huffman SL. Determinants of natural fertility in Matlab, Bangladesh. Brussels: Interuniversity Programme in Demography, 1983. 32 p. (IPD working paper, 1983-4)

"A sample of 3368 currently married women below age 50 in 14 villages near Matlab Bazar were followed prospectively from October 1975 to December 1979 to assess biological and behavioral factors associated with natural fertility among noncontracepting women in Bangladesh. Short questionnaires covering retrospective reproductive events and socioeconomic variables were completed at entrance into the study, and women were visited at monthly intervals during the 1st 3 years. During the last year a question on interval since last intercourse was added. 76% of the women had no formal education, 89% were Muslims, and most were married to cultivators. The observed general

marital fertility rate was 264. 135 nonlive births were recorded per 1000 pregnancies. Seasonal patterns of varying intensity over the 4 years were seen in live birth rates, probability or resuming menstruation, and fecundability. Observed seasonal changes in frequency of intercourse explained some but not all of the seasonality of fertility. Natural fertility in this population is considerably below the maximum possible because of long postpartum amenorrhea due to breastfeeding and relatively low fecundability. Fecundability varies over 2-fold depending on the month of the year and even at its highest is below the levels reported for other populations, partly due to the relatively low frequency of intercourse. The mean open interval of 4.7 days for all months corresponds to a mean frequency of intercourse of 3 times/month. Socioeconomic differentials in birth interval components were small." (POPLINE)

035 Becker S. Les variations saisonnieres des naissances au Bangladesh rural. [The causes of the seasonal trend in births in rural Bangladesh]. Population 1984 Mar-Apr;39(2):265-79. Fr.

"Seasonal fluctuations in the birth rate in Bangladesh are large: there are twice as many births in December as July. Since contraception is not practised, these variations seem to result from sizeable fluctuations in coital frequency during the year. Indeed, particularly for women less than 30 years old, sexual intercourse occurs more frequently during March and April. These variations may be due to temporary migrations of men who go off to harvest the crops in other areas of the country. These different explanations do not, however, account for the extent of the variation noted." (Author's abstract).

036 Becker S, Chowdhury MK. The 1978 sex ratio at birth (Appendix to Demographic Surveillance System-Matlab, 1978). Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 14 p. (ICDDR,B working paper, 24)

'The 1978 sex-ratio at birth 100.4 for Matlab appears lower than the usual. The analysis concludes that some male births were not reported in the comparison area in 1978. Deaths in the early neonatal period were reported differently in the comparison area than in the MCH-FP area (zero days vs. 1 day). It is very likely that some male infants which died in the first week of life in the comparison area were not reported as either births or deaths. The idea that some live births which died in the first day were misreported as stillbirths is supported by the indirect evidence of a high stillbirth ratio in the comparison area in 1978 but is not supported by the direct test with data available. None of the above apply to any year except 1978 or any area except the comparison area." (Authors' abstract)

037 Becker S, Akhter R. Pilot study of the calendar rhythm method in the Matlab area of Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1980. 18 p. (ICDDR,B working paper, 14)

"A pilot study of the calendar rhythm method was done in one village in Matlab. The cycle lengths of these women had been recorded for several years in the "Determinants of Natural Fertility" prospective study. Of 36 women who were initially interested in the method and were given education on reproduction, 11 were not motivated to continue further. Of the 25 remaining women 10 had husband's who objected to the method. Of the 15 remaining women, 5 had irregular cycles so the method could not be used. Of the 10 remaining women, 5 were in postpartum amenorrhea so could not start using the methods. The five remaining women had individual calendars prepared for them, and were guided in its use during two months. However, within 16 months of acceptance of the method, four of these five women had become pregnant. The problems encountered with the calendar rhythm method in this one village are very likely to be common to other rural areas of Bangladesh." (Authors' abstract)

038 Becker S, Black RE, Brown KH, Nahar S. Relations between socio-economic status and morbidity, food intake and growth in young children in two villages in Bangla-

desh. Ecol Food Nutr 1986;18(4):251 - 64

"The relations between socio - economic status (SES) and food - intake, morbidity and anthropometric status of children under five years old were analyzed from longitudinal data collected in two Bangladeshi villages. Illness surveillance every other day and monthly anthropometric measurements were done during one year for 197 children, and weighed food intake studies were done monthly for 65 of these children. Socio - economic variables included wealth (ownership of land, livestock and dwelling size), income (total income and amounts of foodstocks in two seasons) and education (of the head of household, mother and highest in the household). The types of foods taken by study children were associated most with the education of the household head, while the quantity of specific foods eaten, after controlling for child's age, was more related to the income of the household. Considering diarrheal illnesses, the duration of diarrhoea due to *Shigella* or rotavirus and the incidence of shigellosis were negatively associated with the income of the household. Upper respiratory disease and the febrile illnesses were less frequent in children from wealthy families but stomatitis and skin disease were not. The initial values of the anthropometric indicators varied directly with the wealth of the household but inversely with the number of children in the household under the age of five years. The measures of change in anthropometric status over the year were more closely associated with the income variables." (Authors' abstract)

039 Becker S. Seasonal patterns of fertility measures: theory and data. J Am Stat Assoc 1981 Jun;76(374):249 - 59

"Seasonal patterns of five measures of reproduction in a population of married women are considered: marital fertility rate, pregnancy prevalence, mean open birth interval, mean closed birth interval - birth, and mean closed birth interval - woman. In a model the fertility rate is assumed to follow a known trigonometric curve; then the lag and relative variability of the other measures are considered in comparison with the fertility rate curve. The predictions from this theoretical work, when compared with observed patterns and trigonometric regression results for each measure in data from Bangladesh, are shown to be quite accurate. Implications for fertility analyses are discussed." (Author's abstract)

040 Becker S, Chowdhury A, Leridon H. Seasonal patterns of reproduction in Matlab, Bangladesh. Pop Stud 1986 Nov;40(3):457 - 72

"In Bangladesh twice as many births occur in December as in July. This paper examines the seasonal patterns of the risks of conception, fetal loss and return of menses post partum in a longitudinal study of 2,300 women in 14 villages of Matlab, Bangladesh. Life tables were estimated for each month of entry event and then 'period' life tables were constructed with the risks for a given calendar month. Confirming the results of earlier studies, risks of resumption of menses were higher in November and December, regardless of time elapsed since the last birth. Similarly, there are increased conception risks in the period from February to April for all fecundable women. The time of lowest fetal loss and stillbirth risks is in the cool season, though this variation makes only a minor contribution to the overall seasonality of births. The pattern of fecundability estimated from data on coital frequency did not match the pattern estimated from reported conceptions; these discrepancies imply possible seasonal changes in other parameters of fecundability besides intercourse." (Authors' abstract)

041 Becker S, Sardar MA. Seasonal patterns of vital events in Matlab thana, Bangladesh. *In*: Chambers R, Longhurst R, Pacey A, eds. Seasonal dimensions to rural poverty. London: Frances Pinter, 1981:149 - 54

"Data from vital registration and censuses for the period January 1972 - mid 1974 in Matlab are analyzed, mostly with trigonometrical regression analysis in order to detect seasonal cycles. The peak for births is October - December and the trough occurs in May - July. The number of births varies up to 30% above and below the mean with the

peak of fertility estimated as 5 December. Some reasons suggested for this trend are: 1) seasonal absence of husbands, and 2) resumption of menstruation by a larger number of women in November. The peak for deaths is in November - December which could be due to the large number of neonatal deaths which follow births in those months. The peak month for risk of neonatal death is September perhaps due to lower body weights of mothers in that month leading to a reduction in breastfeeding or neonatal tetanus which is a cause of death in 1 - month olds. Among children aged 1 - 4 there is a peak of deaths in March - April. Peaks for marriage which have led to out - or in - migration are in January - February and June - August, perhaps coinciding with the har - vest of crops. 3 socioeconomic variables are studied in relation to deaths: 1) in households in which the head had no formal education or religious school only, the peak is in April but for those with some education no seasonal pattern exists; 2) in house - holds in which the head is a laborer/share cropper deaths are below the level in May and above in October; and 3) there is no pattern in deaths according to housing." (POPLINE)

042 Becker S. Seasonality of deaths in Matlab, Bangladesh. Int J Epidemiol 1981 Sep;10(3):271 - 80

"Deaths registered between 1972 and 1974 in a population of 260,000 in a rural area of Bangladesh were analysed for seasonal patterns. Age and cause of death groups were considered. The findings include: (1) The number of neonatal deaths has a peak in October but after adjustment for the seasonal pattern of births, the actual risk of neonatal mortality is found to peak 2 months earlier. (2) Postneonatal deaths peak in April with above average proportions of deaths in the peak month attributed to dysentery. (3) Deaths of persons above age 45 peak in the cool season. (4) Dysentery and chronic diarrhoea deaths are highest in December. This coincides with the maximum incidence of shigella dysentery. (5) Accidental deaths are maximum in July due to increased drownings during the monsoon. The age and cause of death groups which contribute the largest proportions of total deaths are also the groups which show seasonal patterns." (Author's abstract)

043 Becker S. Seasonality of fertility in Matlab, Bangladesh. J Biosoc Sci 1981 Jan:13(1):97 - 105

"From matched birth and census records in the Matlab area of Bangladesh, monthly fertil - ity rates for the period 1970 - 74 are studied for seasonal patterns by age and parity. Trigonometric regression techniques are used to summarize and compare the multiple series. Pronounced seasonal patterns are apparent for all age and parity groups. The general fertility rate peaks in December with a seasonal variation of 42% above and below the mean level. For younger women at low parities the peak is in late October, while for older women of higher parity it is in January. The shift progresses linearly with age and parity though the age effect is the more pronounced. A seasonal pattern of fecundability which varies by age group could explain the shift." (Author's abstract)

044 Becker S, Mahmud S. Validation of mother's reports of children's ages in preg - nancy history interviews in Matlab, Bangladesh. *In*: Proceedings of the International Population Conference, Manila, 1981. V. 5. Liege: International Union for the Scientific Study of Population, 1983:745 - 60

"The purpose of the study described in this paper was to validate the ages of children reported in a pregnancy history survey in the Matlab area of Bangladesh where a vital registration system has been operating since 1966. The study was designed to explicitly measure the extent of the contamination effect of the continual presence of the vital registration system. Interviews were also done in several adjacent villages not included in the vital registration system so that comparisons of data quality could be made. The Bangladesh Fertility Survey forward questionnaire was used as a model and a backward questionnaire was also done. The contamination hypothesis asserts that because of the

presence of the vital registration system, women in a demographic surveillance system area (DSS area) will give more accurate responses in a pregnancy history questionnaire than women elsewhere in Bangladesh. The contamination analyses indicate that there is a slight effect in the reports of younger women. However, for older women a most surprising reverse contamination is found; overall fewer women in the registration area could give dates of birth events than in the nonregistration area. The validation of reported ages of children shows that the women remembered the time of the events very well, despite the reverse contamination. For 80% of the birth events in the 14-year period, the mother correctly remembered the month of birth, and for 1/2 of the events she remembered both the month and years ago correctly. The accuracy of the reporting declined with the number of years ago that the event occurred, as expected. Comparison of the backward and forward questionnaires shows a general tendency to overstate age in both forms but this tendency is more marked in the forward form. It is concluded that if Bengali month and years ago are both asked for birth events in pregnancy histories in Bangladesh, then very accurate reports can be obtained." (POPLINE)

045 Becker S, Mahmud S. A validation study of backward and forward pregnancy histories in Matlab, Bangladesh. Voorburg: International Statistical Institute, 1984. 37 p. (WFS scientific reports, 52.)

"This report investigates a possible contamination effect in 866 women's reports on pregnancy histories in the Nayergaon area of Comilla District, Bangladesh, as a part of the World Fertility Survey. 566 interviews took place in 5 villages of the Matlab Demographic Surveillance System (DSS) and 300 in 2 adjacent villages outside the surveillance system. Survey procedures were designed to follow as closely as possible those of the 1975 Bangladesh Fertility Survey. The contamination analysis showed that the reporting of younger women was slightly better in the DSS area, but older women's reporting exhibited a reverse contamination effect in that area. For the women in the DSS area, 75% reported the Bengali month of giving birth correctly, and half got both year and month correct. This is a very high figure, keeping in mind that 75% of these women had no formal education. Among women who misreported the time of births, the general tendency was to place the event too far back in time. 5% of the registered births were missed in the pregnancy history survey data; most of the missed events were not live births. These missed events caused fertility rates to be underestimated, but the magnitude of this error was only about 5%. The authors conclude that 1) no marked contamination effect was found in the study and 2) the proportion of the study population who were literate was fairly representative of Bangladesh as a whole. With regard to questionnaire evaluation, the backward questionnaire was preferable to the forward questionnaire because it 1) led to fewer missed events, 2) produced a more symmetrical distribution of errors, and 3) showed a slightly lower overall error for events misplaced in time." (POPLINE)

046 Becker S, Mahmud S, Sarder AM. Validation study of pregnancy histories and indirect techniques of fertility and mortality estimation in Matlab, Bangladesh. V. 1. Methods and study of possible contamination. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982. 59 p. (ICDDR,B working paper, 25)

"The present volume describes the methods and procedures employed in the validation study and some analysis of possible "contamination" of retrospective reporting in the DSS area in Matlab. Detailed tables are provided on the general background of the respondents in the two study areas. The lists of codes and interview forms are appended as well. The actual validation of the pregnancy history and other indirect estimation techniques will follow in later volumes." (Authors' abstract)

047 Begum HA, Chowdhury AKMA. Recent changes in age of marriage of females in rural Bangladesh. *In*: Proceedings of the Second National Seminar of the Bangladesh Population Association, Dhaka, 22-24 Aug 1984. Dhaka: Bangladesh Population Association, 1985:108-13

048 Begum HA, Chowdhury AKMA. Reporting bias in marriage age among rural Bangladesh females. Demogr India 1985 Jan-Jun;14(1):124-9

049 Benenson AS, Mosley WH, Fahimuddin M, Oseasohn RO. Cholera vaccine field trials in East Pakistan. 2. Effectiveness in the field. Bull WHO 1968;38(3):359-72

"A cholera-vaccine field trial in a rural area of East Pakistan where cholera is highly endemic has indicated that a high-potency whole-cell vaccine can provide significant protection against disease due to *Vibrio cholerae* for at least 18 months. This vaccine gave more than 70% protection during the first cholera season after vaccination. In the second cholera season after the administration of a single dose of vaccine, protection fell in those under 5 years of age, while continuing at significantly effective levels in older persons. Purified Ogawa antigen (lipopolysaccharide) afforded significant protection to adults against disease due to the heterologous Inaba serotype, but only protected children against milder diarrhoeas. The effect of cholera vaccine on the incidence of infections among family contacts of cholera patients was variable. Vaccine had no effect on the proportion of asymptomatic infections. Diarrhoeal disease associated with *V. cholerae* occurred predominantly among children, while protection was most marked among adults. Adverse reactions were practically restricted to the adults, suggesting that children will not only tolerate a larger dose, but actually require a larger dose for maximum protection against infection." (Authors' abstract)

050 Benenson AS, Joseph PR, Oseasohn RO. Cholera vaccine field trials in East Pakistan. 1. Reaction and antigenicity studies. Bull WHO 1968;38(4):347-57

"Double-blind controlled cholera-vaccine trials were carried out in rural East Pakistan in 1963 and 1964. Pretrial studies indicated that a whole-cell cholera vaccine of high mouse protective potency, at a dose of 0.5 ml, produced an antibody response and reaction pattern consistent with use in such trials. A purified Ogawa antigen, given at a dose of 100 ug, elicited no adverse reactions and evoked both agglutinating and vibriocidal antibodies against both Inaba and Ogawa test suspensions. In the field, adverse reactions to the cholera vaccines occurred primarily among adults and were observed with both the whole-cell preparation and the purified Ogawa antigen. At the dose used in the field trials (0.4 ml), the reactions elicited by the whole-cell vaccine were acceptable to the population and no more marked than those following the locally prepared typhoid-paratyphoid vaccine. Delayed reactions to the whole-cell cholera vaccine were observed beginning 4 to 7 days after the vaccine was administered; the bulk of them (60%) did not interfere with work at any time; all resolved promptly; and none developed fluctuation or was associated with abscess formation." (Authors' abstract)

051 Bhatia S, Faruque ASG, Chakraborty J. Assessing menstrual regulation performed by paramedics in rural Bangladesh. Stud Fam Plann 1980 Jun;11(6):213-8

"This paper describes and evaluates the performance of menstrual regulation by Bangladeshi lady family planning visitors in one clinic in Matlab and in four subcenter clinics. It also analyzes the feasibility of using MR to evacuate uterine contents up to nine weeks since the last menstrual period. The complication rates of the procedures studied compare favorably with rates reported for MR procedures performed by physicians." (Authors' abstract)

052 Bhatia S, Faruque ASG, Chakraborty J. Changing profile of IUD users in family planning clinics in rural Bangladesh. J Biosoc Sci 1981 Apr;13(1):169-77

"In a rural area of Bangladesh IUD acceptors in the 2 years prior to the introduction of a family planning health services programme differed from the women who accepted IUDs following the initiation of the programme. The pre-programme acceptors were older, higher parity women who were using IUDs to terminate childbearing, in contrast to the post-programme acceptors who were younger, lower parity women who were using

IUDs to space the next pregnancy. The reasons for these differences are examined. The result of the programme has been a pronounced drop in the birth rate." (Authors' abstract)

053 Bhatia S. Contraceptive intentions and subsequent behavior in rural Bangladesh. Stud Fam Plann 1982 Jan;13(1):24 - 31

"The data collection system of the Matlab Family Planning - Health Services Project made it possible to examine prospectively the contraceptive practices of women whose intentions as to future use of contraception had been elicited at the beginning of the project. This article examines various sociodemographic characteristics of the initial family planning acceptors and compares them with those who intended and those who did not intend to contracept. It also examines the subsequent contraceptive behavior of the latter two groups and discusses possible reasons for the differential behavior." (Author's abstract)

054 Bhatia S. Contraceptive users in rural Bangladesh: a time trend analysis. Stud Fam Plann 1983 Jan;14(1):20 - 8

"An examination of the characteristics of contraceptive acceptors in a family planning program in rural Bangladesh revealed trends of declining age and number of living children among new acceptors. A time series analysis of the age - specific acceptance rates confirmed the observation, indicating that over time the program succeeded in attracting younger and low - parity women. The high use prevalence rates resulted in fertility levels that were 25 percent lower in the program area than in the comparison area. The decline in the fertility levels during the first program year was mainly due to a large decline in fertility among women over age 35, but in the second year, the contribution made by women 30 - 35 years old was substantial." (Author's abstract)

055 Bhatia S, Becker S, Kim YJ. The effect of oral contraceptive acceptance on fertility in the postpartum period. Int J Gynaecol Obstet 1987;25(suppl):1 - 11

"In Bangladesh, where postpartum amenorrhea is long and contraceptive pill continuation rates are low, the result of introducing oral contraception during the period of post partum amenorrhea is actually to decrease the interval to the next pregnancy. In 121 matched pairs from rural Matlab thana in 1979 - 1980, fertility is increased relative to that of a matched group of non - acceptors. The earlier return to fertility of acceptors persists, even though there is a higher acceptance rate in the early postpartum period and women who accept at this time have higher continuation rates than those who accepted later. There is a possibility that a few of the women who were later acceptors may have conceived prior to initiating contraception and discontinued as soon as they became aware of the pregnancy. On the other hand, the chance of conception, which has been shown to increase in the later months of lactational amenorrhea, may be further heightened by a short duration of oral contraceptive use. 1 model shows that the most important variable in determining the delay to the next pregnancy is the contraceptive continuation rate. For the group of women who continued use for more than 6 months, the median time to the next pregnancy was close to that of the non - acceptor matched group. This implies that unless program efforts can achieve average continuation of at least 9 months, it would be better not to provide oral contraception during the period of postpartum amenorrhea. This position is reinforced by our knowledge of the adverse effects which hormonal contraception, particularly combined preparations, have on the quantity of milk produced by the lactating, postpartum mother." (POPLINE)

056 Bhatia S, Becker S, Kim YJ. The effect on fecundity of pill acceptance during postpartum amenorrhea in rural Bangladesh. Stud Fam Plann 1982 Jun - Jul;13(6 - 7):200 - 7

"The length of the interval from last live birth to the subsequent pregnancy was studied for 121 contraceptive pill acceptors who were in postpartum amenorrhea at the time of

acceptance and 121 matched nonacceptors in a prospective study in Matlab, Bangladesh. Half of the pill acceptors discontinued use within seven months, and as a group the pill acceptors had a significantly shorter interval to the next pregnancy than the matched nonacceptors. These findings suggest that unless continuation rates can be improved, it is better not to encourage women in rural Bangladesh to start the contraceptive pill during postpartum amenorrhea." (Authors' abstract)

057 Bhatia S. Experience with Lippes Loop and Copper-T intrauterine devices in rural Bangladesh. Int J Gynaecol Obstet 1982 Jun;20(3):175-82

"Experience with IUD use among rural Bangladeshi women within two programmatic efforts demonstrates that the Copper-T IUD suited the needs of younger, lower-parity women better than Lippes Loop. The differential performance by the device was especially marked within the program that offered a broad selection of contraceptive methods and occurred mainly because of lower rates of expulsion and lower rates of discontinuation for bleeding and pain among the Copper-T users. Nevertheless, the easy availability of a wide choice of methods during the second program successfully encouraged dissatisfied IUD discontinuers to try other methods of contraception." (Author's abstract)

058 Bhatia S, Osteria T, Chakraborty J, Faruque ASG. A follow-up survey of sterilization acceptors in the modified Contraceptive Distribution Project. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 20 p. (ICDDR,B scientific report, 19)

"The study presents results of a survey conducted on women who opted for sterilization in the MCH/FP program initiated by the Cholera Research Laboratory, in 70 villages of Matlab thana. The study of the characteristics of the sterilization acceptors, the circumstances surrounding their operation, and the post-operative experience revealed that the mean age of the acceptors was 33.2 years, and in the majority of cases the decision was taken less than 2 years after the last live birth while the women was breastfeeding or still amenorrheic. The decision taking process followed a uniform pattern. Following transmittal of information by the FVWs, the women first discussed the procedure with close female relatives in the same bari, before seeking the approval of and permission from husbands and mothers-in-law. The decisions were thereafter conveyed to the FVWs. One of the most relevant findings of the survey was the concern the women expressed about the implications of the operation for their health. The fear that they may not be able, after the operation, to perform the tasks and attend to their daily chores was very strong. Such strong concern points to the need of careful pre-operation counselling and examination as well as post-operative care to avoid a possibility of complications and prolonged convalescence. One such case in the rural setting may not only ruin the woman's life in her family, but may do irreparable damage and jeopardize the program." (Authors' abstract)

059 Bhatia S, Chakraborty J, Faruque ASG. Indigenous birth practices in rural Bangladesh and their implications for a maternal and child health programme. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 18 p. (ICDDR,B scientific report, 26)

"The report describes the traditional taboos and practices associated with pregnancy, child birth and puerperium in the villages of Matlab thana. The practices in some traditional south-east Asian cultures are reviewed and compared with those prevalent in Bangladesh. The implications of these practices for organizing the delivery of maternal, child health and family planning services in rural areas is discussed with due consideration for the limited financial, technical and health manpower resources available in most developing countries." (Authors' abstract)

060 Bhatia S, Ruzicka LT. M.R. clients in a village based family planning programme. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 21 p.

(ICDDR,B scientific report, 23)

"In October 1977, the Cholera Research Laboratory introduced a village based family planning programme along with certain selected Maternal and Child Care services in 70 villages of Matlab thana. A wide range of family planning methods were made available together with facilities for M.R. (menstrual regulation). The M.R. services were available at the 4 Sub-centre Clinics dispersed within the 70 programme villages and at the central clinic in Matlab. This report concentrates on the social and demographic characteristics of the rural women who opted for M.R. in the first year of the programme operation. It appears that it was predominantly younger women spacing their child bearing, who took that course. The occupational distribution of the women's husbands suggests that they come from better-off families. A large majority of women claimed that they did not desire any more children. Although the majority of them had never used contraception before, most of them did so following M.R. 90% were found to be continuing use of contraception at the time of the follow-up survey. The introduction of the M.R. as a part of the integrated village based MCH/FP programme may be viewed as having been a successful addition to the options offered. It has not only provided women with a safe and simple solution to unwanted pregnancies, but has also served to educate and motivate women to prevent such pregnancies by using effective modern contraceptive methods." (Authors' abstract)

061 Bhatia S, Mosley WH, Faruque ASG, Chakraborty J. The Matlab Family Planning-Health Services Project. Stud Fam Plann 1980 Jun;11(6):202-12

"Major modifications in the field structure and program activities of a simple contraceptive distribution program in rural Bangladesh demanded a more elaborate infrastructure to provide an increased range of methods and services. The modified project was better able to meet the fertility-control needs of women as evidenced by higher rates of contraceptive acceptance and continuation. The established infrastructure could also be used at minimal incremental cost to provide basic MCH services. This report describes the various program modifications and analyzes the results of fertility-control activities over the first 18 months, comparing the findings with the experience of the earlier program." (Authors' abstract)

062 Bhatia S, Ruzicka LT. Menstrual regulation clients in a village-based family planning programme. J Biosoc Sci 1980 Jan;12(1):31-9

"Menstrual regulation (MR) was introduced as one of the components of the village-based family planning and maternal and child care programme initiated by the Cholera Research Laboratory, Dhaka, in 70 villages in Matlab thana in October 1977. Social and demographic characteristics of the MR clients are compared with those of the users of other contraceptive methods offered by the programme. Reasons for pregnancy termination and the high continuation rates of contraceptive use after MR suggest that, in particular, the younger women are becoming increasingly conscious of controlling their child-bearing and spacing their pregnancies." (Authors' abstract)

063 Bhatia S, Kim YJ. Oral contraception in Bangladesh. Stud Fam Plann 1984 Sep-Oct;15(5):233-41

"In rural Bangladesh, the continuation rate of oral contraceptives (OCs) is the lowest among all methods except for condoms, and the pregnancy rate for OC users is comparable to that for users of traditional methods, which lies halfway between that for foam and condom users (high) and Depo-Provera and IUD users (low). To determine why postpartum amenorrheic OC acceptors have shorter pregnancy intervals than postamenorrheic OC acceptors who were matched on time of acceptance as well as on age and parity, subintervals of the pregnancy interval are examined. Results reveal significantly shorter duration of use by amenorrheic acceptors. This short duration of use overrides their significantly longer duration to pregnancy since discontinuation, to give overall short-

er duration to pregnancy since last birth." (Authors' abstract)

064 Bhatia S. Patterns and causes of neonatal and postneonatal mortality in rural Bangladesh. Stud Fam Plann 1989 May-Jun;20(3):136-46

"Community-level research data from a Maternal-Child Health and Family Planning (MCH/FP) program and comparison areas in rural Bangladesh indicate that 60 percent of infant deaths occurred in the neonatal period in both areas. Since the inception of the MCH/FP program, mortality rates declined relative to those in the comparison area. This decline, however, was confined to the neonatal period death rates only, with mortality rates in the postneonatal period remaining similar in the two areas. Prematurity accounted for approximately 40 percent of deaths in the neonatal period. Cause-of-death data indicated that the differences in the neonatal mortality rates between the two areas was mainly due to a marked decline in tetanus neonatorum deaths in the MCH/FP program area, because of the tetanus toxoid immunization of pregnant women there. The interventions in the MCH/FP area, however, did not significantly influence mortality due to any other cause. This study provides an explanation for the limited impact on infant mortality of health interventions that focus on diarrheal diseases and immunizations of children." (Author's abstract)

065 Bhatia S, Faruque ASG, Chakraborty J. Peer pressures and the use of contraceptive sterilization in rural Bangladesh. Int Fam Plann Persp 1980; 6(3):107-9

"The authors examine the impact of sterilization services made available to 70 villages in Matlab thana, Bangladesh, in 1978. Reasons for acceptance or refusal of services are analyzed, with emphasis on concerns about health and peer reactions to sterilization. Factors considered include age, religion, education, number of children, and contraceptive use." (POPLINE)

066 Bhatia S, Osteria T, Chakraborty J, Faruque ASG. A survey of sterilization acceptors in a family planning program in rural Bangladesh. Int J Gynaecol Obstet 1979 Dec;17(3):268-73

"The results of a survey of 275 Bangladeshi women who were sterilized at a rural family planning clinic are presented. The survey comprised two interviews of each woman: one conducted immediately prior to the sterilization procedure and the second conducted one month after each woman was sterilized. Sociodemographic data were gathered for the survey from the patients' clinic records. Reasons for the choice of sterilization and sociodemographic impact of the procedure are discussed, as are implications of the results on other rural family planning programs." (Authors' abstract)

067 Bhatia S. Traditional childbirth practices: implications for a rural MCH program. Stud Fam Plann 1981 Feb;12(2):66-76

"The report describes the traditional taboos and practices associated with pregnancy, childbirth, and the postpartum period in the villages of Matlab thana in Bangladesh, and discusses the implications for and organization of a simple maternal and child health care (MCH) program in the area." (Author's abstract)

068 Bhatia S. Training community health workers in rural Bangladesh. World Health Forum 1981;2(4):491-5

"In September 1977, the International Centre for Diarrhoeal Disease Research, Bangladesh, established a program focusing on family planning and maternal and child health in Matlab. At the village level of this region, of which the population was 85% Hindu, and 83.4% of the women had no formal education, 80 women workers were selected and trained to deliver the planned services. The recruited women averaged 23 years of age, and 41.2% had at least 10 years schooling. The female village workers' training lasted

for 8 weeks, and involved orientation, preservice training and in-service training. They spent time with the former female village workers who were generally older, illiterate women with no formal training, but with experience. The responsibilities of the workers are described in detail. The workers were evaluated on a regular basis during and after training. They began work formally in November 1977. Results show that 45% of eligible couples in the area accepted a contraceptive method within the 1st 18 months of the program, and that the use rate at the end of this period was 33.5%. 60% of the pregnant women in the area were immunized. The village workers trained about 2000 women to provide oral rehydration in their communities." (POPLINE)

069 Bhatia S, Faruque ASG, Yunus M, Chakraborty J. Training manual for female village workers (Contraceptive Distribution Project). Dhaka: Cholera Research Laboratory, 1977. 25 p. (Text in Bengali)

070 Bhuiya A. Factors affecting child survival in Matlab, Bangladesh. Canberra: Department of Demography, Australian National University, 1989. 296 p. (PhD thesis)

"This study investigated the factors that might affect child survival in Matlab, a rural area in Bangladesh, using a 'proximate determinants' conceptual framework. The analysis involved three sets of data. Identification of the important covariates of childhood mortality was based on follow-up of the 1982 birth cohort of the whole Matlab population until December 1984. Their household and maternal characteristics were collected during the 1982 census of the area carried out by the International Centre for Diarrhoeal Disease Research, Bangladesh. A survey conducted in late 1986 collected information in seven purposively selected villages on some selected proximate determinants from the mothers of 1128 children born between 1 October 1983 and 30 June 1986. A survey of 63 health care providers in the area was also conducted during the first half of 1987. The covariates represented various characteristics of the household, of the mother, and of the children; among them economic condition, health program status, maternal age and education, sex and birth order of the children were found, through a hazard logit model analysis, to have significant relationships with child mortality when the age of the children was controlled. The survey revealed widespread malnutrition and morbidity among the children, and the risk of death of the severely malnourished children was found to be very high in comparison to the less severely malnourished and normally nourished children. This pattern supports the argument that child death in this community is mostly preceded by growth faltering. Moreover, most of the previously identified independent variables (excepting birth order, information on which was not available in the survey) maintained a pattern of relationship with severe malnutrition similar to that with mortality. This implied that mortality differentials, as observed for those variables among the children in the study area, are largely due to differentials in malnutrition or growth faltering. A high incidence of morbidity and inappropriate feeding practices may be important causes of malnutrition among the children. Prevalence among mothers of unhygienic practices and lack of appropriate knowledge about disease may be responsible for higher incidence of diseases like diarrhoea among the children. Traditional beliefs prevailing in the community about causes and transmission of diseases may be an important factor deterring parents from approaching scientific or modern methods of treatment and prevention. The practice of food withholding during sickness may also play an important role in aggravating the poor nutritional situation of the study children." (Author's abstract)

071 Bhuiya A. Levels and differentials in child nutritional status and morbidity in a rural area of Bangladesh. Canberra: Australian National University, 1983. 81 p. (MA thesis)

The study was undertaken, in 1981, in five villages of Matlab, Comilla district, Bangladesh, to examine the level of child nutritional status and pattern of morbidity, and their relationships with different household characteristics and sex of the children. The analyses were mainly guided by a conceptual framework. Results of the study showed that malnutrition was highly prevalent among the children; the extent of acute malnutrition was, however,

highest among children aged 13 - 24 months and lowest among children of one year or less. The incidence of disease in the week preceding the survey was also found to be very high among the children. The incidence of gastrointestinal diseases was found to be highest among children aged 13 - 24 months, and had a significant adverse effect on child nutritional status. An analysis of the differentials in child nutritional status by household economic status, educational status, and living environment in the household showed a significant inverse relationship with all the indicators of child nutritional status excepting height - for - age. With regard to the differentials in morbidity by those house - hold variables, no consistent pattern of relationship could be discerned. It was deter - mined that the difference between the proportions of relatively malnourished children with and without any illness episodes in the preceding week was higher in the lower status households. The direct negative relationship of household economic conditions with child nutritional status was demonstrated by smaller proportions of relatively malnourished chil - dren in the higher status households. The hypothesis of poor nutrition among the chil - dren of lower status households due to higher disease incidence is not tenable on the basis of the evidence obtained in the present study. Rather, most children were found to become ill almost independently of household status, but household status starts playing its role after a child becomes ill which, in consequence, makes the children of lower status households relatively more malnourished than those of higher status house - holds. In studying the sex differentials in nutritional status and morbidity, some interest - ing points emerged. Differentials in nutritional status were observed between sexes, but for morbidity no such differences were noted. More girls were found to be malnourished than boys irrespective of their household status, but interestingly the differentials in girls' nutritional status for different household characteristics were not statistically significant. In the case of boys on the other hand, these differentials were significant, implying that the conceptual framework is suitable only to explain the mechanisms of the relationships of nutrition - morbidity - household characteristics for boys. The author suggests that: a) to understand the state of nutritional affairs in a community, a study of both the direct and indirect factors associated with the problem should be made; b) an idea of the mecha - nisms, through which these factors are operating is essential for the development of a rational policy to overcome the malnutrition problem in the community; c) an in - depth study should be carried out for identifying the factors responsible for causing widespread malnutrition at this age; and d) a community - based simple growth monitoring pro - gramme may help in identifying the children needing attention and the parents could be advised of the best possible actions to improve the situation.

072 Bhuiya A. Malnutrition and child mortality: are socioeconomic factors important? [abstract]. *In*: Programme and abstracts of papers of the Fourth Annual Conference of the Indian Society for Medical Statistics, Bangalore, 24 - 26 Nov 1986. Bangalore: Na - tional Institute of Mental Health and Neuro Sciences, 1986:88

073 Bhuiya A, Wojtyniak B, Karim R. Malnutrition and child mortality: are socioeco - nomic factors important? J Biosoc Sci 1989;21:357 - 64

"The influences of household economic condition, maternal education, sex, and nutritional status of children on mortality were examined using multivariate analytical techniques. Weights of around 1700 children aged 2 - 60 months in five villages of Matlab, Bangla - desh, were taken during the first half of 1981. The children were followed for 18 months and their survival was recorded. The severely malnourished children had a risk of death nine times that of their counterparts with better nutritional status. Female children had a higher risk of death than the males. Mother's education and economic condition of household also showed negative relationships with the risk of death, but the effect of mother's education was modified by economic condition and sex of the children." (Authors' abstract)

074 Bhuiya A, Wojtyniak B, D'Souza S, Nahar L, Shaikh K. Measles case fatality among the under - fives: a multivariate analysis of risk factors in a rural area of Bangla - desh. Soc Sci Med 1987;24(5):439 - 43

"This study investigated the relationship of measles case fatality among the under-fives with age, case type, complications, sex, mother's education, and household economic condition in a rural area of Bangladesh. A total of 3465 measles cases were detected during 1980 and 61 of them died of measles associated complications within 45 days of rash onset. Case type, sex, mother's education and household economic condition were found to have statistically significant impact on case fatality. Risk of death among the secondary cases was 1.87 times higher than in the primary cases, girls had 2.73 times higher risk of death than boys. Children of mothers without any formal schooling and those from the poorest households experienced 1.83 and 2.18 times higher risk of death than their counterparts whose mothers had at least one year of schooling and from economically better off households respectively." (Authors' abstract)

075 Bhuiya A, Nahar L, Shaikh K, D'Souza S. Measles mortality among the under five: a multivariate analysis of risk factors in a rural area of Bangladesh [abstract]. *In*: Abstracts; proceedings of the Third Annual Conference of the Indian Society for Medical Statistics, Calcutta, 3-5 Dec 1985:35

076 Bhuiya A, Streatfield K, Meyer P. Mother's hygienic awareness, behaviour, and knowledge of major childhood diseases in Matlab, Bangladesh. *In*: Cultural, social and behavioural determinants of health: what is the evidence?; proceedings of the Health Transition Workshop, Canberra, 15-19 May 1989. Canberra: Australian National University, 1989. 27 p.

077 Bhuiya A, Wojtyniak B, Zimicki S, D'Souza S. Socioeconomic determinants of child nutritional status; boys versus girls [abstract]. *In*: Abstracts; proceedings of the Third Annual Conference of the Indian Society for Medical Statistics, Calcutta, 3-5 Dec 1985:34

078 Bhuiya A, Wojtyniak B, D'Souza S, Zimicki S. Socio-economic determinants of child nutritional status: boys versus girls. Food Nutr Bull 1986 Sep;8(3):3-7

079 Bhuiya A, Zimicki S, D'Souza S. Socioeconomic differentials in child nutrition and morbidity in a rural area of Bangladesh. J Trop Pediatr 1986 Feb;32(1): 17-23

"Socioeconomic differentials in mortality have been well-documented; this study examines differentials in nutritional status and morbidity in an attempt to elucidate some of the mechanisms underlying these patterns. Data were collected during 1981 surveys of household socioeconomic indicators, child nutritional status (determined on the basis of anthropometric measurements), and child morbidity in five villages in Matlab thana, Bangladesh. Household wealth indicators--size of landholding; cows, boats and modern goods owned; occupation of household head, amount of tax paid in the previous year, and size and quality of housing--were negatively associated with the proportion of children who could be classified as malnourished using standard criteria. Years of education of the head of the household, of the household member with the most education, and of the child's mother had a similar relationship with proportion malnourished. Neither of the two measures of household sanitation--source of drinking water or use of a latrine--were correlated with nutritional status. No simple association was observed between any socioeconomic or educational indicator and reported child morbidity in the week preceding the anthropometric measurement. One particularly interesting finding was that the decline in the proportion malnourished seen with increasing socioeconomic status was greater for males than females, so that girls are relatively more disadvantaged in higher-status families." (Authors' abstract)

080 Black RE, Greenberg HB, Kapikian AZ, Brown KH, Becker S. Acquisition of serum antibody to Norwalk virus and rotavirus and relation to diarrhea in a longitudinal study of young children in rural Bangladesh. J Infect Dis 1982 Apr;145(4):483-9

"Serum antibodies to Norwalk virus and to rotavirus were measured during longitudinal

studies of infectious diseases and nutrition in rural Bangladesh. Initially, the prevalence of antibody to Norwalk virus was 7% in children younger than six months and increased to 80% in children two to five years of age. The incidence of titer increases was highest in one- and two-year-olds and in children who had low or undetectable levels of antibody. Some Norwalk virus infections appeared to result in diarrhea. Nearly all children had serum antibodies to rotavirus at the beginning of the study; however, children with the lowest levels of antibody to rotavirus had the greatest risk of rotavirus diarrhea. Over half of the children had a fourfold increase in titer of antibody to rotavirus during the year, and 7% had increases in two of the three study periods during the year. Most increases in titer of antibody to rotavirus appeared to result from subclinical infections." (Authors' abstract)

081 Black RE, Brown KH, Becker S, Alim ARMA, Merson MH. Contamination of weaning foods and transmission of enterotoxigenic *Escherichia coli* diarrhoea in children in rural Bangladesh. Trans R Soc Trop Med Hyg 1982;76(2):259-64

"In longitudinal studies of infectious diseases and nutrition in Bangladesh, we determined the degree of bacterial contamination of traditional weaning foods and evaluated the role of those foods in the transmission of diarrhoeal diseases. 41% of samples of food items fed to weaning aged children contained *Escherichia coli*; these organisms were used as indicators of faecal contamination. Milk and foods prepared particularly for infants were more frequently and heavily contaminated with *E. coli* than was boiled rice, and *E. coli* levels were found to be related to the storage of cooked foods at high environmental temperatures. 50% of drinking water specimens also contained *E. coli*, but colony counts were approximately 10-fold lower than in food specimens. The proportion of a child's food samples that contained *E. coli* was significantly related to the child's annual incidence of diarrhoea associated with enterotoxigenic *E. coli*. This observation underscores the importance of seeking locally available foods that are hygienic as well as nutritious to supplement the diets of breastfeeding children in developing countries." (Authors' abstract)

082 Black RE. Diarrheal diseases and child morbidity and mortality. Pop Dev Rev 1984;10(suppl):141-61

"This paper reviews the major etiologic agents of infant and childhood diarrhea from an epidemiologic perspective. It also discusses the methods for measuring the frequency of diarrheal diseases and for assessing the contribution of these diseases to childhood mortality. Estimates of the importance of specific types or etiologies of diarrhea are given, and the impact of possible interventions, such as vaccines or therapy, considered. Studies done in Matlab, Bangladesh, during 1978-79 provide the most complete information on the etiology and epidemiology of diarrhea in 1 area and are used to demonstrate the frequency and severity of diarrhea associated with different pathogens. The paper concentrates on the agents that appear to contribute most to high diarrheal mortality: *E. coli*, rotavirus and *Shigella*. Besides being the most important causes of severe disease and death, their patterns of transmission are common to the other enteropathogens. Although the high rates of disease and death due to diarrhea in developing countries are well recognized, they have seldom been accurately measured despite the availability of appropriate tools. The terms population at risk, deaths and cases, incidence, prevalence, mortality and case-fatality rates are defined. Sources of data for calculating diarrheal morbidity and mortality rates, such as routine surveillance data, sentinel surveillance, general surveys, morbidity and mortality surveys and prospective studies, are presented and assessed with respect to their advantages and limitations. Interventions to interrupt transmission of the enteropathogens could focus a variety of levels, including safe disposal of human feces or protection of water supplies from contamination. It is argued that the most promising interventions are those which would focus on the household environment and on the immediate risks to which the child is exposed. Potential areas for intervention are improvements in the hygienic quality of weaning foods and reductions in the degree of household fecal contamination. Other approaches to prevention are the

development of vaccines giving long-lasting protection against the most important enteropathogens the prompt administration of rehydration solutions to prevent death from acute dehydrating diarrhea." (POPLINE)

083 Black RE, Brown KH, Becker S. Effects of diarrhea associated with specific enteropathogens on the growth of children in rural Bangladesh. Pediatrics 1984 Jun;73(6):799-805

"Village-based surveillance data from longitudinal studies in rural Bangladesh have been used to evaluate the nutritional consequences of infectious diseases, including diarrhea due to specific pathogens. The prevalences of specific illnesses were related to the ponderal and linear growth of young children for 2-month and 1-year periods. Of the common illnesses, only diarrhea had a significant inverse relationship with increments of weight during 2-month periods and of length during 1 year. Diarrhea accounted for 20% of the difference in linear growth between the study children and the international reference population during the first 5 years of life. Diarrhea associated with enterotoxigenic *Escherichia coli* had a significant negative effect on the bimonthly weight gain of children in this community and shigellosis had the strongest negative effect on bimonthly and annual linear growth. Control of diarrhea due to enterotoxigenic *E. coli* and *Shigella* would not only substantially diminish diarrheal morbidity but would also improve the growth of children and thereby reduce the prevalence of protein-energy malnutrition." (Authors' abstract)

084 Black RE, Merson MH, Rowe B, Taylor R, Alim ARMA, Gross RJ, Sack DA. Enterotoxigenic *Escherichia coli* diarrhoea: acquired immunity and transmission in an endemic area. Bull WHO 1981;59(2):263-8

"Enterotoxigenic *Escherichia coli* (ETEC) are an important cause of diarrhoea in developing countries. Studies were made, in an endemic area of Bangladesh, of household contacts of patients with diarrhoea associated with *E. coli* producing heat-stable and heat-labile toxins (ST/LT) or heat-stable toxin (ST) only. It was found that 11% of contacts were infected in the 10-day study period, and that both the rate of infection and the proportion of infected persons with diarrhoea decreased with increasing age, suggesting the development of immunity. ETEC of the same serotype as that of the index patient were found in 9% of water sources used by index households, in a small number of food and drinking water specimens from the index homes, and in faeces from 3 healthy calves. The rate of infection of household members was highest in houses where there was contaminated food or water, which suggests that infection may take place in the home when contaminated water is brought in." (Authors' abstract)

085 Black RE, Merson MH, Huq I, Alim ARMA. Epidemiological importance of diarrheal agents in rural Bangladesh. *In*: Holme T, Holmgren J, Merson MH, Mollby R, eds. Acute enteric infections in children: new prospects for treatment and prevention. Amsterdam: Elsevier, 1981:141-8

086 Black RE, Merson MH, Rowe B, Taylor PR, Rahman ASMM, Huq MA, Aleem ARMA, Sack DA, Curlin GT. Epidemiology of enterotoxigenic *Escherichia coli* in rural Bangladesh [abstract]. *In*: Proceedings of the 14th Joint Conference on Cholera, U S-Japan Cooperative Medical Science Program Cholera Panel, Karatsu, 27-29 Sep 1978:83

087 Black RE, Merson MH, Rowe B, Taylor PR, Rahman ASMM, Huq MA, Aleem ARMA, Sack DA, Curlin GT. Epidemiology of enterotoxigenic *Escherichia coli* in rural Bangladesh. *In*: Takeya K, Zinnaka Y, eds. Symposium on cholera; proceedings of the 14th Joint Conference on Cholera, U.S.-Japan Cooperative Medical Science Program Cholera Panel, Japan, 27-29 Sep 1978:292-301

088 Black RE, Merson MH, Taylor PR, Yolken RH, Yunus M, Alim ARMA, Sack DA. Glucose vs sucrose in oral rehydration solutions for infants and young children with ro-

tavirus - associated diarrhea. Pediatrics 1981 Jan;67(1):79 - 83

"The use of oral rehydration solutions containing essential electrolytes and either glucose or sucrose of equal osmolality was compared in a double - blind sequential trial of 784 children with rotavirus - associated diarrhea treated at a center in rural Bangladesh. The oral fluid failure rate was 11.5% for the sucrose - containing solution group and 7.3% for the glucose - containing group (P = NS). Vomiting was a significantly more common cause of failure for the group treated with sucrose - containing oral rehydration solution and was associated with an increased rate of intake of the sweeter sucrose - containing solution. The purging rate was not different for the two groups. The oral fluid failure rates for children in the most underweight category (<60% of expected weight for age) were not different from those for other groups, although, as assessed by purging rate and initial dehydration, the stool losses of members of this group constituted a greater proportion of their body weight. Glucose is the preferred carbohydrate for oral electro - lyte solutions, although sucrose can be substituted with only minimum loss of efficacy." (Authors' abstract)

089 Black RE, Merson MH, Huq I, Alim ARMA, Yunus M. Incidence and severity of rotavirus and *Escherichia coli* diarrhoea in rural Bangladesh: implications for vaccine development. Lancet 1981 Jan 17;1(8212):141 - 3

"In a 1 year study of diarrhoea in a village in rural Bangladesh, enterotoxigenic *Escheri - chia coli* (ETEC) were the most frequently detected enteropathogens; shigellae were the second most commonly detected enteropathogens and rotaviruses the third. ETEC and rotavirus were found in 31% of diarrhoea episodes experienced by children aged less than 2 years and in 70% of episodes associated with dehydration. Furthermore these two pathogens were identified in the stools of 77% of young children with life - threaten - ing dehydration seen at a diarrhoea treatment centre. The association of ETEC and rotavirus with such a substantial proportion of cases of dehydrating diarrhoea suggests that immunoprophylaxis to reduce the high incidence of deaths from diarrhoea in develop - ing countries may be feasible and that vaccine development should concentrate on these two enteropathogens." (Authors' abstract)

090 Black RE, Brown KH, Becker S, Alim ARMA, Huq MI. Longitudinal studies of infectious diseases and physical growth of children in rural Bangladesh. II. Incidence of diarrhoea and association with known pathogens. Am J Epidemiol 1982 Mar;115(3):315 - 24

"Longitudinal studies were done in two villages in rural Bangladesh to learn more about the interactions between infectious diseases and the nutritional status of children. Diar - rheal diseases, identified by surveillance of 197 children aged 2 - 60 months, were studied for bacterial, viral and parasitic enteropathogens in 1978 - 1979. The annual incidence of diarrhea was highest in children aged 2 - 11 months, and declined progressively with age from seven to four episodes per child per year. An enteropathogen was identified from rectal cultures taken during diarrhea in 51% of episodes and from 6% of monthly cultures taken when diarrhea was not present. Enterotoxigenic *Escherichia coli* were the patho - gens found most frequently, followed by shigellae and rotaviruses. Diarrheal episodes associated with shigellae had the longest duration, while episodes associated with *Vibrio cholerae* or with rotavirus were more frequently associated with dehydration. *E. coli* diarrhea had a peak incidence during the hot months, and shigellosis was more frequent during the cool, dry months." (Authors' abstract)

091 Black RE, Brown KH, Becker S, Yunus M. Longitudinal studies of infectious diseases and physical growth of children in rural Bangladesh. I. Patterns of morbidity. Am J Epidemiol 1982 Mar;115(3):305 - 14

"Longitudinal studies were done in two villages in rural Bangladesh to learn more about the interactions between infectious diseases and the nutritional status of children. An

intensive system of surveillance was used to determine the occurrence and frequency of infectious diseases in a cohort of 197 children aged 2 - 60 months in 1978 - 1979. This surveillance revealed that illnesses of the upper respiratory tract, such as purulent rhinitis and pharyngitis, had the highest prevalence. Diarrheas were the second most common illnesses, with a peak prevalence rate in children 6 - 11 months of age. Diarrhea was also the most frequent reason for hospitalization of study children. The overall prevalence of infectious diseases was high; at least one and often several concurrent illnesses were noted on 75% of all days of observation. Compared with children in the surrounding area, children in this study had a low mortality rate, perhaps because of medical services provided during the study. Nevertheless, the extensive morbidity from infectious diseases may have had adverse effects on the growth and development of the children." (Authors' abstract)

092 Black RE, Brown KH, Becker S. Malnutrition is a determining factor in diarrheal duration, but not incidence, among young children in a longitudinal study in rural Bangladesh. Am J Clin Nutr 1984 Jan;39(1):87 - 94

"Diarrhea and malnutrition are common in young children in developing countries and a reciprocal relationship has been postulated with diarrhea leading to malnutrition and malnutrition predisposing to diarrhea. To investigate the importance of malnutrition as a determining factor in diarrheal illnesses, data were analyzed from a longitudinal community - based study done in rural Bangladesh. Children classified by nutritional status according to a variety of anthropometric indicators were prospectively evaluated for incidence, duration, and etiology of diarrhea. Children with low weight for length had longer durations of diarrhea than better nourished children; however, children of differing nutritional status had similar diarrheal incidences. The duration of diarrhea, including that associated with enterotoxigenic *Escherichia coli* and *Shigella*, increased progressively as nutritional status indicators worsened. These results suggest that nutritional interventions alone are unlikely to reduce the high incidence of diarrhea, but that efforts to improve nutritional status may have a beneficial effect on the duration of diarrhea and its unfavorable nutritional consequences." (Authors' abstract)

093 Black RE, Huber DH, Curlin GT. Reduction of neonatal tetanus by mass immunization of non - pregnant women: duration of protection provided by one or two doses of aluminium - absorbed tetanus toxoid. Bull WHO 1980;58(6):927 - 30

"Immunization of non - pregnant women in rural Bangladesh with two doses of aluminum - adsorbed tetanus - diphtheria toxoids reduced neonatal mortality by one - third during a period of 9 - 32 months after vaccination. The reduction in mortality rate was attributable almost entirely to a 75% lower mortality rate among 4 - 14 - day - old infants, when tetanus was the predominant cause of death. In the period up to 20 months following vaccination, the reduction in deaths among 4 - 14 - day - old infants after a single dose of tetanus - diphtheria toxoids was about the same as that after two doses. However, beyond 20 months a single dose did not appear to provide protection." (Authors' abstract)

094 Black RE, Yunus M, Eusof A, Ahmed A, Khan MR, Sack DA. Report on reactigenicity and immunogenicity of the Wellcome cholera toxoids in Bangladesh volunteers. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 48 p. (ICDDR,B scientific report, 29)

"This report summarizes the results of two pre - trial assessments of three aluminum adjuvanted cholera vaccines prepared by the Wellcome Research Laboratories of the United Kingdom. These were a whole cell preparation, a toxoid, and a mixture of these two vaccines. They were compared to a standard tetanus toxoid. In the first pre - trial done in January, 1978 skin rashes were observed in recipients of all groups including the tetanus toxoid control vaccine. A second assessment was therefore done in April and May of 1979 to assess this problem. The results of these pre - trials indicate that there

is no unusual reaction associated with the use of any of the vaccines tested. Both the whole cell and toxoid vaccines produced excellent immune responses in a range that would be expected to be protective. There were significant rises in vibriocidal titres in recipients of the toxoid vaccine indicating the residual presence of cell wall antigens in the toxoid preparation. The conclusion of the assessment is that these aluminum adjuvanted whole cell and toxoid cholera vaccines are safe and produce good antibody responses." (Authors' abstract)

095 Black RE, Merson MH, Rahman ASMM, Yunus M, Alim ARMA, Huq I, Yolken RH, Curlin GT. A two-year study of bacterial, viral, and parasitic agents associated with diarrhea in rural Bangladesh. J Infect Dis 1980 Nov;142(5):660-4

"Enteric pathogens associated with diarrhea were studied for two years at a diarrhea treatment center in rural Bangladesh. Enterotoxigenic *Escherichia coli* (ETEC) was the most frequently identified pathogen for patients of all ages. Rotavirus and ETEC were isolated from ~50% and 25%, respectively, of patients less than two years of age. A bacterial or viral pathogen was identified for 70% of these young children and for 56% of all patients with diarrhea. Most ETEC isolates were obtained in the hot dry months of March and April and the hot wet months of August and September. Rotavirus identification peaked in the cool dry months of December and January, but infected patients were found year-round. The low case-fatality rates for patients with watery diarrhea and substantial dehydration further document the usefulness of treating patients with diarrhea with either a glucose- or sucrose-base electrolyte solution such as those used in this treatment center." (Authors' abstract)

096 Blaser MJ, Black RE, Duncan DJ, Amer J. *Campylobacter jejuni* - specific serum antibodies are elevated in healthy Bangladeshi children. J Clin Microbiol 1985 Feb;21(2):164-7

"In Bangladesh and other developing countries, isolation of *Campylobacter jejuni* is common in healthy children, and the illness/infection ratio falls with age. To determine whether specific serum antibodies correlate with this phenomenon, using an enzyme-linked immunosorbent assay, we studied sera from 93 healthy Bangladeshi children and 121 healthy U.S. children under 15 years of age. For each age group (<1,2 to 4, and 5 to 14 years) studied, specific serum antibody levels were significantly higher in the Bangladeshi children. Among Bangladeshi children, for each of the three immunoglobulin subclasses, the change in antibody levels with age was different. Specific immunoglobulin A antibody levels rose linearly with age, immunoglobulin G levels peaked in the 2- to 4-year age group and then fell, and immunoglobulin M levels peaked in the 2- to 4-year age group and then plateaued. Elevated serum antibody levels to *C. jejuni* in Bangladeshi children may be protective in themselves or may reflect other protective phenomena." (Authors' abstract)

097 Blaser MJ, Huq MI, Glass RI, Zimicki S, Birkness KA. Salmonellosis at rural and urban clinics in Bangladesh: epidemiologic and clinical characteristics. Am J Epidemiol 1982 Aug;116(2):266-75

"The authors studied the frequency of diarrheal illness associated with non-*typhi Salmonella* at two clinics in Bangladesh for the years 1977-1979. Non-typhi salmonellae were isolated from 0.29% of fecal specimens or rectal swabs in an urban area and 0.26% of similar specimens in a rural area; the frequency of isolations peaked in the summer months. Isolations of *Shigella* and *Vibrio cholerae* were much more common than *Salmonella*. Only two of 50 *Salmonella* isolates were resistant to more than one antibiotic. None of 13 isolates tested produced an enterotoxin. *S. java* and *S. virchow* accounted for 64% of all the isolates. Patients with diarrheal illness associated with isolation of *Salmonella* frequently had vomiting (88%), watery diarrhea (78%), abdominal pain (61%), and fever (39%), but the clinical features of the illnesses and the socioeconomic backgrounds of the patients could not be distinguished from those of matched controls

who were attending the same clinic. The infrequency of *Salmonella* infection in an area where several other bacterial and viral enteric diseases are hyperendemic requires further investigation." (Authors' abstract)

098 Boyce JM, Hughes JM, Alim ARMA, Khan MU, Aziz KMA, Wells JG, Curlin GT. Patterns of *Shigella* infection in families in rural Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 13 p. (ICDDR,B scientific report, 50)

099 Boyce JM, Hughes JM, Alim ARMA, Khan MU, Aziz KMA, Wells JG, Curlin GT. Patterns of *Shigella* infection in families in rural Bangladesh. Am J Trop Med Hyg 1982 Sep;31(5):1015 - 20

'To assess the mode of transmission of *Shigella* infection in rural Bangladesh, question - naire and culture surveys were conducted in baris (neighborhoods) where persons with diarrhea associated with *Shigella* infection and index controls with non - *Shigella* diarrhea lived. Nineteen percent of persons in *Shigella* baris and 7% of persons in control baris were infected during the survey periods ($p < 0.001$). The prevalence of *Shigella* infection was highest for children 1 - 9 years of age and for females older than 39 years and was not related to socioeconomic status, family size or household crowding. Use of surface water for drinking was not a risk factor for *Shigella* infection; in fact, use of river water was more frequent in control baris. Both household and bari contacts of *Shigella* index cases frequently excreted different serotypes from that excreted by the person with the index case. In *Shigella* baris, families with infection were significantly more likely than uninfected families to have a history of an overnight stay away from home by a family member during the previous week. These observations suggest there were multiple introductions of *Shigella* into some families and that the epidemiology of *Shigella* infec - tion for families in rural Bangladesh differs from that observed for families living in more industrialized countries." (Authors' abstract)

100 Brayton PR, Tamplin ML, Huq A, Colwell RR. Enumeration of *Vibrio cholerae* 01 in Bangladesh waters by fluorescent - antibody direct viable count. Appl Environ Microbi - ol 1987 Dec;53(12):2862 - 5

"A field trial to enumerate *Vibrio cholerae* 01 in aquatic environments in Bangladesh was conducted, comparing fluorescent - antibody direct viable count with culture detection by the most - probable - number index. Specificity of a monoclonal antibody prepared against the 01 antigen was assessed and incorporated into the fluorescence staining method. All pond and water samples yielded higher counts of viable *V. cholerae* 01 by fluorescent - antibody direct viable count than by the most - probable - number index. Fluorescence microscopy is a more sensitive detection system than culture methods because it allows the enumeration of both culturable and nonculturable cells and there - fore provides more precise monitoring of microbiological water quality." (Authors' ab - stract)

101 Briend A, Wojtyniak B, Rowland MGM. Arm circumference and other factors in children at high risk of death in rural Bangladesh. Lancet 1987 Sep 26;2(8561):725 - 8

"Mid upper arm circumference (MUAC) was measured monthly for 6 months in about 5,000 children aged 6 - 36 months from rural Bangladesh. Children who would die within 1 month of screening could be identified with 94% specificity and 56% sensitivity - - almost twice the sensitivity achieved by other anthropometric screening schemes for this level of specificity. Specificity was slightly improved when the absence of breast - feeding, concurrent diarrhoea, oedema, and acute respiratory infection were taken into account. Children at high risk of death can be detected by monthly meas - urement of MUAC, which may be used in poor communities where interventions have to be selective." (Authors' abstract)

102 Briend A, Wojtyniak B, Rowland MGM. Breast feeding, nutritional state, and child

survival in rural Bangladesh. Br Med J 1988 Mar 26;296(6626):879 - 82

"The effect of breast feeding on nutritional state, morbidity, and child survival was examined prospectively in a community in rural Bangladesh. Every month for six months health workers inquired about breast feeding and illness and measured arm circumference in an average of 4,612 children aged 12 - 36 months. Data from children who died within one month of a visit were compared with those from children who survived. Roughly one third of the deaths in the age range 18 - 36 months were attributable to absence of breast feeding. Within this age range protection conferred by breast feeding was independent of age but was evident only in severely malnourished children. In communities with a high prevalence of malnutrition breast feeding may substantially enhance child survival up to 3 years of age." (Authors' abstract)

103 Briend A, Zimicki S. Validation of arm circumference as an indicator of risk of death in one to four year old children. Nutr Res 1986 Mar;6(3):249 - 61

"The quality of the evaluation of the risk of death by measurement of arm circumference in 1 to 4 year old children was estimated from archive data of the International Centre for Diarrhoeal Disease Research, Bangladesh. The relevance of a correction for age or for height was also tested. Anthropometric measurements of 49 children who died in the 6 months following nutritional assessment were compared with those of 873 controls who were measured at the same time in the same conditions. Although height, height for age, arm circumference for age and arm circumference for height were significantly lower in the group of children who died compared to the control when tested individually, a series of logistic equations showed that all these variables had virtually no effect on the quality of the prediction included in the model. Prediction of death by arm circumference without correction for age or height compared favorably in terms of specificity and sensitivity with other anthropometric indices tested in similar studies." (Authors' abstract)

104 Briscoe J, Ahmed S, Chakraborty M. Domestic water use in a village in Bangladesh. I. A methodology and a preliminary analysis of use patterns during the "cholera season". Prog Water Technol 1979;11(1 - 2):131 - 41

"Using consumer behaviour theory, a method is developed for formally analyzing how people choose water sources for different domestic uses. A preliminary analysis of data collected in a Bangladeshi village during the months of November, December and January, the traditional "cholera season", is presented." (Authors' abstract)

105 Briscoe J. Energy use and social structure in a Bangladesh village. Pop Dev Rev 1979 Dec;5(4):615 - 41

"Energy availability and patterns of energy use are examined in the context of a single rural village. The traditional patron - - client system in which richer peasants tried to underwrite the minimal needs of their poorer clients is being replaced by a system in which transactions between families of the same class are the norm and in which the poorest classes are deprived of access to limited resources and employment opportunities. The implications of this changing social structure for a major energy resource - fuel - are analyzed. It is shown that families of different classes use different types and sources of fuel, and it is the socially and economically most disadvantaged who are forced to purchase this increasingly scarce resource from the market. The current social structure and current mechanisms governing resource distribution are contrasted with historical patterns, and future patterns of energy use within the village are estimated." (Author's abstract)

106 Briscoe J. The quantitative effect of infection on the use of food by young children in poor countries. Am J Clin Nutr 1979 Mar;32(3):648 - 76

"A framework based on a consistent and explicit set of assumptions is developed for

evaluating the effect of infection on the intake and efficiency of use of food by children under 5 years old in poor countries. A variety of data is used to obtain quantitative estimates of catabolic losses, clinical and subclinical absorbtive losses, changes in food intake patterns, and losses due to high infant and childhood mortality. Although additional data are required before these estimates can be considered reliable, it appears that about 9% of the food available to a cohort of children under 5 years old in Bangladesh is not used for maintenance, growth, or activity of those children who survive to their 5th birthday. The amount of food that is not used effectively may be reduced to about 3% in a (hypothetical) situation where all sources of infection are eliminated but other conditions remain unchanged. The estimates suggest that the most important factors contributing to this inefficiency are reduced intake through food withdrawal and anorexia, and high mortality in young childhood. The potential nutritional effects of various public health programs are tentatively assessed." (Author's abstract)

107 Briscoe J. The role of water supply in improving health in poor countries (with special reference to Bangladesh). Dhaka: Cholera Research Laboratory, 1977. 34 p. (CRL scientific report, 6)

"The consumption of insufficient quantities of water of poor bacteriological quality is widely believed to be a major factor contributing to the high incidence of gastro-intestinal diseases in poor countries. Governments of these countries have undertaken water improvement programs in the belief that such programs will result in substantial improvements in the health of the populations served. In a rural area in the flooding plain of the Meghna River in Bangladesh four recent studies have examined the effect of the provision of domestic water through hand-pumped tubewells on the incidence of cholera and other diarrheal diseases. These studies have uniformly concluded that drinking tubewell water was not associated with a reduction in the diseases studied. Each of the studies has suggested reasons for this surprising finding. In this paper we examine these explanations closely and offer an alternative hypothesis which may account for these results. A subsequent study, which is reported in the addendum to this paper, suggests that this alternative hypothesis, too, does not explain the results of the field studies. The implications of these findings for the formulation of water supply policy in the study area and in rural Bangladesh as a whole are examined. The problems which arise from the use of cholera as a paradigm for all water-related diseases are emphasised as is the necessity for taking into account different ecological conditions in the formulation of water improvement programs. The paper concludes with a discussion of the necessity for understanding the factors which affect the behaviour of individuals who face a variety of sources of domestic water and the importance of including the proposed users in the design of these programs." (Author's abstract)

108 Briscoe J. The role of water supply in improving health in poor countries (with special reference to Bangladesh). Am J Clin Nutr 1978 Nov;31(11): 2100-13

Findings from a limited set of studies on water supply and diarrhoeal diseases, conducted in a rural area of Bangladesh, are reported. Some hypotheses have been offered to explain the unexpected and contradictory findings. These hypotheses are: (1) the use of tubewell water for drinking does not protect individuals against cholera; (2) cholera in rural Bangladesh is not primarily a waterborne disease; (3) the small amount of protection afforded by drinking bacteriologically safe water is overwhelmed by the exposure to polluted surface water through bathing, food preparation, and utensil washing; (4) in families who are tubewell users, there may be individuals who do not drink tubewell water, and they constitute the group that is most susceptible to cholera; and (5) those who use water from "disconnected" tanks for their surface water requirements are likely to have lower cholera attack rates than those who use canal or river water for drinking, cooking, bathing, and utensil washing. The policy implications of studies on water supply and cholera, the use of cholera as a model for water-related diseases, the use of "intermediate variables" in research and planning, and the specification of water supply standards for different water uses have been discussed. In water supply policy, the fundamental

need appears to be a reorienting and restructuring of the decision-making process. The continuation of traditional water use habits even when people of developing countries are presented with alternative sources of pure water is generally ascribed to the "ignorance of the uneducated masses". The prescription then becomes education of the ignorant and the identification of the communication barriers. The importance of decision-making on issues relating to water improvement programme has been stressed.

109 Brown KH, Gaffar A, Alamgir SM, Gilman R, Strife J. Bacterial infections associated with severe protein-calorie malnutrition. *In*: Johns Hopkins University International Center for Medical Research. Progress report, 1976-1977:38-52

110 Brown KH, Black RE, Becker S, Nahar S, Sawyer J. Consumption of foods and nutrients by weanlings in rural Bangladesh. Am J Clin Nutr 1982 Nov;36(5): 878-89

"Longitudinal studies of the consumption of foods and nutrients by 70 children between 5 and 30 months of age have been completed, during 632 individual days of observation in rural village homes in Bangladesh. Foods and prepared menu items for each child were weighed before serving; leftover food was subtracted from portions served to determine the amounts consumed. Breast milk intakes were estimated by test-weighing of children before and after all feedings during 12-h daytime periods and were corrected to 24-h consumption. All children between 5 and 12 months of age and 85% of children between 24 and 30 months were breast-fed; the average amount of breast milk received by these age groups declined from 632 to 368 g/day. Concurrently, the rate of consumption of cereals increased from 54 to 100% of children, and the amount received increased from 35 to 94 g/day. The children received an average intake of energy between 63 to 71 kcal/kg body weight/day and an average intake of protein between 1.2 to 1.5 g protein/kg body weight/day in the various age and sex categories. The absolute consumption of energy and protein increased with age, but the amount of energy per kg of body weight and the percentage of energy requirement for length-age remained constant or declined in older girls. Vitamin A consumption, mostly from breast milk, averaged between 152 and 249 ug retinol equivalents per day, with younger children receiving more than older ones and boys receiving more than girls. Breast milk was the major source of all nutrients for younger children. Cereals provided more protein and iron than mothers' milk in older boys, but breast milk remained an important source of nutrients for all children." (Authors' abstract)

111 Brown KH, Black RE, Robertson AD, Becker S. Effects of season and illness on the dietary intake of weanlings during longitudinal studies in rural Bangladesh. Am J Clin Nutr 1985 Feb;41(2):343-55

"Longitudinal, quantitative studies of the dietary intake of 70 weanlings between five and 30 months of age from two Bangladeshi villages have been analyzed to determine the effects of season and illness on dietary intake. During 1014 days of observation, all foods consumed by the children were weighed by a field worker present in the home; 24-hour breast milk intake was estimated from 12-hour test weighings. Inter-individual differences explained 29% to 50% of the variance in consumption of selected nutrients and foods during 632 studies conducted when children were free from diarrhea and fever. Multiple linear regressions controlling for inter-individual differences indicated that 60-day seasonal periods explained a significant proportion of the variation in intake. Average energy consumption (kcal/kg/d) was approximately one-third greater during the post-harvest periods than during the pre-harvest monsoon period. Breast milk intake varied similarly even after controlling for age-related decreases. Consumption of rice and wheat, the major non-breast milk sources of energy and protein, had distinct seasonal patterns, thus limiting the overall seasonal variability in cereal intake. Older children, particularly boys, benefited more from the post-harvest relative abundance of food. The intake of most nutrients was significantly depressed by approximately 10% during febrile illnesses. Minor decreases in intake with other illnesses were not statistically significant." (Authors' abstract)

112 Brown KH, Rajan MM, Chakraborty J, Aziz KMA. Failure of a large dose of vitamin A to enhance the antibody response to tetanus toxoid in children. Am J Clin Nutr 1980 Feb;33(2):212 - 7

"Field studies to determine the effects of a large dose of water miscible vitamin A on selected parameters of children's immunological function were completed in rural Bangladesh. There was no difference between vitamin A treated or control groups in tetanus antitoxin responses after tetanus toxoid immunization or in skin test reactivity to common antigens. Subsequent studies with mice demonstrated vitamin A dose-related antitoxin responses, but the animals required amounts of vitamin that would be likely to cause undesirable side effects if administered in similar doses to children." (Authors' abstract)

113 Brown KH, Rajan MM, Chakraborty J, Aziz KMA. Failure of a large dose of vitamin A to enhance the antibody response to tetanus toxoid in children. *In*: Johns Hopkins University International Center for Medical Research. Progress report, 1976-1977:70 - 9

114 Brown KH, Parry L, Khatun M, Ahmed MG. Lactose malabsorption in Bangladeshi village children: relation with age, history of recent diarrhea, nutritional status, and breast feeding. Am J Clin Nutr 1979 Sep;32(9):1962 - 9

"The prevalence of lactose malabsorption (LM) among Bangladeshi village children has been determined using the recently developed breath hydrogen test. Initial hospital-based comparison studies showed general agreement between the breath hydrogen test and a modified lactose tolerance test. Two hundred thirty-four children, stratified by age, nutritional status, and history of recent diarrhea then participated in the field study. LM was diagnosed in more than 80% of children over 36 months of age but in none of the children under 6 months. Rates of LM were significantly increased in children with a history of recent diarrhea and a greater proportion of children in some age groups evidenced malabsorption in association with acute undernutrition. In the weanling age group children who were still breast feeding had a lower rate of LM than fully weaned subjects." (Authors' abstract)

115 Brown KH, Parry L, Khatun M, Ahmed MG. Lactose malabsorption in Bangladeshi village children: relation with age, history of recent diarrhea, nutritional status and breast feeding. *In*: Johns Hopkins University International Center for Medical Research. Progress report, 1978 - 1979:89 - 104

116 Brown KH, Black RE, Becker S, Hoque A. Patterns of physical growth in a longitudinal study of young children in rural Bangladesh. Am J Clin Nutr 1982 Aug;36(2):294 - 302

"Longitudinal field studies of the physical growth of 197 children between 6 and 60 months of age have been completed in two rural villages of Bangladesh. The distribution of weights by age indicated that 90% of the village girls and boys weighed less than the National Center for Health Statistics 5th percentile by 8 and 15 months of age, respectively. Of the children 90% were shorter than the reference population 10th percentile length by age by 10 to 13 months of age. Since the children's patterns of growth differed from those of the reference populations from North America and Europe, internal standards were created for the village girls and boys by fitting curves to their data for weight by age, length by age, arm circumference by age, triceps skinfold thickness by age, and weight by length. The village references enabled age-independent comparisons of children within the study population by relating their actual anthropometric status to the village norms. Comparisons of the village standards with the international reference data showed the period of poorest nutritional status of the village children persisted from shortly after birth to approximately 2 yr of age." (Authors' abstract)

117 Brown KH, Black RE, Becker S. Seasonal changes in nutritional status and the

prevalence of malnutrition in a longitudinal study of young children in rural Bangladesh. Am J Clin Nutr 1982 Aug;36(2):303 - 13

"During longitudinal field studies of the growth, dietary intake, and morbidity from infectious diseases of children between 6 and 60 months of age in two rural villages of Bangladesh, seasonal fluctuations in growth, nutritional status, and the prevalence of malnutrition were observed. The weight, length, arm circumference, and triceps skinfold thickness of 197 children were measured monthly for 15 months and compared with sex - specific local village norms and international reference populations. The percentages of expected weight for length, arm circumference for age, triceps skinfold thickness for age, and the percentages of expected monthly increments of weight and length for age were the indicators most sensitive to seasonal changes. The percentages of expected weight for age and length for age also changed significantly by month of year, but were less responsive to seasonal variation. The periods of greatest nutritional deficit depended on which anthropometric indicator was used to define nutritional status, but generally occurred during the monsoon and persisted until the subsequent harvest period. However, the fall in mean percentage of expected length for age and the increase in the prevalence of stunting occurred several months after the periods of greatest malnutrition identified by the other measurements. The importance of selecting the appropriate anthropometric techniques to detect seasonal changes and the implications of such changes are discussed." (Authors' abstract)

118 Cash RA, Nalin DR, Rochat R, Reller LB, Haque ZA, Rahman ASMM. A clinical trial of oral therapy in a rural cholera - treatment centre. Am J Trop Med Hyg 1970 Jul;19(4):653 - 6

"A clinical trial in a field hospital in rural East Pakistan of an orally administered solution used in conjunction with intravenous fluid for the treatment of cholera in adults has demonstrated the efficacy of oral therapy. After initial intravenous rehydration, fluid balance in actively purging patients with cholera was adequately maintained in most patients, by the administration of an oral solution of drinking water containing sodium chloride, potassium citrate, sodium bicarbonate, and dextrose. It was found that 135 patients with cholera who received oral maintenance therapy required 70% less intravenous fluid than a similar group of 135 treated at the same rural treatment center in a previous epidemic. This treatment regimen has now become routine at our field hospital." (Authors' abstract)

119 Cash RA, Phillips RA. On cholera [editorial]. J Pak Med Assoc 1969 Aug;19(8):344

120 Cash RA, Nalin DR, Forrest JN, Abrutyn E. Rapid correction of acidosis and dehydration of cholera with oral electrolyte and glucose solution. Lancet 1970 Sep 12;2(7672):549 - 50

"Five patients with severe acidosis and dehydration secondary to diarrhoea were treated with an oral solution containing sodium chloride, potassium chloride, sodium bicarbonate, and glucose. Dehydration and acidosis were corrected within 6 hours. These findings imply that if a patient with cholera or other severe diarrhoea is treated with an oral solution early in the course of his illness, the need for intravenous fluid may be completely obviated." (Authors' abstract)

121 Cash RA, Northrup RS, Rahman ASMM. Trimethoprim and sulfamethoxazole in clinical cholera: comparison with tetracycline. J Infect Dis 1973 Nov;128(suppl):S749 - 53

"Twenty - two adult cholera patients were treated with a combination of trimethoprim (80 mg) and sulfamethoxazole (400 mg) (TMP - SMZ) every 6 hr in addition to iv and oral hydration. Twenty - three children were treated in similar fashion with one - half this dose of the drug combination. Results were compared with those in 51 patients treated

concomitantly with tetracycline. Stool volume, duration of diarrhea, and duration of excretion of *Vibrio* were slightly greater in the patients treated with TMP – SMZ, although differences from those treated with tetracycline were neither constant nor significant. No clinical or bacteriologic relapses were seen. Sensitivity studies by tube dilution showed similar MICs of the TMP – SMZ and tetracycline for Vibrio cholerae. These results, considered with other published data, indicate that the TMP – SMZ is a practical alternative to tetracycline in the treatment of cholera." (Authors' abstract)

122 Chakraborty J, Yunus M, Zimicki S. Bari mothers: home based experts for home – prepared oral rehydration solution [abstract]. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):504

123 Chakraborty J, Zimicki S, Yunus M. Knowledge, attitudes and practices concerning diarrhoea in a rural area in Bangladesh [abstract]. *In*: Proceedings of the 1st Asian Conference on Diarrhoeal Disease, Dhaka, 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982:245

124 Chen LC, Chowdhury AKMA, Huffman SL. Anthropometric assessment of energy – protein malnutrition and subsequent risk of mortality among preschool aged children. Am J Clin Nutr 1980 Aug;33(8):1836 – 45

"This paper examines the usefulness of various anthropometric classification systems of nutritional status in prognosticating the subsequent risk of mortality among 2019 children aged 13 to 23 months residing in a rural area of Bangladesh. The indices investigated included: weight – for – age; weight – for – height; height – for – age; arm circumference – for – age; arm circumference – for – height; weight quotient; and height quotient. Cross – sectional anthropometry was conducted during October 1975 to January 1976 and the mortality experience of the study children was followed prospectively over 24 months. Results indicated that severely malnourished children, according to all indices, experienced substantially higher mortality risk. Normal, mild, and moderately malnourished children all experienced the same risk. All indices were found to discriminate mortality risk; weight/age and arm circumference/age were strongest and weight/height weakest. For each index, a threshold level was noted below which mortality risk climbed sharply. The discriminating power of anthropometry was enhanced when maternal weight, maternal height, or housing size were included." (Authors' abstract)

125 Chen LC, Chowdhury AKMA, Huffman SL. Anthropometric assessment of energy – protein malnutrition and subsequent risk of mortality among preschool aged children. *In*: Sukhatme PV, ed. Newer concepts in nutrition and their implications for policy. Pune: Maharashtra Association for the Cultivation of Science Research Institute, 1982:157 – 84

126 Chen LC. Control of diarrheal disease morbidity and mortality: some strategic issues. Am J Clin Nutr 1978 Dec;31(12):2284 – 91

127 Chen LC, Chowdhury AKMA. The dynamics of contemporary famine. *In*: Proceedings of the International Population Conference, Mexico, 1977, v.1. Liege: International Union for the Scientific Study of Population, 1977:409 – 26

128 Chen LC, Rahman M, Sarder AM. Epidemiology and causes of death among children in a rural area of Bangladesh. Int J Epidemiol 1980 Mar;9(1):25 – 33

"From a longitudinal surveillance programme among a rural Bangladesh population of 260,000, the epidemiology and causes of child death (under age 5) over 3 years (1975 – 1977) were analyzed. The most significant causes of death were diarrhoea (watery and dysentery), tetanus, measles, fever, respiratory disease, drowning, skin disease, and other causes. Of an infant mortality rate of 142.6/1000 live births, neonatal tetanus (37.4/1000), diarrhoea (19.6/1000), and respiratory disease (10.4/1000) were the most

significant identifiable causes. Many infant deaths (62.2/1000) were unidentified, taking place during the neonatal (1 – 28 days) period. The 1 – 4 year mortality averaged 34.3/1000. Diarrhoea (15.1/1000), measles (4.5/1000), fever (2.9/1000) and respiratory disease (1.6/1000) accounted for most 1 – 4 year deaths. Mortality trends over the past 10 years showed sharp temporary fluctuations in response to 2 disasters but no definitive long – term trend. Most causes of death displayed seasonal fluctuation, and sex differentials were marked with female deaths exceeding male deaths for all ages after the neonatal period. Malnourished children from low socioeconomic status families had higher ortality rates than their better nourished and wealthier counterparts. Overall, the data suggest that the delivery of a few basic health measures (oral hydration and immunization) could result in substantial reduction of under 5 mortality." (Authors' abstract)

129 Chen LC, Chakraborty J, Sardar AM, Yunus M. Estimating and partitioning the mortality impact of several modern medical technologies in basic health services. *In*: Proceedings of the International Population Conference, Manila, 1981, v. 2. Liege: Ordina Editions, 1981:113 – 40

"Reports on the findings of a study undertaken in 1 area of rural Bangladesh to determine the effect on mortality of the introduction of specific health technologies. The health program involved family planning practice, immunization against tetanus, and home based therapy against diarrhea. Like most lesser developed areas, the Matlab region of Bangladesh had moderately high levels of both death and fertility, with high mortality rates being concentrated among the very young. Other population subgroups were found to be disproportionately affected as well. Infants were most prone to death by tetanus neonatorum, while toddlers died most from diarrheal disease. Results showed conclusive evidence of a reduction in crude birth and death rates in the intervention area as compared to comparison areas. The family planning program was found to have had a positive impact on mortality as well as fertility rates through several mechanisms. The tetanus vaccine program had more straightforward effect on mortality levels. The impact of the diarrhea therapy was less easily quantifiable. Examination of the Matlab project generates some insights into the process of induced mortality changes, and suggests that interventions initiated processes of direct and indirect impact, of long and short term duration, and acted both independently and in an interrelated manner to change the level and pattern of mortality in the population." (POPLINE)

130 Chen LC. Malnutrition and mortality. NFI Bull 1982 Oct:1 – 5

131 Chen LC, Gesche MC, Ahmed S, Chowdhury AI, Mosley WH. Maternal mortality in rural Bangladesh. Stud Fam Plann 1974 Nov;5(11):334 – 41

"The results of two prospective studies of maternal mortality in a population of 231,000 living in Matlab thana between 1967 and 1970 are presented. The maternal mortality rate was observed to be 7.7 and 5.7 deaths per thousand live births. The overwhelming proportion of these deaths were directly related to obstetrical factors, with eclampsia being the most common single cause of death. At high risk to maternal mortality were primigravida mothers and childbearers who had had five or more pregnancies. A family planning program aimed at mothers with four or more children could theoretically reduce maternal mortality by 30 percent, while an antenatal program focused on eclampsia could prevent another 30 percent of the deaths." (Authors' abstract)

132 Chen LC, Rahman M, D'Souza S, Chakraborty J, Sardar AM, Yunus M. Mortality impact of an MCH – FP program in Matlab, Bangladesh. Stud Fam Plann 1983 Aug/Sep;14(8/9):199 – 209

"Family planning, tetanus immunizations, and oral rehydration therapy for diarrhea were introduced in a rural population in which longitudinal surveillance of vital events had been done for 16 years. The delivery of modern contraceptive services exerted a significant influence on fertility, which in turn affected the crude mortality rate primarily through

changes in the age structure of the population. Other mechanisms of fertility decline on mortality included altered patterns of childbearing and possible biological and social effects of prolonged birth spacing and younger termination of childbearing. Maternal tetanus immunization also reduced mortality, particularly neonatal mortality. The effect of oral rehydration therapy was difficult to assess because of methodological problems associated with the use of averted deaths as a health measure, and the competitive and correlative risks of other diseases." (Authors' abstract)

133 Chen LC. Primary health care in developing countries: overcoming operational, technical, and social barriers. Lancet 1986 Nov 29;2(8518):1260-5

"An analysis of survey data from Matlab, Bangladesh, suggests that the provision of primary health care is a more complex process than is reflected by current strategies. The Bangladesh experience indicates that single-outcome indicators (e.g., deaths averted) for assessing the effect of health measures, while necessary for comparing the cost-effectiveness of various approaches, rarely encapsulate all the aims of an intervention. For example, in the year after the introduction in Matlab of modern contraception and tetanus immunization for pregnant women, the intervention population had about a 25% lower crude birth and death rate, yet little difference was observed in infant mortality rates. Policies aimed at centering single diseases may cause factors such as nutrition, which has important biosocial interactions with infection, to be undervalued. Rather than viewing childhood morality in relation to specific diseases--an approach that promotes an emphasis on technology--childhood mortality should be seen as the result of sequential insults accumulated over time. the reluctance of eligible women to accept tetanus vaccine and the greater utilization of diarrhea treatment services for male than female children are examples of the significance of the demand factor. Also needed is improved knowledge of the interaction between the structure of health care delivery systems and a population's political economy. Public investments for primary health care in India have been targeted to large-scale public systems operated by a bureaucracy biased toward procedure rather than performance. Finally, future research should incorporate the strengths of both the natural and the social sciences." (POPLINE)

134 Chen LC, Ahmed S, Gesche M, Mosley WH. A prospective study of birth interval dynamics in rural Bangladesh. Rur Demogr (Dhaka) 1974 Summer;1(1):101-11

135 Chen LC, Ahmed S, Gesche M, Mosley WH. A prospective study of birth interval dynamics in rural Bangladesh. Pop Stud 1974 Jul;28(2):277-97

"A group of 209 married, fecund women in rural Bangladesh were studied prospectively for 24 months from 1969 to 1971 to define some of the biological and sociological factors relating to fertility performance. These women were selected from a larger study population of 112,000 that had been followed with a daily house-to-house vital registration programme since 1966. The selected women were interviewed bi-weekly and were asked questions about menstruation, pregnancy, lactation, husband's occupational absences, and monthly urine tests for pregnancy were taken. The results for 193 non-contracepting women revealed that the seasonal pattern of births previously observed in this population could be associated with a corresponding seasonal pattern of conceptions and that this was due to a seasonal trend in fecundability. The highest conception rates were in the coolest months of the year. Post-partum lactational amenorrhoea was very prolonged, averaging 17 months for women with a surviving child. The appearance of the first post-partum menstrual flow (onset of ovulation) also had a seasonal trend which could not be adequately explained. The median waiting time to conception, once menstruation had resumed was eight months. This interval was influenced by seasonal fluctuations, as well as by the age of women and by husband's absences. The foetal wastage rate was 15.0 per 100 conceptions, with 62 per cent of the foetal losses occurring during the second month of gestation. Overall, the average birth interval was 33 months, with the prolonged lactational amenorrhoea accounting for almost 45 per cent of this interval." (Authors' abstract)

136 Chen LC, Huq E, Huffman SL. A prospective study of the risk of diarrhoeal diseases according to the nutritional status of children. Am J Epidemiol 1981 Aug;114(2):284 – 92

The aim of this study is to re – examine the hypothesis that protein – calorie malnutrition increases the incidence of diarrhoeal diseases. The study was undertaken in Matlab where the International Centre for Diarrhoeal Disease Research, Bangladesh was maintaining a longitudinal demographic – epidemiologic surveillance system and diarrheal disease health services. The prospective epidemiological field data collected from this area was used to examine the effect of child malnutrition on the subsequent risk of diarrhea among preschool children in rural Bangladesh. A total of 2,019 children aged 12 – 23 months were classified according to weight – for – age, weight – for – height, and height – for – age as a percentage of the Harvard median standard. Over a prospective period of 24 months, diarrhoeal hospitalisation rates among the children were matched to the initial anthropometric assessment. No differences were observed in diarrhoeal hospitalization rates according to initial nutritional status. Another group of 207 children aged under 5 years were classified according to weight – for – age, and after the nutritional assessment, their diarrhoeal attack rate was followed prospectively for one year. Again, no differences in diarrhoeal attack rates between varying nutritional status categories were observed. The nutritional status of the 207 children was then defined as monthly growth velocity (kg change in body weight, per cent change of initial body weight, and per cent change of weight – for – age) and the diarrhoeal attack rate for the subsequent one month period was observed, but again no difference in attack rates was noted between nutritional groups. The results of the study suggest that the nutritional status of children exerts little influence on subsequent diarrhoeal incidence. The impact of diarrhoea in predisposing and exacerbating malnutrition might be the more important of the bidirectional interactions. It is further concluded that the predominant effect of malnutrition on diarrhoea might be through disease duration and mortality rather than through disease incidence.

137 Chen LC, Huq E, Huffman SL. A prospective study of the risk of diarrhoeal diseases according to the nutritional status of children. *In*: Sukhatme PV, ed. Newer concepts in nutrition and their implications for policy. Pune: Maharashtra Association for the Cultivation of Science Research Institute, 1982:185 – 94

138 Chen LC, Chowdhury AKMA, Huffman SL. Seasonal dimensions of energy protein malnutrition in rural Bangladesh: the role of agriculture, dietary practices, and infection. Ecol Food Nutr 1979;8(3):175 – 87

"The influence of seasonal variations in agricultural practices, dietary intakes and illness on the nutritional status of preschool children was examined in this longitudinal study of approximately 200 woman – child pairs in rural Bangladesh. The seasonal nature of cropping patterns was associated with varying levels of rice prices, agriculture wage rates, and household food stocks. Rice prices were highest, household food stocks lowest and agricultural demand weakest in August – October, the months preceding the major rice harvest. Maternal work patterns also varied by season with the peak demand on women's time coincident with postharvest rice processing activities. Breastfeeding frequency declined during the months when maternal activities increased, suggesting that time available for childrearing activities varied seasonally. Seasonal patterns in diarrheal disease and other illnesses were also observed. Maternal and child nutritional status exhibited seasonal variations which were associated with low levels of family food availability. However these fluctuations were more pronounced among the landless than among landowning families. Maternal nutritional status also varied by landholding, with landless women weighing an average of 39.9 Kg compared to 41.9 Kg for women in landowning families. A reduction of the marked seasonal fluctuations of nutritional well – being appears important to eliminate the severe consequences of malnutrition and to assist in breaking the cycle of rural poverty." (Authors' abstract)

139 Chen LC, Huq E, D'Souza S. Sex bias in the family allocation of food and health care in rural Bangladesh. Pop Dev Rev 1981 Mar;7(1):55-70

"This study examines the behavioral antecedents to the higher female than male mortality from shortly after birth through the childbearing ages in a rural area of Bangladesh. A framework is presented in which the intermediate variables through which sex-biased attitudes and practices might operate to affect health, nutrition, and mortality are postulated. The malnutrition rate was found to be substantially higher among female children than among male children. In-depth dietary surveys showed that males consistently consumed more calories and proteins than females at all ages, even when nutrient requirements due to varying body weight, pregnancy, lactation, and activity levels were considered. Although child infection rates were similar between sexes, utilization of health care services at a free treatment unit showed marked male preferences. Implications for policy formulation and program implementation are discussed in the conclusion." (Authors' abstract)

140 Chen LC, Chowdhury AKMA. The use of anthropometry for nutritional surveillance in mortality control programs [letter]. Am J Clin Nutr 1981 Nov;34(11):2596-9

141 Chen LC, Black RE, Sarder AM, Merson MH, Bhatia S, Yunus M, Chakraborty J. Village-based distribution of oral rehydration therapy packets in Bangladesh. Am J Trop Med Hyg 1980 Mar;29(2):285-90

"The distribution of sucrose-electrolyte oral therapy packets (1 liter) by community-based workers in a rural Bangladesh population of 157,000 was evaluated. A similar population of 134,000 served as a comparison group. The locally-produced packets showed satisfactory chemical composition with a shelf-life of up to 3 months and a cost of U.S. $0.05. After 4 months the workers were distributing an average of 70 packets/1,000 population per month. Most patients used one packet for each episode of diarrhea; 13% of children used two packets, and 15% and 8% of adults used, respectively, two and three packets. The electrolyte composition of the oral fluids prepared by field workers and mothers showed substantial variation, but no hyperconcentrated solutions were noted. A comparison of the hospitalization rate from the two study areas suggested a 29% reduction in hospitalization for diarrhea during the 4 months of distribution." (Authors' abstract)

142 Chen LC. Where have the women gone? Insights from Bangladesh on low sex ratio of India's population. Econ Pol Wkly 1982 Mar 6;17(10):364-72

"In India the low ratio of females to males raises several questions: are the data on low sex ratio accurate? how and why does low sex ratio occur? and what action can be taken, assuming that the deteriorating sex ratio is undesirable from a public welfare perspective? Substantial research undertaken in Matlab thana in Bangladesh is reviewed to provide insights into these issues within India. Despite out-migration of males to find jobs, the number of males is greater than females in Matlab. This predominance of males is caused not by any unusual sex ratio at birth, but because female death rates exceed male rates at all ages except among the neonatal or very old. Differences were most marked during postneonatal and childhood years, persist through adolescence, and are maintained during the reproductive ages when maternity-related deaths among women account for much of the excess. Among children the proportion of females suffering with severe or moderate malnutrition exceeds that of males. Some of this disparity may be attributed to sex discrimination against females in food allocation by the mother. Disease incidence in the community was roughly comparable between the sexes, but males were more likely to be taken to the health services, providing evidence of sex-biased parental responses to illness. Inferior status, role, and work opportunities of Bangladesh women may explain this sex-biased health and nutrition behavior. Data by age groups and migration, and the inconsistency of multiple data sets suggests single explanations cannot fully account for the observed low sex-ratio of India's population.

Rather than simplistic policy prescriptions, it seems likely that fundamental structural changes in role, status, and economic value of women will be required along with allevia-tion of poverty to reduce female death rates." (POPLINE)

143 Chowdhury AI, Phillips JF. Analysis of motivation to contraceptive use applying the weighting procedure. Soc Biol 1989 Fall-Winter;36(3-4):279-83

"This paper presents a technique for scaling contraceptive use motivation for the sample population of the Family Planning Health Services Project in Matlab. The project, which began in 1977, is conducted by the International Centre for Diarrhoeal Disease Research, Bangladesh. The hypothesis of the research is that through the use of a scaling algo-rithm the power of demographic characteristics, attitudes, and intentions for predicting contraceptive use can be enhanced. The analysis shows that two factors explain use motivation. Scale 1 is weighted for demographic variables and desire for additional chil-dren, while Scale 2 is comprised of education and intentions of contraceptive use. Both scales have a pronounced independent predictive power. We conclude that scaling has improved upon the predictive power of indicators of reproductive motivations." (Authors' abstract)

144 Chowdhury AI, Aziz KMA, Shaikh K. Demographic studies in rural Bangladesh: May 1969-April 1970. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 21 p. (ICDDR,B working paper, 16)

The population of 1968-69 was distributed in single year age with osculatory interpola-tion and the midyear population of Matlab Demographic Surveillance System for 1969-70 was estimated by balancing the equation with adjustment of births, deaths, and migra-tions. An average annual rate of increase of 2.03% was found. In this population, the proportion of males in the under 14 age groups was larger than that of the females. Whereas among the 15-34 year age group females were more numerous than the males, beyond age 35, males were more numerous than females. The crude birth rate and crude death rate show a crude rate of 3.0% natural increase. The outmigrations were higher than inmigrations and both male and female outmigrants were reported higher than inmigrants. In both the neonatal and postneonatal periods, male deaths were higher than female deaths. The age specific death rates were distributed in a U-shape pattern and October-December was the peak period of death. More than 3/4 of the children under age 1 died of Takuria, i.e., cause unknown. About 1/4 of the children aged 1-14 years of age died of gastrointestinal diseases and 1/2 of the persons older than 15 died of other causes. The male life expectancy was higher than female life expectancy. The sex ratio at birth was 105.0 males for 100 females. The peak age specific fertility rate was 332.4 for women ages 20-24. The mean length of generation was 26.27, indicating that the Bangladeshi woman replaces herself with 2.24 females. (Modified authors' abstract) (POPLINE)

145 Chowdhury AI, Aziz KMA, Shaikh K. Demographic studies in rural Bangladesh, May 1970-April 1971. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 23 p. (ICDDR,B working paper, 17)

"The mid year population of Matlab Demographic Surveillance System for 1970-71 was estimated with an adjustment of births, deaths and migrations. An average annual rate of increase of 2.4% was found. The CBR and CDR were lower than the preceding years and the crude rate of natural increase was 2.9%. Out-migration rate was 22.1 and in-migration rate 30.8. Both male and female immigration was greater than outmigration. In the neonatal period, the death rate among male infants was higher than the female infants. Whereas in the post-neonatal period death rate among the female infants was higher than the male infants. Overall, infant mortality rate was higher among the male than the female. The age specific death rates showed a U shape pattern. The peak occurred during October to December 1970-71 and earlier years. This peak period of death coincides with the peak in winter which causes death among children <1 and

above 40 years during 1970 - 1971 period and earlier years. Over two - thirds of children < 1 reportedly died of 'Takuria' i.e. cause 'unknown' and about a half of the above 40 years old persons died of 'dropsy, asthma, rheumatism etc.' i.e. others. The life expectancy of males was higher than females. Sex ratio at birth was 101 males per 100 females. October - December period of 1970 - 71 was the peak period for pregnancy termination. Higher numbers of first pregnancies were terminated in September - November. Second and third pregnancies were terminated mostly during October - January. Fourth through seven pregnancies were terminated during October - December and beyond, seven were terminated largely during October - November. Overall, most of the conceptions took place during the spring and early summer (February - April) seasons. The peak age specific fertility rate was 329.7 for women aged 20 - 24. The intrinsic rate of natural increase was 2.88% per year." (Authors' abstract)

146 Chowdhury AI, Aziz KMA. Demographic studies in rural Bangladesh: May 1971 - April 1972. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982. 24 p. (ICDDR,B working paper, 28)

"Children under 14 and adults over 60 comprise 48 and 4.4 percent respectively of the total population. The CBR was 44.6 per 1000 population. The CDR was 20.6 per 1000 population (the highest since 1966). These rates resulted into a crude rate of natural increase of 2.4 percent. The reasons for very high mortality may be primarily attributed to the war of liberation. The in - and out - migration rates were 29.5 and 30.6 per 1000 population respectively. The net balance of migration was 1.1 per 1000 population. Overall, 146.8 per 1000 of infants died before reaching the age of one year. The excess female mortality is evident in the 1 - 4 year age group. There was a sharp fall of mortality in pre - school children. From age 10 the death rates rise slowly with mortality of females exceeding that for males up to the age of 30 - 34 years. From the ages of 35 - 59, the male mortality exceeded those for females. Slightly more than 41 percent of deaths occurred during the four - month period of September to December. One - fourth of all deaths were attributed to unknown causes or *takuria* (evil spirits). Most of these deaths occurred amongst infants aged less than one year. Gastrointestinal diseases other than cholera and fever were important causes of death. For both sexes the expectation of life at birth was 42.1 years. This figure represents a drop in life expectancy of almost 10 years from the 1970 - 71 period which reflects the effects of the on - going war of liberation. The sex ratio at birth was 104.1 males per 1000 females. One stillbirth occurred for every 26.4 live births. Slightly over 21 pregnancies occurred for every miscarriage. There was a marked decline in fertility among women aged 40 - 49 years. The gross reproduction rate was 3.1, the net reproduction rate was 2.0 and the mean length of generation was 27.1 years." (Authors' abstract)

147 Chowdhury AI, Aziz KMA. Demographic studies in rural Bangladesh: May 1972 - April 1973. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982. 24 p. (ICDDR,B working paper, 29)

"Children under 14 and adults over 60 comprise 46.9 and 5 percent respectively of the total population. The CBR was 42.1 per 1000 population. The CDR was 16.3 per 1000 population. These rates resulted into a crude rate of natural increase of 2.6 percent. The in - and out - migration rates were 25.2 and 34.6 per 1000 population respectively. The net balance of migration was 9.4 per 1000 population. Overall, 126.8 per 1000 of infants died before reaching the age of one year. Female mortality rate exceed that for males from childhood through age 29. During ages 1 - 4 the female mortality rate exceeded the rate for males by 53 percent. Excluding 60 - 64 age group, male mortality exceeded female mortality from age 30 onward. Overall, there was relatively little seasonality of deaths. One - fourth of all deaths were attributed to *takuria* (i.e. cause 'unknown'). Gastrointestinal diseases other than cholera and fever were important causes of death. For both sexes the life expectancy at birth was 46.9 years. This life expectancy was substantially higher for males (48.3 vs. 45.4). Through age 5 there were markedly higher female mortality rates. The sex ratio at birth was 104 males per 100

females. One stillbirth occurred for every 25.9 live births and 14.4 pregnancies for every miscarriage. The gross reproduction rate was 3.0, the net reproduction rate was 2.1 and the mean length of generation was 26.8 years. (Authors' abstract)

148 Chowdhury AI, Aziz KMA. Demographic studies in rural Bangladesh: May 1973 - April 1974. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982. 22 p. (ICDDR,B working paper, 30)

"Children under 14 and adults over 60 comprise 46.5 and 4.8 percent, respectively of the total population. The CBR rose from 42.1 per 1000 the previous year to 47.9 per 1000 during the 1973 - 74 period. The death rate declined from 16.3 to 14.2 per 1000 during this period. The CBR and CDR resulted in a crude rate of natural increase of 3.4 percent during this period. The in - and out - migration rates were 17.2 and 21.2 per 1000 population respectively. The net balance of migration was 4 per 1000 population. One hundred and twenty - six infants per 1000 die in the first year of life. Male mortality exceeded female mortality from age 40 onward except 65 and above ages. Overall, there was very little seasonal variation in death rates, with the exception of the youngest age group. Over one - third of the total deaths were classified as unknown or *takuria* (evil spirits). Most of these deaths occurred amongst infants aged one year or less. Gastrointestinal diseases and fever were amongst the leading causes of death. For both sexes the life expectation at birth was 50.8 year. The sex ratio at birth was 103 males per 100 females, one stillbirth occurred for every 27.2 live births. One miscarriage occurred for every 18.8 pregnancies. The gross reproduction rate was 3.5, the net reproduction rate was 2.6 and the mean length of generation was 28.5 years." (Authors' abstract)

149 Chowdhury AI, Aziz KMA, Mosley WH. Demographic studies in rural East Pakistan: Second year, May 1967 - April 1968: Based on regular registration of births, deaths and migrations. Dhaka: Pakistan - SEATO Cholera Research Laboratory, 1969. 26 p.

150 Chowdhury AI, Aziz KMA, Mosley WH. Demographic studies in rural East Pakistan: Third year, May 1968 - April 1969. Dhaka: Pakistan - SEATO Cholera Research Laboratory, 1970. 19 p.

151 Chowdhury AI, Koenig MA, Fauveau V. The influence of sex composition of living children on contraceptive behavior in Matlab, rural Bangladesh [abstract]. *In*: Programme and abstracts of papers of the Fourth Annual Conference of the Indian Society for Medical Statistics, Bangalore, 24 - 26 Nov 1986. Bangalore: National Institute of Mental Health and Neuro Sciences, 1986:60

152 Chowdhury AI, Aziz KMA. Occupation: a determinant of birth and death rates in rural Bangladesh. Rur Demogr (Dhaka) 1974 Summer;1(1):13 - 26

"An analysis of the age - specific occupational distribution of working males shows that birth and death rates significantly vary in different occupational groups. The highest fertility rate occurs among the farming category and the lowest among the service and mill - worker category. The highest mortality rate occurs among the non - working category and the lowest among business, service and mill - worker categories. Further analysis revealed that the highest infant mortality occurs among the self - employed and the lowest among the farming population." (Authors' abstract)

153 Chowdhury AI, Phillips JF. Predicting contraceptive use in Bangladesh: a logistic regression analysis. J Biosoc Sci 1989 Apr;21(2):161 - 8

"Family planning knowledge, attitude and practice surveys typically assess respondents' reproductive attitudes and intentions to use contraception. Longitudinal observation of individual respondents nevertheless shows that such questions are not strongly predictive of subsequent behaviour. This study examines 3 years' data which show that a set of

such responses to questions are nevertheless substantially superior in predicting behaviour than any single indicator. Thus statistical techniques which bring into account the apparent multidimensionality of contraceptive motivation can greatly improve upon the estimation of future practice of family planning in a population." (Authors' abstract)

154 Chowdhury AI, Phillips JF, Rahman M. Predicting the adoption of contraception: a multivariate analysis of contraceptive intentions and subsequent use in Matlab Thana, Bangladesh. *In*: Srivastava RN, Verma BL, Shukla GD, eds. Principles and practice of statistics in medicine; proceedings of the National Symposium on Statistics in Medicine, Jhansi, 1983 Bombay: Himalaya Publishing House, 1985;271 - 80

"This study examines 3 years of panel data (1977, 1978, 1979) on responses of 2111 women from Matlab thana in rural Bangladesh to test a procedure for measuring underlying motivation to practice family planning. The logic of the analysis is related to the observation that many characteristics of women correlate in some way with contraceptive use, and each variable thus reflects motivation to some degree. The analysis uses maximum likelihood logit regression to examine the net effect of 8 predisposing variables on the prediction of behavior and to illustrate the underlying complexity of family planning motivation. The aim is to test whether a single survey can be used to construct a scale that reliably predicts behavior. Described 1st are the data and the model; presented next are bivariate relationships for characteristics of users with prevalence of use at 3 successive points in time. The independent variables studied include desire for more children, number, age and sex of living children, maternal age, husband's education and occupation and wife's education. Results indicate that among non-users who said they wanted no more children, 34.2% were users in round 2 (1978) and 42.3% in round 3 (1979). The data, however, suggest that current behavior in round 1 was a better predictor than attitudes: among 1979 users, the proportion of subsequent users was 72.0% in 1978 and 64.3% in 1979 as opposed to 20.5 and 26.0 among 1977 non-users in 1978 and 1979, respectively. The bivariate relationships suggest that characteristics of users and non-users differed markedly throughout the study period, but that differentials diminished with time. By 1979, users and non-users were more similar than in 1977 when the project had just begun. Results suggest that variables such as living children and living sons strongly affect attitudes, which, in turn, affect ultimate use. Variables such as socioeconomic status had a direct effect on motivation that was independent of stated attitudes. While results show that each effect was significant, no single variable reliably predicted use of contraception. Since coefficients are additive, however, results permit examination of the combined predictive power of a set of characteristics. For example, among contracepting women in 1977 who were educated, who intended to use in the future, and wanted no more children, 98% were using in 1979. Results thus suggest that questions in knowledge, attitude and practice (KAP) surveys elicit responses that measure different aspects of the motivation to contraception. For purposes of analysing KAP data, it is appropriate to use multidimensional scaling to produce a composite index for predicting which individuals will ultimately use contraception when services are made readily available." (POPLINE)

155 Chowdhury AI, Phillips JF. Scaling contraceptive use motivation in the Matlab Family Planning Health Services Project: a factor analytic approach [abstract]. *In*: Abstracts; proceedings of the Third Annual Conference of the Indian Society for Medical Statistics, Calcutta, 3 - 5 Dec 1985. Calcutta: Indian Society for Medical Statistics, 1985

156 Chowdhury AI, Phillips JF. Scaling contraceptive use motivation in the Matlab Family Planning Health Services Project: a factor analytic approach. *In*: Krishnan T, ed. Statistics in medicine; proceedings of the Third Annual Conference of the Indian Society for Medical Statistics, Calcutta, 3 - 5 Dec 1985. Bombay: Himalaya Publishing House, 1989:135 - 41

"The main purpose of this paper is to present a technique for scaling contraceptive use motivation for the sample population of the Family Planning Health Services Project

(FPHSP) in Matlab. This project, which began in 1977, is conducted by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The hypothesis of the research is that through the use of a scaling algorithm the power of demographic characteristics, attitudes and intentions for predicting contraceptive use can be enhanced. The analysis shows that two factors explain use motivation. Scale one is weighted for demographic variables and desire for additional children, while scale two is comprised of education and intentions of contraceptive use. Both scales have a pronounced independent predictive power. We conclude that scaling has improved upon the predictive power of indicators of reproductive motivations." (Authors' abstract)

157 Chowdhury AI, Koenig MA, Phillips JF, Shahidullah M. Sex composition and fertility behaviour in Matlab, rural Bangladesh. *In*: Kaliaperumal VG, Subbakrishna DK, Sundararaj N, eds. Biostatistics – issues in medical research; proceedings of the Fourth Annual Conference of the Indian Society for Medical Statistics, Bangalore, 24–26 Oct 1986. Bangalore: National Institute of Mental Health and Neuro Sciences, 1989:140–52

158 Chowdhury AI, Phillips JF. Socio-economic status differentials among currently married women of reproductive age: FP services project, 1974 Matlab census. J Fam Welf 1985 Jun;31(4):3–11

"In October 1977, a Family Planning and Health Services Project (FPHSP) was introduced in 70 villages in a rural area of Bangladesh in Matlab, Comilla district, to test the hypothesis that a latent demand for contraception exists which can be fulfilled with comprehensive family planning and selected maternal and child health services. An additional 79 villages served as comparison villages. Pre-project treatment-comparison area differentials for the socioeconomic and demographic characteristics of the population studies were, for the most part, inconsequential: the age composition of women, family size, and structure of dwelling units, and occupational categories are similar in treatment and comparison areas. Only the religious composition varies appreciably and this, in turn, correlates with the type of education. Of the total number of married women of reproductive age, 15.3% are Hindus while the rest are Muslims. However, there is a higher proportion of Hindus in the treatment area than in the comparison area--19.7 versus 11.0%, respectively. While the religious differentials are not likely to directly affect the results of the FPHSP, there may be indirect effects through the correlation of religion with the source of education. The preponderance of Hindu women in treatment areas tends to decrease the overall proportion of the population exposed to religious education at "Maktab," a Muslim institution. One could hypothesize that Maktab education fosters more conservative views on family planning. Since there are more Muslims in comparison areas and they, in turn, have a higher Maktab component one can hypothesize that the adoption rate in the comparison area is affected by the high prevalence of Maktab educated women. Educational type and religion therefore bear careful consideration in the interpretation of FPHSP results." (POPLINE)

159 Chowdhury AI, Phillips JF, Shaikh K. The trends in neonatal and child mortality over the baseline and project periods of the Matlab Family Planning Services Project. *In*: Proceedings of the Second National Seminar of Bangladesh Population Association, Dhaka, 1984. Dhaka: Bangladesh Population Association, 1985:93–7

160 Chowdhury AI, Phillips JF, Shaikh AK. The trends in neonatal, infant and child mortality in Matlab Project period. Demogr India 1986 Jan–Jun;15(1):26–33

"The overall trends of neonatal, infant and child mortality at Matlab, Bangladesh and the effectiveness of health-related interventions are highlighted. Data were processed from January 1974 to December 1982 covering the Family Planning Health Services Project's (FPHSP) treatment and comparison areas. Of the 62,211 live-births, 4,256 neonatal and 3,185 post-neonatal deaths were recorded. The neonatal mortality rates were higher in comparison areas than treatment areas, except for 1977. There was a decline in post-neonatal mortality rates after introduction of the FPHSP programme in 1977. The infant

mortality rates had declined most prominently during 1980 – 1982. The child mortality rates had diverged steadily subsequent to the 1977 FPHSP intervention. There was a reduction in neonatal mortality rates in the FPHSP treatment area relative to comparison areas, due to a cholera vaccine trial carried out in 1974. It is concluded that the FPHSP has a great impact on mortality in the study area." (POPLINE)

161 Chowdhury AKMA, Huffman SL, Chen LC. Agriculture and nutrition in Matlab Thana, Bangladesh. *In*: Chambers R, Longhurst R, Pacey A, eds. Seasonal dimensions to rural poverty. London: Printer, 1981:52 – 4

162 Chowdhury AKMA. Application of a marriage model in rural Bangladesh. J Biosoc Sci 1983 Apr;15(2):281 – 7

"The applicability of the Coale – McNeil marriage entry model to a Bangladesh population is examined. The distribution of ages at entry into the marriage market is taken as normal and the general waiting times to marriage as negative exponential. This article examines two types of data from Bangladesh: (1) the distributions of ages at entry to the marriage market and waiting times, to verify the basic assumptions of the model, and (2) cross – sectional survey data, to derive the fitted first – marriage schedule. In both instances, the model showed a good fit with the Bangladesh data. In the absence of accurate marital registration data, the model may be appropriately utilized to estimate the ages of marriage of females in Bangladesh." (Author's abstract)

163 Chowdhury AKMA. Calendar month improves fertility estimate in Bangladesh. Rur Demogr (Dhaka) 1982;9(1 – 2):7 – 15

"Problems involving misreporting of the time period during which births occur are examined for rural Bangladesh. The author suggests methods for minimizing these errors by collecting data on births according to the Bengali calendar month. Fertility rates estimated using the proposed method in a rural area of Comilla district are compared with indirect estimates of fertility for the same area and with fertility rates based on vital registration data for nearby Matlab. The results indicate the value of the proposed method in estimating fertility more accurately." (POPLINE)

164 Chowdhury AKMA. Changes in maternal nutritional status in a chronically malnourished population in rural Bangladesh. Ecol Food Nutr 1987;19(3):201 – 11

"This paper presents a descriptive analysis of maternal anthropometry in Bangladesh. Rural Bangladeshi women (aged 15 – 49) were found to have a mean height of 147.8 cm, mean weight of 40.8 kg with SD of 4.9 and arm circumference of 21.8 cm. Their mean weight was much lower than the weight for height standard and was negatively related to their ages. The prevalence of low hematocrit levels in this population was high (mean 34%). Nearly one tenth of the women had hematocrit levels of less than 30% even when not pregnant. A seasonal pattern of maternal nutrition was also seen, with a lean period from August through October. Body weight and hematocrit levels decreased in that period; weight gain is recorded in that period because pregnancy is also affected. This seasonal pattern of maternal weight and arm circumference correlated with seasonal availability of food. Overall, maternal nutritional status in rural Bangladesh was low at all times and was worsened by seasonal food scarcity and frequent pregnancies." (Author's abstract)

165 Chowdhury AKMA. Child mortality in Bangladesh: food versus health care. Food Nutr Bull 1988 Jun;10(2):3 – 8

166 Chowdhury AKMA, Becker S. Determinants of natural fertility study. V. 1. Methods and descriptive tables for the prospective study 1975 – 1978. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 46 p. (ICDDR,B scientific report, 48)

"Beginning in October 1975, married women in 14 villages near Matlab were questioned at monthly intervals about their reproductive status and related events. The data presented here covered the period up to March 1978. The purpose of the study was to accurately measure the parameters of the reproductive process in this natural fertility population. During the first year of the study anthropometric measures were taken and blood specimens were collected for biochemical analyses of the nutritional status of the women. Analyses of the prospective data revealed a mean waiting time to conception of five months and a mean duration of amenorrhea after live birth of 12 months. Because of the turncation of the study, these are of course underestimates of the actual population values. (The medians for these two intervals were 7 and 15 respectively). Nutritional status varied little between women in the various reproductive states but variation was found according to the age group of women, with older women having a lower weight, and arm circumference than younger women." (Authors' abstract)

167 Chowdhury AKMA. Double round survey on pregnancy and estimate of traditional fertility rates. Dhaka: Cholera Research Laboratory, 1977. 24 p. (CRL scientific report, 1)

"This paper describes a new survey method which estimates the traditional fertility rates for a future twelve month period. Twice a year, with a six month interval, two cross-sectional surveys are to be conducted for the same group of women. One empirical analysis of this method is made and compared the results with an extensive vital registration system maintained by Cholera Research Laboratory in a rural area of Bangladesh. It is found that the fertility rates estimated by the new method are as good as those of the vital registration system." (Author's abstract)

168 Chowdhury AKMA. Double-round survey on pregnancy prevalence and estimate of traditional fertility rates. *In*: Proceedings of the International Population Conference, Mexico, 8-13 Aug 1977, v. 3. Liege: International Union for the Scientific Study of Population, 1977:327-48

169 Chowdhury AKMA. Education and infant survival in rural Bangladesh. Health Pol Educ 1982;2(3-4):369-74

"This paper explores the mechanism through which socioeconomic status affects infant deaths. The data used here come from a prospective study in rural Bangladesh. Both neonatal deaths and post-neonatal deaths were found to be higher in number among those whose mothers have no schooling. Again, education of the mother has been found to be related to gestational month at termination and this gestational month at termination (which is the maturity of the newborn) determines the neonatal death. The other factors affecting infant mortality were the height of the mother and the weight of the infant. The taller the mother, the fewer the neonatal and post-natal deaths. The weight of the infant has a direct relationship to its survival during infancy." (Author's abstract)

170 Chowdhury AKMA, Khan AR, Chen LC. The effect of child mortality experience on subsequent fertility in Pakistan and Bangladesh. Pop Stud 1976 Jul;30(2):249-61

"This paper presents an empirical analysis of the effects, behavioural and biological, of child mortality experience on subsequent fertility in two South Asian Islamic nations. Data for the investigation came from retrospective pregnancy histories of 2,910 currently married women interviewed in the Pakistan National Impact Survey (1968-69) and from longitudinal vital registration data (1966-70) of 5,236 women residing in a rural area of Bangladesh collected by the Cholera Research Laboratory. The aim of this study was to assess the importance of the child-replacement motivational response to child death experience after biological effects have been controlled adequately. A common approach employed previously has been to examine cumulative fertility according to child death experience. In Pakistan and Bangladesh, a consistently positive relationship was demon-

strated between the number of children ever born and the number of child deaths. This method, however, did not exclude the inverse relationship, the influence of fertility on mortality, nor did it dissect out behavioural from biological effects. Utilizing a measure of subsequent fertility, live-birth-to-live-birth intervals, the study further illustrated another common pitfall. Since the risk of infant death, which leads to shorter birth intervals, is associated with the mother's reproductive history, women with child mortality experience are more likely to experience shorter intervals because of the biological effect of subsequent infant death. Behavioural influences may, therefore, be observed by considering only those birth intervals in which the first-born child survives to the end of the interval. With these limitations controlled, very few, if any, behavioural influences were noted in the Pakistan and Bangladesh data. Median birth intervals in Pakistan varied between 35.3 and 41.2 months, increasing with parity. Within each parity group, no consistent difference was observed between women with and without previous child loss. In Bangladesh, the median birth interval for all women with a surviving infant was 37.2 months. This was shortened to 24.1 months by an infant death. When intervals with infant deaths were excluded, little or no behavioural influence was detected among women of the same parity, but with varying levels of previous child loss. Even without behavioural effects, elimination of infant mortality in Bangladesh would reduce fertility by prolonging the average period of post-partum sterility. In the Bangladesh setting, however, the size of the effect was only about four per cent. This modest effect, moreover, was counterbalanced by an overall increase of net reproduction by seven per cent due to better survivorship of infants." (Authors' abstract)

171 Chowdhury AKMA. Effect of maternal nutrition on fertility in rural Bangladesh. *In*: Mosley WH, ed. Nutrition and human reproduction. New York: Plenum Press, 1978:401-10

172 Chowdhury AKMA, Khan AR, Chen LC. Experience in Pakistan and Bangladesh. *In*: The effects of infant and child mortality on fertility. New York: Academic Press, 1978:113-33

173 Chowdhury AKMA, Rahman M. Fertility and mortality trends in rural area of Bangladesh. Demogr India 1984 Jan-Dec;13(1-2):92-9

"An analysis of fertility and mortality trends in Bangladesh between 1966 and 1982 is presented based on data from the Demographic Surveillance System (DSS) in the rural area of Matlab. The study population consists of about 173,000 individuals residing in 159 villages; vital statistics have been registered bimonthly since the DSS program began in 1966. In addition, the population was divided into two groups in 1978. One group began receiving maternal and child health services and contraceptive advice; the other group was left as a comparison population. Graphs and tables showing mortality and fertility patterns for the Matlab population as a whole are presented, as well as some comparisons of demographic data for the intervention and nonintervention groups since 1978. The only significant trend identified is a decline in fertility for women aged 15-19." (POPLINE)

174 Chowdhury AKMA. Infant deaths, determinants and dilemmas (a cohort analysis for rural Bangladesh). Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 22 p. (ICDDR,B scientific report, 46)

175 Chowdhury AKMA. Infant mortality in relation to internal migration in rural Bangladesh. J Biosoc Sci 1986 Oct;18(4):449-56

"In Matlab thana, a rural area of Bangladesh, there is a substantial deficit of males of reproductive age owing to urban migration of males who leave their families behind. These men nevertheless return to visit their families frequently. Thirty percent of the births in this area occur to families with migrant fathers: neonatal mortality rates in these families are nearly double those of families with non-migrant fathers. This high risk, in

turn, interacts with educational attainment and maternal nutrition. Only those migrant families where mothers have no education or low body weight experience high neonatal mortality rates. Psychological stress during pregnancy, probably caused by fear and anxiety related to the husband's absence may in part be responsible for such differential risk of mortality during the neonatal period." (Author's abstract)

176 Chowdhury AKMA, Chen LC. The interaction of nutrition, infection and mortality during recent food crises in Bangladesh. Food Res Inst Stud 1977;16(2):47 - 61

This paper presents data on the demographic impact of two contemporary Bangladesh famines, one associated with war in 1971 and the other with crop failure in 1974. Fluctuations of births, deaths, and migrations are analyzed and disaggregated. From such empirical data, an analytical framework delineating the multiple, interacting causes and consequences of famine is constructed. The framework postulates that several mutually-reinforcing vicious cycles, between infection and malnutrition and between the three demographic variables, contribute to the impact of acute nutritional crises. The implications of these findings for preventive and remedial interventions are discussed in the conclusion.

177 Chowdhury AKMA, Huffman SL, Curlin GT. Malnutrition, menarche, and marriage in rural Bangladesh. Dhaka: Cholera Research Laboratory, 1976. 25 p.

"Data initially collected by the Cholera Research Laboratory in Matlab, Bangladesh, were utilized in a study of the relationship between menarche and nutritional status. The process of data collection, along with cautionary notes regarding the quality of the data, is explained. Since the War of Liberation in 1971, the socioeconomic condition of the country, including health conditions, has deteriorated. The effects of this deterioration have been felt most seriously in rural areas. The data indicate that the age of onset of menarche has increased, especially in rural areas. This increasing age at menarche is probably related to the increased malnutrition characteristic of the times since 1971. Body weight is seen to be one of the most influential factors associated with menarche onset. Age is another, but less, influential, factor. The seasonal peak of menarche onset occurs during that time of the year when food is most available and malnutrition at a minimum. Age at marriage among this rural population has increased, possibly due to increased age at menarche. It is likely that a decline in fertility will result among 15 - 19 - year olds." (POPLINE)

178 Chowdhury AKMA, Huffman SL, Curlin GT. Malnutrition, menarche, and marriage in rural Bangladesh. Soc Biol 1977 Winter;24(4):316 - 25

"A survey of 1,155 girls aged 10 through 20 was conducted in a rural area of Bangladesh in March, 1976, to assess the impact of nutritional status on the onset of menarche and the association between age at menarche and age at marriage. In recent years there has been an increased age at onset of menarche which appears to have been associated with malnutrition caused by war, postwar inflation, floods, and famine in the period 1971 - 76. Body weight was highly correlated with the age of onset of menarche. A seasonal trend in onset of menarche was noted with the peak occurring in the winter months corresponding to the largest annual rice harvest. An increased age of marriage was also noted, which may be correlated with the increased age of menarche." (Authors' abstract)

179 Chowdhury AKMA, Rahman M. Matlab data on fertility and mortality. *In*: Recent trends in fertility and mortality in Bangladesh; proceedings of a National Seminar, Dhaka, 29 - 31 Jan 1984. Dhaka: Population and Development Planning Unit, Planning Commission, Government of Bangladesh, 1984:71 - 80

180 Chowdhury AKMA, Aziz KMA. Possible limitations of the family planning programme on population growth of East Pakistan. *In*: Proceedings of the CENTO Sympo-

sium on Demographic Statistics, Karachi, 5 - 12 Nov 1968:181 - 7

181 Chowdhury AKMA. Pregnancy: a direct method of estimating fertility. Baltimore, MD: Johns Hopkins University, 1979. 140 p. (PhD thesis)

"The objective of this study is to test the applicability and efficiency of a new method of estimating traditional fertility in a field situation where retrospective surveys have limitations and vital registration systems don't exist. The method was developed by the author and named "pregnancy prevalence method". The basic idea is to find a number of pregnant women at any cross - section of time through a survey and to do a second survey exactly six months later, using the same sample to see how many live births occurred from those pregnancies and, in addition, to find the number of pregnant women again in the second survey. From this one can estimate total births expected to occur in the next 12 months beginning at the time of the first survey. The first empirical study using this method was done in a rural area of Bangladesh. Responses regarding pregnancies were found to be accurate in that population. Results obtained from this method were also compared with other recently developed indirect methods such as 1) Coale's three parameter model, 2) Coale's natural fertility model, and 3) Bongaarts' intermediate variable model. In estimating fertility level, the pregnancy prevalence method gave an estimate found close to or equal to those of indirect methods. Moreover, this method has additional advantages: 1) it estimates the seasonal fluctuations, 2) it estimates the year to year fluctuations, and 3) it can be used to evaluate the population program of a country. This method was found suitable in Bangladesh to estimate fertility and its dynamics." (Author's abstract)

182 Chowdhury AKMA, Curlin GT. Recent trends in fertility and mortality in rural Bangladesh 1966 - 1975. Dhaka: Cholera Research Laboratory, 1978. 10 p. (CRL working paper, 3)

183 Chowdhury AKMA. A report on neonatal and post neonatal mortality in Matlab vaccine trial area in Bangladesh. *In*: Proceedings of the 9th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between Center for Medical Research and Cholera Research Laboratory. Dhaka: Cholera Research Laboratory, 1975:263 - 82

184 Chowdhury HR, Fauveau V, Yunus M, Zaman K. Is acute non - watery diarrhoea an important cause of morbidity and mortality among rural Bangladeshi children? [abstract]. *In*: Abstracts; proceedings of the Fifth Asian Conference on Diarrhoeal Diseases, Kathmandu, 21 - 23 Sep 1989:1 - 2

185 Chowdhury MAR, Huq A, Sack DA. Physico - chemical variations in water bodies within one kilometer area at Matlab [abstract]. *In*: Programme and abstracts; proceedings of the 6th Annual Conference of Bangladesh Society of Microbiologists, Dhaka, 20 - 21 Mar 1987. Dhaka: Bangladesh Society of Microbiologists, 1987:4 - 5

186 Chowdhury MK, Gupta VM, Bairagi M. Childhood survival in rural Bangladesh: a multivariate logistic regression analysis [abstract]. *In*: Health programmes and their implementation; proceedings of the Second Conference of U.P. Chapter of Indian Association of Preventive and Social Medicine, Varanasi, 4 - 5 Feb 1984:52

187 Chowdhury MK, Becker S, Razzaque A, Sarder AM. Demographic Surveillance System - Matlab. V. 7. Vital events and migration, 1978. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 71 p. (ICDDR,B scientific report, 47)

This report, 7th in a series of scientific reports, contains data from the Demographic Surveillance System in Matlab, Bangladesh, for 1978. The population of the area concerned totalled some 280,000 in 233 villages. Data are presented on natural growth, mortality, marriage and divorce, and migration.

188 Chowdhury MK, Razzaque A, Becker S, Sarder AM, D'Souza S. Demographic Surveillance System - Matlab. V. 9. Vital events and migration - 1979. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982. 56 p. (ICDDR,B scientific report, 56)

This is the 9th volume in a series of scientific reports, produced by the International Centre for Diarrhoeal Disease Research, Bangladesh, presenting basic tabulations from the registration of births, deaths, marriages, divorces and migrations in the Demographic Surveillance System of the Matlab Field Station (Bangladesh). Results for the calendar year 1979 are presented for the reduced surveillance area, largely in tabular form.

189 Chowdhury MK, Razzaque A, Mostafa G, Sarder AM, D'Souza S. Demographic Surveillance System - Matlab. V. 10. Vital events and migration - tables, 1980. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982. 61 p. (ICDDR,B scientific report, 58)

This report presents basic tabulations from the registration of births, deaths, marriages, divorces and migrations in the Demographic Surveillance System of the Matlab Field Station (Bangladesh) for 1980. Included are: mid - year population by age and sex; mid - year population, events registered and population change; deaths by age group; death rates in 1980 by age and sex; abridged life tables for males and females based on 1980 mortality rates; abridged life tables for both sexes based on 1980 mortality rates; number and rates of outcome of pregnancies by type; age - specific fertility rates/1000; mean number of previous pregnancies and surviving children for mothers of different ages who had live - births in 1980; age sex - specific marriage rates; groom's age at marriage by previous marital status; bride's age at marriage by previous marital status; % divorces in 1980 by duration of marriage at divorce and husband's age; in - and out - migrants by sex and major categories of reasons for migration; age and sex - specific migration rates by direction; age - specific death rates in Maternal Child Health and Family planning Project comparison area, Matlab, and fertility rates by age and area in Matlab. (Modified authors' abstract)

190 Chowdhury MK, Karim MR, Mostafa G, Sarder AM, D'Souza S. Demographic Surveillance System - Matlab. V. 11. Vital events and migration - tables, 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1983. 60 p. (ICDDR,B scientific report, 59)

This is the 11th volume in the series of scientific reports, produced by the International Centre for Diarrhoeal Disease Research, Bangladesh, presenting basic tabulations from the registration of births, deaths, marriages, divorces and migrations in the Demographic Surveillance System of the Matlab Field Station. The present volume presents results as obtained from the surveillance area for the calendar 1981.

191 Clemens JD, Sack DA, Harris JR, Chakraborty J, Khan MR, Huda S, Ahmed F, Gomes J, Rao MR, Svennerholm A - M, Holmgren J. ABO blood groups and cholera: new observations on specificity of risk and modification of vaccine efficacy. J Infect Dis 1989 Apr;159(4):770 - 3

192 Clemens JD, Stanton BF, Chakraborty J, Sack DA, Khan MR, Huda S, Ahmed F, Harris JR, Yunus M, Khan MU, Svennerholm A - M, Jertborn M, Holmgren J. B subu - nit - whole cell and whole cell - only oral vaccines against cholera: studies on reactogenic - ity and immunogenicity. J Infect Dis 1987 Jan;155(1):79 - 85

"We conducted a randomized trial among persons in rural Bangladesh to evaluate the side effects and immunogenicity of orally administered B subunit - killed whole cell (BS - WC) and killed whole cell - only (WC) cholera vaccines and a killed *Escherichia coli* strain K12 placebo proposed for field testing. Three doses of BS - WC, WC, *E. coli*, or

a control agent were given with antacid to 1,257 women (aged >15 years) and children (aged two to 15 years). The four groups exhibited to statistically significant differences in occurrence of symptoms after each dose, and rises in titers of vibriocidal (VC) antibodies to Inaba and Ogawa were twofold higher for vaccines than for controls ($p<.001$). Half of the persons with fourfold or greater VC responses to WC responded after the first dose; many additional patients, particularly young children, responded after subsequent doses. In contrast, 89% of persons who responded to BS-WC with twofold or greater rises in titer of IgG antibodies to cholera toxin did so after the first dose. After the third dose, vaccinees exhibited a fivefold higher rise in titer than did controls ($p<.001$); a dose-to-dose booster effect was most evident in young children." (Authors' abstract)

193 Clemens JD, Sack DA, Harris JR, Chakraborty J, Neogy PK, Stanton B, Huda N, Khan MU, Kay BA, Khan MR, Ansaruzzaman M, Yunus M, Rao MR, Svennerholm A-M, Holmgren J. Cross-protection by B subunit-whole cell cholera vaccine against diarrhea associated with heat-labile toxin-producing enterotoxigenic *Escherichia coli*: results of a large-scale field trial. J Infect Dis 1988 Aug;158(2):372-7

"The B subunit (BS) of cholera toxin and that of the heat-labile enterotoxin (LT) of enterotoxigenic *Escherichia coli* (ETEC) are antigenically similar. We therefore assessed whether a combined cholera toxin BS/whole-cell (BS-WC) oral vaccine against cholera conferred cross-protection against LT-producing ETEC (LT-ETEC) diarrhea in a randomized, double-blind field trial among rural Bangladeshi children and women. The 24 770 persons who ingested two or more doses of BS-WC vaccine were compared with 24 842 controls who took two or more doses of killed whole-cell (WC) oral cholera vaccine. Sixty-seven percent fewer episodes of LT-ETEC diarrhea were noted in the BS-WC group than in the WC group during short-term (three-month) follow-up ($p<.01$), but no reduction was evident during the ensuing nine months. Short-term protection was particularly notable against LT-ETEC diarrhea causing life-threatening dehydration (protective efficacy, 86%; $p<.05$)." (Authors' abstract)

194 Clemens JD, Harris JR, Sack DA, Huda MN, Chowdhury S, Ali M, Rao MR. Discontinuation of breast-feeding during episodes of diarrhoea in rural Bangladeshi children. Trans R Soc Trop Med Hyg 1988 Sep-Oct;82(5):779-83

"Discontinuation of breast-feeding during an episode of childhood diarrhoea is widely regarded as a common, high-risk practice in the developing world. We studied cessation of breast-feeding in a rural Bangladeshi population under comprehensive surveillance for medically treated diarrhoeal episodes. Among 2129 episodes in children aged under 36 months and breast-fed before the onset of diarrhoea, there were only 33 (2%) in whom breast-feeding had stopped before presentation for care. Children in whom breast-feeding had stopped (cases) differed little from those in whom it had not (controls) in respect to exclusive vs partial breast-feeding, age, gender, or several maternal characteristics (maternal age, education, and recent maternal diarrhoeal illness). In contrast, cases were more likely to have presented with clinically severe illness or to have died within 30 d of presentation (odds ratio = 2.20, $p<0.05$). We conclude that discontinuation of breast-feeding during diarrhoea is an infrequent phenomenon in this population. However, the association of cessation of breast-feeding with severe clinical outcomes may be of considerable importance, particularly in countries where discontinuation of breast-feeding is more common." (Authors' abstract)

195 Clemens JD, Jertborn M, Sack D, Stanton B, Holmgren J, Khan MR, Huda S. Effect of neutralization of gastric acid on immune responses to an oral B subunit, killed whole-cell cholera vaccine. J Infect Dis 1986 Jul;154(1):175-8

196 Clemens JD, Stanton BF, Harris JR, Chakraborty J, Sack DA, Rao MR, Ahmed F, Ansaruzzaman M, Yunus M, Svennerholm A-M, Holmgren J. Exclusion of clinically atypical or microbiologically mixed diarrhoeal episodes from outcome events in a field trial of oral cholera vaccines. Int J Epidemiol 1989 Jun;18(2):440-5

"We investigated whether alternative clinical and microbiological criteria for outcome events affected estimates of vaccine efficacy in a randomized, double-blind field trial of B subunit-killed whole cell (BS-WC) and killed whole cell-only (WC) oral cholera vaccines among 62285 rural Bangladeshi participants. At one year of follow-up estimates of vaccine protective efficacy (PE=60%, P<0.0001 for BS-WC; PE=54%, P<0.0001 for WC) against all treated diarrhoeal episodes associated with *V. cholerae* O1 were similar to estimates of efficacy against only those episodes which were clinically typical and unassociated with additional enteric pathogens (PE=62%, P<0.0001 for BS-WC; PE=52%, P<0.0001 for WC). In contrast, estimates of vaccine cross-protection against episodes associated with each of several agents antigenically related to *V. cholerae* O1 (LT-ETEC, non-cholera *Vibrio* sp, *Aeromonas* sp) were substantially reduced when mixed infections with *V. cholerae* O1 were excluded. We conclude that restrictive criteria intended to improve the specificity of the definition of cholera did not increase the detectability of vaccine efficacy against *V. cholerae* O1, but that exclusion of mixed infections with *V. cholerae* O1 was necessary to avoid false-positive conclusions about vaccine cross-protection against other potential target pathogens." (Authors' abstract)

197 Clemens JD, Sack DA, Harris JR, Chakraborty J, Khan MR, Stanton BF, Kay BA, Khan MU, Yunus M, Atkinson W, Svennerholm A-M, Holmgren J. Field trial of oral cholera vaccines in Bangladesh. Lancet 1986 Jul 19;2(8499):124-7

"The protective efficacy of oral B subunit killed whole-cell (BS-WC) and killed whole-cell (WC) cholera vaccines was assessed in 63,498 Bangladeshi children aged 2-15 years and women aged over 15 years. Each received three doses of BS-WC, WC, or placebo in a randomised, double-blinded fashion. Surveillance for cases seeking medical care up to six months after the third dose revealed 26 cases of confirmed cholera in the placebo group, 4 cases in the BS-WC group (protective efficacy 85%; p<0.0001), and 11 cases in the WC group (protective efficacy 58%; p<0.01). For each vaccine protective efficacy was consistent in different age-groups (2-10 years versus >10 years) and for different severities of cholera." (Authors' abstract)

198 Clemens JD, Harris JR, Sack DA, Chakraborty J, Ahmed F, Stanton BF, Huda N, Khan MR, Khan MU, Kay BA, Neogi PK, Yunus M, Rao MR, Svennerholm A-M, Holmgren J. Field trial of oral cholera vaccines in Bangladesh. Southeast Asian J Trop Med Public Health 1988 Sep;19(3):417-22

199 Clemens JD, Harris JR, Sack DA, Chakraborty J, Ahmed F, Stanton BF, Khan MU, Kay BA, Huda N, Khan MR, Yunus M, Rao MR, Svennerholm A-M, Holmgren J. Field trial of oral cholera vaccines in Bangladesh: results of one year of follow-up. J Infect Dis 1988 Jul;158(1):60-9

"We assessed the protective efficacy (PE) of three doses of B subunit-killed whole cell (BS-WC) and killed whole cell-only (WC) oral cholera vaccines in a randomized, double-blind trial among 62 285 children and women residing in rural Bangladesh. After one complete year of surveillance, 110 cases of cholera were detected in the placebo group, 52 in the WC group (PE, 53%; p<.0001), and 41 in the BS-WC group (PE, 62%; p<.0001). Protection was greater for BS-WC recipients than for WC recipients only during the initial eight months of observation. Both vaccines conferred equivalent protection against cholera associated with life-threatening dehydration and against less severe cholera. High-grade, sustained protection was observed in persons vaccinated when older than five years; in younger persons protection was transient. We conclude that BS-WC and WC vaccines confer significant protection against cholera, particularly in persons vaccinated when older than five years." (Authors' abstract)

200 Clemens JD, Sack DA, Harris JR, Chakraborty J, Khan MR, Stanton BF, Ali M, Ahmed F, Yunus M, Kay BA, Khan MU, Rao MR, Svennerholm A-M, Holmgren J. Impact of B subunit killed whole-cell and killed whole-cell-only oral vaccines against cholera upon treated diarrhoeal illness and mortality in an area endemic for cholera.

Lancet 1988 Jun 18;1(8599):1375 - 9

"The impact of B subunit killed whole - cell (BS - WC) and killed whole - cell - only (WC) oral cholera vaccines was assessed in a randomised double - blind trial in rural Bangladesh. 62 285 children aged 2 - 15 years and women aged over 15 ingested three doses of one of the vaccines or placebo. During the first year of follow - up there was a 26% reduction of all visits for treatment of diarrhoea in the BS - WC group and a 22% reduction in the WC group. The reduction of all admissions for fatal or severely dehydrating diarrhoea was 48% in the BS - WC group and 33% in the WC group. Overall mortality rates were 26% lower in the BS - WC group and 23% lower in the WC group during the first year, and reductions of mortality were observed only in women vaccinated at ages over 15 years. However, no differences in cumulative mortality were evident at the end of the second year of surveillance." (Authors' abstract)

201 Clemens JD, Stanton BF, Chakraborty J, Chowdhury S, Rao MR, Ali M, Zimicki S, Wojtyniak B. Measles vaccination and childhood mortality in rural Bangladesh. Am J Epidemiol 1988 Dec;128(6):1330 - 9

"To ascertain whether measles vaccination was associated with reduced mortality rates in rural Bangladeshi children, the authors conducted a case - control study in four contiguous areas, two of which had participated in an intensive measles vaccination program which began in the spring of 1982. Cases were 536 children who had died in the four - area region at the age of 10 - 60 months between April 1982 and December 1984. Two age - and sex - matched controls were selected from the four - area region for each case; each control had survived at least through the date of death of the matched case. Measles vaccination was associated with a 36% (95% confidence interval 21% - 48%) proportionate reduction in the overall rate of death and a 57% (95% confidence interval 43% - 67%) reduction in the rate of deaths directly attributed to measles or ascribed to diarrhea, respiratory illness, or malnutrition. The association of measles vaccination and reduced mortality remained unchanged after the authors restricted controls to children who had survived at least one year after the deaths of their matched cases. Moreover, children vaccinated in 1982 exhibited a sustained reduction in the rate of death in 1983 and 1984. The authors concluded that measles vaccination was associated with a pronounced and sustained reduction in the rate of death among children in this study." (Authors' abstract)

202 Clemens JD, Sack DA, Harris JR, Chakraborty J, Stanton BF, Khan MR, Kay BA, Svennerholm A - M, Holmgren J. 1985 field trial of oral cholera vaccine in Bangladesh [abstract]. *In*: Program and abstracts; proceedings of the 26th Interscience Conference on Antimicrobial Agents and Chemotherapy, New Orleans, Louisiana, 28 Sep - 01 Oct 1986. New York: American Society for Microbiology, 1986:180

203 Clemens JD, Harris JR, Kay BA, Chakraborty J, Sack DA, Ansaruzzaman M, Rahman R, Stanton BF, Khan MU, Khan MR, Yunus M, Rao MR, Ciznar I, Svennerholm A - M, Holmgren J. Oral cholera vaccines containing B - subunit - killed whole cells and killed whole cells only. II. Field evaluation of cross - protection against other members of the *Vibrionaceae* family. Vaccine 1989 Apr;7(2):117 - 20

"Because of demonstrable cross - reactivity of cellular antigens contained in B subunit - killed whole - cell (BS - WC) and killed whole - cell - only (WC) oral cholera vaccines with antigens of various non - cholera species of the family *Vibrionaceae* (NCV), the protection conferred by the vaccines against diarrhoea associated with NCV was evaluated during a randomized, double - blind field trial in Bangladesh. Children aged 2 - 15 years and women aged > 15 years (62,285 in number) received three doses of BS - WC vaccine, WC - only vaccine, or a placebo consisting of *Escherichia coli* K12 strain (K12). During 1 year of follow - up, the incidence of treated episodes of diarrhoea associated with non - cholera vibrios known to be enteric pathogens (non - O1 *Vibrio cholerae*, *V. fluvialis*, *V. parahaemolyticus*, *V. mimicus*) in the placebo group was low (1.9 cases per 10,000

recipients) and identical to that for the two vaccine groups combined. The incidence (per 10,000 recipients) of treated diarrhoeal episodes associated with Aeromonas species was considerably higher, but nearly identical in the three groups (26.1 cases for BS – WC, 26.0 cases for WC; 25.9 cases for K12). *Plesiomonas shigelloides* was not isolated from any participant. It is concluded that NCV other than *Aeromonas* were rarely isolated from diarrhoeal patients in our study population and that killed oral vaccines which were effective against cholera exhibited no detectable cross – protection against diarrhoea associated with NCV organisms." (Authors' abstract)

204 Clemens JD. Oral vaccination against cholera. *In*: Programme, papers and abstracts of the Third Asian Conference on Diarrhoeal Diseases, Bangkok, 10 – 14 Jun 1985. Bangkok: Mahidol University, 1985:139 – 40

205 Cogill B. Ranking anthropometric indicators using mortality in rural Bangladeshi children. Ithaca, NY: Cornell University, 1982. 240 p. (MS thesis)

"This study examined various criteria of performance to evaluate indicators so as to choose the best criterion to rank anthropometric indicators. The indicators were ranked in terms of their ability to discriminate between survival and death in 2,006 rural Bangla – deshi children, aged 12 – 24 months, and under demographic surveillance for 24 months. The four criteria of performance were (1) relative risk (RR), (2) maximum sum of sensitivi – ty plus specificity (MSS), (3) area under an adapted Receiver Operating Characteristic (ROC) curve ($A_{(z)}$), and (4) normalized distance (d_a). Indicator ranking by RR was based on the magnitude of the risk of mortality in the worst ten percent of children (classified by the indicator) compared to the mortality of the best ten percent. The remaining three criteria relate directly to the indicator characteristics of sensitivity (propor – tion of deaths correctly identified) and specificity (proportion of survivors correctly identi – fied). MSS was computed by summing Se and Sp over a range of indicator cutoffs, and the greatest sum provided the best indicator and cutoff. The $A_{(z)}$ was graphically derived from an adapted ROC curve which was the indicator Se and Sp characteristics plotted on binormal coordinate graph paper. An equivalent criterion to $A_{(z)}$ for continu – ous indicators is d_a which is the standardized distance between the mean of the dead (Se) and surviving (Sp) indicator distributions, and is related to the adjusted Student's *t* statistic. The three last criteria assumed approximately Gaussian indicator sensitivity and specificity distributions of known variances. Based on consistency of indicator ranks across sexes and socio – economic status (SES), on statistical efficiency, and on compu – tational ease, d_a was found to be the best of the four criteria. The d_a criterion was used to compare the standardization procedures of the anthropometric measures (weight, length, and arm circumference) by 1) the international NCHS standards (measures ex – pressed as percent of median and Z – score), and 2) a local standard derived from the data themselves. For the measures that were standardized for age and sex (weight – for – age: Wt/A, height – for – age: Ht/A, and arm circumference – for – age: AC/A), the method of standardization makes little difference to the discriminatory ability of the indicator (d_a values). The age – independent indicators (arm circumference – for – height: AC/Ht and weight – for – height: Wt/Ht) however, illustrated limitations of the NCHS stand – ards; for example, the AC/Ht's discriminatory ability was significantly inflated because the extrapolation of the standard beyond their range to include the smaller AC and lengths of the Bangladeshi children made the AC/Ht indicator age and height dependent. For females, who had a higher mortality than males, the discriminatory capabilities of Ht/A and Wt/A were greater than those of the outright measure of arm circumference and AC/A ($P < .05$), which in turn were better than AC/Ht and Wt/Ht ($P < .05$). The results for males suggested the discriminatory ability among the indicators were not statistically significant from each other because of the small number of male deaths. The outright measure of arm circumference was better than the other age – independent indicators, and this finding is of importance in the common situation of unreliable age data." (Author's abstract)

206 Craig M. Time-space clustering of *Vibrio cholerae* 01 in Matlab, Bangladesh, 1970-1982. Soc Sci Med 1988;26(1):5-13

"Growing evidence for the existence of an aquatic reservoir of *Vibrio cholerae* has led some observers to postulate the existence of two distinct modes of disease transmission: primary and secondary. In primary transmission vibrios pass from the aquatic reservoir to humans via edible aquatic flora or fauna, or drinking water. Secondary transmission consists of faecal-oral transmission from person-to-person and may spawn epidemics. Cholera outbreaks are particularly well documented for the Matlab area of Bangladesh, where a field station has been run since 1963, at which patients from a study population of nearly 200,000 are treated for diarrhoeal diseases and monitored in a longitudinal demographic surveillance system. This paper seeks to illuminate the process of secondary transmission by presenting preliminary results of an analysis of the time-space distribution of cholera cases in Matlab for the period 1970-1982. It is argued that the detection of time-space clusters of cases resulting from secondary transmission requires locational data below the level of the village, that is at the level of the bari, or patrilineally-related household group because this is where inter-personal contact is greatest. The mapping of the study area at the bari level is described briefly and it is argued that the proportion of all asymptomatic infections and cases which can be mapped is great enough to enable inferences about transmission processes to be drawn. Results of the analysis of time-space interaction using the Knox method are presented and provide some support for within-bari clustering of cases resulting from secondary transmission. Further analysis of time-space clustering of cholera cases in Matlab must restrict comparison to epidemics of the same biotype, occurring within periods for which similar proportions of cases may be mapped." (Author's abstract)

207 Curlin GT, Ahmed A. Antitoxin and vibriocidal responses in the toxoid field trial serologic survey [abstract]. *In*: Proceedings of the 9th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research laboratory and reports of the collaborative studies between Center for Medical Research and Cholera Research Laboratory, 1975:204

208 Curlin GT, Aziz KMA, Rahman ASMM, Levine R, Verwey WF. Cholera toxoid field trial [abstract]. *In*: Proceedings of the 10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory for the year 1975:73

209 Curlin GT. Current progress in the cholera toxoid field trial in Bangladesh [abstract]. *In*: Proceedings of the 10th Joint Conference, US-Japan Cooperative Medical Science Program Cholera Panel, Kyoto, 14-16 Oct 1974:10

210 Curlin GT, Chen LC, Hussain SB. Demographic crisis: the impact of the Bangladesh Civil War (1971) on births and deaths in a rural area of Bangladesh. Pop Stud 1976 Mar;30(1):87-105

"In Matlab Bazaar Thana the Cholera Research Laboratory has registered the births, deaths and migrations in a population of approximately 125,000 since 1966. Although this rural area was not the scene of any significant armed encounters, striking changes in birth and death rates were registered during and after the conflict. Birth rates did not change during the relatively brief period of the civil war, but a small decline was registered for one year after the war. Fertility rates which had been declining slightly and irregularly in the pre-war baseline period may have increased slightly during the war and fell substantially in all age groups in the year following the war. The crude death rate, which rose by 37 per cent during the war, was a very sensitive reflection of the administrative and economic problems. Overall infant mortality rose by only 15 per cent over pre-war levels because all of the increase was observed in the post-neo-natal component, which traditionally accounts for less than one-third of the total infant mortality in Bangladesh. Children and older adults accounted for the majority of excess deaths which were largely attributed to acute diarrhoeas and other gastro-intestinal causes.

The death rate at ages 1 – 4 rose by 43 per cent and at ages 5 – 9 soared to 208 per cent above pre – war baseline rates. All increases in age – specific mortality rates fell to baseline levels during the year following the war, except the 5 – 9 year age group, in which rates continued to be high largely because of deaths due to dysentery." (Authors' abstract)

211 Curlin GT. Effects of the Bangladesh Civil War on birth and death rates in Matlab [abstract]. *In*: Proceedings of the 9th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between Center for Medical Research and Cholera Research Laboratory, 1975:262

212 Curlin GT, Chen LC, Hossain SB. Effects of war on birth and death rates in rural Bangladesh. Rur Demogr (Dhaka) 1974 Summer;1(1):5 – 12
"The events preceding the Independence of Bangladesh affected many aspects of life. This paper describes the patterns of mortality and fertility rates in Matlab Bazar Thana in Comilla District before, during and after the disruption in 1971." (Authors' abstract)

213 Curlin GT, Levine R, Aziz KMA, Rahman ASMM, Verwey WF. Field trial of cholera toxoid. *In*: Proceedings of the 11th Joint Conference on Cholera, U.S. – Japan Cooperative Medical Science Program, New Orleans, Louisiana, 4 – 6 Nov 1975: 314 – 29

214 Curlin GT, Levine RJ, Ahmed A, Aziz KMA, Rahman ASMM, Verwey WF. Immunological aspects of a cholera toxoid field trial in Bangladesh. Dhaka: Cholera Research Laboratory, 1978. 13 p. (CRL scientific report, 8)

"A gluteraldehyde – treated prototype cholera toxoid lot no. 21201 by Wyeth Laboratories was field – tested on 92,838 participants from field study area of the Cholera Research Laboratory in rural Bangladesh. Volunteers received on a double blind basis either 0.5 ml of toxoid (100 mcg) with protamine and aluminum phosphate adjuvants or 0.5 ml of adult dose diphtheria – tetanus toxoid. Seventy – four percent of them received a second dose, six weeks later. A serological survey was conducted among all volunteers of every thirty third family by taking finger – stick blood in saline (1:10) immediately prior to the first injection, and six weeks after the first and second injections. The supernate of blood sample was assayed for vibriocidal Inaba antibody by microtechnique and antitoxin antibody by a passive hemagglutination specially developed at CRL. Antitoxin titer was also determined on every fifth sample by rabbit skin assay for coroboration. Cases were defined as patients who were seen at the CRL field hospital with a complaint of diarrhea whose stool or rectal swab yielded *V. cholerae* on culture. A brief review of the efficacy data of the field trial, that was presented at the 11th U.S. – Japan Joint Conference on Cholera, is given which shows that in Inaba cholera the overall protection of the entire year for all ages was 26%, but almost all of the protection was restricted among the 5 – 14 year – olds during the first 90 days, while in case of Ogawa cholera no significant protection was seen in any age group in any time. As 60% of Ogawa infections occurred in the later part of the epidemic, modest levels of protection of brief duration would not have been detected. The toxoid did not stimulate a rise in vibriocidal titer but, as expected from previous reports from Bangladesh, higher titers were noted with increasing age. Due to initial one extra two – fold dilution of the plasma the passive hemagglutination assay for antitoxin quantification proved to be less sensitive than the rabbit – skin assay. The data of skin assay shows that a higher proportion of individuals with 10 AU/ml or more was noted in younger ages confirming earlier observations of an inverse relationship between age and serum antitoxin among residents of endemic areas of Bangladesh. A modest rise in vibriocidal Inaba titer and antitoxin titer that was detected in the placebo participants was accountable for the estimate of overall clinical and inapparent infection rate in epidemic of 1974. To seek serological and clinical attack rate correlates by calculating the numbers at risk in each vibriocidal/antitoxin categories no distinct pattern was found in 1 – 4 year age group. In 5 – 14 year age group attack rate had no correlation with antitoxin titers, however, while disregarding the antitoxin titer, the

rates decrease with elevation in vibriocidal titer. To obviate the strong age-dependency of vibriocidal titer, antitoxin titer and attack rate an examination of age - adjusted attack rates as a function of vibriocidal and antitoxin titer did not show any consistent pattern, although higher rates remained in the lowest vibriocidal class. A statistical analysis of these data when arranged in a two-by-two array of vibriocidal and antitoxin titer by comparing the number of cases observed to the number of cases expected if cases were distributed among the population independent of antibody titer, no significant association was noted in 1-4 year age group; but, significant patterns of lower than expected number of cases in higher vibriocidal classes and vice versa were observed in both the 5-14 year and adult groups. A future field testing of a vaccine containing both toxoid and somatic antigens is suggested in which we might see the additive effect of both the antibodies on attack rates." (Authors' abstract)

215 Curlin GT, Aziz KMA, Khan MR. Impact of the handpump tubewell on diarrheal disease rates in rural Bangladesh. *In*: Proceedings of the 10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory for the year 1975:107-119

216 Curlin GT, Aziz KMA, Khan MR. The influence of drinking tubewell water on diarrhoea rates in Matlab Thana, Bangladesh. Dhaka: Cholera Research Laboratory, 1977 (Reprinted 1978). 21 p. (CRL working paper, 1).

"Diarrheal disease is a major health problem in Bangladesh, especially among the younger age groups. Although recent clinical advances have remarkably reduced the mortality of treated cases, prevention, which is acknowledged to be the ultimate means with which to control morbidity and mortality of diarrhea, remains largely ineffective in traditional rural societies such as Bangladesh. One effort to reduce infectious diarrheal disease incidence underway in Bangladesh is the rural tubewell water improvement program. Recently, UNICEF and the Bangladesh government announced a plan to double the number of available tubewells in the rural areas. This paper gives the first year results of a UNICEF-CRL study of the impact handpump tubewells have on the health as measured by diarrhea rates in a rural population in Maltab. During the first year, weekly household surveillance for diarrhea among approximately 20,000 persons in 12 villages revealed striking patterns of seasonal and age-specific rates. As expected, younger ages had higher rates but the observed reduction in overall rates of 50% during the monsoon was not expected. Approximately 10% of the residents drank tubewell water although insignificant numbers used tubewell water for other domestic purposes. Drinking tubewell water was not associated with a reduction in overall diarrhea rates or in the hospitalized or outpatient rates of cholera or shigellosis. A complete analysis will follow the collection of the second year's data. The preliminary conclusion appears to be that tubewells, as they are currently used, are not associated with a reduction in diarrhea rates." (Authors' abstract)

217 Curlin GT, Aziz KMA, Khan MR. The influence of drinking tubewell water on diarrhoea rates in Matlab Thana, Bangladesh. *In*: Proceedings of the 12th Joint Conference on Cholera, US-Japan Cooperative Medical Science Program, Sapporo, Oct 1976:48-54

218 Curlin GT, Khan M, Palmer D, Jackson T, Koster F, Aziz KMA. A longitudinal prospective study of diarrhoeal morbidity, nutrition and immunological status in a rural Bangladesh village. *In*: Proceedings of the 9th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between Center for Medical Research and Cholera Research Laboratory, 1975:48-54

219 Curlin GT, Chakraborty J, Aziz KMA, Levine RJ, Verwey WF. Risk factors in neighborhood cholera studies. *In*: Takeya K, Zinnaka Y, eds. Symposium on Cholera; proceedings of the 14th Joint Conference, U.S.-Japan Cooperative Medical Science

Program Cholera Panel, Karatsu, 27-29 Sep 1978:9-17

220 Curlin GT, Levine RJ, Aziz KMA, Rahman ASMM, Verwey WF. Serological aspects of a cholera toxoid field trial in Bangladesh. *In*: Proceedings of the 12th Joint Conference on Cholera, U.S.-Japan Cooperative Medical Science Program, Sapporo, Oct 1976:276-85

221 DeGraff DS. An economic analysis of the determinants of contraceptive use in Matlab, Bangladesh. Michigan: University of Michigan, 1989. 239 p. (PhD thesis)

"This research analyzes the determinants of contraceptive use in Matlab, Bangladesh using a microeconomic decision-making framework. The Matlab region of Bangladesh has experienced a large and sustained increase in contraceptive use since the late 1970s. This change in contraceptive use rates is of particular interest because of its occurrence in a country that is very poor, is religiously conservative, and has experienced little economic development in recent years. It is often argued that a transition from high fertility to high contraceptive prevalence and low fertility is not possible under such conditions. This research focuses on the role of an intensive family planning and health care services project in Matlab in contributing to the increase in contraceptive use. The study develops a theoretical model of contraceptive use behavior which is based on the assumption of rational decision-making and uses a household consumption/production expected utility maximizing framework. The model is sequential in nature allowing for adaptive behavior and child spacing, and also incorporates the psychic and resource costs of contraception, heterogeneity of fecundity, child mortality, the uncertainty of fertility regulation, and the contributions of children to household production. The empirical work employs an econometric methodology which is correctly specified given the nature of the dependent variables and the possibility of correlated error structures. The empirical framework exploits the existence of comparable data from project treatment and control areas in order to evaluate contraceptive use decisions in the presence and in the absence of the services of the project and to account for the difference in contraceptive use across areas. The results indicate that it is appropriate to model contraceptive use behavior in this society within a rational choice framework, and that the intensive family planning and health care project has had an effect on use rates. The project has acted to change both the values of factors which determine contraceptive use and to change the degree of influence of these factors. Specific factors which contribute to the difference in contraceptive use include the prevalence and effect of opposition by others towards family planning, the variety of contraceptive methods available and knowledge of these methods and their sources, and the incidence of and reaction to contraceptive side effects. Demand for additional children is also a strong determinant of contraceptive use behavior, particularly in the treatment area where those who desire to space births are more likely to attempt to achieve this objective through fertility regulation." (Author's abstract)

222 DeGraff DS, Phillips JF, Simmons R, Chakraborty J. Integrating health services into an MCH-FP program in Matlab, Bangladesh: an analytical update. Stud Fam Plann 1986 Sep-Oct;17(5):228-34

"This is a follow-up to a 1984 study that analyzed the relationship between areal variation in the contraceptive prevalence time series and in the intensity of maternal and child health (MCH) services of the Matlab Family Planning Health Services Project. Results based on 69 months of observation suggested that the addition of MCH components to a program with basic MCH and comprehensive family planning services had no incremental impact on family planning efficacy. However, basic MCH services, involving clinical back-up to family planning and child care since the beginning of the program in Matlab, may have contributed to clients' faith in the clinic staff and the overall efficacy of the Matlab program. In the 18 months that followed the cut-off date for this analysis, contraceptive prevalence increased markedly in the study areas. The present analysis repeats the earlier one for the extended time series to determine if the intensification of

health services in Matlab contributed to this secondary increase in prevalence, and to ascertain whether the MCH service regimes have long-run differential impacts. Results for the 87-month time series are similar to those of the previous analysis, suggesting that the introduction of additional MCH inputs in the Matlab service area over the 1982-83 period had no incremental impact on the contraceptive rate time trend." (Authors' abstract)

223 Demographic Surveillance System - Matlab. V. 1. Methods and procedures. Dhaka: Cholera Research Laboratory, 1978. 28 p. (CRL scientific report, 9)

Described is the continuing Demographic Surveillance System in the villages of the Matlab Field Station (Bangladesh). The history of the surveillance is reviewed, and the main features of the country and characteristics of the people are described. Detailed information on the surveillance operations since 1974 are presented. The procedures followed in the field and the definitions of events as they are used in the surveillance are described. Lists of codes and registration forms are appended. (Modified authors' abstract)

224 Diarrhoeal Diseases Control Programme. Wkly Epidemiol Rec 1984 Nov 23; 59(47):361-3

"12 hospitals with data on diarrheal disease cases both before and after the introduction of oral rehydration therapy (ORT) used as a routine measure were included in a study of ORT's impact. 8 of 9 hospitals providing data allowing calculation of hospital admission rates for both pre- and post-ORT periods had statistically significant decreases in the admission rate. Decreases ranged from 19.6% to 80.9% of the pre-ORT rates, with a median of 64.2%. No changes in admission policy or factors external to the hospital were reported in the explanatory notes accompanying the data, but it is not possible to conclude that they played no role in the declining admission rate. A significant increase in admission rates reported in 1 case (the Matlab station of the International Centre for Diarrhoeal Disease Research, Bangladesh) was explained by improved village-based management of mild dehydration and a policy of admitting some patients who would be unable to return home the same day. In 6 of 9 hospitals where a change in overall hospital diarrheal disease case-fatality rate (overall CFR) was calulable, the rate significantly declined, and no significant increases were reported. Changes in comparison with the pre-ORT rate ranged from a reduction of 93% to an increase of 11%, with the median change a decrease of 71%. The likely underreporting of deaths occurring outside the hospital complicates the interpretation of changes in the overall hospital CFR. It was possible for 12 hospitals to calculate the inpatient diarrheal disease case-fatality rate (inpatient CFR) for both pre- and post-ORT periods. There were statistically significant decreases in only 4 cases and a significant increase in 1 case. Changes including nonsignificant changes ranged from an 86% decrease to a greater than 5-fold increase, with the median a reduction of 50%. Decreases in inpatient CFR could result from improved case management associated with a greater awareness of the problem of dehydration, while increases in inpatient CFR could occur if effective outpatient management with ORT results in only the most serious cases being admitted. Although decreases outnumbered increases in the 3 indicators, interpretation of changes in the 3 indicators is difficult in the absence of more comprehensive data for the 12 hospitals." (POPLINE)

225 Door-to-door distribution working in Bangladesh. Int Fam Plann Digest 1976 Sep;2(3):9-11

"In 1975 an experimental 3-year program was begun by the Cholera Research Laboratory in Bangladesh to test the feasibility and effectiveness of distributing oral contraceptives on a door-to-door basis. Matlab, a rural area with a population density higher than the country's average, was chosen for the test because the Cholera Research Laboratory had been located there since 1963 and because solid demographic data on the local

population already existed. The program used local, mostly illiterate lady Village Workers and a few better-educated male field workers. Pill acceptance and usage was correlated with high parity; religion, education of the husband and wife, and occupation of the husband played little part in contraceptive acceptance. Neither Hindus nor Muslims opposed household contraceptive distribution, a change in the situation of several years ago. Follow-up data on side effects experienced were collected. No serious side effects occurred." (POPLINE)

226 D'Souza S. Introductory remarks on health policies and their effects on mortality in developing countries. *In*: Mortality and health policy; proceedings of the Expert Group on Mortality and Health Policy, Rome, 30 May - 03 Jun 1983. New York: United Nations Department of International Economic and Social Affairs, 1984:218-28

"The problems of studying mortality in developing countries are examined using data collected in the Matlab area of Bangladesh by the International Centre for Diarrhoeal Disease Research, Bangladesh. The data, which have been collected continuously since 1966, concern a population of 180,000 (in 1982) living in 149 villages. The focus is on infant and child mortality. Consideration is given to mortality differentials and to the relationship between differences in child mortality by sex and selective malnutrition." (POPLINE)

227 D'Souza S, Bhuiya A, Zimicki S, Sheikh K. Mortality and morbidity: the Matlab experience. Ottawa: International Development Research Centre, 1988. 59 p. (Technical study, 56e)

"The increased interest in mortality studies in recent years has seen the proliferation of frameworks and models to study the factors underlying mortality. However, insufficient attention has been focussed on the fact that in developing countries appropriate data rarely exist to test the validity of such models. Accurate vital registration systems are practically nonexistent, and developing countries have relied on surveys for estimates, developed usually on indirect procedures. Unfortunately, although these approaches have provided reliable levels of mortality, differentials such as those due to sex, have been masked because of cultural factors involved in sex-selective omissions in remembrance and responses regarding children that have died. The Matlab field station in Bangladesh has acquired international recognition because of the availability of longitudinal data of reliable quality since its inception in 1966. Scientific results based on Matlab data, and specially designed studies in the area, have been published in various medical and demographic journals. This paper is intended to present examples of studies showing how mortality and morbidity can be studied within a "small area". Recent efforts to ensure timely processing and linkage of data, through the use of an appropriate numbering system and new approaches in data base technology, have been provided. The possibility of grafting small studies at relatively little cost onto an ongoing longitudinal system is described. The study of correlates stressed in mortality frameworks is thus facilitated. The paper attempts to establish that although cost considerations prevent population laboratories like that of Matlab being replicated in every developing country, regional centres particularly in Africa could be usefully considered." (Authors' abstract)

228 D'Souza S. Mortality case study Matlab, Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1985. 80 p. (ICDDR,B special publication, 24)

"The Matlab mortality case study was prepared within the context of a joint UN Population Division/WHO project. Mortality levels and trends were studied in five countries: Bangladesh, Guatemala, Kenya, Senegal and Sri Lanka. In the case of Bangladesh it was recognised that vital registration data would be inadequate, and that data prepared under the Demographic Surveillance System (DSS) maintained by the ICDDR,B in Matlab thana would be of great relevance for the project. The Case Study report has been constructed with a set of illustrative investigations done in the Matlab area prior to 1982.

Studies on sex and socio-economic differentials in mortality are provided. Problems related to cost and "cause of death" are discussed. Despite the complexity of the development problems faced in attempting to reduce mortality, some simple strategies are available that can have a rapid impact on infant and child mortality. The impact of a tetanus immunisation programme has been documented in the Matlab area. Comparisons between the Matlab area and the rest of Bangladesh have not been attempted, though some information from surveys and other indirect estimation procedures are provided. The few studies cited in the report should not be considered comprehensive, either for Bangladesh or for Matlab itself. They are intended to help policy makers choose those options whereby mortality can be monitored and reduced in developing countries." (Author's abstract)

229 D'Souza S, Bhuiya A. Mortality differentials in a rural area of Bangladesh: results from Matlab Thana, Comilla District. *In*: Edmonston B, Bairagi R, eds. Infant and child mortality in Bangladesh; proceedings of a Conference on Infant and Child Mortality, Dhaka, 9 Jan 1982. Dhaka: Institute of Statistical Research and Training, University of Dhaka, 1982:69-96

This paper reports results of an intensive study in a small area of Matlab Thana, Comilla District, Bangladesh, which documents the inverse relationship between mortality and socio-economic status. Socio-economic parameters examined included education, occupation, housing conditions, and property ownership. Sex differentials and health-related differentials were also examined. All measures of socio-economic status effectively demonstrate the inverse relationship with mortality. Substantial sex differentials are also demonstrated.

230 D'Souza S, Bhuiya A. Mortality differentials in a rural area of Bangladesh: results from Matlab Thana, Comilla District. *In*: Basu A, Malhotra KC, eds. Proceedings of the Indian Statistical Institute Golden Jubilee International Conference on Human Genetics and Adaptation, Calcutta, 1-5 Feb 1982. V.2. Human adaptation. Calcutta: Indian Statistical Institute, 1984:290-308

"'Around the world it has been documented that mortality and socioeconomic status of the household are inversely correlated. By using the 1974 SES information from Matlab in Comilla District, Bangladesh, D'Souza et al. (1980) also found similar inverse relationship'. Results from this study as well as 1981 data from a pilot study undertaken in 5 villages are presented in this paper. Further, an attempt is made to link socioeconomic differentials with mortality for different age groups. The study shows that inspite of the improvement of medical facilities mortality in the low income group remains very high." (Authors' abstract)

231 D'Souza S. Mortality structure in Matlab (Bangladesh) and the effect of selected health interventions. *In*: Determinants of mortality change and differentials in developing countries: the five-country case study project. New York: United Nations Department of International Economic and Social Affairs, 1986:117-44. (Population studies, 94)

"The author describes the Demographic Surveillance System (DSS) established in 1963 in Matlab, Bangladesh, and attempts "to illustrate the utility of maintaining a 'small study area' within which mortality and morbidity processes can be investigated. For a developing country, such an area can provide immensely valuable data about a wide range of health and population issues." Data from the DSS and from other published sources are used to discuss levels and trends in mortality in Matlab and in the country as a whole; mortality differentials by socioeconomic status; causes of death; and health interventions, particularly maternal-child health programs, and mortality. The design and costs of data collection of the DSS are outlined and compared with the Companiganj health project, begun in 1973. Advantages and limitations of the Matlab system are summarized." (POPLINE)

232 D'Souza S. Population laboratories for studying disease; processes and mortality: the Demographic Surveillance System, Matlab. *In*: Vallin J, Pollard JH, Heligman L, eds. Methods for the collection and analysis of mortality data; proceedings of a seminar, Dakar, 7-10 Jul 1981. Liege: Ordina Editions, 1984:65-86

233 D'Souza S. A population laboratory for studying disease processes and mortality: the Demographic Surveillance System, Matlab, Comilla, Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 29 p. (ICDDR,B special publication, 13)

234 D'Souza S. A population laboratory for studying disease processes and mortality--the Demographic Surveillance System, Matlab, Comilla, Bangladesh. Rur Demogr (Dhaka) 1981;8(1):29-51

This paper describes the Demographic Surveillance System (DSS) of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), initiated in 1963. The DSS consists of periodic censuses of the study population with intervening registration of vital events. The surveillance area currently consists of 159 villages, containing an estimated population (1974) of 160 thousand, in Matlab, Comilla district. Immediate objectives are assessment of maternal and child health and family planning services in the area, research related to diarrheal diseases, measurements and determinants of fertility and mortality, and development of a demographic field site for training of people involved in national programmes. Data are collected through a 3-tier system: vital events are recorded by female village workers, whose work is checked by field assistants, then coded and processed in Dhaka, and put on computer. Selected results from DSS studies are discussed, focusing on particular aspects of mortality or morbidity and epidemiological studies regarding diarrhoea and nutrition, to illustrate the possibilities of a population laboratory in these contexts. The DSS has 7 advantages: 1) enables an accurate count of the population; 2) provides accurate sampling frames; 3) provides precise age data; 4) enables studies of client co-operation with health services; 5) facilitates prospective research designs; 6) collects demographic data which may reflect national statistics; 7) serves as a field training site. However, limitations of expense, data collected on causes of events, error correction, and study design must be considered. Computerisation should make it possible to turn the DSS into a registration system. Population laboratories in other parts of the world, with differing focuses, are briefly described, and some of their studies are compared to those of the DSS.

235 D'Souza S, Chen LC. Sex differentials in mortality in rural Bangladesh. Pop Dev Rev 1980 Jun;6(2):257-70

"This study provides conclusive documentation of higher female than male mortality from shortly after birth through the childbearing ages in a rural area of Bangladesh. The higher male mortality rates during the neonatal period are consistent with reports from developed countries; but, whereas in developed countries this higher male mortality risk continues through childhood and adolescence, the differential is reversed during the post-neonatal period in Bangladesh, with female mortality exceeding that of males by as much as 50 percent. Son preference in parental care, and feeding patterns, food distribution, and treatment of illness favoring male children are possible causes of such aberrant childhood mortality differences by sex." (Authors' abstract)

236 D'Souza S. Small-area intensive studies for understanding mortality and morbidity processes: two models from Bangladesh--the Matlab project and the Companiganj health project. *In*: Data bases for mortality measurement. Papers of the Meeting of the United Nations/World Health Organization Working Group on Data Bases for Measurement of Levels, Trends and Differentials, in Mortality, Bangkok, 20-23 Oct 1981. New York: United Nations Department of International Economic and Social Affairs, 1984:146-58 (Population studies, 84)

"This chapter describes 2 small-area studies in Bangladesh in which a detailed monitoring of changes in birth and death rates has been possible because of intensive data-collection methods. The 2 areas are Matlab Thana (a thana is a minor administrative unit), situated in Comilla District, and Companiganj Thana in Noakhali District. The methodologies utilized in the 2 areas are different and represent different procedures of data collection intended to study mortality and disease processes. The methods and procedures of each project are outlined, and results are given. Advantages and disadvantages of the projects are discussed along with directions for future development. The small-area studies have provided valuable data about a wide range of health and population issues. The careful supervision made possible by the small-area nature of the surveys is largely responsible for the high quality of the basic data (although considerable credit must go also to the responsible organizations and personnel) and for the usefulness of the studies. However, the small-area nature of the studies also makes them of limited use for monitoring national trends, and they cannot be regarded as full substitutes for national registration systems or surveys. It is hoped that the research results of these studies can be utilized by other countries with similar problems, since the overall return of such studies is unlikely to be directly proportional to their number. For many types of medical research, however, such studies are the only feasible approach." (POPLINE)

237 D'Souza S, Bhuiya A, Rahman M. Socio-economic differentials in mortality in a rural area of Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1980. 25 p. (ICDDR,B scientific report, 40)

"This paper examines the age specific mortality differentials of Matlab Demographic Surveillance area for 1974-1977, by socio-economic variables of the households. SES data from the 1974 census are used - classified on the basis of education, occupation and ownership of articles. Due to some matching problems of infant deaths with the household socioeconomic variables, analysis on infant mortality was not covered in this paper. For all other age groups it is observed that mortality is negatively correlated with SES status--higher levels having lower mortality rates. Among the various criteria "education of mother" shows the greatest statistical significance." (Authors' abstract)

238 D'Souza S, Bhuiya A, Rahman M. Socioeconomic differentials in mortality in a rural area of Bangladesh. *In*: Mortality in South and East Asia: a review of changing trends and patterns, 1950-1975; report and selected papers presented at Joint WHO/ESCAP Meeting, Manila, 1-5 Dec 1980. Manila: Regional Office for the Western Pacific, World Health Organization, 1982:195-214

"Mortality rates, especially of infants and children remain high in less developed countries, and it has been noted that health care is not reaching the various classes of society in an egalitarian manner. In Bangladesh a unique source of reliable data to study the problem of mortality differentials in a Third-World country is available. The International Centre for Diarrhoeal Disease Research, Bangladesh has operated a field station in Matlab, a rural area, since 1963, and a demographic surveillance system consisting of regular cross-sectional censuses and continuous registration of vital events has been maintained. This paper provides tables which correlate mortality data for the years 1974-77 with selected socioeconomic characteristics, i.e. education and occupation of household head, structure and area of house, number of boats, ownership of selected items, sources of drinking water, and use of fixed latrine. On all the measures of the socioeconomic condition of the family, educational attainment of the household head and mother show an independent effect, irrespective of whether the family is poor or rich, on child mortality. The major importance of this paper is that serious differentials in mortality levels have been substantiated for various socioeconomic strata, the lowest having the highest mortality levels. In the case of sex differentials, social change in the status and economic role of women may be a critical factor. In the absense of more sexually egalitarian social structures, there may be insurmountable sex biases in child care and food allocation which would nullify the availability of inexpensive health technologies." (POPLINE)

239 D'Souza S, Bhuiya A. Socioeconomic mortality differentials in a rural area of Bangladesh. Pop Dev Rev 1982 Dec;8(4):753 – 69

"The inverse correlation between mortality and socioeconomic status has been documented in various parts of the developing world. Using 1974 socioeconomic status information from Matlab, Bangladesh, the authors show a similar inverse relationship. Several indicators are used, such as education of household head, mother's education, size of dwelling, and health practices. SES data from a pilot study undertaken in 1981 in five villages from the same area corroborate the result that mother's education provides a striking indicator of mortality levels in young children." (Authors' abstract)

240 Fahimuddin M. Fertility pattern in rural East Pakistan [abstract]. *In*: Souvenir of the Joint Meeting of Pakistan Medical Association and British Medical Association, Karachi, 29 Nov – 3 Dec 1966:26

241 Fahimuddin M. Field trial of cholera vaccine in rural East Pakistan [abstract]. *In*: Souvenir of the 5th Annual Medical Symposium, Karachi, 8 – 13 Aug 1966:35 – 6

242 Faruque ASG, Eusof A, Rahman ASMM, Zaman K. Study of makeshift hospital during cholera outbreak. Bangladesh Med Res Counc Bull 1984 Dec;10(2):45 – 52

"This is a report on the study of utilization pattern of a makeshift hospital during a major cholera outbreak, by analyzing data on dehydration status, distance covered, number of deaths averted, and operation – wise comparison with other permanent facilities. To avoid unnecessary deaths due to dehydration and to ensure prompt and adequate care to suddenly accumulated debilitated patients, the makeshift hospital intervened. Subsequent to the intervention, a gradual reduction in patient admissions and cholera case accumulation was noted. Nearly half the cholera cases attending the makeshift hospital came from relatively far (13+ miles). The reporting of the majority (72%) of cholera patients with none – to – mild dehydration indicates an increased awareness of the need for early treatment during a cholera outbreak. Early attendance of diarrhoeal patients probably saved more patients by preventing shock and complications. Para – professionals given a short training accomplished similar efficacy as in a permanent facility. Nearer the affected areas, a simple but effective temporary facility is more effective than a sophisticated facility which is further away and takes several hours to reach, with risk to patients." (Authors' abstract)

243 Fauveau V, Koenig MA, Chakraborty J, Chowdhury AI. Causes of maternal mortality in rural Bangladesh, 1976 – 85. Bull WHO 1988;66(5):643 – 51

"Of a total of 1,037 women of reproductive age who died during the period 1976 – 85 in the Matlab area that was under demographic surveillance, 387 (37%) were maternal deaths. The mean maternal mortality over the 10 – year period was 5.5 per 1,000 live births (101 per 100,000 women of reproductive age). Major causes of maternal death, which were assessed using a combination of record review and field interviews, included postpartum haemorrhage (20%), complications of abortion (18%), eclampsia (12%), violence and injuries (9%), concomitant medical causes (9%), postpartum sepsis (7%), and obstructed labour (6.5%). Deaths caused by postpartum haemorrhage were positively associated with both maternal age and parity, whereas those caused by eclampsia and injuries were more common among young and low – parity women. If maternal deaths arising from complications of abortion are disregarded, 20% of all maternal deaths occurred during pregnancy, 44% during labour and the two days following delivery, and 36% during the remaining postpartum period. These findings support the need to develop a service strategy to address the risks of childbearing and childbirth in areas such as rural Bangladesh, where almost all deliveries take place at home. This strategy must be based not only on preventive and educational interventions, including family planning and antenatal care, but also on systematic attendance at home deliveries by trained professional midwives, backed up by an effective chain of referral." (Authors' abstract)

244 Fauveau V, Blanchet T. Deaths from injuries and induced abortion among rural Bangladeshi women. Soc Sci Med 1989;29(9):1121 – 7

"Information about injuries and violence as causes of death of women is scarce and often incomplete, and particularly so regarding women in the rural areas of South Asia. This report provides detailed specific information collected in Matlab, a sub – district of rural Bangladesh. Of 1139 women (aged 15 – 44 yr) who died there during the 11 – yr period from 1976 to 1986, 207 (18%) were victims of unintentional injuries or violence. In this study, unintentional injuries include domestic and traffic accidents, drowning and snake – bites, while violent deaths are defined as due to intentional injury and include homicide, suicide and lethal complications of induced abortion. Injuries and violence accounted for 31% of all deaths among women aged 15 – 19 yr. This proportion dropped significantly with age to 10% among women aged 35 – 44 yr. Unmarried women suffered a higher proportion of such deaths (36%) than married women (15%). Violent deaths during pregnancy and complications of induced abortion among young unmarried women deserve special attention. In the male – dominated society under study, suicide and homicide are observed to be two frequent consequences of illegitimate pregnancy. Although this study suffers from the absence of data on non – fatal injuries and attempted violence, it may serve as a basis for recommending preventive measures." (Authors' abstract)

245 Fauveau V, Wojtyniak B, Koenig MA, Chakraborty J, Chowdhury AI. Epidemiology and cause of deaths among women in rural Bangladesh. Int J Epidemiol 1989 Mar;18(1):139 – 45

"A total of 542 women aged 15 to 44 years died during the 10 – year period 1985 in the control area of Matlab, an area with a population of 90 000, representative of many other rural areas of southern Bangladesh. The corresponding age – specific mortality rate was 290 per 100 000 women 15 – 44 years. These deaths have been analysed retrospectively, using information collected through the Demographic Surveillance System set up by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) and verbal autopsies conducted in the homes. Of these deaths, 175 (32%) were due to infectious diseases, 163 (30%) to direct obstetric complications, 67 (12%) to injuries, and the remaining 26% to other causes. Cause – specific and proportionate mortality rates showed a positive association with age for deaths due to infectious diseases, non – infectious diseases and unspecified causes, and an inverse association with age for deaths due to injuries. These rates showed a peak in the intermediate age group 25 to 34 years for deaths due to direct obstetric causes. No consistent trends were visible when annual rates were studied over time. Prior to death, 42% of the women were attended by traditional practitioners, and 33% were not attended at all. Demographic impact is discussed, emphasizing the contribution of obstetric causes to overall mortality. Priorities for health policy implications are proposed, focusing upon a strong maternity care programme, and improved availability of female health personnel, in the context of the socio – cultural constraints imposed on women in poor rural areas." (Authors' abstract)

246 Fauveau V. Forum of voluntary hospitals in Bangladesh – preliminary results of a study in Matlab [abstract]. *In*: Proceedings of the 1st Annual Meeting of Forum of Voluntary Hospitals in Bangladesh, Dhaka, 9 Jan 1987. Dhaka: Dhaka Shishu Hospital, 1987:21

247 Fauveau V, Koenig MA, Wojtyniak B, Chakraborty J. Impact of a family planning and health services programme on adult female mortality. Health Pol Plann 1988;3(4):271 – 9

"In recent years, the issue of women's health in developing countries has received increased attention. Little is known, however, about the effectiveness of strategies to improve the health of women. An innovative family planning and health services programme, launched almost ten years ago, provides a unique opportunity to evaluate the

impact of a service programme upon adult female mortality rates. A total of 1039 women aged 15 to 44 years died in the ten-year period from 1976 to 1985 in 149 villages under the demographic surveillance system set up by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). Of these, 492 died in the treatment area where the service programme started in 1978, and 547 died in the neighbouring comparison area covered only by the government health services. After the start of the ICDDR,B service programme, the overall mortality rate among women of reproductive age became significantly lower in the treatment area than in the adjacent comparison area (2.4 vs 3.0 per thousand, p=0.001). An analysis of cause-specific mortality rates revealed that half of the difference observed was due to a lower number of deaths due to obstetrical causes in the intervention area, suggesting that this intensive family planning programme was successful in limiting pregnancies and their related deaths. Twenty-two per cent of the difference observed was due to a lower number of deaths caused by infectious diseases. The rate of deaths due to injuries, however, remained similar in both areas. The breakdown by age revealed that the largest mortality differential after implementation of the service programme was observed in the youngest age group. Access to modern medical care prior to death was substantially higher in the treatment area. These findings suggest that if further reductions of adult female mortality are to be achieved, the vigorous family planning programme implemented in Matlab must be augmented with additional interventions addressing the other determinants of women's death. These additional interventions, which should include a strong maternity care programme and actions to facilitate the access of rural women to community-based female health professionals, have yet to be tested and evaluated in rural Bangladesh." (Authors' abstract)

248 Fauveau V, Chakraborty J. Maternity care in Matlab: present status and possible interventions. Matlab MCH-FP Project. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1988. 53 p. (ICDDR,B special publication, 26)

"The current status of maternity care in Matlab, and possible interventions, is the subject of this work by the International Centre for Diarrhoeal Disease Research, Bangladesh. Concern about maternal health conditions in developing countries prompted the Matlab project, which sought to improve maternal health status through birth spacing. This report presents an implementation plan in the Matlab MCH-FP area to further reduce maternal mortality, perinatal mortality, and improve the quality of maternity care. Section I presents KAP survey questions about knowledge, attitudes, and practices regarding birth and maternity care. The next section examines survey findings about traditional birth attendants in Matlab. Section III offers a summary of 2 studies that outlines the causes of maternal deaths and neonatal deaths in Matlab, 1976-1985. Future goals and possible interventions to improve maternity care are outlined in Section IV. Existing services are analyzed and a schedule of step-wise interventions is described. The ultimate goal of the program, to have all pregnancies examined and all births attended by trained personnel, is put forth in the conclusion. Emphasis is given to family planning and control of complications of induced abortion as 2 important interventions that would significantly reduce maternal mortality. References, tables, and figures follow, with notes on the management of complications in the village, and equipment and supplies lists for midwives." (POPLINE)

249 Fauveau V. Preliminary results of a study of cause of death in Matlab [abstract]. *In*: Proceedings of the 1st Annual meeting of the Forum of Voluntary Hospitals in Bangladesh, Dhaka, 9 Jan 1987:21

250 Fauveau V, Chakraborty J. Prevalence of diarrhoeal diseases in rural Bangladeshi children [abstract]. *In*: Programme and abstracts; proceedings of the Fourth Asian Conference on Diarrhoeal Diseases, Colombo, 7-10 Sep 1987:27

251 Feachem RG, Koblinsky MA. Interventions for the control of diarrhoeal diseases among young children: promotion of breast-feeding. Bull WHO 1984;62(2):271-91

The literature on the relative risks of diarrheal morbidity for infants on different feeding modes suffers from several methodological problems. Thirty-five studies from 14 countries were reviewed; 83% of studies found that exclusive breast feeding was protective compared to partial breast feeding, 88% that exclusive breast feeding was protective compared to no breast feeding, and 76% that partial breast feeding was protective compared to no breast feeding. When infants receiving no breastmilk are contrasted with infants on exclusive or partial breast feeding, the median relative risks are 3.0 for those aged 0-2 months, 2.4 for those aged 3-5 months, and 1.3-1.5 for those aged 6-11 months. Above 1 year of age no protective effect of breast feeding on diarrheal morbidity is evident. When infants receiving no breastmilk are contrasted with those on exclusive breast feeding, median relative risks are 3.5-4.9 in the first 6 months of life. The literature does not suggest that the relative risks of diarrheal morbidity for bottlefed infants are higher in poor families than in more wealthy families. The protective effects of breast feeding do not appear to continue after the cessation of breast feeding. There is evidence of considerably increased severity of diarrhea among bottlefed infants. There is limited literature on the relative risks of diarrheal mortality for infants on different feeding modes. Nine studies from 5 countries were reviewed, most of which showed that breast feeding protects substantially against death from diarrhea. When infants receiving no breastmilk are contrasted with those on exclusive breast feeding, the median relative risk of death from diarrhea during the first 6 months of life is 25. When partially and exclusively breastfed infants are contrasted, the median relative risk of death from diarrhea is 8.6. Breast feeding can be promoted by changes in hospital routine and by giving information and support to mothers. A review of 21 studies from 8 countries shows that, by such promotion, the most likely reductions in the prevalence of nonbreastfed infants are 40% among infants aged 0-2 months, 30% among those aged 3-5 months, and 10% among those between 6 months and 1 year old. Theoretical calculations based on these data show that such promotion can reduce diarrheal morbidity rates by 8-20% and diarrheal mortality rates by 24-27% in the first 6 months of life. For children aged 0-59 months, diarrheal morbidity rates would be reduced by 1-4% and mortality rates by 8-9%. A recent study in Costa Rica has documented a substantial impact of breast feeding promotion on neonatal diarrheal morbidity and mortality, and on diarrheal morbidity in infants aged 0-5 months. The Costa Rican data show good agreement with the theoretical computations presented in this paper. Several important aspects of breast feeding and diarrhea remain to be clarified by research. However, the need for this research should not delay action designed to promote breast feeding and to monitor its effects upon feeding practice and upon diarrhea. (Modified authors' abstract)

252 Feeley JC, Curlin GT, Aziz KMA, Wiggins GL, Albritton WL. Response of children in Bangladesh to adult-type tetanus-diptheria toxoid (Td) administered during a field trial of cholera toxoid. J Biol Stand 1979 Jul;7(3):249-52

253 Ford K, Huffman SL, Chowdhury AKMA, Becker S, Allen H, Menken J. Birth-interval dynamics in rural Bangladesh and maternal weight. Demography 1989 Aug;26(3):425-37

"This article reports on the results of a study conducted in rural Bangladesh on the influence of maternal weight on the components of birth intervals, including gestation and intrauterine mortality, the duration of postpartum amenorrhea, and the duration of waiting time to conception (the menstrual interval). When biological factors (including maternal age, parity, and supplementation practices) and behavioral variables, including religion, education, and occupation, were controlled, maternal weight was found to be related to the risk of intrauterine mortality and to the probability of resuming menses in the postpartum period. The implications of these findings for policies and programs in developing countries are discussed." (Authors' abstract)

254 Ford K, Huffman S. Nutrition, infant feeding and post-partum amenorrhoea in rural Bangladesh. J Biosoc Sci 1988 Oct;20(4):461-9

"The duration of amenorrhoea among a group of chronically malnourished women in a rural area of Bangladesh is examined by application of multivariate hazard models with time-varying covariates, including the influence of maternal nutrition, seasonality and patterns of infant feeding. Both maternal weight at pregnancy termination and the pattern of infant feeding affected the length of post-partum amenorrhoea. Analyses focused on season of birth showed the importance of differences by education in infant feeding." (Authors' abstract)

255 Foster A, Chowdhury A, Menken J, Huffman SL. Age at menarche and its influence on fertility. New York: Population Council, 1986. 6 p. (Fertility determinants research notes, 10)

"Among populations in developing countries, where use of contraception is limited, mechanisms that affect natural fertility exert a major influence on overall fertility levels. These include variation in duration of reproductive span--from 1st menstruation to menopause--and in the components of the intervals between births. In countries such as Bangladesh where premarital sexual contact is rare, marriage generally follows menarche. In 1976 and 1977 a longitudinal study of factors associated with menarche and adolescent subfecundity was conducted at the International Centre for Diarrhoeal Disease Research, Bangladesh, among the female population residing in 14 villages within the Matlab area. All females 10-20 years old were interviewed and information was collected on menstruation, pregnancy history, nutrition, and socioeconomic status. Median age at menarche was 15 yrs 8 months. The 2 most important predictors of menarche were age and weight. Older girls were more likely to have reached menarche than younger girls, regardless of nutritional or socioeconomic status. Median interval from menarche to conception was 1.5 years. Girls with later menarche had shorter duration of subfecundity, suggesting that late maturing girls tend to catch up in terms of fertility performance. Use of contraception is limited in part because of high levels of infant and child mortality. In 1983 the infant mortality rate was 132/1000. Improvements in nutrition of women of childbearing age would reduce child mortality; although improved nutrition would lead to lower age at menarche, the duration of subfecundity would also be extended, so overall impact on fertility would be negligible." (POPLINE)

256 Foster A, Menken J, Chowdhury A, Trussell J. Female reproductive development: a hazards model analysis. Soc Biol 1986 Fall-Winter;33(3-4):183-98

"In this paper we applied a recently developed statistical technique, hazard modelling, to the study of menarche and adolescent subfecundity. Using data collected in Bangladesh in 1976 and 1977, which included anthropometric and socioeconomic status measures, we found that age and weight were significant predictors of menarche; no other measure of growth significantly added explanatory power. Weight was at least as good as other more complex measures, including the fat index proposed by Frisch. Low SES was associated with later age at menarche and appears to act through slower growth. Whenever weight was included in an analysis, the SES effects were not significant. Finally, although low SES tends to delay menarche, it seems to have little effect on the interval of adolescent subfecundity. Indeed, late maturers exhibit some degree of "catching up" in that the length of the subfecundity interval is negatively related to age at menarche. The study also has a methodological focus. We demonstrate that use of hazard models permits more detailed and penetrating findings to be extracted from the kinds of retrospective data traditionally collected as well as from longitudinal data of the types only recently available. In particular, multivariate analysis of age at menarche and the subfecundity interval, and their relations to anthropometric time-varying covariates as well as socioeconomic indicators, is shown to be feasible and informative." (Authors' abstract)

257 Glass RI, Svennerholm A-M, Stoll BJ, Khan MR, Huda S, Huq MI, Holmgren J. Effects of undernutrition on infection with *Vibrio cholerae* O1 and on response to oral cholera vaccine. Pediatr Infect Dis J 1989 Feb;8(2):105-9

"The association between undernutrition and the risk of colonization and disease with *Vibrio cholerae* O1, concentrations of salivary IgA and the serologic response to infection and to orally administered cholera B subunit were examined prospectively in a family study in Bangladesh. Children aged 1 to 8 years who were family contacts of patients hospitalized with culture-confirmed cholera were visited within 24 hours of the hospitalization and daily for 10 days, queried for the presence of diarrhea and cultured for *V. cholerae* O1. On day 1 each child was weighed and saliva was collected to measure total IgA. On days 1 and 21 blood was taken to assess vibriocidal and antitoxin titers, and on days 1 and 2 B subunit or placebo was given orally as part of a trial to look for a toxin-blocking effect. Of 412 children enrolled in the study 35% (143) became infected with *V. cholerae* O1 and 49% (70) of these developed diarrhea. Undernutrition, defined in a child as weight less than 70% of the Harvard reference weight-for-age, was not associated with colonization, disease or the duration or severity of cholera. Moreover well-nourished children did not differ from undernourished children in their concentrations of salivary total IgA, initial serum antitoxin or vibriocidal antibodies or in their serologic response to colonization, disease or B subunit. The immune system in its response to cholera appears to be quite resistant to nutritional insults. The good antitox-in response to B subunit among undernourished children is of particular importance in considering the use of future oral cholera vaccines in areas where such undernutrition is common." (Authors' abstract)

258 Glass RI, Huq I, Alim ARMA, Yunus M. Emergence of multiply antibiotic-resistant *Vibrio cholerae* in Bangladesh. J Infect Dis 1980 Dec;142(6):939-42

"In December 1979, a *Vibrio cholerae* O1 resistant to tetracycline, ampicillin, kanamycin, streptomycin, and trimethoprim-sulfamethoxazole was obtained from a patient with cholera at the Matlab Hospital, Bangladesh. All 256 isolates of *V. cholerae* O1 stocked in the previous six months were tested for antibiotic sensitivity: 54 were resistant to tetracycline, and 44 of these were resistant to all five antibiotics. The clinical presentation and hospital course for 51 patients with resistant strains of *V. cholerae* O1 and 102 patients with sensitive strains were compared by their medical records. Patients with resistant strains were indistinguishable from controls by age, sex, or severity of symptoms at presentation. All were treated with tetracycline, and patients with the resistant strains purged longer (mean, 37 vs. 25 hr; $p<0.01$) and in greater volume (mean, 4.3 vs. 2.3 liters; $p<0.01$) than their controls with cholera due to susceptible strains. A resistance plasmid was identified. Based on these results, antibiotic use in areas with resistant vibrios must be reconsidered." (Authors' abstract)

259 Glass RI, Becker S, Huq MI, Stoll BJ, Khan MU, Merson MH, Lee JV, Black RE. Endemic cholera in rural Bangladesh, 1966-1980. Am J Epidemiol 1982 Dec;116(6):959-70

"Since 1963, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), formerly the Cholera Research Laboratory, has maintained a field station in Matlab to treat patients from a surveillance population of 240,000 who have cholera and other diarrheal diseases. Since 1966, the authors have analyzed hospital records of 7141 surveillance-area patients culture-positive for *V. cholerae* O1 to relate the seasonality, age and sex distribution, and geographic trends with hypotheses concerning transmission, immunity, and risk groups. From this review, they have found that: 1) children 2-9 years old and adult women are most commonly hospitalized for cholera; 2) *V. cholerae* O1 emerges simultaneously throughout the area of surveillance, with the early cases being of different phage types; 3) three patients were hospitalized twice for cholera compared with 29 expected on the basis of life-table analysis ($p<0.01$), suggesting that immunity to severe disease conferred by previous illness may be stable and long-lasting; 4) no constant relationship was found between the times of onset or peaks of the yearly cholera epidemic and the times of onset or peaks of the monsoon rains or river water levels; and 5) an outbreak of multiply antibiotic-resistant *V. cholerae* O1 infection documented in 1979 raises questions about the dissemination of resistance

plasmids, antibiotic-use patterns, and the need for other drugs in addition to tetracycline. While little progress has been made in understanding the mode of transmission of *V. cholerae* 01, and in identifying practices for prevention, fluid therapy in this area has decreased the case fatality rate significantly and provides guidance for similar programs elsewhere." (Authors' abstract)

260 Glass RI, Huq MI, Lee JV, Threlfall EJ, Khan MR, Alim ARMA, Rowe B, Gross RJ. Plasmid-borne multiple drug resistance in *Vibrio cholerae* serogroup 01, biotype El Tor: evidence for a point-source outbreak in Bangladesh. J Infect Dis 1983 Feb;147(2): 204-9

"In 1979, an outbreak of plasmid-borne, multiply drug-resistant *Vibrio cholerae* serogroup 01 biotype El Tor (*V. cholerae* 01) occurred in the Matlab area of Bangladesh. The outbreak could have resulted from the introduction into the area of a single resistant strain or from multiple conjugations of drug-sensitive *V. cholerae* 01 with C plasmids in other environmental flora. Resistant strains were phage typed to determine their relatedness, and plasmid studies were conducted to determine the frequency of C plasmids in nonvibrio flora of family contacts of cholera patients. Forty-one (85%) of 48 resistant strains of *V. cholerae* 01 examined belonged to two closely related phage types new to the area, whereas 59 drug-sensitive strains from the same period were primarily of two different phage types. Group C plasmids were in nonvibrio strains from five of 36 family contacts of patients with drug-resistant cholera but none of 82 family contacts of patients with sensitive cholera. This outbreak most likely began from the introduction into the area of a single, multiply drug-resistant strain of *V. cholerae* 01. C plasmids detected in the nonvibrio flora of family contacts probably came from the resistant strain of *V. cholerae* 01." (Authors' abstract)

261 Glass RI, Holmgren J, Haley CE, Khan MR, Svennerholm A-M, Stoll BJ, Hossain KMB, Black RE, Yunus M, Barua D. Predisposition for cholera of individuals with O blood group: possible evolutionary significance. Am J Epidemiol 1985 Jun;121(6):791-6

"At the Matlab Hospital of the International Centre for Diarrhoeal Disease Research, Bangladesh, the authors examined the blood groups of patients hospitalized between January and September 1979 for diarrheal disease due to a variety of bacterial and viral agents. A significant association was identified only for cholera, in which cholera patients were twice as likely to have blood group O and one-ninth as likely to have blood group AB as community controls. A follow-up study of family contacts of cholera patients, carried out between September 1980 and July 1982, indicated that blood group did not affect an individual's risk of having a culture-proven infection with *V. cholerae* O1 but was directly related to the severity of disease. Individuals with the most severe diarrhea compared with those with asymptomatic infection were more often of blood group O (68% versus 36%, $p < 0.01$) and less often of AB (0% versus 7%, $p < 0.01$). It was not possible to identify the molecular basis for this genetically related protection using biologic models of cholera that are currently available. The constant selective pressure of cholera against people of O blood group may account in part for the extremely low prevalence of O group genes and the high prevalence of B group genes found among the people living in the Gangetic Delta." (Authors' abstract)

262 Glass RI, Stoll BJ. The protective effect of human milk against diarrhea: a review of studies from Bangladesh. Acta Paediatr Scand 1989;(suppl 351):131-6

263 Glass RI, Holmgren J, Khan MR, Hossain KMB, Huq MI, Greenough WB. A randomized, controlled trial of the toxin-blocking effects of B subunit in family members of patients with cholera. J Infect Dis 1984 Apr;149(4):495-500

"A randomized, controlled field trial was performed to test the ability of B subunit, the nontoxic, binding portion of cholera toxin, to block the toxin receptors (GM1 ganglioside) in the small intestine and thereby prevent diarrhea in individuals infected with *Vibrio*

cholerae O1. Of 1,922 family contacts of 370 index patients selected randomly to receive orally on two successive days either B subunit (low dose, 1.0 mg; high dose, 5.0 mg) or placebo, 190 were asymptomatically infected on day 1 or day 2 of the study and within 24 hr of receiving B subunit. During the first 24-hr period of follow-up, the relative risk of disease among contacts receiving B subunit versus placebo was 0.18 for the low dose ($p = .08$) and 0.50 for the high dose ($p = .22$). Subsequently the relative risk increased toward 1.0 and was at no single point significantly reduced, although in five of the six follow-up periods the risk of disease was less in the B subunit group." (Authors' abstract)

264 Glass RI, Svennerholm A-M, Khan MR, Huda S, Huq MI, Holmgren J. Seroepidemiological studies of El Tor cholera in Bangladesh: association of serum antibody levels with protection. J Infect Dis 1985 Feb;151(2):236-42

"In rural Bangladesh, family contacts of patients with cholera were studied prospectively to examine whether protection against colonization and disease due to *Vibrio cholerae* O1 was associated with circulating antibodies to *V. cholerae*. Family contacts (1,071) of 370 patients with cholera were visited daily for 10 days, cultured for *V. cholerae*, and queried about diarrhea. Sera collected on days 1 and 21 were assayed for vibriocidal antibodies, IgG and IgA antibodies to cholera toxin, and IgG antibodies to lipopolysaccharide (LPS). Vibriocidal titers of >20 present in 50% of contacts by 20 years of age were associated with protection against both colonization and disease. An elevated level of IgG antitoxin was not associated with protection against colonization or disease but was the most sensitive indicator of recent symptomatic cholera and of immune response to the oral immunogen B subunit. IgG antibody to LPS and IgA antitoxin were of little value in predicting colonization or disease." (Authors' abstract)

265 Glass RI, Khan MR, Greenough WB, Holmgren J. The use of family studies for prospective epidemiologic investigations of cholera. *In*: Kuwahara S, Pierce NF, eds. Advances in research on cholera and related diarrheas. Tokyo: KTK Scientific Publishers, 1986:25-33

266 Gray R, Huber D. The effect on fecundity of pill acceptance during postpartum amenorrhea: a comment. Stud Fam Plann 1983 May;14(5):150-2

"This article examines the results of a previous study conducted in Matlab Thana, Bangladesh. That study suggested that women who accepted the pill during postpartum amenorrhea experienced an actual decrease in the interval to the next pregnancy, while the group of nonacceptors experienced no such decrease in the birth interval. This article suggests that there might have been problems of bias in the selection of the groups as well as with the method of statistical analysis. Another possible failing in the initial study is the exclusion of those women using another form of birth control during amenorrhea. This article suggests that the design of the original study as well as the compilation and methodology used in analyzing the statistical results may have been at fault." (POPLINE)

267 Greenberg HB, Valdesuso J, Kapikian AZ, Chanock RM, Wyatt RG, Szmuness W, Larrick J, Kaplan J, Gilman RH, Sack DA. Prevalence of antibody to the Norwalk virus in various countries. Infect Immun 1979 Oct;26(1):270-3

"Serum samples from children and adults from several countries were tested by radioimmunoassay for antibody to the Norwalk virus. Antibody was commonly found in adults from all the countries tested. Antibody appears to be acquired more rapidly in children from underdeveloped countries than in children from the United States." (Authors' abstract)

268 Greenough WB, III, Hirschhorn N, Gordon RS, Jr., Lindenbaum J, Ally KM. Pulmonary oedema associated with acidosis in patients with cholera. Trop Geogr Med

1976;28:86 - 90

"Five patients [two from Matlab field hospital] with severe acidosis and pulmonary oedema complicating cholera were seen at the Cholera Research Laboratory, Dhaka, in a two - year period. All had had inadequate treatment. Their disease resulted in acidosis prior to admission; only the two who subsequently survived received volumes of sodium bicarbonate solutions sufficiently large to repair completely their acidosis. Saline alone worsened pulmonary congestion, while alkali appeared to relieve it despite the accompanying volume expansion. These observations are consistent with the known redistribution of blood to the central circulation in acidosis. Timely and proper treatment of cholera will avert this syndrome. When encountered use of isotonic sodium bicarbonate sufficient to correct acidosis may be very helpful." (Authors' abstract)

269 Horton S, Claquin P. Cost effectiveness study of hospital and of ambulance services at Matlab treatment centre. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982. 52 p. (ICDDR,B working paper, 26)

"In its Matlab rural research station the ICDDR,B services include a treatment centre for diarrhoeal diseases and a fleet of ambulances (speed boats). The study aimed to estimate economic resource cost of the services and to analyse their cost/effectiveness. Alternative forms of services are discussed." (Authors' abstract)

270 Hossain MB, Phillips JF. A factor analysis of economic status indicators from four rural upazilas of Bangladesh. *In*: Proceedings of the Second National Seminar of Bangladesh Population Association, Dhaka, 1984. Dhaka: Bangladesh Population Association, 1985:154 - 63

271 Hossain MM, Glass RI, Khan MR. Antibiotic use in a rural community in Bangladesh. Int J Epidemiol 1982 Dec;11(4):402 - 5

"Antibiotic use by 175,000 people in the Matlab rural surveillance area (MSA) of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) was studied to identify practices which might affect microbial drug resistance. We surveyed a 3% sample of drug purchases from pharmacies in the MSA over a four - week period in August and September 1980. Fifty - seven drug purchases were made per thousand Matlab residents per week; 9% of these were of tetracycline and 26% were antibiotics. Forty - eight per cent of the antibiotic tablets or capsules for persons aged 15 years or more were purchased in quantities which represented less than a single day's dose and rarely was a full course of therapy purchased at one time. The rate of tetracycline purchase for young children - - in whom it is usually contraindicated - - equalled the rate for older children and young adults. These practices have probably not led to improvements in health and may have promoted the emergence and persistence of drug - resistant micro - organisms. To optimize antibiotic use, control measures at government, producer, prescriber and consumer levels need to be pursued." (Authors' abstract)

272 Hossain MM, Glass RI, Black RE. The prevalence of *Ascaris*, hookworm, and *Trichuris* in patients attending a rural diarrhoea treatment center in Banglaesh. Southeast Asian J Trop Med Public Health 1981 Dec;12(4):539 - 43

'The prevalence of *Ascaris*, hookworm and *Trichuris* among patients attending a diarrhea treatment center in rural Bangladesh was estimated by direct examination of a single stool smear. Between February and August 1977, stool specimens from 2,791 (61%) of the 4,555 patients attending the center were examined. One or more helminths were detected in 39% (1,094). Ascariasis was the most common helminthic infection. Four percent of infants under 1 year of age had at least 1 helminth, and the rate increased to 78% by age 4 years. The high prevalence observed in children aged 4 years or more has indicated the possible value of treatment and control measures in this high - risk group." (Authors' abstract)

273 Hoyle B, Yunus M, Chen LC. Breast-feeding and food intake among children with acute diarrheal disease. Am J Clin Nutr 1980 Nov;33(11):2365-71

"To quantitate reduced food intake during diarrhea and to assess possible means of promoting such intake, the 24-hr food and breast milk intakes of 41 children 6 to 35 months divided into three groups were measured. The energy and protein intake of 15 children hospitalized with acute watery diarrhea averaged 75 kcal/kg and 0.96 g/kg, respectively. The energy and protein consumption of another group of 15 children with diarrhea whose mothers received intensive education to promote food intake during hospitalization averaged 60.9 kcal/kg and 0.70 g/kg, respectively. These intake levels were significantly lower than 129.9 kcal/kg and 1.89 g/kg observed among healthy control children. These results suggest that child anorexia may be an important cause of reduced food intake during diarrhea. Anorexia was not overcome with intensive educational efforts. Breast milk was found to be an important nutrient source with breast-fed children better protected against reduced intake during diarrhea." (Authors' abstract)

274 Huber DH, Rahman M, Chakraborty J. The condom in rural Bangladesh. *In*: Zatuchni GI, Sobrero AJ, Speidel JJ, Sciarra JJ, eds. Vaginal contraception: new developments; proceedings of an International Workshop on New Developments in Vaginal Contraception, Guatemala City, 25-27 Apr 1979. Hagerstown, Md.: Harper & Row, 1979:317-24 (PARFP series in fertility regulation)

"The feasibility of using household distribution techniques to promote condom use in Bangladesh was assessed in a pilot study; the distribution program had only a slight impact on condom usage but knowledge about condoms improved considerably. In October 1975 the Cholera Research Laboratory undertook a program in which both pills and condoms were distributed to 1/2 the households in Matlab county while the residents in the other 1/2 of the county continued to receive only those family planning services regularly provided by the national health service. Initially the emphasis was placed on promoting oral contraceptives; however, the emphasis was later shifted to condoms as a result of the high drop out rate observed for pill acceptors. In August 1976 condoms along with educational materials were distributed to households in the distribution area and were accepted by 35% of the families. 3 months later the impact of the distribution was assessed by comparing prevalence rates for condom use in the distribution area with those in the non-distribution areas. The rate in the distribution area increased from 1.2% to 3.8% while in the non-distribution area it remained at 0.2%. A sample of men in both areas was surveyed after the distribution, regarding their level of knowledge about condoms. When the men were shown a condom and asked what it was used for, 46.5% in the distribution area and 12.8% in the non-distribution area were able to correctly identify it as a contraceptive. In the non-distribution area 54.9% of the men incorrectly identified it as a balloon or other toy while only 47.5% in the distribution area identified it as a toy. In the distribution area 45% of the men knew how to use a condom compared to only 10% in the non-distribution area. More men in the distribution group knew how to obtain condoms and were aware that they could be obtained free than in the non-distribution group. In the distribution area, colored condoms were distributed to 1/2 of the households and plain ones to the other 1/2. No differences in usage were observed between these groups. Tables show the comparisons between the non-distribution and distribution areas in terms of 1) prevalence rates for pill and condom use, and 2) responses to survey questions concerning condom knowledge." (POPLINE)

275 Huber DH, Rahman, Chakraborty J. The condom in rural Bangladesh: problems and prospects. *In*: Proceedings of the Bangladesh Fertility Research Programme Second Contributors Conference on Fertility Regulation Techniques, Dhaka, 18 Nov 1977. Dhaka: Bangladesh Fertility Research Programme, 1978.

"A pilot project to provide condoms and oral contraceptives to all eligible couples was undertaken in rural Bangladesh by the Cholera Research Laboratory (CRL) in 1975.

Contraceptives were distributed house-to-house in 143 villages, half the 260,000 population of the Matlab thana field surveillance area (FSA). The other half in the nondistribution area received family planning services from the government program. Condoms are perceived by many Bangladesh men as toys, balloons, which are purchased by and played with by children. A survey of men found that most in the government served area could not identify the condom as other than a toy. One-third of men in the contraceptive area and two-thirds men in nondistribution area could not explain how the condom was used for family planning. Most men knew who provided condoms, where to find them, and their price. Enough condoms were being distributed by the government in 1975 to serve 2.7% of the country's 16 million fertile couples. The Bangladesh Fertility Survey (BFS) found only .9% of eligible couples using condoms. Compared to oral contraceptives, where the same figures were 2.8% distribution, 3.4% use, condoms are not generally accepted. An aggressive education, social marketing, mass media program is needed to increase condom understanding and use and overcome the image of the children's toy." (POPLINE)

276 Huber DH, Rahman M, Chakraborty J. The condom in rural Bangladesh - a special effort is needed. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 14 p. (ICDDR,B working paper, 31)

277 Huber DH, Khan AR. Contraceptive distribution in Bangladesh villages: the initial impact. Stud Fam Plann 1979 Aug/Sep;10(6/9):246-53

"Oral contraceptives and condoms were made available to households in 150 villages of rural Bangladesh. Active use of modern contraceptives increased from 1 percent to 18 percent of eligible couples within 3 months of distribution. However, because there was no strong field support system, discontinuation of orals was high and the use rate fell to 15 percent at 12 months. The addition of injectables and intensified field activities raised the use rate to 21 percent. An 11-17 percent decline in the general fertility rate can be attributed to the initial phase of the contraceptive program." (Authors' abstract)

278 Huber DH, Curlin GT, Khan AR, Chakraborty J, Aziz KMA, Rahman M. Contraceptive Distribution Project. *In*: Proceedings of the 10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory for the year 1975:120-77

279 Huber DH, Khan AR, Curlin GT, Langsten R. Contraceptive Distribution Project in rural Bangladesh - one year experience. *In*: Proceedings of the 11th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory for the year 1976:74-93

280 Huber DH, Rahman M, Chakraborty J. Injectable contraceptives in six villages of Matlab Thana, Bangladesh; initial experience. *In*: Proceedings of the Workshop on "The Role of Injectable Contraceptives in Bangladesh", Bangladesh Fertility Research Programme and the Johns Hopkins University Fertility Research Project, Dhaka, 1 Mar 1977:26-35

281 Huber DH, Rahman M, Chakraborty J. Injectable contraceptives in six villages of Matlab Thana, Bangladesh: initial experience. Dhaka: Cholera Research Laboratory, 1977. 8 p.

"This reports on 103 women who enrolled in the study as initial acceptors of 6-month injections of Depo-Provera (depo-medroxyprogesterone acetate, DMPA), 3 cc-450 mg dose, and 70 women as initial acceptors of 3-month injections, 1 cc-150 mg dose, from August through December 1976. The injections were started by the Cholera Research Laboratory, which started a house-to-house oral contraceptive distribution project but found that the pills had high discontinuation rates. The injections were given any time during the menstrual cycle provided it could be ascertained the woman was not

pregnant. She was instructed to use condoms until after the next menstrual period. Follow-up visits were made within 15 days and at 1-month intervals. Continuation for the 3-month acceptors was 87% through 6 months and remained at 87% through 9 months. 80% of the 6-month acceptors came back for a 2nd injection. Switchover from 3 to 6-month injections usually occurred among women with few side effects who did not wish further pregnancies. Switchover from 6 to 3-month injections happened among women who suffered from some problem or feared future side effects. 40% of 3-month and 45% of 6-month acceptors reported at least 1 side effect. Most common were dizziness, weakness, cessation of menstruation, heavy or prolonged bleeding, and burning sensation in hands and feet. In comparison, 62% of pill users reported side effects, usually dizziness, intermenstrual bleeding, prolonged or heavy menstrual bleeding, and weakness. No women became pregnant after taking the injection although 3 were pregnant when they received the injection. 1 had an abortion 1 1/2 months after the injection, another had twin stillbirths, and the 3rd was carrying the pregnancy without complication. Most of the women had used other contraceptive methods. The injections were given in the upper arm by a Muslim male worker and this seemed to cause little concern to the women. Although no definite conclusions can be drawn from these preliminary data, a relatively large number of women are using injectables without significant difficulty and the continuation rate is high. It can be supplied with a minimum of expenditure of time and professional personnel." (POPLINE)

282 Huber DH. Management of bleeding side effects of DMPA - Matlab village based distribution of injectables [abstract]. *In*: A report on the First Asian Regional Workshop on Injectable Contraceptives, Chiang Mai, 15-19 May 1978:57-8

283 Huber DH, Harvey R. Saturation in a land of water. People 1977;4(1):19-22

"An experimental contraceptive distribution program is being run in Matlab, Bangladesh, under the joint sponsorship of the United States Agency for International Development and the Cholera Research Laboratory in Dhaka. The 3-year program has 1 1/2 years yet to run. Contraceptive saturation is conducted on a house-to-house basis by dais, older women who function as traditional birth attendants. 6 months after the initial distribution of pills, 15% of the women were continuing to use them, as compared to 1% previously. Acceptors were generally higher parity women. No correlation exists between such socioeconomic indicators as the husband's occupational level or educational level and contraceptive use. The project so far has revealed little resistance to pill distribution, a lack of reticence about family planning, and a lessening of strict Islamic attitudes towards women. Women often make the decision to accept contraception in a group. Experience with the Matlab program indicates that the government could run an equally successful program using existing manpower and facilities, that Bengali women are favorable toward and will practice family planning, and that such a contraceptive delivery system will be more effective in a setting of mutual trust between client and distributor." (POPLINE)

284 Huber SC, Huber DH, Khan AR, Chakraborty J, Chowdhury AY, Rahman M, Chowdhury AI. Oral contraceptives and family health in rural Bangladesh. Int J Gynaecol Obstet 1980;18(4):268-74

"A case-control survey of mothers was undertaken in rural Bangladesh to assess the health problems of oral contraceptive users compared with two groups of nonusers. The complaint most often reported was weakness--more than 80% of all women surveyed. Significantly more pill users than nonusers reported experiencing dizziness and eye problems. However, only one fifth of dizziness complaints among pill users could be attributed to the pill. Although more pill users reported a decrease in lactation, a greater problem among the control group was total cessation of lactation related to a subsequent pregnancy. Therefore, in this context the pill may postpone weaning more often than it reduces lactation. That few women choose to use oral contraceptives in the early postpartum period, when a reduction in breast milk would be most hazardous to

the child, contributes to this favorable balance. The attitude toward early termination of pregnancy was positive for 61% of pill users and 34% of nonusers. It is likely that abortion services would be favorably received in this traditional society." (Authors' abstract)

285 Huber SC, Khan AR, Huber DG, Rahman M, Chowdhury AY, Chakraborty J, Chowdhury AI. Oral contraceptive users and their children - a health survey in rural Bangladesh. Dhaka: Johns Hopkins University Fertility Research Project, 1977. 13 p. (FRP report, 9)

"To analyze the relative frequency of health problems reported by Bangladesh women using oral contraceptives, a case-control health status survey of mothers was conducted by trained female interviewers in rural Matlab thana. None of the interviewers were associated with the family planning program. The matching procedure paired each user with a control from the same village area plus an additional control from outside the area. The final study included 191 users, 191 village controls, and 185 controls from other villages. More than 80% of pill users reported weakness, significantly more than nonusers. Dizziness ($p < .01$), eye problems, and burning sensations of the extremities ($p < .05$) were also significant. Pill users had a larger number of children still breast-feeding; more nonusers had discontinued breast-feeding due to pregnancy. More pill users reported reduced breast milk; more nonusers reported cessation of lactation. The pill users had been advised not to start contraception until 6 months postpartum and many had waited up to 12 months. Effects on health of the child were difficult to assess, but seemed minimal. Users and village controls both reported more fever and sore throat than the matched controls from other villages. This is considered due to the infectious nature of the illnesses. Surprisingly, 2/3 of the women said they wanted no more children and 61% of pill users and 34% of nonusers would favorably consider pregnancy termination." (POPLINE)

286 Huffman SL, Chowdhury AKMA, Chakraborty J, Simpson NK. Breast-feeding patterns in rural Bangladesh. Am J Clin Nutr 1980 Jan;33(1):144-54

"Nearly 1,500 women with live births from February through September 1974 were included in this multiple phase study of breast-feeding patterns in a rural area of Bangladesh. The median duration of breast feeding was observed to be 30 months. Over 75% of the women whose most recently born children were living were breast feeding at 2-1/2 years postpartum. The major reason for discontinuing breast feeding in the 1st year was infant death, and in the 2nd year, pregnancy. Insufficient milk was given as a reason for discontinuing breast feeding by 18% of the women who stopped breast feeding for reasons other than child death; among these women almost 60% were pregnant at the time they stopped. Of the breast-feeding women who became pregnant, over 50% continued to breast feed through the 6th month of pregnancy. A sample of 200 breast-feeding women with children ages 17 to 25 months were followed longitudinally for 1-1/2 years or until the mothers conceived. A seasonal trend in suckling time was observed with women reducing suckling during the harvest season. Total suckling time was inversely associated with socioeconomic factors and with infant nutritional status. No association was found between mean suckling time and maternal nutritional status, maternal morbidity, infant morbidity, or child's sex." (Authors' abstract)

287 Huffman SL. Determinants of postpartum amenorrhoea in rural Bangladesh. Baltimore, Md.: Johns Hopkins University School of Hygiene and Public Health, 1977. 183 p. (Doctoral thesis).

288 Huffman SL, Chowdhury AKMA, Mosley WH. Difference between postpartum and nutritional amenorrhea [reply]. Science 1979 Mar 2;203(4383):922-3

289 Huffman SL, Chowdhury AKMA, Sykes ZM. Lactation and fertility in rural Bangladesh. Pop Stud 1980 Jul;34(2):337-47

"Analysis of data from various phases of a study of post-partum amenorrhoea in Bangladesh illustrated good aggregate consistency of response on menstrual status, but less individual consistency on duration of post-partum amenorrhoea. Using life table techniques, the median duration of amenorrhoea was calculated as 19.9 months for women with births between February and September 1974. There were substantial seasonal variations in duration, with the median decreasing from 21.5 months for women with February births to 16.9 months for those with September births. By contrast, the median duration of post-partum amenorrhoea varies by only two months for women in the lowest and highest quartiles of weight and weight for height. The seasonal pattern was similar for all weight groups." (Authors' abstract)

290 Huffman SL, Krasovec K. Maternal nutritional risk assessment in Bangladesh. *In*: Taylor TG, Jenkins NK, eds. Proceedings of the 13th International Congress of Nutrition, Brighton, 18-23 Aug 1985. London: Libbey, 1986:100-3

291 Huffman SL, Ford K, Allen HA, Jr., Streble P. Nutrition and fertility in Bangladesh: breastfeeding and post partum amenorrhoea. Pop Stud 1987 Nov;41(3):447-62

"From 1975 to 1980 a prospective study in a nearly 2,500 married, fertile women was conducted in Matlab, Bangladesh at the International Centre for Diarrhoeal Disease Research. Women were interviewed at monthly intervals to collect information on nutritional and reproductive status, in order to study the factors associated with natural fertility. The median duration of amenorrhoea for women with no child deaths was 15.5 months, with older women and those of higher parities recording longer durations than younger women or those of lower parities. Median duration of amenorrhoea for women with six or more years of education was 8.4 months compared to 16.4 months among women with no education. When classified by weight at pregnancy termination, average duration of amenorrhoea of women weighing less than 38 kg was 17.6 months compared to 13.6 months among women weighing more than 44 kg. Proportional hazards analyses show that mother's education, parity, month of birth, supplementation practices and nutritional status were significantly associated with the probability of resuming menstruation." (Authors' abstract)

292 Huffman SL, Wolff M, Lowell S. Nutrition and fertility in Bangladesh: nutritional status of nonpregnant women. Am J Clin Nutr 1985 Oct;42(4):725-38

"In October 1975 a longitudinal study of over 2000 married women was initiated in Matlab, Bangladesh, to determine the association of fertility with nutritional status. This paper reports the results on nutritional status among nonpregnant women. The average weight and height of the study women was 40.4 kg and 147.9 cm. Weight fluctuated throughout the 2-1/2 yr study period corresponding to seasonal food shortages. Maternal weight (controlling for height) was consistently lower for older, higher parity women, illustrating the negative impact of increasing numbers of births on the mother's nutrient stores. Older women were also shorter than younger women, due to greater deficits in growth during childhood. Older, higher parity women had slightly lower hematocrits than younger women with an overall mean of 35%. Education level was associated positively with height, weight, and hematocrit. Muslims were taller and heavier than Hindus, reflecting their generally higher socioeconomic status. The seasonal pattern of nutritional status is discussed in relation to the seasonality of food availability, activity patterns, and incidence of infectious disease." (Authors' abstract)

293 Huffman SL, Chowdhury AKMA, Chakraborty J, Mosley WH. Nutrition and post-partum amenorrhoea in rural Bangladesh. Pop Stud 1978 Jul;32(2):251-60

"In this study we attempted to isolate some of the variables affecting the extended lengths of post-partum amenorrhoea evident in rural Bangladesh. The seasonal return to menstruation is an interesting but as yet unexplained phenomenon. As previously reported in the literature, maternal age is strongly associated with post-partum amenor-

rhoea. This effect may relate to an internal physiological mechanism that takes longer to return to normal hormonal functioning with increasing age. This could be in combination with a lowered threshold of suckling stimulus needed to prevent ovulation among older mothers. Evidence for decreased fecundability among older women in all populations does suggest that the hormonal mechanisms necessary for successful ovulation, nidation, and maintenance of the pregnancy are impaired with increasing age. Since hormonal mechanisms are responsible for the onset of menses post-partum, it is likely that a parallel effect of age found among lactating women is due to a natural physiological mechanism. The data from this study suggest that maternal nutritional status is unlikely to shorten the length of post-partum amenorrhoea significantly. Average durations of amenorrhoea differed by less than one month for well-nourished women. This effect is minimal in relation to the total length of the birth interval. A finding that supports the role of breast-feeding practices in relation to post-partum amenorrhoea is that infant food supplementation practices were related to the proportion of amenorrhoeic women. This suggests that improvements in the quantity or quality of infant foods may lead to decreased frequencies of suckling and this may result in curtailed durations of amenorrhoea with subsequently shortened birth intervals. We have no evidence why socio-economic status was related to post-partum amenorrhoea. However, socio-economic status proved to have a large independent effect. We suspect that the cultural factors differing between socio-economic groups result in variations in breast-feeding practices. Women in the upper classes in Bangladesh, like in many other areas of the world, may believe that breast-feeding is a less sophisticated and thus less suitable behaviour. The beliefs may cause upper-class women to restrict their patterns of breast-feeding and limit the frequency with which they breast-feed their infants. The evidence suggests that breast-feeding practices are most probably the primary determinant of post-partum amenorrhoea. One of the methodological difficulties in confirming this assumption is that it is seldom possible to control for breast-feeding practices. The best evidence available at present that breast-feeding practices determines length of amenorrhoea is the fact that menstruation returns rather promptly when suckling is terminated because of infant death." (Authors' abstract)

294 Huffman SL, Chowdhury AKMA, Mosley WH. Postpartum amenorrhea: how is it affected by maternal nutritional status? Science 1978 Jun 9;200(4346):1155-7

"The average length of postpartum amenorrhea reported by breast-feeding women in rural Bangladesh in 1975 was 18 to 20 months. Its duration was found to be only slightly related to maternal nutritional status. There was no evidence of a threshold of weight for height necessary for the resumption of menses postpartum. Factors related to the duration of postpartum amenorrhea were maternal age, socioeconomic status, and supplemental feeding of the infant." (Authors' abstract)

295 Huffman SL, Huque AAZ. Pre-school child malnutrition in Bangladesh: causes and interventions. Baltimore, MD: Johns Hopkins University, 1983. 65 p.

296 Huffman SL. Response to determinants of natural fertility reconsidered. Pop Stud 1985 Mar;39(1):163-8

"This is a response to Langsten's critique (same issue) of a study conducted by the author to assess the association of suckling patterns with resumption of menses in Bangladesh. In his critique, Langsten suggests that the 1974-5 famine has affected the results of this study conducted in Matlab in 1975-76. The points raised by Langsten are each discussed separately to show that he is mistaken in his interpretation of the famine's effects on the results. In attempting to illustrate the impact of the famine on women in Bangladesh, and possible biases in the data collected, Langsten has lost sight of the specific study design (purposely chosen to yield a selective sample of breastfeeding women) and the results. Only a minimal difference in the length of amenorrhea was seen for women with average weights of 37.1 kg. (21.2 months) compared to those with mean weights of 44.8 kg (20.2 months). Whatever the famine's effect on the data, it is

likely to have had only a slight effect on the magnitude of these differences, but none on the conclusions. In this population, improvements in mother's nutritional status are unlikely to have a major impact on reducing the length of amenorrhea and increasing fertility. A difference of 2 months in a population with an average length of amenorrhea between 18 and 22 months will result in an increase in fertility of about 6% over a woman's total reproductive span. This is insufficient evidence to suggest that mother's nutritional status has a major effect through postpartum amenorrhea on fertility." (POP-LINE)

297 Huffman SL, Chowdhury A, Allen H, Nahar L. Suckling patterns and post-partum amenorrhoea in Bangladesh. J Biosoc Sci 1987 Apr;19(2):171-9

"The association between breast-feeding patterns and resumption of menses post-partum was examined in a longitudinal study initiated in March 1976 in Bangladesh. Information on suckling patterns and menstrual status was collected on 148 breast-feeding women who were still amenorrhoeic at 17-25 months post-partum at the beginning of the study. Suckling was measured during an 8-hr period once a month for up to 19 months of follow-up. A high frequency of suckling was found, even at this late post-partum duration. Total suckling time and the number of suckling episodes declined with the age of the child but the mean duration of each episode did not change. The fact that regression analyses did not show a correlation between suckling patterns and return of menses post-partum may be related to the large individual variations in suckling patterns and in the duration of amenorrhoea in this population, and the need to study suckling patterns for longer than 8 hr per day." (Authors' abstract)

298 Hughes JM, Boyce JM, Levine RJ, Khan MU, Aziz KMA, Huq MI, Curlin GT. Epidemiology of eltor cholera in rural Bangladesh: importance of surface water in transmission. Bull WHO 1982;60(3):395-404

"In order to define the role of water used for drinking, cooking, bathing, and washing in the transmission of *Vibrio cholerae* biotype eltor infections in an area with endemic cholera, surveillance was initiated in neighbourhoods with a culture-confirmed cholera index case and others with index cases with non-cholera diarrhoea as controls. In neighbourhoods with cholera infection, 44% of surface water sources were positive for *V. cholerae*; whereas only 2% of surface sources were positive in control neighbourhoods. Canals, rivers, and tanks were most frequently positive. There was an increased risk of infection for families using water from culture-positive sources for drinking, cooking, bathing, or washing and for those using water sources used by index families for drinking, cooking or bathing. Analysis of the results for individuals showed that in this case there was an increased risk of infection associated with using water from culture-positive sources for cooking, bathing, or washing, but not with using water from culture-positive sources for drinking. Individuals who used the same water source as an index family for bathing were more likely to be infected than those using different sources. For families drinking from a culture-negative source, there was an association between infection and bathing in a positive source. For families using a different bathing source from the index family there was an association between infection and drinking from the same source as the index family, and for families using a different drinking source from the index family there was an association between infection and bathing in the same source as the index family. These data suggest that use of surface water is important in the transmission of *V. cholerae* and that, in addition to providing safe drinking water, education regarding the risk of transmission of infection by water from potentially contaminated sources used for other purposes, especially bathing, may also be necessary to control transmission in areas where eltor cholera is endemic." (Authors' abstract)

299 Hughes JM, Boyce JM, Levine RJ, Khan MU, Aziz KMA, Huq MI, Curlin GT. Epidemiology of El Tor cholera in rural Bangladesh: importance of surface water in transmission. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 21 p. (ICDDR,B scientific report, 52)

300 Hughes JM, Boyce JM, Aleem ARMA, Wells JG, Rahman ASMM, Curlin GT. *Vibrio parahaemolyticus* enterocolitis in Bangladesh: report of an outbreak. Am J Trop Med Hyg 1978 Jan;27(1):106-12

"In March 1974 eight men in a rural area of Bangladesh, experienced an illness characterized by severe abdominal cramps, nausea, vomiting and bloody diarrhea with onset 20 min to 9 h (median 2.5 h) after eating one of two fish dishes at a restaurant. Rectal cultures from all eight grew Kanagawa-positive strains of *Vibrio parahaemolyticus* (serotype O3K5) that were negative in the Sereny test for invasiveness and the Y-1 adrenal cell and infant mouse assays for enterotoxin production. The short incubation, severity of abdominal cramps and grossly bloody stools distinguish this illness from that usually associated with *V. parahaemolyticus* infection in the United States." (Authors' abstract)

301 Hughes JM, Boyce JM, Levine RJ, Khan MU, Curlin GT. Water and the transmission of El Tor cholera in rural Bangladesh. Dhaka: Cholera Research Laboratory, 1977. 24 p. (CRL working paper, 2)

"During the 1973-74 cholera season an investigation was conducted in the Matlab field trial area to determine the appropriate cholera case finding techniques for the 1974 cholera toxoid field trial, and to elucidate the role of water in cholera transmission. Visits to the house and neighbourhood of cholera index cases identified an average of 5.6 persons infected with *V. cholerae* and 3.3 symptomatic cholera cases for each index case residing in a small neighbourhood. No cases were detected in control neighbourhoods. Children age 1-14 years and adult females accounted for 4.8 total cases and 2.7 symptomatic cases per index case and were available at home in contrast to adult males. For these reasons this group was chosen for the toxoid vaccine trial in 1974. Extensive contamination of water was found in neighbourhoods where individuals infected with *V. cholerae* resided. Fortythree percent of all water sources in infected neighbourhoods were positive for *V. cholerae* versus 2% in control neighbourhoods. Families using a culture positive water source for drinking, cooking, bathing, or washing were significantly more likely to be infected with cholera than other families. In addition, families using the same water source as the index family for either drinking or bathing were more likely to be infected. These observations suggest that water may be important in transmission of cholera in the Matlab field surveillance area." (Authors' abstract)

302 Huq A, Aziz KMS. Comparison of physiochemical characteristics of ponds and canal water in Matlab, Comilla [abstract]. *In*: Proceedings of the Fourth Bangladesh Science Conference, Rajshahi, 2-5 Mar 1980:103

303 Huq A, Chowdhury MAR, Felsenstein A, Colwell RR, Rahman R, Hossain KMB. Detection of *Vibrio cholerae* from aquatic environments in Bangladesh. *In*: Yasuno M, Whitton BA, eds. Biological monitoring of environmental pollution; proceedings of the Fourth IUBS International Symposium on Biomonitoring of the State of the Environment (Bioindicators), Tokyo, 6-8 Nov 1987. Tokyo: Tokai University Press, 1988:259-64

'The seasonal distribution of *Vibrio cholerae* is being studied in water samples from ponds and river in Matlab, Bangladesh. Emphasis is given on the physical, chemical and biological parameters of the aquatic environment. Sampling includes sites with no known human contamination to those with moderate to heavy utilisation by the surrounding population. Results from six months of bi-weekly sampling shows *V. cholerae* and *V. mimicus* are isolated more frequently from water than from plankton samples. With fluorescent antibody examination for *V. cholerae* 50 plankton samples out of 110 were positive. However, none of the samples yielded *V. cholerae* 01 following conventional plate culture method, suggesting *V. cholerae* 01 is in a non-culturable state. Increased salinity was significantly correlated with increased isolation of environmental *V. cholerae*. The influence of the dissolved oxygen, pH and water temperature on *V. cholerae* isolation is being examined and is analyzed with data on the presence of phytoplankton and zooplankton. Chemical factors measured are nitrate, nitrite, phosphate, manganese, iron,

iodine, hardness, fluoride, copper, chromium, CO_2, calcium content and conductivity." (Authors' abstract)

304 Huq MI. Characterisation of non-agglutinable vibrios and *Vibrio parahaemolyticus* isolated from diarrheal cases in Bangladesh. *In*: Mazumder DNG, Chakraborty AK, De S, Kumar AK, eds. Proceedings of the 8th National Conference on Communicable Diseases, Calcutta, 8-10 Dec 1978. Calcutta: All India Institute of Hygiene & Public Health, 1980:68-74

305 Huq MI, Huber D, Kibryia G. Isolation of urease producing *Vibrio parahaemolyticus* strains from cases of gastroenteritis. Indian J Med Res 1979 Oct;70:549-53
"In Bangladesh, incidence of diarrhoea due to *Vibrio parahaemolyticus* was not common and occurred as sporadic cases in places. Since 1974, the number of cases was found to increase, and a few severe clinical cases have been reported in Dhaka and Matlab Hospital. Isolates from these cases fitted very well in the biochemical and other characteristics of classical *V. parahaemolyticus* strains but a few produced urease. This report presents the isolation of a group of urease producing *V. parahaemolyticus*." (Authors' abstract)

306 Huq MI, Glass RI, Alim ARMA. Microbiologic studies of multiple antibiotic resistant *Vibrio cholerae* 01 (MARV) El tor in Bangladesh. *In*: Holme T, Holmgren J, Merson MH, Mollby R, eds. Acute enteric infections in children; new prospects for treatment and prevention. Amsterdam: Elsevier, 1981:126-31

307 Husain Z, Chen LC. Bangladesh. *In*: Watson WB, ed. Family planning in the developing world: a review of programs. New York: Population Council, 1977:31-3

"In 1975 the Bangladesh population program was reorganized and a Division of Population Control and Family Planning was established in the Ministry of Health. A seminar to heighten government commitment to family planning, a nationwide intensive household drive, and specific vasectomy and tubectomy drives were undertaken. New demographic data are limited. Crude birth rate is estimated at 49/1000, total fertility rate 7.1, crude death rate at 20/1000, infant mortality at 153/1000 live births, and female and male life expectancies at birth at 47 and 46 years. In 1974-1975 the Cholera Research Laboratory, which maintains a longitudinal vital registration system in Matlab, noted unusual demographic fluctuations, probably as a result of severe food shortages in 1974. The crude birth rates which had averaged about 45 dropped to 40 and the crude death rates rose from 15 to 20. Similar crude birth and death rates were registered for 1975 in a small area of Noakhali District by the Companiganj Health Project. These figures indicate that large numbers of excess deaths may have occurred due to food shortages. The new Population Control division has trained 4500 fieldworkers and 1500 supervisors to begin intensive motivational work. In 1975, 3 million cycles of pills and 2.5 million condoms were distributed, a significant improvement over 1974. In addition the number of IUD insertions, male and female sterilizations, and menstrual regulations performed increased. The substantial improvement in performance is attributed to the low level of activity in 1974 and the program initiatives of 1975." (POPLINE)

308 Interaction of infection and nutrition in children: two studies from Bangladesh. Nutr Rev 1981 Nov;39(11):394-6

309 Islam MS, Shahid NS, Haque E. Belief and attitude related to food preference and food avoidance during pregnancy in a rural population of Bangladesh. *In*: Proceedings of the 8th Bangladesh Science Conference, Dhaka, 1983:329-30

310 Islam MS, Shahid NS, Haque ME. Belief and practice related to food preference and food avoidance after childbirth in Matlab, Bangladesh. *In*: Proceedings of the Second National Seminar of the Bangladesh Population Association, Dhaka, 22-24 Aug 1984. Dhaka: Bangladesh Population Association, 1985:240-6

311 Islam MS, Shahid NS, Haque ME, Mostafa G. Characteristics and practices of traditional birth attendants in Matlab, Bangladesh. J Prev Soc Med 1984 Dec;3(2):23 - 31

"The study highlights the characteristics of 258 birth attendants who, in 1982, delivered 505 women in the Matlab Demographic Surveillance System area of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). Traditional Birth Attendants (TBAs) were predominantly illiterate, older or widowed women, mainly housewives. They delivered 85% of local women, cut 67% of the umbilical cords and tied 80% of them. Relations of the mother and mothers of the newborn delivered the remaining women, and both cut and tied the umbilical cords. Mothers of the newborn applied dressing materials to 94% of the umbilical cords and relations of the mother did so for the rest. Razor blades were used to cut the umbilical cords in 80% of deliveries and bamboo splits in the remaining cases. Torn cloth or thread was used to tie 60% of umbilical cords, while old and new thread, respectively were used for 22% and 18% cases. The razor blades or bamboo splits and the thread used in deliveries were not cleaned in 56% and 77% of the cases respectively. In a few cases they were cleaned, but unscientifically. Unconventional materials, such as ash from ovens, goat or cow-dung, burnt catechu powder, mustard oil and vermillion were applied as umbilical cord dressings." (Authors' abstract)

312 Islam MS, Shahid NS, Haque ME, Mostafa G. Customs related to childbirth in a rural area of Bangladesh. Hygeia (Dhaka) 1989;3(4):109 - 14

"Customs related to childbirth between the two religious groups, Muslim and Hindu were investigated through a survey carried out in Matlab project of International Centre for Diarrhoeal Disease Research, Bangladesh. Included were 505 pregnant women spread over 46 of 159 study villages of the area. The data analysis related to place of delivery, location of home delivery, kind of cover used on the floor during delivery, colostrum feeding to the newborns and confinement of the mothers and the newborns in the birth rooms. Deliveries of 86% of the women took place in their husband's house and 14% in their parent's house. Living and eating rooms were utilized as labour rooms in 86% of the deliveries. In the remaining cases, kitchens, verandahs, separate or new rooms were utilized. Old or torn mats were used as a cover on the floor in 82% of deliveries. In the remaining deliveries banana leaves or nothing on the floor, polythene or rubber sheets, gunny bags, jute sticks and torn clothes were used. 82% of the mothers fed colostrum to their newborns. The new borns were confined in their birth rooms for a mean duration of 10 + S.D. 6 days and their mothers for 8 + S.D. 5 days. Training traditional birth attendants in modern methods of delivery and immunization of potential mothers are effective measures to prevent probable infections and consequent mortality. Friendly persuasion and health education of mothers and traditional birth attendants might modify the customs harmful to mothers and neonates." (Authors' abstract)

313 Islam MS, Curlin GT, Aziz KMA. An estimation of response bias of literacy in a census of rural Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 21 p. (ICDDR,B scientific report, 21)

314 Islam MS, Curlin GT, Aziz KMA. An estimation of response bias of literacy in a census of rural Bangladesh [abstract]. *In*: Proceedings of the Fourth Bangladesh Science Conference, Rajshahi, 2 - 5 Mar 1980:120 - 21

315 Islam MS, Becker S. Interrelationships among certain socioeconomic variables in a rural population of Bangladesh. Rur Demogr (Dhaka) 1979;6(1 - 2):51 - 65

"Interrelationships among three key socioeconomic variables, household income, education and occupation of head of 2,352 households were determined and compared with a fourth variable, dwelling space. The 1974 census data of Matlab demographic surveillance about dwelling space, education and primary occupation of head of households were matched with household income data calculated on the annual household land yield

collected through a follow-up systematic sample survey in five percent of the households. There was significant difference in the mean education level and the mean dwelling space between groups ($p<0.001$). Mean annual income increased significantly with educational level of the household head ($p<0.001$). Similarly, mean dwelling space increased significantly with educational level of the head of household and annual income of the household ($p<0.001$). Dwelling space is a readily available objective criterion for measuring the socioeconomic status of rural households when reliable data on other such variables are lacking." (Authors' abstract)

316 Islam MS, Becker S. Interrelationships among certain socioeconomic variables in a rural population of Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 16 p. (ICDDR,B working paper, 18)

Inter-relationships among 3 key socio-economic variables- -household income, education, and occupation of heads of 2,352 households were determined and compared with a 4th variable, dwelling space. The 1974 census data of Matlab demographic surveillance about dwelling space, education and primary occupation of heads of households, were matched with household income data calculated on the annual household land yield collected through a follow-up systematic sample survey in 5% of the households. There was significant difference in the mean education level and the mean dwelling space between occupational groups. Mean annual income increased significantly with educational level. Mean dwelling space increased significantly with educational level and annual income. Dwelling space is, thus, seen as a readily available and easily measurable criterion for determining the socio-economic status of rural households. (Modified authors' abstract)

317 Islam MS, Bhuiya A, Yunus M. Socioeconomic differentials of diarrhoea morbidity and mortality in selected villages of Bangladesh. J Diarrhoeal Dis Res 1984 Dec;2(4):232-7

"Socioeconomic differentials of diarrhoea episodes, hospitalizations and fatalities were investigated in 11 selected villages of the Matlab study area in Bangladesh. Four data sources were used: (i) a UNICEF-CRL (Cholera Research Laboratory, now ICDDR,B) collaborative study of the impact of hand-pumped tubewells on diarrhoea episodes; (ii) hospitalized diarrhoea patients; and (iii) field diarrhoea deaths of 1975. These were linked with socioeconomic and demographic data from a 1974 ICDDR,B census. Socioeconomic status showed a significant positive relationship with the diarrhoea episode rate, and a negative relationship with the mortality rate. The relationship between socioeconomic status and the diarrhoea hospitalization rate was inconsistent. Possible attitude differences toward the disease symptoms in various socioeconomic subgroups should be recognized, before designing studies to estimate diarrhoeal disease prevalence and control." (Authors' abstract)

318 Islam MS, Rahaman MM, Aziz KMS, Patwari Y, Rahman M. Variations of oral therapy volume measurement in rural Bangladesh [abstract]. *In*: Proceedings of the National Workshop on Oral Rehydration, International Centre for Diarrhoeal Disease Research, Bangladesh, 26-28 Sep 1979. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1980:11

319 Islam S, Curlin GT. Objective indices of social class in agrarian families in Matlab. *In*: Proceedings of the 9th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between Center for Medical Research and Cholera Research Laboratory, 1975:242-61

320 Jalil MA. A multivariate analysis of measurements of socio-economic status from rural areas in Bangladesh [abstract]. *In*: Program and abstracts of papers of the Fourth Annual Conference of the Indian Society for Medical Statistics, Bangalore, 24-26 Nov

1986. Bangalore: National Institute of Mental Health & Neuro Sciences, 1986:86

321 John AM, Menken JA, Chowdhury AKMA. The effects of breastfeeding and nutrition on fecundability in rural Bangladesh: a hazards-model analysis. Pop Stud 1987 Nov;41(3):433-6

"Data taken from the 'Determinants of Natural Fertility' study, Bangladesh, are used with multivariate hazard models to study variations in fecundability between women, especially the relationship between nutritional status, breastfeeding practices, and the monthly probability of conceiving. It is found that fecundability varies both between women of a given age and, for a particular woman, by age. The variation is related to four variables: separation, which affects coital frequency; age, which represents biological changes; lactation practices; and the duration of amenorrhoea. Nutrition above famine or starvation levels is not a significant determinant of fecundability. The most surprising finding is the effect of the pattern of breastfeeding on fecundability: as a menstruating woman begins to wean her child, her probability of conceiving increases as her serum prolactin, which inhibits ovulation, decreases. Thus, those menstruating women who are most likely to conceive are those who have completely weaned their infants in the very recent past." (Authors' abstract)

322 Kabir M. Determinants of secondary sterility in Matlab Upazila. J Prev Soc Med 1984 Dec;3(2):55-61

323 Kabir M. Levels and patterns of infant and child mortality in Bangladesh. Soc Biol 1977 Summer;24(2):158-65

"Utilizing the 1974 Retrospective Survey data and registration data by Cholera Research for 1967-68 and by the Population Growth Experiment for 1962-63, this study attempts to measure infant and child mortality levels in Bangladesh and to determine their structure. The child mortality technique is used to convert proportions dead among children ever born to women in the childbearing ages into conventional life table measures of mortality. Shortcomings of present methods of measuring infant and child mortality in developing populations are discussed." (Author's abstract)

324 Karim A, Chowdhury AKMA, Kabir M. Nutritional status and age at secondary sterility in rural Bangladesh. J Biosoc Sci 1985 Oct;17(4):497-502

"In a prospective study of 2324 women in Matlab, Bangladesh, the occurrence of primary and secondary sterility by age groups was examined. The results were related to the nutritional status of the women, as assessed by measurements of height, weight, arm circumference and ponderal index. There is evidence that nutritional status is an important factor in estimated age at sterility, with thinner women experiencing a slightly earlier menopause." (Authors' abstract)

325 Khan AR, Huber DH. Household contraceptive distribution program in rural Bangladesh -- six month's experience. *In*: Gardner JS, Wolff RJ, Gillespie D, Duncan GW, eds. Village and household availability of contraceptives: Southeast Asia, 1976. Seattle: Battelle Memorial Institute, Human Affairs Research Center, 1976:55-76

"The Cholera Research Laboratory (CRL) conducted house-to-house distribution of oral contraceptives in Matlab, a poor, rural, agricultural, traditional area of Bangladesh during the October-December 1975 period. Household distribution was used due to lack of convenient contraceptive availability, inadequate clinic facilities, and a shortage of medical personnel. The study area was divided into 2 parts, in 1 of which contraceptive distribution was made to the house and in the other of which a family planning clinic provided contraceptive supplies. Baseline KAP and contraceptive prevalence surveys were conducted before the distribution program began in order to provide a basis for comparison. There was an increase in contraceptive use among eligible women from 1% preprogram

to 15% after 6 months. Religion (Muslim or Hindu) did not differentiate users. Nor did education or husband's occupation. Contraceptive practice increased as the number of live births for a woman rose. 62% of all women who started with the pill reported at least 1 side effect; dizziness was most commonly reported and was the most common cause of discontinuance. Management of side effects and good counseling are important to the program." (POPLINE)

326 Khan AR, Huber DH, Rahman M. Household distribution of contraceptives in Bangladesh - rural experience. Rur Demogr (Dhaka) 1977;4(1-2):1-15

"The Cholera Research Laboratory distributed oral contraceptives house-to-house in half of the Matlab Thana Field Surveillance Area in November 1975 to assess the acceptability and effectiveness of a programme that provides full availability of contraceptives with a minimum of additional services. Eight field workers were given 5 days' training and together with village dais distributed instructions and contraceptives to all married fertile women who wished to receive the supplies in the 150 villages of the contraceptive area. The other half (control area) received government services as before. Sixty-nine percent of all eligible women received the pill during the initial distribution. Prevalence surveys showed the rate of contraceptive practice increased from 1 percent before the distribution to 18 percent 3 months later. However, the Dai system for managing client problems was not strong and the use rate declined to 14 percent at 9 months due to dropouts exceeding new users. A more intensive promotion of the condom resulted in a modest increase to 15 percent. However, the addition of injectable contraceptives in 6 villages increased the practice rate to 20 percent. The project has thus far demonstrated a considerable interest in contraception among rural couples. However, the management of fears, complaints and side effects requires a higher quality service delivery approach. Availability alone is not enough for many couples. We found the addition of injectables further increased the level of contraceptive practice more than condoms." (Authors' abstract)

327 Khan AR, Huber DH, Rahman M. Household distribution of contraceptives in Bangladesh--the rural experience. Dhaka: Cholera Research Laboratory, 1977. 16 p. (CRL scientific report, 5)

In October 1975, the Cholera Research Laboratory (currently International Centre for Diarrhoeal Disease Research, Bangladesh) started a house-to-house distribution of contraceptives in the Matlab field surveillance area. For this purpose, the whole field area was divided into 2 -- 1 designated as the contraceptive distribution area and the other as a control. A total of 150 villages with a population of about 125 thousand were in the distribution area, with 84 villages with a population of about 135 thousand were in the control area. All married women aged 15-44 years in the distribution area were supplied with oral contraceptives. Only about 1% of the population had previously been using a modern contraceptive method. The household distribution project significantly promoted this practice level to about 15% in a one-year period. (Modified authors' abstract)

328 Khan AR, Huber DH. Household distribution of contraceptives in Bangladesh - the rural experience. Dhaka: Bangladesh Fertility Research Project, 1976. (BFRP report, 6)

329 Khan MA, Smith C, Akbar J, Koenig MA. Contraceptive use patterns in Matlab, Bangladesh: insights from a 1984 survey. J Biosoc Sci 1989 Jan;21(1):47-58

"An experimental maternal and child health and family planning programme has been in existence in Matlab for almost 10 years. During this time the project has achieved remarkable success in the area of family planning. Based upon a 1984 survey, this study examines the pattern of contraceptive use in the Matlab treatment area, and contrasts it with the regular government programme in the neighbouring comparison area.

Important differences between the two areas are observed, with the treatment area characterized by substantially higher levels of current contraceptive use, greater reliance upon temporary methods for birth spacing and, among acceptors of sterilization, more prior experimentation with other methods. In the comparison area lower rates of contraceptive use are observed, with heavy reliance upon tubectomy for limiting family size. The findings suggest that an intensive and innovative family planning programme in rural Bangladesh can achieve success not only in terms of contraceptive prevalence, but can also attract users interested in child spacing and others wanting to limit their family size, by offering the widest range of contraceptive methods." (Authors' abstract)

330 Khan MMA, Smith C, Koenig MA. Contraceptive dynamics in the Matlab treatment and comparison areas: insights from a 1984 survey. *In*: Kaliaperumal VG, Subbakrishna DK, Sundararaj N, eds. Biostatistics – issues in medical research; proceedings of the Fourth Annual Conference of the Indian Society for Medical Statistics, Bangalore, on 24–26 Oct 1986. Bangalore: National Institute of Mental Health and Neuro Sciences, 1989:130–9

"The purpose of this paper was to throw light on contraceptive use pattern in both treatment and comparison areas. The data source for this paper was derived from the 1984 Matlab survey, a KAP survey of 6214 women, carried out in Bangladesh. The knowledge of family planning methods and the attitude towards family size were compared between treatment and comparison areas with a view to test the hypothesis that family planning programs could achieve success under prevailing unfavourable socio-economic conditions." (Authors' abstract)

331 Khan MMA, Smith C, Koenig M. A decomposition of unmet need for family planning in rural Bangladesh [abstract]. *In*: Programme and abstracts of papers of the Fourth Annual Conference of the Indian Society for Medical Statistics, Bangalore, 24–26 Nov 1986. Bangalore: National Institute of Mental Health and Neuro Sciences, 1986:58

332 Khan MU. Age of acquiring diarrhoeal diseases by rural children, Bangladesh [abstract]. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):504

333 Khan MU. Breastfeeding, growth and diarrhoea in rural Bangladesh. Hum Nutr Clin Nutr 1984 Mar;38C(2):113–9

"It has been observed that breastfeeding protects infants from many illnesses. We examined whether breastfeeding alone or with a supplement maintained normal growth and whether the incidence of diarrhoea was different in the two groups. The study was conducted on 223 children in a rural area. Anthropometric measurements were obtained every month up to 12 months and then every 3 months. The history of feeding was recorded. The mothers were visited weekly to record information on diarrhoeal illness. Homemade supplements were used. The average weight of exclusively breastfed children was not significantly different from that of those who were breastfed with supplements. The average weight paralleled the Harvard standard up to the 4th month, and the increase in height showed the same pattern. During the first year the incidences and duration of diarrhoeal attacks were higher in the exclusively breastfed children than in the supplemented groups. On average there were 3.2 attacks of diarrhoea per child per year and the average duration was 15.9 days per child per year during the first 2 years." (Author's abstract)

334 Khan MU, Bart KJ, Haq Z. The changing pattern of cholera in East Pakistan: the appearance of El Tor *Vibrio cholerae*. J Pak Med Assoc 1970 Feb;20(2):43–8

"The incidence of cholera, the clinical course of hospitalized cases and the spectrum of illness among family contacts during simultaneous outbreaks of El Tor Ogawa and classical Inaba cholera was studied in East Pakistan. A rise in the incidence of El Tor Ogawa cholera is described in East Pakistan. Although the El Tor Ogawa and classical Inaba

hospitalized cholera patients had identical clinical courses, the case to infection ratio among those at highest risk in the community i.e., family contacts was strikingly different. The high frequency of unrecognized El Tor Ogawa infections coupled with the prolonged survival of El Tor Ogawa vibrios in the environment makes dissemination of El Tor Ogawa cholera through a community possible without recognition." (Authors' abstract)

335 Khan MU, Khan MR, Sheikh AK. Dehydrating diarrhoea & cataract in rural Bangladesh. Indian J Med Res 1987 Mar;85:311 - 5

A retrospective - cum - prospective study was conducted in 149 villages of Matlab, Bangladesh on a population of 182,976 to ascertain whether dehydration due to diarrhoea has any association with developing cataract, an eye disease. Between 1966 and 1981, of the 7,386 admitted patients with cholera, 14 (0.2%) had cataracts, while 916 (0.5%) of the remaining 175,590 non - admitted population had cataracts. Between 1978 and 1981, 8 (0.4%) of the 1,922 admitted cholera patients had cataracts, and 922 (0.5%) of the remaining 181,054 non - admitted population had cataracts. Between 1978 and 1981, of the 1,258 admitted patients with shigellosis, 11 (0.87%) had cataracts, and 919 (0.5%) of the remaining 181,718 non - admitted population had cataracts. In all these cases, the differences were not statistically significant ($p > 0.05$). Prevalence of cataracts in admitted patients with acute diarrhoea was not higher than that for non - admitted patients. In general, dehydration due to diarrhoea was found to occur more frequently in children than in elderly people, while cataract was common in adults aged 50 years and above. It is concluded that dehydration from acute diarrhoea has no association with cataract.

336 Khan MU, Curlin GT. Development of milk teeth in rural Meheran children of Bangladesh. Dhaka: Cholera Research Laboratory, 1978. 23 p. (CRL working paper, 8)

337 Khan MU, Curlin GT, Chakraborty J. Growth and development studies: Meheran. Dhaka: International Centre for Diarrhoeal Disease Research, 1979. 28 p. (ICDDR,B scientific report, 28)

Growth and development studies were continued for 3 years in the village of Meheran of Matlab thana. Usual anthropometric measurements were obtained monthly up to 12 months and then after each quarter. History of diet, socio - economic status and illnesses were obtained regularly. Eruption of teeth was also observed and recorded. The measurements of height, weight, head, chest, arm and crainiococcyx length have been recorded and tabulated. These measurements are close to Boston standard at birth. These remain parallel during the 1st quarter of life. With the increase in age the gap between Boston standard and this group widens, and the 90th percentile measurements fall below the Boston standard, especially from the 5th month. Dietary supplementation was poor. Children born with low birth weight could not attain the measurements of children born with higher birth weight up to 3 years of age. This trend may be reflected in later life. The children, who died earlier than others, were mostly born with low birth weight, and they continued to have lower birth weight than others until they died. Proper nutrition of the expectant mothers and proper supplementation of food from the 3rd month of life of every child are most essential for growth and development.

338 Khan MU, Curlin GT. Growth and development studies, Meheran. *In*: Proceedings of the 10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory for the year 1975:83 - 106

339 Khan MU, Curlin GT. Growth and development studies, Meheran, Comilla [abstract]. *In*: Souvenir of the 5th National Conference of the Bangladesh Medical Association, Dhaka, 6 - 9 Jan 1977

340 Khan MU. Growth and development studies: Meheran, Matlab. *In*: Proceedings of the 9th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between Center for

Medical Research and Cholera Research Laboratory, 1975:292 – 304

341 Khan MU, Curlin GT, Chakraborty J. Growth and development studies: rural Meheran, Comilla. Bangladesh Med J 1979:7(3 – 4):74 – 90

"Growth and development studies had been conducted for 3 years in the village Meheran of Matlab Police station. Usual anthropometric measurements were obtained. History of diet, dentition, socioeconomic status and illness were obtained regularly. The pattern of weight, height, head, chest, arm and Hb have been recorded and tabulated. These measurements are close to Boston standard at birth. With the increase in age the gap between Boston standard and this group widens up and the 90th percentile measure – ments fall below the Boston standard specially from the 4th month. Dietary supplementa – tion was poor. Children born with low birth weight could not attain the measurements of children born with higher birth weight. The Hb of the low birth weight group though initially higher, fell below the high birth weight group from 4th month. Though the level of income is very low the children of parents having higher per capita income tended to attain better measurements than the poorer ones. The children who died out earlier than other were mostly born with low birth weight and they continued to have lower birth weight than the other till they died. Poor birth weight, and poor supplementation among other causes, seem to be the important causes of poor physical growth." (Authors' ab – stract)

342 Khan MU. Infant feeding practices in rural Meheran, Comilla [abstract]. *In*: Proceedings of the 3rd Asian Congress of Pediatrics, Bangkok, 19 – 23 Nov 1979:97

343 Khan MU. Infant feeding practices in rural Meheran, Comilla, Bangladesh. Am J Clin Nutr 1980 Nov;33(11):2356 – 64

"Since 1930 breast – feeding has declined worldwide. Differences exist in breast – feeding practices between developed and developing countries and between urban and rural people. In order to define the breast – feeding practices in Bangladesh, we studied longi – tudinally 401 rural children and cross – sectionally 193 urban children. Collections of dietary data and anthropometric measurements were done monthly during the 1st year and quarterly thereafter by trained paramedical staff. One hundred percent rural, 98% urban poor, and 78% urban elite mothers breastfed their babies at birth. At 1 year 97% rural, 90% urban poor, and 25% elite continued breastfeeding. By 2 years it decreased further. Only some rural children but many of the urban children were provided with cow's milk during breast – feeding. At 10 months, 100% urban elite, 33% of the urban poor, and 6% of rural mothers provided rice and bread to babies. The growth pattern from 4th months of age fell behind the developed countries. Heavier mothers produced heavier children. Mothers should be trained about supplementation of food and the time of supplementation. Breastfeeding is still quite prevalent in the villages of this country. Maternal nutrition and timely supplementation are important for development of children." (Author's abstract)

344 Khan MU. Influence of mother's haemoglobin level and weight on newborn's haemoglobin level and weight. Nutr Rep Int 1985 Nov;32(5):1081 – 7

"Mother's haemoglobin levels and weights after delivery were compared prospectively with newborns' haemoglobin levels and weights in rural Bangladesh. Changes in newborn's haemoglobin levels over time and infants' and mothers' weights were recorded. Mothers' and infants' haemoglobin levels were estimated, using the Sahli – Hellige's method. Weight was recorded using Salter's scale. Mothers' and newborns' haemoglobin levels were inversely associated with the newborns' birth weights; while newborns' haemoglobin levels were directly associated with mothers' haemoglobin levels following delivery. Mothers' weights also were directly associated with newborns' birth weights. All grades of haemoglobin levels after birth and at the three months fell significantly by 12 months. The inverse relationship between mothers' and newborns' haemoglobin levels and new –

borns' birth weights had not been documented by other investigators. There was significant fall of haemoglobin level in all newborns by age 12 months." (Author's abstract)

345 Khan MU, Khan MR, Hossain B, Ahmed QS, Sack DA. Intervention of transmission of cholera by using alum in domestic water. *In*: Basaran AKT, Islam R, eds. Proceedings of the Workshop on Water and Sanitation Intervention Related to Diarrhoeal Disease in Bangladesh, Dhaka, 17 - 19 Dec 1985. Dhaka: United Nations Children's Fund, 1986:32 - 7

346 Khan MU, Haque E, Khan MR. Nutritional ocular diseases and their association with diarrhoea in Matlab, Bangladesh. Br J Nutr 1984 Jul;52(1):1 - 9

The prevalence of visual defects, especially from causes associated with nutritional deficiencies, and their relation to diarrhoea in rural Bangladesh have been studied. A trained physician and a team of health workers examined visual defects in 149 villages with a total population of 182,976. According to the World Health Organization (WHO) classification, night blindness (XN) was found in only 0.03 persons/1000 population and 0.04 were found to have connjuctival xerosis (XIA) and Bitot's spot (XIB). Corneal xerosis (X2, X3A, X3B) also was found in 0.04 persons/1000. Night blindness combined with conjunctival xerosis and Bitot's spot (XN + XIA + XIB) was present in 1.69 persons/1000 and all combined stages of active xerophthalmia were seen in 0.06 persons/1000. Xerophthalmia prevailed up to age 19. Males had a significant higher (2.9) incidence/1000 than did females (1.2). The total rate of keratomalacial scar for all ages was 0.31 persons/1000, while corneal opacity from other causes was seen in 2.25 persons/1000 population. More than 2.06 persons/1000 had ocular manifestations of 1 or more vitamin A deficiencies, while 4.47 persons/1000 had other ocular disease except for cataracts. Only 12.0% of all corneal scars (XS) were due to keratomalacia. A history of XN is a good indicator of vitamin A deficiency. In 96% of the cases, XN was associated with XIA and XIB. The onset of about 86% of cases of corneal xeroses (X2, X3A, X3B) and XN associated with XIA and XIB was related to diarrhoea.

347 Khan MU, Haque E, Khan MR. Prevalence and causes of blindness in rural Bangladesh. Indian J Med Res 1985 Sep;82:257 - 62

"A survey was conducted among a rural Matlab, Bangladesh population of 183,011 to determine the prevalence and clinical causes of blindness. Examination was done by village - to - village visits during 1981, after prior intimation of the visit, with over 90 per cent coverage. A trained physician and four local field assistants conducted the study. The overall combined blindness rate was 5.58 per 1,000; 2.42 for corneal opacity ($m = 2.57$, $f = 2.28$), and 2.61 for cataracts ($m = 2.03$, $f = 3.20$, $p < 0.01$). Infection and injury were the main causes of corneal opacity. Night blindness was prevalent up to the age of 21; and males had a significantly higher rate (2.56) than did females (0.78). Cataract was significantly higher in female. The overall rate for all grades of nightblindness was 2.61 per 1,000. By extrapolating these results, one would arrive at a figure of nearly 530,000 blind people in Bangladesh. Proper training of physicians and motivation of people for prompt eye care may save a majority of these people from blindness." (Authors' abstract)

348 Khan MU, Samadi AR, Huq MI, Greenough WB. Reappearance of classical *Vibrio cholerae* in Bangladesh. *In*: Kuwahara S, Pierce NF, eds. Advances in research on cholera and related diarrheas, v. 3. Tokyo: KTK Scientific Publishers, 1986:3 - 12

349 Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. The relationship of cholera to water source and use in rural Bangladesh. Int J Epidemiol 1981 Mar;10(1):23 - 5

"The cholera experience of a sample of families in a rural area of Bangladesh is reported in relation to water supply and use. Tanks were the primary source for 65% of families,

canals for 20% and the river for 14%. The highest attack rate was associated with access to canal water (13%). Attack rates did not vary markedly according to the purpose for which a source was used. The importance of cultural patterns in water use is identified." (Authors' abstract)

350 Khan MU. Some interesting bio-statistics of rural Bangladesh population [abstract]. *In*: Proceedings of the Fourth Bangladesh Science Conference, Rajshahi, 2-5 Mar 1980:125

351 Khan MU. Some population bio-statistics of rural Bangladesh population. Bangladesh Med J 1979;8(1):5-12

352 Khan MU, Chakraborty J, Paul SR. Teeth as index to health and age in Bangladeshi children. Nutr Rep Int 1981 Nov;24(5):963-71

"This study endeavours to estimate the age of dentition and factors influencing growth of milk teeth and to develop a formula which is fairly precise in calculating a child's age. 401 children in a village in Bangladesh were followed closely. Children below 1 year were examined monthly. Children over 1 year were examined every 3 months. High birth weight and income favourably influenced eruption. But frequent sickness did not influence it. By 30 month, 19 out of 20 milk teeth erupted. The minimum and maximum age for the 1st tooth to erupt was 5 and 18 month respectively. The formula "7 + average number of teeth + 3" for calculating age in months, holds good up to 17 teeth only. A modified formula "11 + no. of teeth + 3" for 18-19 teeth only can be used for children up to 30 months of age. Less than 3 teeth at 15 month age seemed to indicate death before 5 years age and 9 teeth or more indicated survival." (Authors' abstract)

353 Khan MU, Alam AKMJ, Rahman ASMM. Ten years review of the age and sex of cholera patients. Dhaka: Cholera Research Laboratory, 1978. 14 p. (CRL scientific report, 14)

"Over a period of 10 years, more than 13,000 cholera cases, both urban and rural Classical and El Tor, have been analysed to determine the age and sex characteristics of cholera patients. Findings show that over 50% of all cholera occurs in the age group 0-9. Male children contract cholera more often than female children. But females between the ages of 20-39 contract cholera more often than males of the same age group. This trend has been observed during Classical and El Tor periods both in urban and rural areas. The rates of cholera were not much different in urban and rural areas. The overall rate of cholera on the average was a little over 1 per 1000 per year. This includes some non-cholera years when the rates were very low. The greatest rate (1.7/1000/year) was found during the El Tor epidemic of 1974 and 1975." (Authors' abstract)

354 Khan MU. Victims of childhood deaths. Indian J Pediatr 1981 Sep-Oct;48(394):575-80

"Out of 471 children studied in rural Bangladesh by anthropometry and feeding pattern, 28 expired. Records of dentition and kinds and dates of introduction of supplementary food by parents were maintained. The anthropometry of the deceased were compared with the age matched survivors from the same village. The average weight, height, arm circumference, number of erupted teeth between 10 and 15 months and income of the survivors were higher than those who died. These data suggest that children who die in infancy are less well nourished from their birth, grow at a slower rate and are mainly from poorest and 3rd and 2nd degree malnourished groups." (Author's abstract)

355 Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. Water sources and the incidence of cholera in rural Bangladesh. Dhaka: Cholera Research Laboratory, 1978.

15 p. (CRL scientific report, 16)

356 Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. Water sources and the incidence of cholera in rural Bangladesh [abstract]. *In*: Proceedings of the Third Bangladesh Science Conference, Chittagong, 8 – 12 Jan 1978:148

357 Khan MU, Ahmad K. Withdrawal of food during diarrhoea: major mechanism of malnutrition following diarrhoea in Bangladesh children. J Trop Pediatr 1986 Apr;32(2):57 – 61

"To understand the mechanism of malnutrition following diarrhoea, 500 urban and 555 rural mothers attending diarrhoea treatment centres with their children were interviewed. They were asked to list the types of food the children ate during the last 24 hours; and also the types of food the children normally ate before the onset of diarrhoea. In a longitudinal study, the weights of the study children, and diarrhoea history were recorded. It was revealed that during and after a bout of diarrhoea 40 per cent of the carbohydrate and 55 per cent of the protein containing diets and 60 per cent of the vegetables were withdrawn from the diet. The weight of all children fell after a diarrhoea episode. In many cases another episode of diarrhoea occurred before a rise in weight was registered. This created a vicious 'diarrhoea – withdrawal – of – food – malnutrition – diarrhoea' cycle, which explains the rapid development of malnutrition after diarrhoea." (Authors' abstract)

358 Koblinsky MA, Simmons R, Phillips JF, Yunus M. Barriers to implementing an effective national MCH – FP program. *In*: Kluge D, ed. International health and family planning: controversy and consensus; selected papers of the 1984 Annual Conference of the National Council for International Health, Arlington, Virginia, 11 – 13 Jun 1984. Washington, D.C.: National Council for International Health, Samaritan Medical Foundation, 1984:195 – 207

359 Koenig MA, Phillips JF, Campbell O, D'Souza S. Birth intervals and childhood mortality in rural Bangladesh. New York: The Population Council, 1988. 33 p. (Working paper, 23)

360 Koenig MA, Fauveau V, Chowdhury AI, Chakraborty J, Khan MA. Maternal mortality in Matlab, Bangladesh: 1976 – 85. Stud Fam Plann 1988 Mar/Apr;19(2):69 – 80

"This paper reports findings from a study of maternal mortality in Matlab, Bangladesh during the 1976 – 85 period. The study employed a multiple – step procedure to identify maternity – related deaths to all reproductive – aged women within the study area during this period. A total of 387 maternal deaths were identified, resulting in an overall maternal mortality ratio of 5.5 per 1,000 live births. The introduction of a family planning program in half of the Matlab study area led to a moderate but significant reduction in maternal mortality rates, relative to the comparison area. This appears to have been primarily due to a reduction in the overall number of pregnancies in the treatment area, since among women who became pregnant, mortality risks remained high. The results of this study underscore the need for a broad – based service strategy that includes but is not limited solely to family planning, in order to achieve significant reductions in maternal mortality levels in settings such as rural Bangladesh." (Authors' abstract)

361 Koenig MA, Fauveau V, Wojtyniak B. Potential reductions in infant and child mortality through immunization programmes: evidence from Matlab, Bangladesh. *In*: Proceedings of the XXIst International Population Conference, New Delhi. New Delhi: IUSSP, 1989:433 – 48

362 Koenig MA, Shahidullah M. Reduction in neonatal mortality associated with tetanus toxoid immunization in Matlab, Bangladesh [abstract]. *In*: Programme and abstracts of papers of the Fourth Annual Conference of the Indian Society for Medical Statistics,

Bangalore, 24 – 26 Nov 1986. Bangalore: National Institute of Mental Health and Neuro Sciences, 1986:62

363 Koenig MA, D'Souza S. Sex differences in childhood mortality in rural Bangladesh. Soc Sci Med 1986;22(1):15 – 22

"The issue of higher female than male mortality during childhood in developing countries has recently generated considerable interest. This paper presents additional evidence on this subject, based upon an analysis of longitudinal data from children in rural Bangladesh. Initially, the basis for higher female than male mortality in patriarchal societies is explored, and more specifically, the rationale for the differential valuation of male and female offspring. The pattern, timing and magnitude of sex differentials in mortality during infancy and early childhood is subsequently examined for children in our study. The paper concludes with a review of possible behavioral mechanisms which may contribute to higher female than male mortality during childhood." (Authors' abstract)

364 Koenig MA, Phillips JF, Simmons RS, Khan MA. Trends in family size preferences and contraceptive use in Matlab, Bangladesh. Stud Fam Plann 1987 May/Jun;18(3):117 – 27

"In the nearly ten years of its existence, the Matlab Family Planning and Health Services Project has been characterized by a remarkable rise in contraceptive use and a corresponding decline in fertility. This study examines available evidence on trends in family size preferences in the Matlab area from 1977 to 1984 and their relationship to contraceptive use. Within the Matlab treatment area, the most significant factor behind the increase in contraceptive use has been a sharp rise in the practice of contraception for spacing births. There also appears to have been a more modest increase in the proportion of women wanting no additional children. Family size preferences in the treatment and comparison areas were roughly comparable, suggesting – to the extent that such preferences have changed over time – change may have occurred throughout the Matlab study area. The findings are evaluated in terms of their implications for the current debate on the contribution of family planning programs to fertility decline in developing countries." (Authors' abstract)

365 Koster FT, Palmer DL, Chakraborty J, Jackson T, Curlin GC. Cellular immune competence and diarrheal morbidity in malnourished Bangladeshi children: a prospective field study. Am J Clin Nutr 1987 Jul;46(1):115 – 20

"A year – long prospective study of 152 Bangladeshi children with mild to moderate protein – calorie malnutrition related nutritional status and cellular immune defects to morbidity due to diarrheal, respiratory, and febrile diseases. In children older than 36 mo, wasting correlated with skin test anergy to three recall antigens and with inability to initiate hypersensitivity to dinitrochlorobenzene. In this older age group, anergy was associated with a 58% increased attack rate and an 83% increased duration of diarrheal diseases but not with febrile or respiratory infections. In stepwise regression analysis, this anergy effect was independent of the small negative impact of poorer nutritional status on morbidity. Ninety – three percent of diarrheal illnesses lasting at least 14 d were among anergic children. Cellular immune incompetence, indicated by anergy of unknown etiology, is associated with increased diarrheal morbidity and may promote the vicious cycle of repeated infections and deteriorating nutritional status." (Authors' abstract)

366 Koster FT, Aziz KMA, Haque A, Curlin GT. Measles in Bangladesh: synergy between measles, diarrhea and malnutrition. *In*: Johns Hopkins University International Center for Medical Research. Progress report, 1976 – 1977:29 – 37

367 Koster FT, Curlin GC, Aziz KMA, Haque A. Synergistic impact of measles and diarrhoea on nutrition and mortality in Bangladesh. Bull WHO 1981;59(6):901 – 8

"The efficacy of recent efforts to improve the delivery of available vaccines, especially in the developing countries, can be aided by surveys that identify populations suffering from unduly high morbidity and mortality as a result of a particular disease. This paper gives the results of a prospective household surveillance of 5,775 children in 12 villages in Bangladesh, in which the occurrence of measles and diarrhoea, and changes in nutritional status, and the causes of all deaths during a 12-month period were monitored. The measles case-fatality rate was 3.7% among all children. Prolonged diarrhoea was the most common complication in fatal cases. The greatest weight loss was seen in children with measles complicated by prolonged diarrhoea, and children under 4 years of age in this group failed to achieve "catchup" growth. Thus measles and diarrhoea appeared to interact synergistically to increase mortality and the irreversible effects of nutritional deprivation. This information should provide further impetus to an extensive measles vaccination programme in Bangladesh. Until then, nutrition intervention programmes should be aimed at children under 4 years of age, convalescing from measles." (Authors' abstract)

368 Langsten R, Potter RG, Kobrin F, Mosley WH. Alternate strategies for beginning contraceptive use: the case of Bangladesh. Bangladesh Dev Stud 1979;7(2):107-21

369 Langsten R, Chakraborty J. Constraints on use and impact of contraceptives in rural Bangladesh: some preliminary speculations. Dhaka: Cholera Research Laboratory, 1978. 19 p. (CRL working paper, 6)

"This paper attempts to look at some findings of the baseline KAP and subsequent prevalence surveys of the Matlab Contraceptive Distribution Programme and examine the impact of the programme on contraceptive use and the expected demographic impact from such use. The findings showed that contraceptive use rate increased from 1.7 to 18.7 percent after 3 months and then declined to 15.6 percent at 12 months after the start of the programme. This level of use rate can probably ensure a drop of 6 or 7 points per thousand to a birth rate of 37 to 38, assuming a normal CBR of 44 in Matlab before the start of the contraceptive distribution programme. The most striking finding of the KAP survey was that 40 percent of those in need, i.e. those whose desired family size is less than or equal to their number of living children stated that they would not use contraception in the future. The estimation of current demand indicated a maximum likely use prevalence rate of 15 to 20 percent of eligible couples which may at best contribute a drop of 9 points per thousand in the CBR. The demand for contraceptive appeared to remain low until significant changes could be made in the desire for children, and particularly in the strong preference for sons." (Authors' abstract)

370 Langsten R. Determinants of natural fertility in rural Bangladesh reconsidered. Pop Stud 1985 Mar;39(1):153-61

"Recent work by Sandra L. Huffman and her colleagues on the determinants of the length of amenorrhoea in Bangladesh is examined. It is shown that the data on which their work is based are contaminated by an important period effect: the 1974-75 famine in Bangladesh. The famine is described and its possible effects on Huffman's results examined. Huffman argues that breastfeeding behaviour is a more important factor in prolonging amenorrhoea among lactating women than is the mother's nutritional status. It is shown, however, that measures for the key variables used by Huffman - nutritional status, breastfeeding behaviour, and length of amenorrhoea - were all affected by the famine, and that the famine effects may have biased her findings. This does not necessarily mean that her hypothesis is wrong, but does suggest that it must be tested in unbiased data." (Author's abstract)

371 Levine RJ, Khan MR, D'Souza S, Nalin DR. Cholera transmission near a cholera hospital. Lancet 1976 Jul 10;2(7976):84-6

"A review of the incidence of cholera from 1964 through 1974 in Matlab, Bangladesh, revealed that among the villages several had very high incidence-rates. Investigation

indicated that high cholera-rates in two of these villages were probably related to water contamination from a nearby cholera hospital established in 1963. The data imply that heavy contamination can overcome any immunity resulting from repeated exposure." (Authors' abstract)

372 Levine RJ, Khan MR, D'Souza S, Nalin DR. Failure of sanitary wells to protect against cholera and other diarrhoeas in Bangladesh. Lancet 1976 Jul 10;2(7976):86-9

"Within an area of Bangladesh in which the incidence of cholera was high, use of sanitary pipe wells did not protect against cholera or related non-cholera diarrhoeas because well users also used contaminated water sources regularly enough to maintain high infection-rates. Protection was found to correlate with education and wealth." (Authors' abstract)

373 Lindenbaum S, Chakraborty M, Elias M. The influence of maternal education on infant and child mortality in Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1985. 24 p. (ICDDR,B special publication, 23)

"An anthropological approach, using survey, case study and historical data examines the effect of maternal education on infant survival and child mortality in Bangladesh. The study focuses on the recent shift in the meaning of education, the psychological, social and economic changes effected by the education of women, and the implications these may have for the survival of infants and children, as well as for educated women themselves. The study demonstrates also that health behaviours may change in the absence of a shift in previously held theories of disease causation. The findings lead to the formulation of thirteen questions that could be investigated further by epidemiologists." (Authors' abstract)

374 Love AHG, Rohde JE, Abrams ME, Veall N. The measurement of bidirectional sodium fluxes across the intestinal wall in man using whole gut perfusion. Clin Sci 1973 Mar;44(3):267-78

"1. Double-tracer studies have been carried out in order to investigate the validity of a whole-gut perfusion technique for the measurement of gut lumen-to-plasma and plasma-to-gut lumen sodium fluxes in man. 2. The use of two tracers permits differentiation between the unabsorbed orally administered sodium in the stools and the sodium which has been absorbed and resecreted. The latter is by no means negligible and may amount to some 30% of the recovered material. 3. The available data do not permit the calculation of the absolute values of the bidirectional fluxes without the introduction of some assumption concerning the reabsorption of the sodium which crosses from the plasma to the gut lumen. It is assumed here that this sodium is absorbed by the gut to the same extent as the orally administered material. Analysis of the kinetics of sodium transfer from mouth to stool direct and via the blood plasma in normal subjects and patients with diarrhoea provided experimental evidence confirming the correctness of this assumption. 4. In eleven normal volunteers the gut lumen-to-plasma flow of sodium averaged 13.0 mmol min-1, implying that the observed absorption averaging 1.65 mmol min-1 represents a relatively small imbalance between the bidirectional fluxes. Although one patient with post-gastrectomy dumping syndrome had high fluxes and another with malabsorption following gut resection gave low values, it is suggested that changes in the fluxes in the same patient are more significant than isolated observations on individuals. 5. Granted the validity of the primary assumption, a considerably simpler technique may be used for clinical and field studies which is sufficiently accurate for most purposes and employs a single tracer." (Authors' abstract)

375 McCormack WM, Islam MS, Fahimuddin M, Mosley WH. A community study of inapparent cholera infections. Am J Epidemiol 1969 Jun;89(6):658-64

"A village with a population of 1,609 in the endemic cholera area of rural East Pakistan

was studied for 10 weeks during the 1966 - 1967 cholera season to estimate the relative frequency of inapparent and mild cholera infections. Paired serum specimens were obtained from all available village residents before and after the usual cholera season. Active diarrhea surveillance between serologic collections disclosed 5 mild diarrheal illnesses associated with the isolation of *Vibrio cholerae*. None of these patients was ill enough to require specific treatment or hospitalization. There was evidence from the vibriocidal antibody titrations of 948 serum pairs for at least an additional 22 inapparent infections with *V. cholerae*. The overall *V. cholerae* infection rate was estimated to be at least 27.4 per 1,000 for this community although there was not a single clinically recognizable case of cholera. It is suggested that cholera has a high infection to case ratio and that there are many mild and inapparent infections for every clinically recognizable case." (Authors' abstract)

376 McCormack WM, Mosley WH, Fahimuddin M, Benenson AS. Endemic cholera in rural East Pakistan. Am J Epidemiol 1969 Apr;89(4):393 - 404

"The pattern of cholera in an endemic area of rural East Pakistan is described. Cholera has a definite season, with most cases occurring during December and January. There is sometimes a second epidemic in May, June, and July. Although the area is considered to be endemic for cholera, the infection was not detected for periods varying from 2 to 5 months. The disease is widely disseminated. The entire area appears to become involved at once with little evidence of village - to - village spread suggesting multiple simultaneous introductions of the disease. The age specific attack rate is highest in the under 5 - year age group and declines with age. The attack rate is higher among Hindus than among Muslims. Mild cases of cholera which do not require hospitalization are most likely to occur in children under the age of 5. Within the families of cholera patients, the secondary infection rate is highest in young children." (Authors' abstract)

377 McCormack WM, Rahman ASMM, Chowdhury AKMA, Mosley WH, Phillips RA. Report of the 1966 - 67 cholera vaccine field trial in rural East Pakistan. 3. The lack of effect of prior vaccination or circulating vibriocidal antibody on the severity of clinical cholera. Bull WHO 1969;40(2):199 - 204

"In a controlled study, it has been shown that the prior administration of cholera vaccine had no beneficial effect on the clinical course of cholera as measured by either the condition of the patient on admission to hospital or the subsequent course of the disease. In fact, the disease was, if anything, more severe in those who had received cholera vaccine. Although the presence of a high vibriocidal titre is associated with protection from cholera, pre - existing antibody had no effect on the clinical course of the disease in those patients who developed cholera." (Authors' abstract)

378 McCormack, WM, Chakraborty J, Rahman ASMM, Mosley WH. Vibriocidal antibody in clinical cholera. J Infect Dis 1969 Aug;120(2):192 - 201

"Daily blood specimens obtained from 47 children with acute cholera were examined for vibriocidal antibodies. Vibriocidal titers rose rapidly. By the seventh day of illness about 90% of the children had a significant rise in titer against the homologous serotype, and about 70% of the patients had significant rises against the heterologous serotype. Children under 5 years of age responded to cholera infection less well than older children. Blood specimens collected from 130 cholera patients of all ages during the 6 months following hospitalization with cholera were also examined for vibriocidal antibodies. Vibriocidal titers fell rapidly after illness. At 6 months only 17.1% of patients had titers significantly higher than at the time of hospital admission. The fall in titer following infection was most marked among children. Vibriocidal titers were higher 6 months after cholera vaccination than 6 months after symptomatic infection with *V. cholerae*." (Authors' abstract)

379 McNicol LA, Aziz KMS, Huq I, Kaper JB, Lockman HA, Remmers EF, Spira WM,

Voll MJ, Colwell RR. Isolation of drug-resistant *Aeromonas hydrophila* from aquatic environments. Antimicrob Agents Chemother 1980 Mar;17(3):477-83

"Antibiotic-resistant strains of *Aeromonas hydrophila* have been isolated from the natural environment in the Chesapeake Bay and areas surrounding Dhaka and the Matlab region of Bangladesh. The Bangladesh strains carried resistance to chloramphenicol, streptomycin, and tetracycline, and 57% of them had a multiple streptomycin-tetracycline resistance phenotype correlated with the presence of a large plasmid. The Chesapeake Bay strains were resistant to polymyxin B and tetracycline, but showed neither multiple resistance nor R-factor carriage. Twenty-five percent of the environmental strains were toxigenic in a Y-1 adrenal cell assay. Toxigenicity showed no positive correlation with drug resistance or with plasmid carriage. Environmental areas of heavy human impact appear to be associated with a higher incidence of antibiotic-resistant strains of aeromonads." (Authors' abstract)

380 Mahmud S, Becker S. Error patterns in children's age reports in retrospective sample surveys. Bangladesh Dev Stud 1984 Dec;12(4):123-35

"Age misreporting distorts age distributions as well as affects fertility and mortality estimates in a population. Reported ages in Bangladesh are often inaccurate because respondents do not know their exact ages; ages must be estimated by the interviewer. This paper attempts to validate reports of children's ages in retrospective sample surveys by comparing them to the actual ages recorded in a vital registration system in Matlab Thana, Bangladesh. In 1 of 2 field surveys in 1980, 2076 women aged 15-50 reported on their 3859 living children. 19% of the children's ages were reported within 1 month of their true age. The ages of 34% were overreported, and the ages of 46% were underreported. Incorrect ages were, on average, off by 14 months. Women less than 30 years old correctly reported the ages of 28% of their living children, twice the percentage of women over 30 years old. Women with 3 or fewer live births were more likely to report their children's ages correctly than women with more than 3 live births. In general, as a woman grew older and had more children, not only did she report incorrect ages for a higher proportion of her living children, but the errors were larger in magnitude and mostly negative in sign. Correct ages were reported equally often for male and female children. Overstatement of age was more common for children under 5 years old. It was also found that the quality of age data deteriorated significantly with the progress of field work." (POPLINE)

381 Maine D. Women's health and family planning. Mother Child 1985 Oct-Dec;22(4):19-26

"Family planning improves the health of women by helping them to avoid high-risk pregnancies. When women have access to effective contraceptive methods, they are less likely to resort to illegal abortions to control their fertility. Thus, adoption of contraception can prevent many needless deaths among women in the developing world. In the mid-1970s, 40-180 women in developing countries died due to pregnancy or childbirth for every 100,000 children born. In some areas, rates are even higher. During the same period, there were fewer than 20 maternal deaths/100,000 live births in most parts of Europe. The effect of pregnancy and birth on a woman's health is determined in part by the number of pregnancies she has had. Among women having their 4th or 5th birth, the risk of death was almost double that of women having their 2nd or 3rd birth in more than 200 villages in Matlab, Bangladesh. Women having their 8th or later birth had 3 times the risk of death as women having their 2nd or 3rd birth. An estimated 20 million women in developed countries have such complications every year. In England and Wales during 1973-75, deaths from hemorrhage and from pulmonary embolism are especially common among 4th and higher order births. Toxemia is about equally high among 1st and 4th and later births but much lower among 2nd and 3rd births. 4th and higher order births carry many times the risk of death of 1st or 2nd births, even in a country where medical care is available and free to all people. Other complications that

increase with birth order are problems with the placenta and umbilical cord, collapse and tearing of the uterus, abnormal birth position of the fetus, and anemia. The risk of complications of pregnancy and delivery are affected by a woman's age, regardless of the level of maternal mortality in the country. Women over 30 continue to run a considerably greater risk of death from pregnancy than do younger women. An estimated 15-25 million women resort to illegal abortion each year rather than have unwanted births. Many of these women do not have access to effective contraceptive methods, which would have prevented most of their unwanted pregnancies. In developed and developing countries, as contraceptive use increases, women have smaller families and fewer births at unfavorable ages. By making it possible for women to avoid high-risk pregnancies, family planning makes a substantial contribution to maternal health." (POPLINE)

382 Maloney C, Aziz KMA, Sarker PC. Beliefs and fertility in Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 366 p. (ICDDR,B monograph, 2)

383 Maloney C, Aziz KMA, Sarker PC. Some beliefs concerning pregnancy and childbirth in Bangladesh. S Asian Anthropol 1981 Sep;2(2):61-70

"Many believe that the sex of a child can be determined by the time of coitus or orgasm, day of the week, phase of the moon, length of duration of coitus, quantity of semen, and the like as well as by the will of Allah. Similarly birth of twin and deformed babies, and spontaneous abortion have many possible causes. In the world view of Bangladesh peasants, all events have causes, and there may be moral, physical, or environmental causes, evil influence, and divine will, all operating simultaneously, of which some are proximate and some ultimate causes. Different women are believed to have different natural birth intervals, and a woman's birth interval is predetermined. The number of children to be born to a woman may be read in the placenta. Lactational amenorrhea is 17 to 20 months in Bangladesh. Because of this and early resumption of coitus, post-partum abstinence would have to be extended for two years to have any effect on fertility, which is not likely to succeed as a widespread means of reducing fertility." (Authors' abstract)

384 Martin AR. Preventive aspects of rural medicine. East Pak Med J 1968;12(4):132-6

385 Mauldin WP. The determinants of fertility decline in LDCs: an overview of the available empirical evidence. *In*: Proceedings of the International Population Conference, Manila, 1981, v. 1. Liege: Ordina Editions 1981:5-24

"Factors such as social structure, cultural norms, economic conditions, and environmental conditions are often cited in analyses of fertility change, but not in a quantitative methodology. This, along with the absence of an accepted theory of fertility change has resulted in the lack of a commonly accepted methodology for analyzing the determinants of fertility change. Studies that have explored the variables affecting fertility decline in less developed countries are summarized and discussed. Inter and intracountry studies, as well as regional studies are presented. Examples include World Bank studies, works by Srikantan, Berelson, Chen and Jones, and studies on the Family Planning Programs in Matlab, Bangladesh. The Cho and Retherford formula is used to present decompositions of the changes in the crude birth rates of less developed countries. The author summarizes that the studies reviewed leave more questions about the determinants of fertility change than they answer." (POPLINE)

386 Merson MH, Black RE, Khan MU, Huq I. Cholera as seen at a rural treatment centre in Matlab, Bangladesh from 1966-1977 [abstract]. *In*: Proceedings of the 15th Joint Conference on Cholera, US-Japan Cooperative Medical Science Conference Program, Bethesda, Maryland, 23-25 Jul 1979:73

387 Merson MH, Black RE. Enterotoxigenic *Escherichia coli* diarrhoea. *In*: Holme T, Holmgren J, Merson MH, Mollby R, eds. Acute enteric infections in children: new prospects for treatment and prevention. Amsterdam: Elsevier, 1981:81-92

388 Mitra AK, Clemens J. Risk factors of dysenteric deaths in rural areas of Matlab, Bangladesh [abstract]. *In*: Programme, papers and abstracts of the Third Asian Conference on Diarrhoeal Diseases, Bangkok, 10-14 Jun 1985. Bangkok: Mahidol University, 1985:283

389 Monsur KA, Clemens JD, Sack DA, Miah AL, Begum YA. The use of phage-sensitivity patterns for tracing heat labile toxin-positive (LT+) *Escherichia coli*. J Med Microbiol 1989 Jan;28(1):43-7

"The heat-labile toxin (LT) positive *Escherichia coli* colonies from 785 stool specimens obtained during a cholera vaccine trial were examined for their phage-sensitivity pattern to 31 *E. coli* phages. These specimens originated from 105 index cases and their contacts. Isolates with common phage-sensitivity patterns were grouped and were studied further both serologically and for their plasmid profile. The largest group (42 isolates) belonged to serogroup 078 and the second largest group (19 isolates) belonged to serogroup O6. There were 23 index cases which had *E. coli* with the same phage-sensitivity pattern as some of their contact strains. The identity of isolates from 16 index cases with strains from their respective contacts could be verified serologically. For the remaining seven index cases and their contacts, the isolates did not agglutinate with available antisera. However, subsequent studies demonstrated that, when the phage-sensitivity pattern among the strains matched, the plasmid profiles of these strains also matched. This further indicates the ability of phage-sensitivity patterns to serve as markers in tracing strains." (Authors' abstract)

390 Mosley WH, Fahimuddin M, Aziz KMA, Chowdhury AKMA. Cholera vaccine studies in rural East Pakistan [abstract]. *In*: Souvenir of the 10th All Pakistan Medical Conference of the Pakistan Medical Association, Dhaka, 14-17 Nov 1968

391 Mosley WH, Chowdhury AK, Aziz KMA. Demographic characteristics of a population laboratory in rural East Pakistan. CPR Pop Res, 1970 Sept

"Lack of accurate data on demographic variables results in difficulty in assessing the severity of population problems in developing countries and in evaluating program effectiveness. The Pakistan-SEATO Cholera Research Laboratory was established in Dhaka, in 1960 to develop, improve and demonstrate preventive methods for cholera. Villages in Matlab Thana, located in the central area of East Pakistan were selected for controlled field trials of cholera vaccines. A total of 225,000 persons are under surveillance. This paper summarizes the data collection methods and describes some of the demographic characteristics of the 112,000 persons being studied since March 1966. The general method is to take a census including all the regular residents of the villages under study. A surveillance of births, deaths, and migration is maintained by weekly registrations. Because of close supervision of personnel and regular house-to-house surveillance, the data gathered are highly reliable. The population showed a young median age (16.3), and high birth rate (45-47 per 1,000 population), and a moderate death rate (15-17)." (POPLINE)

392 Mosley WH, Chowdhury AKMA, Aziz KMA, Islam S, Fahimuddin M. Demographic studies in rural East Pakistan: preliminary analysis of the results of daily registration of births, deaths and migrations in 132 villages in the cholera vaccine field trial area in Comilla district, East Pakistan, May 1966-Apr 1967. Dhaka: Pakistan-SEATO Cholera Research Laboratory, 1968. 30 p.

393 Mosley WH, Aziz KMA, Rahman ASMM, Chowdhury AKMA, Ahmed A. Field trials of monovalent Ogawa and Inaba cholera vaccines in rural Bangladesh--three years of

observation. Bull WHO 1973;49(4):381 - 7

"A controlled cholera vaccine field trial was carried out to test the efficacy of monovalent whole - cell Inaba and Ogawa cholera vaccines and a purified Inaba antigen. This study was designed particularly to study the level of protection produced by these vaccines against homologous and heterologous serotypes and to correlate the results with mouse protection tests and human serological response to the vaccines. A cohort of 45,000 children, aged 0 - 14 years, was divided into a control group and three vaccine groups. Inoculations were given annually for 2 years just before the start of the cholera season, and follow - up was continued for one additional year. Essentially, all cholera cases were due to the Inaba serotype, so that protection could be studied only against that sero - type. Two annual injections of the whole - cell Inaba vaccine gave the highest level of protection, averaging 84% over the 3 years of follow - up; a single injection of the puri - fied Inaba vaccine gave less protection (51%). Two annual injections of the whole - cell Ogawa vaccine failed to protect children under the age of 5 but did produce 48% pro - tection for children aged 5 - 14 against Inaba cholera. Serological surveys correlated poorly with protection; specifically, the Ogawa vaccine produced high anti - Inaba titres in young children but no protection. The cross - protection against Inaba cholera produced by Ogawa vaccine in the older children is assumed to be due to boosting of naturally acquired immunity in this population. Monovalent vaccine cannot be recommended for general public health use because of the serotype specificity of protection that this study has demonstrated." (Authors' abstract)

394 Mosley WH. Health, nutrition and mortality in Bangladesh. *In*: Sirajeldin I, ed. Research in human capital and development. Baltimore: Johns Hopkins University Press, 1979:77 - 94

395 Mosley WH, McCormack WM, Fahimuddin M, Aziz KMA, Rahman ASMM, Chowd - hury AKMA, Ahmed A, Martin AR, Feeley JC, Phillips RA. 1966 - 67 cholera vaccine field trial in rural East Pakistan. East Pak Med J 1969 Apr;13(2):77 - 84

396 Mosley WH, Woodward WE, Aziz KMA, Rahman ASMM, Chowdhury AKMA, Ahmed A, Feeley JC. The 1968 - 1969 cholera - vaccine field trial in rural East Pakistan: effective - ness of monovalent Ogawa and Inaba antigen, with comparative results of serological and animal protection tests. J Infect Dis 1970 May;121(suppl):S1 - S9.

"In the field trial in 1968 in rural East Pakistan, monovalent whole - cell Ogawa and Inaba vaccines and a purified Inaba antigen were tested to determine the degree of protection induced by these vaccines against infection with the heterologous serotype of *Vibrio cholerae*, as well as the relationship between the level of protection, the results of animal protection tests, and human serological responses to the vaccines. During the first cholera season following inoculation, essentially all the cases were due to the Inaba serotype of *V. cholerae*; thus analysis was limited to effectiveness against that serotype. The monovalent Inaba vaccine and the purified Inaba antigen gave excellent protection in the first cholera season, which was primarily within 3 months after inoculation. The monovalent Ogawa vaccine was ineffective against Inaba cholera. The failure of the Ogawa vaccine to cross - protect against Inaba cholera paralleled the results of the tests of potency in mice but did not correlate with the serological studies, since recipients of the Ogawa vaccine developed substantial anti - Inaba vibriocidal antibody titers. The results indicate that vaccine - induced protection against cholera depends upon the devel - opment of type - specific immunity." (Authors' abstract)

397 Mosley WH, McCormack WM, Fahimuddin M, Aziz KMA, Rahman ASMM, Chowd - hury AKMA, Martin AR, Feeley JC, Phillips RA. Report of the 1966 - 67 cholera vaccine field trial in rural East Pakistan. 1. Study design and results of the first year of observa - tion. Bull WHO 1969;40(2):177 - 85

"A controlled cholera vaccine field trial was carried out in rural East Pakistan during the

1966 – 67 cholera season. A commercial cholera vaccine of average potency was tested in 40,000 children aged 3 months to 14 years in 1 – and 2 – dose schedules. In the cholera season extending for 8 months following immunization, a single dose produced an over – all protection of 46%; 2 doses at an interval of 1 month provided 64% protec – tion. The single dose was virtually ineffective in children under 5 years, but provided significant protection in older children. The enhanced effect of the 2 – dose schedule was primarily due to the boosting of protection in children under the age of 5 years. The duration of significant protection, even with the 2 – dose schedule, did not appear to extend beyond the first 3 months of the 8 – month cholera season." (Authors' abstract)

398 Mosley WH, McCormack WM, Ahmed A, Chowdhury AKMA, Barui RK. Report of the 1966 – 67 cholera vaccine field trial in rural East Pakistan. 2. Results of the serologi – cal surveys in the study population – the relationship of case rate to antibody titre and an estimate of the inapparent infection rate with *Vibrio cholerae*. Bull WHO 1969;40(2):187 – 97

"The 1966 – 67 cholera vaccine field trials in East Pakistan tested 1 – and 2 – dose schedules of a commercial cholera vaccine in 40,000 children aged 3 months to 14 years. Random – sample serological surveys, made prior to the inoculations and 3 months and 6 months after the inoculations, demonstrated that there was a rise in the vibriocidal titres of the vaccinated children during the first 3 months after inoculation and a subsequent fall by the end of the second 3 months. The antibody response to 2 doses of cholera vaccine was better than the response to a single dose in children under 5 years of age. In children aged 5 – 14 years, the antibody response was similar for both inoculation schedules. Since the majority of the older children had vibriocidal antibodies before inoculation, the data suggest that the single dose acted as a booster, and this effect was not enhanced by a second inoculation. Serological studies of the hospitalized cholera patients indicated that the majority had low vibriocidal titres on admission to hospital. By comparing the distribution of admission titres of the hospital – ized patients with the distribution of titres found in the population survey, it was possible to demonstrate a progressive reduction in the cholera case rate for the population with high levels of vibriocidal antibody. The sample surveys from the control population re – vealed a rise in titre following the peak of the cholera season, and a fall 3 months later. The data suggest that the rate of infection with *V. cholerae* for the 10,000 children in the control group during the cholera season may have been as high as 27% while the clini – cal case rate was only 0.26%." (Authors' abstract)

399 Mosley WH, Aziz KMA, Rahman ASMM, Chowdhury AKMA, Ahmed A, Fahimuddin M. Report of the 1966 – 67 cholera vaccine trial in rural East Pakistan. 4. Five years of observation with a practical assessment of the role of a cholera vaccine in cholera control programmes. Bull WHO 1972;47(2):229 – 38

"A controlled cholera vaccine field trial was carried out in rural East Pakistan to deter – mine the efficacy of a cholera vaccine of average antigenic potency when used in a continuing programme with annual reimmunizations. A cohort of 40,000 children aged 0 – 14 years was equally divided into a control group and 3 vaccine groups. Inoculations of vaccine were given annually for 3 years just before the start of the cholera season, and follow – up continued for 2 additional years. The results indicate that there was increasing protection with reimmunization, reaching a maximum with a 3 doses. One dose produced 43% protection, 2 doses 64%, 3 doses 81%, and 4 doses 76%. Protec – tion was more sustained after reimmunization; being 50% and 39%, 1 and 2 years after the fourth injection, respectively. Serological surveys suggested a general parallel in the antibody response to vaccine and the level of protection achieved; however, the levels of vibriocidal antibody titres could not be related directly to levels of protection. The overall protection achieved with the 3 – year programme of annual reimmunizations was 55% for the group receiving one inoculation annually, and 65% for the group receiving 2 inocula – tions in the first year followed by annual reimmunizations. When the costs and effective – ness of annual vaccine programmes are compared with those for cholera treatment

centres, it becomes clear that the cholera vaccines now available are not appropriate alternatives to treatment in routine cholera control programmes." (Authors' abstract)

400 Mosley WH. The role of immunity in cholera: a review of epidemiological and serological studies. Texas Rep Biol Med 1969 Jul;27(suppl 1):227 - 41

"Epidemiological studies have shown that residents in the endemic cholera area acquire a high level of immunity to cholera with age. Controlled cholera vaccine field trials conducted in East Pakistan and the Philippines since 1963 have established the protective efficacy of whole cell cholera vaccines. Serological surveys in the East Pakistan vaccine field trials have revealed that the fall in the cholera case rate with age as well as with cholera vaccine correlates closely with the level of vibriocidal antibody titer. A study of family contacts of cholera cases demonstrated a lower infection rate in these contacts with higher vibriocidal titers. These studies, demonstrating that the cholera infection rate in a population will fall about 50% with every doubling of the vibriocidal antibody titer, suggest that immunity is primarily due to an antibacterial mechanism operating in the intestinal lumen. Antibodies to diarrhea factor (toxin) have also been shown to develop in cholera, and diarrhea factor immunity has been demonstrated to be protective in animal models. The whole cell cholera vaccines used in the East Pakistan field trial do not induce diarrhea factor antibodies. The role of diarrhea factor immunity in cholera remains to be defined." (Author's abstract)

401 Mosley WH, Benenson AS, Barui RK. A serological survey for cholera antibodies in the cholera vaccine field trial populations in rural East Pakistan [abstract]. *In*:. Proceedings of the 11th Pacific Science Congress, Tokyo, 23 - 29 Aug 1966:20

402 Mosley WH, Benenson AS, Barui R. A serological survey for cholera antibodies in rural East Pakistan. 1. The distribution of antibody in the control population of a cholera - vaccine field - trial area and the relation of antibody titre to the pattern of endemic cholera. Bull WHO 1968;38(3):327 - 34

"Controlled cholera vaccine field trials were held in Matlab Bazar in rural East Pakistan in 1963 and 1964. In July - September 1965, a serological survey for cholera antibodies was carried out on a random sample of the field - trial population. Results are given for the control group only, as representative of the pattern found in an endemic cholera area. Only 2% of the blood samples from children under 10 years of age were found to have detectable agglutinating antibody (titres of 1:20 or more), while the proportion in the age - group over 30 years was 27% - 30%. Tests for vibriocidal antibody showed that none of the blood samples from children under 1 year of age contained detectable antibody, while 87% - 90% of those from adults over 30 years did so. The rise in the geometric mean vibriocidal titre showed an almost linear correlation with a sharp fall in the cholera case rate with age. Since a similar survey in a non - endemic area (Czechoslovakia) did not reveal any rise in antibody titre with age, and since cholera epidemics in areas without recent experience of the disease are characterized by a higher incidence rate in adults than in children, it is suggested that the antibody titres give a measure of the level of immunity in a population." (Authors' abstract)

403 Mosley WH, Benenson AS, Barui R. A serological survey for cholera antibodies in rural East Pakistan. 2. A comparison of antibody titres in the immunized and control populations of a cholera - vaccine field - trial area and the relation of antibody titre to cholera case rate. Bull WHO 1968;38(3):335 - 46

"Controlled field trials of a highly antigenic cholera vaccine were held in Matlab Bazar in rural East Pakistan in 1963 and again in 1964. In July - September 1965, a serological survey for cholera antibodies was carried out on a random sample of the field - trial population. This survey revealed that it was possible to demonstrate the effect of a single injection of the cholera vaccine per head on the proportion of the population with detectable vibriocidal and agglutinating antibody 10 and 22 months after injection. More

significantly, the reduction in cholera case rate caused by the vaccine could be correlated with the rise in vibriocidal antibody after vaccination, suggesting that the serological response to vaccine in man may be a useful measure of vaccine potency. The survey also indicated that in this endemic cholera area, with a high level of immunity in adults, a single injection of cholera vaccine was in fact a booster dose for the majority of the population. Thus, the results of cholera vaccine field trials in endemic areas cannot be directly extrapolated to predict the effects of the same vaccine in non-endemic areas." (Authors' abstract)

404 Mosley WH. Strategies for evaluating new cholera vaccines in the field trials. *In*: Rahman S, ed. Proceedings of the Conference on Experimental Cholera Vaccine, Dhaka, 6-8 Apr 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981:45-50

405 Mosley WH. Typhoid and cholera vaccines [letter]. Lancet 1968 Feb 10;1(7537): 299

406 Mosley WH, McCormack WM, Benenson AS, Ahmed A, Barui R, Rahman M, Aziz KMA, Fahimuddin M. The vibriocidal antibody titer as a measure of immunity to cholera in man. *In*: Proceedings of the Symposium on Cholera, Palo Alto, California, 26-28 Jul 1967:53-5

407 Mostafa G, Wojtyniak B, Bhuiya A, Razzaque A. Sociodemographic correlates of pregnancy outcome in a rural area of Bangladesh [abstract]. *In*: Programme and abstracts of papers of the Fourth Annual Conference of the Indian Society for Medical Statistics, Bangalore, 24-26 Nov 1986. Bangalore: National Institute of Mental Health and Neuro Sciences, 1986:56

408 Mostafa MG. The influence of birth circumstances and practices on neonatal survival in Matlab, Bangladesh. London: London School of Hygiene and Tropical Medicine, University of London, 1989. 47 p. (MS thesis)

409 Mozumder ABMKA, Phillips JF. Baseline vital event rates for four upazilas of the MCH-FP extension project for 1983 as reported by a new data base system of demographic assessment. *In*: Proceedings of the Second National Seminar of the Bangladesh Population Association, Dhaka, 22-24 Aug 1984. Dhaka: Bangladesh Population Association, 1985:84-92

410 Nag M, Duza MB. Application of focus group discussion technique in understanding determinants of contraceptive use: a case study in Matlab, Bangladesh. *In*: Proceedings of the International Population Conference, New Delhi, 1989. V. 3. Liege: International Union for the Scientific Study of Population, 1989:367-78

411 Nag M, Duza MB, Koenig M. Explaining fertility transition in Matlab, Bangladesh: a qualitative study. New York: The Population Council, (1987?). ii, 131 p. (Mimeo)

412 Nalin DR, Al-Mahmud A, Curlin GT, Ahmed A, Peterson J. Cholera toxoid boosts serum *Escherichia coli* antitoxin in humans. Infect Immun 1974 Oct;10(4):747-9

"Sera from individuals vaccinated with a cholera toxoid were tested to determine if sera with significant titers of cholera antitoxin could neutralize *Escherichia coli* thermolabile enterotoxin. Individuals who responded to immunization with significant increases in serum cholera antitoxin titers also showed increases in serum *E. coli* enterotoxin-neutralizing capacity. These findings suggested the possibility that the cholera toxoid vaccine may be useful in preventing disease caused by *E. coli*." (Authors' abstract)

413 Nalin DR, Cash RA, Rahman M, Yunus M. Effect of glycine and glucose on sodium and water absorption in patients with cholera. Gut 1970 Sep;11(3):768-72

"Electrolyte solutions containing glucose, glycine, or a combination of the two were absorbed sufficiently well from the intestine to supply maintenance fluid and the electrolytes required by cholera patients. Data on net absorption and duration and volume of diarrhoea show that a solution containing both glucose and glycine provides more effective therapy than solutions containing either glucose or glycine alone." (Authors' abstract)

414 Nalin DR, McLaughlin JC, Rahaman M, Yunus M, Curlin G. Enterotoxigenic *Escherichia coli* and idiopathic diarrhoea in Bangladesh. Lancet 1975 Dec 6;2(7945):1116-9

"Faecal *Escherichia coli* from Bangalee patients with idiopathic diarrhoea were tested in the Chinese hamster ovary cell (C.H.O.) assay to detect production of thermolabile enterotoxin (L.T.). C.H.O.-positive *E. coli* produce both L.T. and a thermostable toxin (S.T.). C.H.O.-positive strains were found in 19.2% of all cases and in 70% of the most severely ill patients with non-*Vibrio cholerae*. *E. coli* which produce S.T. alone were identified in a third of the C.H.O.-negative cases. Enterotoxigenic *E. coli* were found in 55% of inpatients with idiopathic diarrhoea and, if an aetiological role is confirmed, may be one of the commonest causes of tropical diarrhoea." (Authors' abstract)

415 Nalin DR. Mortality from cholera and other diarrhoeal diseases at a cholera hospital [communications]. Trop Geogr Med 1972 Jun;24(2):101-6

"During a 5-year period 4,627 patients with culture-proven cholera were treated with a standard intravenous solution and tetracycline. Although 55% of the patients arrived in shock, mortality was less than 1%. In a few cases, death was directly attributable to delay in arriving at the hospital for treatment. A survey of 34 fatal cases revealed that most patients had major complicating diseases, most often pneumonia and/or marasmus." (Author's abstract)

416 Nalin DR, Cash RA, Reller B, Rochat R, Islam R, Molla M, Haque Z. Reduction of maintenance of intravenous fluid needs in cholera by means of an oral therapeutic solution. J Pak Med Assoc 1969 Aug;19(8):373-9

"An oral solution was used in addition to intravenous fluids for the therapy of severe cholera in adults. Patients treated with the oral solution required 80 percent less intravenous fluid than patients who received intravenous fluid alone." (Authors' abstract)

417 Oberle MW, Merson MH, Islam MS, Rahman ASMM, Huber DH, Curlin G. Diarrhoeal disease in Bangladesh: epidemiology, mortality averted and costs at a rural treatment centre. Int J Epidemiol 1980 Dec;9(4):341-8

"The basic epidemiology of acute diarrhoeal disease seen at a rural Bangladesh hospital in 1975 is reviewed. *V. cholerae* O1 was isolated from 28% of 1,964 h patients. Significant differences in hospitalisation rates were observed between males and females in several age groups. Overall hospital case fatality was 9/1000 cases. We estimate that approximately a quarter to half of the hospitalised patients would have died had no rehydration therapy been available. The region's total mortality was reduced by approximately 7%-15%, at a cost of United States $0.14 per capita. Mortality from acute diarrhoeal diseases was greatly reduced for all age groups, and total mortality and mortality from all diarrhoeal diseases were particularly reduced for young children and young adults. Rehydration therapy used in a field hospital was apparently highly effective in reducing general mortality and mortality from acute diarrhoeal diseases." (Authors' abstract)

418 Oseasohn RO, Benenson AS, Fahimuddin M. Cholera vaccine field trial in rural East Pakistan [abstract]. *In*: Souvenir of the 8th All Pakistan Medical Conference and International Clinical Seminar, Dhaka, 26-29 Nov 1964

419 Oseasohn RO, Benenson AS, Fahimuddin M. Cholera vaccine field trial in rural East Pakistan (first year of observation). *In*: Proceedings of the Cholera Research Symposium, Honolulu, 24-29 Jan 1965:362-6

420 Oseasohn RO, Benenson AS, Fahimuddin M. Field trial of cholera vaccine in rural East Pakistan: first year of observation. Lancet 1965 Feb 27;1(7383):450-3

"During the first year of a double-blind trial of a cholera vaccine in an endemic area, the incidence of diarrhoea associated with *V. cholerae* was 6.1 per 1,000 among controls given a typhoid-paratyphoid vaccine, and 1.7 per 1,000 among subjects given a commercial cholera vaccine of high potency. The disease was concentrated among children." (Authors' abstract)

421 Osteria T, Bhatia S, Faruque ASG, Chakraborty J. An areal analysis of family planning program performance in rural Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 14 p. (ICDDR,B working paper, 12)

"The surveys undertaken in the first 2 years of the simple, household contraceptive distribution project revealed, after an initial relatively high acceptance, a limited impact by the beginning of the 18th month. The inability of field workers to manage the side effects was one of the reasons posited for this deterioration. The program was restructured in October 1977. A cadre of better educated, better trained, and better motivated field workers were introduced. At the end of 6 months the prevalence rates were higher than the previous program recorded and continued to rise to the end of the first year. The paper attempts to dissect the different factors responsible for the diversity in prevalence rates among the 80 villages after the first six months and to determine the extent to which these differences could be attributed to the field workers and independently, to the areal characteristics. The female village workers characteristics considered included age, education, number of living children, and scores in the first and second examination given a month apart. The areal characteristics included the percentages wanting no more children and the percentage of women who have used a contraceptive method in each of the villages. The regression analysis revealed that 33.7% of the variability in prevalence rates could be explained by the aforementioned variables jointly. The areal characteristics alone explained 30.5% of the inter-village variation. The villages with large proportions wanting no more children in December 1977 exhibited high prevalence rates in March 1978." (Authors' abstract)

422 Osteria T, Rahman M, Langsten R, Khan AR, Huber DH, Mosley WH. Assessment of the Matlab Contraceptive Distribution Project - implications for program strategy. Dhaka: Cholera Research Laboratory, 1978. 20 p. (CRL working paper, 4)

"In October, 1975, the Cholera Research Laboratory in collaboration with the Ministry of Health and Population initiated a simple but extensive house-to-house distribution program of non-clinical methods of contraception (oral pills and condom) in 150 villages (125,000 population) of the Matlab Surveillance Area (MSA). The remaining 84 villages (135,000 population) serviced by the regular Government program, was the control group. The specific objectives of this program were to assess a household delivery system of oral contraceptives and condoms in Rural Bangladesh in terms of: a) feasibility of organizing and implementing such a delivery system; b) total demand for these contraceptives; and c) demographic impact. The baseline KAP survey suggested that while modest, there exists a significant demand for contraception in this rural area. Three months after contraceptive distribution was operationalized, 17.1% of the eligible women claimed to be using oral pills. After 18 months of program effort, the prevalence of oral pill use has declined to 8.7%. The corresponding prevalence rate for use of all methods in the program village were 18% and 13% respectively. The declining prevalence rates were due to both declining rates of new acceptors and briefer rates of method continuation over time. The rate of pill acceptance declined from 24% to 2% 18 months later. Oral pill continuation rates similarly declined with each successive cohort of acceptors. It

seems clear therefore, the provision of a full range of clinical and non-clinical fertility control services will be required to fully meet the existing contraceptive demand. Furthermore, to adequately deliver these services and provide the critical support to maintain use a cadre of well-trained and motivated village level workers is required. These workers should deliver other preventive services related to maternal and child health to fully meet the need for reproductive health in the population." (Authors' abstract)

423 Osteria T, Mosley WH, Chowdhury AI. The demographic impact of the Contraceptive Distribution Project. Dhaka: Cholera Research Laboratory, 1978. 13 p. (CRL working paper, 7)

424 Osteria T, Bhatia S, Chakraborty J, Chowdhury AI. The demographic impact of sterilization in the Matlab village-based MCH-FP program. Dhaka: Cholera Research Laboratory, 1978. 19 p. (CRL working paper, 10)

"The demographic impact of sterilization in the Matlab family planning program was assessed through the utilization of two indices - the couple years of protection and the number of births averted. The couple years of protection utilized was derived from the approach of Wishik which considers the age at menopause and the couples' joint probability of surviving until the wife's menopause. The number of births averted was obtained from Simmons where the proportion surviving and the marital age specific fertility rates were taken into consideration. There were 484 sterilization acceptors registered by the program in its first 6 months of operation. The average age of the acceptor was 33.2 years and that of her husband 43.6 years. The couple years of protection increased with earlier age at acceptance. Women who were sterilized at age group 20-24 were given 19.7 years of protection, those who were sterilized at age group 25-29 had 15.5 years and women who submitted to the operation at age group 40-44 were accorded 2.4 years. Based on this, 4927 years of protection were realized by 484 acceptors. The number of births averted was 6 if the women accepted at age group 20-24; 4 at 25-29; 2 at 30-34; and 1 at 35-39. There were 981 births averted by the program." (Authors' abstract)

425 Pebley AR. Intervention projects and the study of socioeconomic determinants of mortality. Pop Dev Rev 1984;10(suppl):281-305

"This paper examines the potential role of data from longitudinal public health intervention projects and their attempts to test and quantify the relationship between socioeconomic and biological determinants of mortality. 3 projects with different research designs and objectives are discussed as examples: the Narangwal project in India, INCAP's El Progreso study in eastern Guatemala and the Matlab project in Bangladesh. The objectives of this paper are to discuss 1) the types of data these studies have collected; 2) analytical approaches and problems related to the study of socioeconomic determinants of child mortality using data of this type; and 3) the ways in which the design of such projects may affect the usefulness of the data generated. In the case of the Matlab MCH-FP study, the evidence is fairly clear that the intervention reduced infant and child mortality rates in comparison to what they would otherwise have been. Reasons for this clear-cut impact are that the study involved a comparison over time between a treatment and a control group, and the sample size was sufficiently large. However, in the case of the other 2 projects, one cannot adequately determine how much of the mortality decline resulted from the intervention. All 3 projects produced publications and reports on a wide variety of public health issues. Most of these reports were descriptive rather than explanatory and although they are only indirectly concerned with child mortality, they are included in the present discussion to illustrate potentially more fruitful uses of intervention study data in mortality analyses. It is argued that much of the potential of these data for testing models including both socioeconomic and biological mortality determinants remains untapped. At least 2 problems limit the usefulness of many of these analyses. The 1st is the lack of a conceptual model or framework guiding the analysis that describes both the biological process of child mortality and the ways socioeconomic factors

may affect this process. The 2nd is reliance on simple bivariate statistical methods that are inadequate to the task of testing complex hypotheses. A final section considers possibilities of inference from intervention study data. Generalizability from these projects is problematic because the samples chosen for intervention are not, in any statistical sense, samples of a larger population; the design and implementation of the intervention may have altered the patterns of variance and covariance within the study population. It is concluded that results from analyses of socioeconomic determinants of mortality using health intervention project data must be interpreted cautiously." (POPLINE)

426 Pebley AR, Huffman SL, Chowdhury AKMA, Stupp PW. Intra-uterine mortality and maternal nutritional status in rural Bangladesh. Pop Stud 1985 Nov;39(3):425-40

"This paper is an investigation of the relationship of a maternal nutritional status with intra-uterine mortality in a population of chronically malnourished rural Bangladeshi women. First, life-table techniques are used to compare the level of intra-uterine mortality in this population with levels reported in other studies. Then the relationships of maternal nutritional status, age, parity, foetal loss and season of conception with intra-uterine mortality are examined in a multivariate analysis. The results indicate foetal mortality in rural Bangladesh to be markedly higher than in other populations where living conditions and health care are superior. Maternal nutritional status, maternal age and season of conception all appear to be related significantly to foetal mortality." (Authors' abstract)

427 Phillips JF, Stinson WS, Bhatia S, Rahman M, Chakraborty J. The demographic impact of the Family Planning--Health Services Project in Matlab, Bangladesh. Stud Fam Plann 1982 May;13(5):131-40

"This paper evaluates the demographic impact of the Family Planning-Health Services Project in Matlab Thana of rural Bangladesh. The project was begun by the International Centre for Diarrhoeal Disease Research, Bangladesh in October 1977. Contraceptive services - including pills, condoms, IUDs, sterilization, and injectables - are supplemented by oral rehydration, tetanus toxoid, and other services. About 33 percent of eligible couples are using contraception. Impact is evaluated by direct measurement of birth rates in the treatment and comparison areas. An overall fertility decline of about 25 percent is observed, concentrated among older women. The impact is two-to-three times that of an earlier project that included fewer methods and used lesser trained workers. The study shows that intensive family planning efforts can affect fertility in the absence of socioeconomic changes." (Authors' abstract)

428 Phillips JF, Stinson W, Bhatia S, Rahman M, Chakraborty J. The demographic impact of two contraceptive service projects in Matlab Thana of Bangladesh: a compendium of findings for the 1975-1980 period. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 82 p. (ICDDR,B scientific report, 23)

"Two studies have been conducted in Matlab Thana of Rural Bangladesh over the 1975 to 1981 period to test the hypothesis that contraceptive services can reduce fertility in rural Bangladesh. This paper reviews the designs of the two studies and analyzes their demographic effects. The first study tested a pill and condom household contraceptive distribution approach; the second augmented that strategy with better training of workers, a wider battery of methods, more intensive follow-up and referral services, and ancillary health care. Both projects had an impact on fertility. Contraceptive distribution had a modest impact in its first year and no effect subsequently. The initial impact of the comprehensive health and contraceptive care approach was at least double the initial impact of the contraceptive distribution approach. Moreover, effects of the second study were sustained over time. Policy implications of the findings of the studies are reviewed." (Authors' abstract)

429 Phillips JF, Simmons R, Koenig MA, Chakraborty J. Determinants of reproductive

change in a traditional society: evidence from Matlab, Bangladesh. New York: The Population Council, 1987. 58 p. (Working paper, 135)

430 Phillips JF, Simmons R, Koenig MA, Chakraborty J. Determinants of reproductive change in a traditional society: evidence from Matlab, Bangladesh. Stud Fam Plann 1988 Nov-Dec;19(6):313-34

"A decade has elapsed since a project was launched in Matlab, Bangladesh to test the hypothesis that contraceptive services can induce and sustain fertility decline in a rural traditional population. The demographic impact of this project has been pronounced, lending support to the view that supply-side policies can succeed even where institutional supports for demand are weak. This paper reviews the relationship between the Bangladesh climate of demand and the Matlab system of supply with the aim of explaining how such effects arise. A sociologically appropriate system of supply can induce fertility change in a society where such change would not spontaneously arise. The study of programs and the "sociology of the supply side" thus deserve the same degree of rigor accorded to research on the "sociology of demand." (Authors' abstract)

431 Phillips JF, Simmons R, Chakraborty J, Chowdhury AI. Integrating health service components into a family planning efficacy in the Matlab Family Planning Health Services Project. *In*: Proceedings of the 8th Contributors Conference, Bangladesh Fertility Research Programme, Azimpur, Dhaka, 22-23 Jan 1984. Dhaka: National Institute of Population Research and Training, 1984:56-88

432 Phillips JF, Simmons R, Chakraborty J, Chowdhury AI. Integrating health services into an MCH-FP program: lessons from Matlab, Bangladesh. Stud Fam Plann 1984 Jul-Aug;15(4):153-61

"Since 1977 the International Centre for Diarrhoeal Disease Research, Bangladesh, has conducted a field experiment in family planning and MCH in its Matlab research station. The project began with an emphasis on family planning and MCH services were added in stages. This paper uses time series regression methods to address the question of whether the addition of health services contributed to family planning efficacy in Matlab in a program launched with minimal MCH services. The results show that some MCH interventions increased contraceptive prevalence, some decreased it, and others had no effect. The broader significance of these findings for implementing integrated programs is discussed." (Authors' abstract)

433 Phillips JF. A logit regression method for the multivariate analysis of contraceptives attrition. *In*: Hermalin AI, Entwistle B, eds. The role of surveys in the analysis of family planning programs. Liege: Ordina Editions, 1981:481-536

434 Phillips JF, Simmons R, Simmons GB, Yunus M. Transferring health and family planning service innovations to the public sector: an experiment in organization development in Bangladesh. Stud Fam Plann 1984 Mar-Apr;15(2): 62-73

"The International Centre for Diarrhoeal Disease Research, Bangladesh, has launched a field experiment in two rural thanas of Bangladesh to test the transferability of its successful health and family planning experiment in Matlab to the Ministry of Health and Population Control service system. This paper reviews the Matlab experiment with particular attention to its organization and identifies elements for transfer. The intervention strategy and operations research design of the new experiment are discussed. The proposed design follows an organization development strategy in which collaborative diagnostic research is used to foster institutional change." (Authors' abstract)

435 Phillips JF. Translating pilot project success into national policy development: two projects in Bangladesh. Asia-Pacific Pop J 1987 Dec;2(4):3-28

"Operations research often generates prescriptions for policy change that fail to influence what bureaucracies actually do. This article reviews the experience of two pilot projects in Bangladesh that have addressed the question of how such research can be designed to foster its utilization. In a rural field experiment in Matlab subdistrict, research has demonstrated that contraceptive services, if carefully designed and properly implemented, can influence demographic dynamics even where social and economic circumstances are not conducive to fertility change. Despite the success that Matlab represents, the project was not systematically utilized for policy until a second study was launched to address government questions concerning its replicability in the public sector programme. Results suggest that pilot projects, if fielded in conjunction with research systems for testing their replicability, can foster organizational development in contexts that are not conducive to bureaucratic change." (Author's abstract)

436 Phillips M, Everett D, Huber DH. Investigation of contraceptive side effects and their impact on contraceptive usages. *In*: Proceedings of the 10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory for the year 1975:147-68

437 Phillips RA. Progress in cholera research. J Pak Med Assoc 1969 Aug;19(8):343

438 Rahaman MM. Diarrhoea in Bangladesh: an overview of research conducted between 1962-1984. *In*: Tzipori S, Barnes G, Bishop R, Holmes I, Robins-Browne R, eds. Infectious diarrhoea in the young: strategies for control in humans and animals; proceedings of an International Seminar on Diarrhoeal Disease in South East Asia and the Western Pacific Region, Geelong, 10-15 Feb 1985. Amsterdam: Elsevier, 1985:69-72

This paper presents an overview of diarrhoea-related research conducted in Bangladesh between 1962-1984 at the International Centre for Diarrhoeal Disease Research, Bangladesh. The development of oral rehydration therapy is discussed with the use of "Dhaka" solution containing physiologically-balanced electrolytes. The decline in the use of the whole-cell cholera vaccine is reported. The classical vaccines were found to be useless for all practical purposes in studies carried out at the Matlab Field station of the ICDDR,B. Findings of research show that *Shigella* species are a major cause of diarrhoea, while non-cholera *Vibrio*, enterotoxigenic *Escherichia coli* and rotavirus are considered as important causative agents of diarrhoea. Dehydration due to rotavirus could be corrected by oral rehydration solution. Some inexplicable phenomena of classical and El Tor cholera in Bangladesh are discussed. Tetracycline-resistant *Vibrio cholerae* infection was found to be rare either in the laboratory or in nature. Search for new and effective vaccines against cholera and other diarrhoeal pathogens are continuing through vaccine trials at field level and experimentation at the laboratories of the ICDDR,B. The "Dhaka" solution for oral rehydration therapy is recommended for use in cholera patients.

439 Rahaman MM. Rehydration therapy in diarrhoea: looking at it from a village. *In*: Holme T, Holmgren J, Merson MH, Mollby R, eds. Acute enteric infections in children; new prospects for treatment and prevention. Amsterdam: Elsevier, 1981:323-4

440 Rahman ASMM. A clinical study of the effectiveness of furazolidone and tetracycline in different doses in the treatment of cholera in children. Pak Med Forum 1970 Apr;5(4):133-40

441 Rahman ASMM, Curlin GT. Comparison of clinical expression of diarrhoea among field trial patients. *In*: Proceedings of the 9th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between Center for Medical Research and Cholera Research Laboratory, 1974:181-92

442 Rahman ASMM. Experience in treating cholera at a rural hospital. J Pak Med

Assoc 1969 Aug;19(8):366-72

443 Rahman M, Ruzicka L. Bangladesh: lessons learnt from two service strategies employed in Matlab. Asian-Pacific Pop Progr News 1983;12(4):25-7

"In late 1975 the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) initiated a contraceptive distribution program (CDP) in its field research area in Matlab thana (county) in rural Bangladesh. The project had a dual purpose: to confirm the existence of an unmet demand for contraception; and to assess to what degree it could be met by simply making oral contraceptives (OCs) and condoms available to every household. A total of 154 lady village workers (LVWs) were trained to work as distributors and depot holders of contraceptives. 1 LVW was responsible for about 200 families in the neighborhood of her residence. The initial results of the CDP were encouraging, but the prevalence of contraceptive practice declined thereafter to what appeared to be a plateau of 12% in the 2nd year of the program. This led to substantial modification in the field structure and program activities of the original CDP in late 1977. The modified program replaced the LVWs by a cadre of better educated and better trained female village workers (FVWs), backed up by a strong supervision and technical staff in 70 villages to provide a full range of contraceptives and selected maternal and child health (MCH) services. A group of 20 FVWs is assigned to a subcenter that is staffed by a full time paramedic to provide routine MCH services, IUD services, and referral support. Work routines require each FVW to visit all currently married women of reproductive age of her area fortnightly and to attend meetings at the subcenter to report on progress. The project has 1 woman physician who does regular rounds in the field and provides professional support to a central sterilization clinic in Matlab. 3 components of the project have been fully implemented thus far: family planning services, tetanus immunization, and diarrheal disease treatment. The project effect was a prompt and continuing increase in contraceptive use prevalence rates. The proportion of married women of reproductive age using contraceptives rose rapidly to 32% in the 1st year and stayed at 33% in the 2nd year. The project has been maintaining this use prevalence rate for the last 4 years with only a slight increase to 34% more recently. 1 important observation of the Matlab project is that acceptors tend to cluster geographically producing a wide intervillage variation in contraceptive use prevalence rates. Given the free household distribution of contraceptives by the project, the question arises as to why rates differ among a population which appears to be so homogeneous." (POPLINE)

444 Rahman M, Mosley WH, Khan AR, Chowdhury AI, Chakraborty J. Contraceptive distribution in Bangladesh: some lessons learned. *In*: Proceedings of the First One-day Bi-Annual Seminar on Family Planning Research, Dhaka, Bangladesh, 28 Aug 1980

445 Rahman M, Mosley WH, Khan AR, Chowdhury AI, Chakraborty J. Contraceptive distribution in Bangladesh: some lessons learned. Stud Fam Plann 1980 Jun;11(6):191-201

"In 1975 the Cholera Research Laboratory began a contraceptive distribution program in 150 rural villages in Matlab thana to confirm that an unmet demand existed and to assess to what degree it could be met by making orals and condoms available to every family. Three months after initial distribution, the percentage of women currently contracepting had risen from 1 to 17 percent. Thereafter the current use rate declined to around 12 percent by the second year. This drop was due both to declining rates of new acceptors and to shorter rates of continuation. Surveys revealed that availability of a single method choice, side effects, inadequate medical back-up, lack of encouragement for continued use, inefficient female fieldworkers, and inadequate supervision were responsible for program deterioration." (Authors' abstract)

446 Rahman M. Experiences in treating cholera in a rural hospital [abstract]. *In*: Souvenir of the 10th All Pakistan Medical Conference of the Pakistan Medical Association, Dhaka, 14-17 Nov 1968

447 Rahman M, Chen LC, Chakraborty J, Yunus M, Faruque ASG, Chowdhury AI. Factors related to acceptance of tetanus toxoid immunization among pregnant women in a maternal-child health programme in rural Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 26 p. (ICDDR,B scientific report, 43)

"In a rural area of Bangladesh, tetanus vaccination to pregnant women was offered within the context of a maternal-child health and family planning programme. During a period of 16 months, only about 34 percent of pregnant women identified by field workers received full immunization (2 injections) and about 5 percent received partial immunization (1 injection). The major reported reasons for non-acceptance of vaccination were objection by husbands and mother-in-laws, fear of women due to lack of experience with injections during pregnancy, fear from village rumours, and failure of workers to inform pregnant women about vaccination early enough. The most frequently reported reason for failure to accept the second injection was the departure of the women from their usual residence in preference of confinement in their parents' house. The constraints in the community diagnosis of neonatal tetanus appeared to adversely effect perception of the cent-percent effectiveness of the vaccine. The findings of this study did not support an apprehension that previous provision of injectable contraceptive had discouraged women from accepting tetanus vaccination. The families of tetanus vaccination acceptors appeared to adopt usage of home-based oral therapy for diarrhoea sooner than the families of tetanus vaccination non-acceptors, suggesting that in the community some households were likely to accept a variety of modern medical technologies earlier than others. However, a comparison of acceptors and non-acceptors of vaccination showed little differences between the two groups in terms of their socio-demographic characteristics." (Authors' abstract)

448 Rahman M, Huber D, Chakraborty J. A follow-up survey of sterilization acceptors in Matlab, Bangladesh. Dhaka: Cholera Research Laboratory, 1978. 27 p. (CRL working paper, 9)

"This paper reports some findings of a follow-up survey conducted among 185 vasectomy and 136 tubectomy acceptors from the Matlab Cholera Research Laboratory Field Surveillance Area. The clients were sterilized during the eight-week nation-wide intensive sterilization campaign, beginning from February, 1977 and were followed-up within two weeks following the operation. The findings of the survey showed that the sterilization campaign attracted clients mostly from the lower socioeconomic stratum of the country. The mean age for vasectomy acceptors was 49.3 years and the mean number of their living children 5.2. The corresponding figures for tubectomy acceptors were 34 and 5 respectively. The clients seemed in general to be satisfied with the results of tubectomy and vasectomy procedures, management of the clinics and services offered during the campaign. Community support was found to be more favourable toward tubectomy than toward vasectomy. Marked discrepancies in age reporting on the part of vasectomy acceptors were observed. The elderly vasectomy acceptors were found to have systematically understated their own age, the age of their wives and that of their youngest child. A combination of factors like, monetary incentive, pressure on workers for meeting the target and inability to check fecundity of the wives resulted in at least 25 percent of vasectomy clients as ineligible for sterilization." (Authors' abstract)

449 Rahman M, Phillips JF. An investigation into proximate determinants responsible for fertility differentials between two rural Bangladeshi populations. J Biosoc Sci 1988 Oct;20(4):411-21

"The levels of fertility of two rural areas, Matlab and Teknaf, of different environmental and cultural settings of Bangladesh are markedly different. The proximate fertility determinants that may explain this difference are identified and their possible effect is examined. Most of the variation of natural fertility is explained by the difference in breast-feeding practices of the two populations, median duration 30 months for Matlab and 22 months for Teknaf. This difference suggests that prolonged breast-feeding is as impor-

tant a factor contributing to the relatively low fertility in Matlab as contraception. While the increase of contraceptive use in Matlab has greatly affected fertility, the concomitant contribution of prolonged lactational amenorrhoea is also important." (Authors' abstract)

450 Rahman M, Mosley WH, Khan AR, Chowdhury AI, Chakraborty J. The Matlab Contraceptive Distribution Project. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 111 p. (ICDDR,B scientific report, 32)

"This paper provides an overview of the Matlab Contraceptive Distribution Project, with a detailed analysis of the service delivery aspects of the project. The Cholera Research Laboratory (CRL), in collaboration with the Ministry of Health and Population Control, initiated this project in October 1975, with the objective to determine the feasibility and impact of a household delivery system for non-clinical contraceptive (oral pills and condoms) in Bangladesh. Between October and December, 1975, eight CRL field assistants with the help of 154 CRL resident dais made a house-to-house distribution of oral pills in 150 villages (about 125,000 population) of the Matlab field surveillance area. Contact was made with 19,027 eligible women (currently married women of age between 15-44 years) and of them, 13,087 (69 percent accepted the supplies, usually 6 cycles of pills. Subsequent distribution for resupply and for recruitment of new acceptors was made by dais in their daily contact with the villagers for vital events and diarrhoea surveillance. After about one year, a second round of intensive house-to-house distribution was made by male field workers. This time the main emphasis was on the distribution of condoms. As part of supervision process and to assess progress, eight quarterly prevalence surveys were conducted during the life time of the project. The findings of these surveys showed that within 3 months following the initial distribution, the percentage of eligible women currently using contraceptives rose from a baseline level of 1 percent to 17 percent. However, the prevalence of contraceptive practice declined thereafter and came down to what appeared to be a plateau level of 12 percent in the second year of the programme. The declining prevalence rates were due to both declining rates of new acceptors and briefer rates of method continuation over time. A number of special studies were undertaken to learn the reasons for the relatively modest achievements of the programme. Based on the recommendations derived from these studies, the project was restructured in October, 1977, after about two years of its operation. The restructured programme differed from the original programme in three important characteristics: (1) the level of training and social status of the female village workers was greatly elevated; (2) the range of contraceptives available in the programme was substantially broadened and (3) the introduction of medical services, both supportive for contraceptive acceptors and, latter, for general maternal and child care. The effect of the restructured programme was a prompt and continuing rise in contraceptive prevalence. At the end of one year the current use rate rose to above 30 percent level, with an increasing percentage recorded each month, and no peak yet reached." (Authors' abstract)

451 Rahman M. Neonatal tetanus in Bangladesh: effect of active immunization of mothers; anti-tetanus active immunization of mothers--field experience in Bangladesh. Pak Pediatr J 1982;6(2-3):144-51

452 Rahman M. Parental dependency on children in Matlab, Bangladesh. Dhaka: Cholera Research Laboratory, 1978. 24 p. (CRL working paper, 11)

"This paper reports some findings on the extent of and reasons for parental dependency on children in Matlab, Bangladesh. From the findings it appears that the parental dependency has its root mainly in the productive utility of children and the need for old-age support. Children in Matlab begin their economically useful lives as early as by age 6. About 29 percent of boys and 78 percent of girls by age 8, over 60 percent of boys and 93 percent of girls by age 10, and almost every boy and every girl by age 12 enter the house-hold labour force. 96 percent of the women expect financial help from their grown-up children. In about 94 percent of the cases the grown-up children

engaged in gainful employment have been regularly or occasionally helping their parents with money. Help from children is the major means of support in old-age for as many as 95 percent of the women; this includes 74 percent of the women for whom help from children is the only means of their support. 96 percent of the women expect to live with their children even after their marriage and of these as many as 95 percent wish to spend their entire lives with children. Obviously, despite the wide spread awareness among the women about disadvantages of a large family and advantages of a two-child family, the overwhelming majority of the women desire a family of average 4-5 children. The findings, further indicate that parents in Matlab tend to see children in an economic rather than a psychological or social context. All other considerations relevant to family size -- the psychological or social benefits of a large or small number of children, risk to the mother's health, fear of infant or child mortality -- are mentioned with nearly insignificant frequency." (Author's abstract)

453 Rahman M, Chen LC, Chakraborty J, Yunus M, Chowdhury AI, Sarder AM, Bhatia S, Curlin GT. Reduction of neonatal mortality by immunization of non-pregnant women and women during pregnancy with alluminum-adsorbed tetanus toxoid. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 18 p. (ICDDR,B scientific report, 41)

454 Rahman M, D'Souza S. A review of findings on the impact of health intervention programmes in two rural areas of Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1980. 24 p. (ICDDR,B special publication, 11)

"Intervention programs under development by the International Centre for Diarrhoeal Disease Research, Bangladesh in its 2 field stations at Matlab and Teknaf for the treatment of diarrheal disease, tetanus neonatorum, and high fertility are described. Distribution of oral therapy packets for diarrhea through a village-based program using female village workers in Matlab and indigenous health practitioners in adjacent thanas and 2 domiciliary programs using family depot holders in Teknaf and mothers representing kin groups in Matlab resulted in use rates of over 80% and substantially reduced case-fatality rates. The Matlab maternal tetanus immunization study demonstrated the impact on neonatal mortality of active immunization of pregnant women with 2 tetanus injections, but acceptance rates of only 33% by pregnant women reduce the impact of the program on the overall neonatal mortality rate in the community. The maternal-child health and family planning program achieved a contraceptive use-prevalence rate of about 33% in the second year after the program was restructured to correct inadequacies in the previous program. The place of these interventions in the ICDDR,B program and in the Bangladesh health care structure is discussed." (POPLINE)

455 Rahman M, D'Souza S. A review of the findings on the impact of health intervention programmes in two rural areas of Bangladesh. *In*: Lopez A, ed. Mortality in South and East Asia: a review of changing trends and patterns, 1950-1975; report and selected papers presented at Joint WHO/ESCAP meeting, held in Manila, 1-5 December 1980. Manila: Regional Office for the Western Pacific, World Health Organization, 1982:377-95

456 Rahman M, Osteria T, Chakraborty J, Huber DH, Mosley WH. A study of the field worker performance in the Matlab Contraceptive Distribution Project. Dhaka: Cholera Research Laboratory, 1978. 13 p. (CRL working paper, 5)

"This paper attempts to look at the characteristics of the dais (female village workers) in Matlab Contraceptive Distribution Project and how they relate to their level of knowledge about contraceptives, acceptance rates and prevalence of contraceptive use in their areas. Most of the dais were found to be elderly illiterate widows with about 4 living children. The number of living children and the age of the dais seemed to be strongly correlated with their level of contraceptive knowledge which, in turn, was found to be positively related to both prevalence and acceptance rate. Younger dais with more living children

were able to assimilate better the instructions concerning contraceptive use. Education was found negatively associated with both acceptance and prevalence indicating that the level of knowledge was not dependent on education but on the motivation to learn." (Authors' abstract)

457 Rahman M, Kane P, Ruzicka L. Tradition, development, and the individual: a study of conflicts and supports to family planning in rural Bangladesh. Canberra: Department of Demography, Australian National University, 1986. 190 p. (Asian population change series, 1)

"This study is concerned with variations in levels of contraceptive practice in Matlab thana, Bangladesh. The focus of the study was "to examine to what extent theories and findings of other studies on the causes of variation in levels of contraceptive practice apply in the rural area of Bangladesh. A corollary objective was to identify some policy guidelines that could be utilized to improve or modify the present educational and motivational strategy of the Matlab project, in particular, and the national population control programme, in general." The data are from five surveys conducted in Matlab in 1982. The results show that an individual's practice of contraception is affected by the characteristics of his or her immediate social group, as well as by individual characteristics. Thus, the regional variations observed in Matlab are primarily due to the conservative or progressive nature of the communities concerned, particularly the attitudes of local community leaders. Individual factors affecting contraceptive use include number of living sons, wife's listening to radio, and educational status of husband and wife." (POPLINE)

458 Rahman M, Chen LC, Chakraborty J, Yunus M, Chowdhury AI, Sarder AM, Bhatia S, Curlin GT. Use of tetanus toxoid for the prevention of neonatal tetanus. 1. Reduction of neonatal mortality by immunization of non-pregnant and pregnant women in rural Bangladesh. Bull WHO 1982;60(2):261-7

"An analysis of the live births between September 1978 and December 1979 in a rural epidemiological surveillance area of Bangladesh showed that for infants whose mother had received two tetanus injections 48-64 months prior to delivery, the neonatal mortality rate was 63.8 per 1000 live births compared with 78.3 per 1000 for infants whose mother did not receive tetanus immunization. Immunization of women with two tetanus injections during pregnancy reduced neonatal mortality rates to 42.8 per 1000, a reduction of 35.5 per 1000. Mortality on days 4-14 was reduced even more--by about 70%. One injection during pregnancy did not appear to provide protection against tetanus neonatorum." (Authors' abstract)

459 Rahman M, Chen LC, Chakraborty J, Yunus M, Faruque ASG, Chowdhury AI. Use of tetanus toxoid for the prevention of neonatal tetanus. 2. Immunization acceptance among pregnant women in rural Bangladesh. Bull WHO 1982;60(2):269-77

"In a rural area of Bangladesh, two injections of aluminium phosphate-adsorbed tetanus toxoid were offered to pregnant women within the context of a maternal and child health and family planning programme. Over the first 16 months of the programme, only 34.2% of pregnant women identified by field workers accepted full immunization and 4.8% accepted partial immunization. A comparison of acceptors and non-acceptors of immunization showed only small differences between the two groups in terms of their socio-demographic characteristics, such as age, religion, education, number of children, and occupation. The main reasons reported for non-acceptance were objection by husbands and mothers-in-law, fear of harming the fetus exacerbated by village rumours, and failure to inform the women sufficiently early during pregnancy. The most frequently reported reason for failure to accept the second injection among the partially immunized was the temporary migration of women from their usual residence for confinement in their parents' house. Confusion caused by local names for neonatal tetanus may have adversely affected perception by the community of the effectiveness of the vaccine. The study demonstrated that previous use of injectable and other contraceptives did not

decrease subsequent acceptance of tetanus immunization. The families of tetanus immunization acceptors appeared also to adopt home-based oral rehydration therapy for diarrhoea more readily than the families of non-acceptors." (Authors' abstract)

460 Rahman M, D'Souza S, Karim MR. Village characteristics and contraceptive practices. *In*: Proceedings of the Bangladesh Fertility Research Programme Seventh Contributors Conference, held in Dhaka, on 8-9 December 1982. Dhaka: Bangladesh Fertility Research Programme, 1983:455-90

"This paper presents some preliminary findings on village characteristics and contraceptive practices in Matlab thana, Comilla district, Bangladesh. The findings tend to support the hypothesis that the villages of Matlab thana differ in their socio-demographic characteristics and infrastructure. The difference in these characteristics seems to produce a difference in village contraceptive use-prevalence rates. Villages where Hindus form a majority have higher use-prevalence rates than the villages where Muslims form a majority. Villages with majority agricultural families have higher use-prevalence rates than the village with majority fishing families. Similarly, villages with higher proportion of literate household heads have higher use-prevalence rates. The most important findings of this study is that village contraceptive use-prevalence rates are strongly associated with the availability of modern communication facilities like launch transportation. Another important observation is that availability of a family welfare centre within one house travel distance from the village or availability of a family welfare assistant in the area significantly affect the village contraceptive use-prevalence rate. An association between village development programs like women's co-operative, farmer's co-operative, adult education program, etc. and village contraceptive use-prevalence rates has been documented. Whether this association is real or artificial can not, however, be adequately answered without further analysis of data." (Authors' abstract)

461 Razzaque A. Effect of famine on fertility: a case study in rural Bangladesh [abstract]. *In*: Abstracts; program and abstracts of papers of the Fourth Annual Conference of the Indian Society for Medical Statistics, Bangalore, 24-26 Nov 1986. Bangalore: National Institute of Mental Health and Neuro Sciences, 1986:54

462 Razzaque A. Effect of famine on fertility in a rural area of Bangladesh. J Biosoc Sci 1988 Jul;20(3):287-94

"This study investigates the effects of the 1974-75 famine on differential fertility in a rural population of Bangladesh, using information on household socioeconomic status collected in the 1974 census, and registration data on births, deaths and migrations for the period 1974-77 from the Demographic Surveillance System of the International Centre for Diarrhoeal Disease Research, Bangladesh. Occupation of household head was taken as a measure of socioeconomic status. Total fertility rates were analysed for three periods: pre-famine, famine and post-famine. Overall fertility declined due to the famine by 34%, but this was compensated partially by a 17% increase in the post-famine period. Fertility of women of all ages and socioeconomic groups was affected by the famine, a more pronounced effect being observed among the poor. Fertility showed a higher post-famine recovery among women in the middle socioeconomic groups and in those aged 25-34 years." (Author's abstract)

463 Razzaque A. Effects of 1974-75 famine on differential mortality in rural Bangladesh. *In*: Krishnan T, ed. Statistics in medicine; proceedings of the Third Annual Conference of the Indian Society for Medical Statistics, Calcutta, 3-5 Dec 1985. Bombay: Himalaya Publishing House, 1989:142-54

"This study investigates the effect of the 1974-75 famine on the socio-economic differentials in mortality in a rural population of Bangladesh. The analysis is based on socio-economic data from the 1974 census, registration data on births, deaths, and migration for the period 1974-77, from the Demographic Surveillance System of the

International Centre for Diarrhoeal Disease Research, Bangladesh. It was found that the poorer families, as measured by possession of household items, suffered considerably higher mortality during the famine than the wealthier groups. Most affected were the younger and older age groups. Cohorts born during the famine had a lower cumulative proportion surviving at different points in time than post-famine birth cohorts. During the famine, infant mortality for the lower socio-economic groups was very high but in the post-famine period, the socio-economic differentials almost disappeared. Similarly, during the famine, infant mortality of females was higher than that of males, but after the famine the pattern was reversed." (Author's abstract)

464 Razzaque A. Effects of 1974-75 famine on differential mortality in rural Bangladesh [abstract]. *In*: Abstracts; proceedings of the Third Annual Conference of the Indian Society for Medical Statistics, Calcutta, 3-5 Dec 1985. Calcutta: Indian Statistical Institute, 1985:66.

465 Razzaque A, Begum HA. Levels and trends in fertility in the demographic surveillance areas of ICDDR,B. *In*: Mabud MA, ed. Recent trend in fertility and mortality in Bangladesh; proceedings of a national seminar, Dhaka, 11-13 Jun 1987. Dhaka: Population Planning Wing, Population Development and Evaluation Unit, Nov 1987:35-45

466 Razzaque A. Sociodemographic differentials in mortality during the 1974-75 famine in a rural area of Bangladesh. J Biosoc Sci 1989 Jan;21(1):13-22

"This study investigates the socio-demographic differentials in mortality during the 1974-75 famine in a rural area of Bangladesh. It is based on household socioeconomic information collected in the 1974 census and registration data on births, deaths and migrations for the period 1974-79 from the Demographic Surveillance System of the International Centre for Diarrhoeal Disease Research, Bangladesh. Ownership of selected household items was considered in the analysis as an indicator of household socioeconomic status. Mortality was 62% higher during the famine period and 31% higher during the post-famine period compared to the non-famine period. The mortality of both the poor and the rich increased during the famine period, by 117% and 28% respectively compared to the non-famine period. The poor suffered significantly in all age groups except 5-14 years, while the rich suffered only for ages 65 and over. Poor males suffered more than poor females except for ages 65 and over, while rich females suffered more than rich males except for ages under 1 year." (Author's abstract)

467 Razzaque A, Alam N, Wai L, Foster A. Sustained effects of the 1974-5 famine on infant and child mortality in a rural area of Bangladesh. Pop Stud 1990 Mar;44(1):145-54

468 Reduction of neonatal deaths by immunizing women against tetanus (international note). Wkly Epidemiol Rec 1981 Jun 19;56(24):185-6

469 Riley AP. Age at menarche and growth among adolescent females in rural Bangladesh: implications for childbearing. Baltimore, MD: Johns Hopkins University, 1987. 178 p. (PhD thesis)

"This study describes growth in height and weight among adolescent females in rural Bangladesh, and examines the association of age at menarche with postmenarcheal growth. The relationship of adolescent growth and age at menarche has important implications for childbearing where menarche and growth are delayed, because pregnancy may occur in women who are still in active growth. This may have a negative impact on birth outcome, and interfere with the completion of growth in young mothers. Age at menarche is delayed by about three years in Bangladesh compared to Western populations, undernutrition is pervasive, and marriage follows shortly after menarche. Data for this research were collected in rural Bangladesh by the International Centre for Diarrhoeal Disease Research, Bangladesh. Monthly height and weight measurements were taken

over a one year period on 1,064 females aged 10 to 20 years. The population includes 300 postmenarcheal girls for whom time since menarche was ascertained, 108 girls who reached menarche during the study, and 656 premenarcheal girls. Two stage regression analysis was used to study the effects of age, time since menarche, socioeconomic factors on postmenarcheal growth in girls with known times since menarche. In premenarcheal girls, the effects of age and socioeconomic factors on growth were examined. Results demonstrate that the adolescent growth spurt is considerably delayed, extended and less intense in Bangladeshi females, compared to a sample of British girls. Growth continued for an extended period after menarche and increases in height and weight were observed through twenty years of ages. Time postmenarche had a greater influence on postmenarcheal growth in weight and height than did chronological age. Therefore, growth continued among postmenarcheal females in Bangladesh regardless of the age at which menarche occurred. This suggests that young women in this population are at risk of becoming pregnant before their adolescent growth is complete." (Author's abstract)

470 Riley AP, Huffman SL, Chowdhury AKM. Age at menarche and postmenarcheal growth in rural Bangladesh females. Ann Hum Biol 1989 Jul-Aug;16(4):347-60

"This study examines the role of chronological age and time since menarche (TSM) as determinants of postmenarcheal growth in height and weight in a chronically malnourished population of rural Bangladeshi females aged 10-20 years. Height and weight measurements were collected for 12 months from 290 postmenarcheal girls, with known times since menarche, and on 118 girls who reached menarche during the one year follow-up. Two stage regression analysis was employed to study the relationship of age and time since menarche to postmenarcheal growth in height and weight, while adjusting for socioeconomic status. TSM is a more important determinant of postmenarcheal growth in height and weight than is age. For postmenarcheal growth in weight, the regression coefficient for TSM is six times greater then the coefficient for age. The effect of TSM was twice as strong as the age effect for postmenarcheal growth in height. Age has a statistically significant negative influence on statural growth and weight gain, but its practical effect on weight gain is small. An interaction between TSM and age suggests that TSM does not have the same implications for biological maturity for all ages at menarche. Findings demonstrate that Bangladeshi adolescents are still in active growth in height and weight into their late teens and past 20 years in some girls. This extended growth period may pose increased health risks to young mothers and their offspring." (Authors' abstract)

471 Rob U, Phillips JF, Chakraborty J, Koenig MA. The use effectiveness of the copper T-200 in Matlab, Bangladesh. Int J Gynaecol Obstet 1987 Aug;25(4): 315-22

"Using a unique record keeping system, the use effectiveness of the Copper T-200 is examined in rural Bangladesh. In Matlab the Cooper T-200 is a highly effective contraceptive modality. The adopters are typically low to medium parity women under 30 years of age. The most important cause of termination among women in the study was voluntary removal of the device. The complaint most often reported was bleeding followed by pain and weakness. The Matlab experience suggests that sustained motivation and regular resupply are the two key components of this highly successful family planning program." (Authors' abstract)

472 Roy SK, Chowdhury AKMA, Rahaman MM. Excess mortality among children discharged from hospital after treatment for diarrhoea in rural Bangladesh. Br Med J 1983 Oct 15;287(6399):1097-9

"Five hundred and fifty one children aged between 3 months and 3 years were followed up at home for 12 months after treatment of diarrhoea in a rural treatment centre of the International Centre for Diarrhoeal Disease Research, Bangladesh. During follow up the children were found to have a significantly higher mortality than generally observed in the community. The first three months after discharge appeared to be crucial, some 70% of

the deaths occurring in that period. Severely malnourished children (nutritional state below 56% of the American National Center for Health Statistics (NCHS) standard of weight for age ratio) had a risk of death 14 times that of their well nourished counterparts (nutritional state 66% or more of the NCHS standard). The highest mortality occurred in 2 year olds, one in three of the severely malnourished children dying compared with one in 10 of the moderately malnourished. This pattern was not seen in children aged under 2 years. Immediate priority should be given to providing nutritional rehabilitation for malnourished children who contract diarrhoea." (Authors' abstract)

473 Roy SK, Rabbani GH, Black RE. Oral rehydration solution safely used in breast-fed children without additional water. J Trop Med Hyg 1984 Feb;87(1):11-3

"Sixty-four children of age 3 months to 2 years were treated for diarrhoea in a rural treatment centre with oral rehydration solution (90 mmol/l Na+); plain water was not supplied during rehydration. All children continued breast-feeding during the therapy. Serum sodium levels after 24 h of intake indicated that 61 children had serum sodium level below 148 mmol/l and three were above (range 150-151). None of the children developed clinical signs or symptoms of hypernatremia. The use of additional water may not be necessary during rehydration therapy of breast-fed children." (Authors' abstract)

474 Ruzicka LT, Bhatia S. Coital frequency and sexual abstinence in rural Bangladesh. J Biosoc Sci 1982 Oct;14(4):397-420

"The paper analyses results of a survey of sexual and reproductive behaviour in a sample of 2301 currently married women aged less than 50 years. The survey was conducted in 22 villages of the ICDDR,B field station in Bangladesh. Admittedly, the sample is not representative as co-operation could not be obtained from about one-third of eligible women. The results suggest higher coital frequencies among Hindu than among Muslim respondents. There appears to be a clear age and marriage duration pattern with coital frequencies declining rapidly to a plateau after about 5 years of marriage and among women aged 25 and over, followed by another step decline at durations of marriage over 20 years and age 40 and more. Generally, recently married, young, non-breast-feeding, non-contracepting and pregnant respondents reported higher coital frequencies than their peers of opposite characteristics. Post-partum abstinence among both Muslims and Hindus was comparatively short, generally not exceeding 3 months." (Authors' abstract)

475 Ruzicka LT, Chowdhury AKMA. Demographic Surveillance System - Matlab. V. 2. Census, 1974. Dhaka: Cholera Research Laboratory, 1978. 45 p. (CRL scientific report, 10)

The Demographic Surveillance System consists of 2 types of operations: continuing registration of vital statistics (marriages, divorces, migration), and cross-sectional censuses taken at different points in time. The results of the census taken between April 22 and July 4, 1974 in 228 villages are described and analyzed in this volume, in 8 sections: method and definitions, population size and distribution, sex and age structure, marital status, religion, education, occupation, and family size and structure. The census schedule, instructions for enumerators, code list, and list of villages under the surveillance with the enumerated population by census month, are appended. Selected tabulations are added in a separately published annex. (Modified authors' abstract)

476 Ruzicka LT, Chowdhury AKMA. Demographic Surveillance System - Matlab. V. 3. Vital events and migration, 1974. Dhaka: Cholera Research Laboratory, 1978. 42 p. (CRL scientific report, 11)

"The results of the Demographic Surveillance System (DSS) in Matlab for the calendar year 1974 are presented in three sections: (A) A summary overview of the vital events and migration recorded in 1974 with a descriptive analysis of the results. (B) A detailed

study of mortality differentials between males and females, and an analysis of the prevailing patterns of marital fertility. (C) Selected cross-tabulations of the recorded events. The present volume is a part of a series describing and analysing the annual results of the DSS - Matlab." (Authors' abstract)

477 Ruzicka LT, Chowdhury AKMA. Demographic Surveillance System - Matlab. V. 4. Vital events and migration, 1975. Dhaka: Cholera Research Laboratory, 1978. 45 p. (CRL scientific report, 12)

"The results of the Demographic Surveillance System (DSS) in Matlab for the calendar year 1975 are presented in three sections: (A) Summary overview of the vital events, migration, marriages and divorces recorded in 1975 with a descriptive analysis of the results. (B) A detailed study of the demographic implications of the economic crisis of 1974-1975 in the DSS area. (C) Selected cross-tabulations of the recorded events. The present volume is a part of a series describing and analysing the annual results of the DSS-Matlab." (Authors' abstract))

478 Ruzicka LT, Chowdhury AKMA. Demographic Surveillance System - Matlab. V. 5. Vital events, migration, and marriages, 1976. Dhaka: Cholera Research Laboratory, 1978. 52 p. (CRL scientific report, 13)

"The results of the Demographic Surveillance System (DSS) in Matlab for the calendar year 1976 are presented in three sections: (A) A summary over-view of the vital events, migration, marriages and divorces recorded in 1976 with a descriptive analysis of the results; (B) A study of marriage and divorce patterns in 1975-1976; (C) Selected cross-tabulations of the recorded events. The present volume is a part of a series describing and analysing the annual results of the DSS-Matlab." (Authors' abstract)

479 Ruzicka LT, Chowdhury AKMA. Marriage and fertility in rural Bangladesh. IPPF Med Bull 1978;12(4):3-4

480 Ryder RW, Sack DA, Kapikian AZ, McLaughlin JC, Chakraborty J, Rahman ASMM, Merson M, Wells JG. Enterotoxigenic *Escherichia coli* and reovirus-like agent in rural Bangladesh. Lancet 1976 Mar 27;1(7961):659-62

"48 patients admitted to a rural Bangladesh hospital with dehydration secondary to diarrhoea were examined for infection caused by reovirus-like agent (R.L.A.) or enterotoxigenic *Escherichia coli* (E.T.E.C.). The diagnosis of R.L.A. infection was established by electron microscopy of stool filtrates and by a fourfold or greater rise in serum complement-fixing antibodies to the Nebraska calf diarrhoea virus. Evidence of infection by heat-labile-toxin (L.T.)-producing E.T.E.C. was sought by stool culture and serological testing using the adrenal-cell tissue-culture system. Infection by heat-stable-toxin (S.T.)-producing E.T.E.C. was sought by stool culture using the infant mouse test. 12 patients, all less than two years old, had evidence of R.L.A. infection, accounting for illness in 55% of the 22 patients who were less than two years old. None of these 22 children had evidence of E.T.E.C. infection. R.L.A. diarrhoea lasted five to six days, often led to serious dehydration, and was associated with vomiting and fever. 11 cases of E.T.E.C. diarrhoea were detected, accounting for 56% of the cases of diarrhoea in the 18 patients who were more than ten years old. Diarrhoea caused by E.T.E.C. was sudden in onset, shorter in duration, and caused pronounced dehydration. In a community survey E.T.E.C. was isolated with equal frequency in the stools of control and case family members. The data suggest that E.T.E.C. is a common cause of adult diarrhoea in Bangladesh, while R.L.A. is a common cause of diarrhoea in children." (Authors' abstract)

481 Ryder RW, Rahman AS, Alim AR, Yunus M, Honda BS. An outbreak of nosocomial cholera in a rural Bangladesh hospital. J Hosp Infect 1986 Nov;8(3):275-82

"At a time of year when Vibrio cholerae infection accounted for over 50% of admissions to a rural Bangladeshi diarrhoea treatment centre, 29% of 48 patients hospitalized with non-cholera diarrhoea developed nosocomial V. cholerae infection. During an investigation of the 8-week outbreak, only the severity of the non-cholera diarrhoea which prompted hospital admission emerged as an important risk factor for nosocomial infection; food, intravenous solutions, oral rehydration fluid, patient attendants and hospital personnel could not be implicated as transmission sources. Patients receiving antibiotics while hospitalized did not develop nosocomial infection. Antecedent non-cholera diarrhoea may represent an important risk factor in some cases of V. cholerae infection occurring in persons who reside in cholera-endemic areas where rates of non-cholera diarrhoea are also high." (Authors' abstract)

482 Sack DA. Intermediate stage of cholera vaccine development. *In*: Rahman S, ed. Proceedings of the Conference on Experimental Cholera Vaccines, Dhaka, 6-8 Apr 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981:40-4

483 Sack DA, Gilman RH, Kapikian AZ, Aziz KMS. Seroepidemiology of rotavirus infection in rural Bangladesh. *In*: Johns Hopkins University International Center for Medical Research. Progress report, 1978-1979:42-6

484 Sack DA, Gilman RH, Kapikian AZ, Aziz KMS. Seroepidemiology of rotavirus infection in rural Bangladesh. J Clin Microbiol 1980 May;11(5):530-2

"A prospective seroepidemiological study of rotavirus infection was performed in children in a village in rural Bangladesh. Ninety-three percent of the children had detectable antibodies during the study, and there were 66 significant rises in titer occurring in 57 of the 85 children. Antibody titer rises occurred in older children and younger children with equal frequency. Nine children (11%) had evidence of multiple infections during the 16-month period. Winter infections were most frequent, although one summer (monsoon) season was also associated with a large cluster. Subjects with high titers (>1:8) of antibody less frequently developed a titer rise than did subjects with lower titers." (Authors' abstract)

485 Sack DA, Islam S, Merson MH, Brown KH, Black RE, Rahman M, Chowdhury AKMA, Ali MA. Sucrose or glucose: which sugar to use in oral rehydration solution? A summary of four clinical trials. *In*: Johns Hopkins University International Center for Medical Research. Progress report, 1978-1979:7-26

486 Sack DA, Islam S, Merson MH, Brown KH, Black RE, Rahman M, Chowdhury MA, Ali MA. Sucrose or glucose: which sugar to use in oral rehydration solution? A summary of four clinical trials. *In*: Takeya K, Zinnaka Y, eds. Symposium on Cholera; proceedings of the Fourteenth Joint Conference, U.S.-Japan Cooperative Medical Science Program, Cholera Panel. Karatsu, Japan, 1978. Tokyo: Japanese Cholera Panel, 1979:154-64

"A series of 3 double-blind controlled trials was conducted to compare the efficacy of sucrose with glucose oral solutions in managing patients hospitalized with bacterial and viral dehydration diarrhea. One 'before-after' trial was also conducted in children with rotavirus diarrhea attending the Matlab rehydration center. The 1st group of patients included 148 male adults with cholera-like diarrhea with at least 7.5% dehydration; the 2nd group consisted of 111 children with cholera-like diarrhea with at least 7.5% dehydration. The 3rd group included 89 children with 'rotavirus-like' diarrhea with some detectable dehydration. The Matlab rehydration group consisted of 787 children with rotavirus diarrhea; on a given day, the oral solution was switched from glucose to sucrose without informing the attendants who administered treatment. A higher success rate of treatment was achieved with the glucose solution than with the sucrose solution, confirming similar findings of other studies. The combined results of the 4 trials suggest

that the trend is real but small. The difference appear to increase with increasing purging rates. Both solutions are nearly always effective for mild non-cholera diarrhea. Local and national health planners have a choice of which sugar to use depending on local assessment of availability, cost and distribution of ingredients. Sucrose can be considered an effective alternative to glucose." (POPLINE)

487 Samad A, Sheikh K, Sarder AM, Becker S, Chen LC. Demographic Surveillance System-Matlab. V. 6. Vital events and migration - 1977. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1979. 56 p. (ICDDR,B scientific report, 18)

488 Samadi AR, Huq MI, Shahid N, Khan MU, Eusof A, Rahman ASMM, Yunus M, Faruque ASG. Classical *Vibrio cholerae* biotype displaces El Tor in Bangladesh. Lancet 1983 Apr 9;1(8328):805-9

"The El Tor biotype of *Vibrio cholerae* caused all endemic and epidemic cholera in Bangladesh from 1973 until Sept. 3, 1982, when the first classical strain was isolated from a patient in Matlab. Since then the number of isolations of the classical biotype has increased very rapidly and spread to other districts, replacing the El Tor biotype as the main epidemic strain. The classical strains isolated in the 1982 outbreak were indistinguishable by the standard tests from those isolated a decade ago and the very few isolates in 1979, 1980, and 1981. This suggests that beyond the taxonomic traits used to identify the classical and El Tor strains, there may be other more crucial biological characteristics that have given this new strain an advantage over the existing strains. The mechanism by which a new biotype of *V. cholerae* 01 achieves such a crucial biological advantage to displace the existing strains may be a key point in control of the global spread of cholera." (Authors' abstract)

489 Sarder AM, Chen LC. Are there barefoot doctors in Bangladesh: a survey of non-government rural health practitioners. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 25 p. (ICDDR,B scientific report, 42)

"A survey of all non-government health practitioners residing in a rural area of Bangladesh was conducted in August-September 1978 in an effort to eludcidate the type, pattern, distribution, and characteristics of non-government practitioners in a rural area. Their types of practice, client perception of their usefulness, and cost structure are analyzed. The rural health practitioners examined were all residents of Matlab thana, Comilla district. A total of 1292 non-government practitioners participated in the survey. Practitioners employed by the government health system and traditional midwives were excluded from this study. Very few practitioners (1.8%) were registered with their respective licensing authorities. Allopathic practitioners -- those who base their diagnosis and treatment on modern (western) scientific concepts -- constituted 14.9% of all practitioners. Only 3.3% of practitioners were homeopaths, following a school of medicine originally developed in Europe. "Kobiraj", "totka", (indigenous healers), and other categories comprised 15.3, 60.5, and 6.0%, respectively. All allopaths and homeopaths were younger, better educated, and male-dominated in comparison to "Kobiraj", "totka", and other practitioners, who tended to be older, less educated, and more often women who learned their skills by apprenticeship. Most practitioners reported unrestricted, fulltime availability to clients in homes and offices. Allopaths and homeopaths averaged 18 patients daily, while "Kobiraj", "totkas", and others averaged less than 10 patients daily. Despite high costs, the non-government system is utilized extensively because of availability, social access, and social perceptions of illness causation. Perceived effectiveness was sufficiently high to attract patients despite the high costs." (POPLINE)

490 Sarder AM, Chen LC. Distribution and characteristics of non-government health practitioners in a rural area of Bangladesh. Soc Sci Med 1981;15A(5):543-50

"In August-September 1978, a survey was undertaken of all non-government health practitioners residing in an area containing a study population of 263,000 in rural Bangla-

desh. The aim of the survey was to elucidate the type, pattern, distribution, characteristics of practice of non-government practitioners in one rural area of Bangladesh. The quality of data on this study population is considered unique because of 15 years of longitudinal demographic surveillance undertaken by the International Centre for Diarrhoeal Disease Research, Bangladesh. Altogether, 1,292 practitioners were identified, giving a practitioner density of 4.7 per 1000 population. Allopathic and homeopathic practitioners constituted 14.9 and 3.3% respectively, of the total. Very few of these two practitioner categories were officially registered (1.8% of total). Kobiraj, totka (an indigenous healer), and other categories comprised 15.3, 60.5, and 6.0, respectively. Allopaths and homeopaths were younger, better educated, and predominately male in comparison to the more numerous kobiraj, totka, and other practitioners, who tended to be older, less educated, and more often women. Most of the latter group of practitioners learned their skills by apprenticeship while the former group more frequently attended schools. The geographic distribution of allopaths and homeopaths was thinner than the more numerous kobiraj, totka, and other groups. Most practitioners reported unrestricted, full-time availability to clients in homes and offices without time limitations. Although most non-allopathic practitioners denied the use of allopathic drugs, indepth interviews suggested that this response was biased due to fear of regulatory violations. Allopaths and homeopaths averaged 18 patients daily, while kobiraj, totkas, and others averaged fewer than 10 patients daily. When practitioners and clients were asked about specialization, a disease-specific utilization pattern emerged. For some diseases, all types of practitioners were employed: but for others, specific practitioner types were utilized. In general, there appeared to be good correspondence between the reported specialization of practitioners and the reported utilization pattern of clients. An attempt was also made to estimate the financial resources involved in non-government health systems. Crude estimations of reported income by practitioners was ten-fold lower than income estimated by client reports of cost and frequency of consultations. The paper concludes by hypothesizing that, despite high financial costs, the non-government systems are utilized heavily because of availability, social access, and social perceptions of illness causation. Government services are not yet competitive because of poor availability, access, quality, and cost. Although information was not obtained on the biomedical effectiveness of native pharmacopoeias, perceived effectiveness was sufficiently high to attract heavy utilization of high costs. Finally, the prospect of integrating non-governmental traditional medical systems into state-sanctioned medical bureaucracies is discussed with a view toward rationalizing health services in Bangladesh." (Authors' abstract)

491 Seaton B. Noncompliance among oral contraceptive acceptors in rural Bangladesh. Stud Fam Plann 1985 Jan-Feb;16(1):52-9

"The levels of noncompliance among 175 oral contraceptive acceptors in a rural area of Bangladesh were monitored for three to four months. Unexpectedly high levels of noncompliance were observed, including both overconsumption and underconsumption of oral contraceptive pills. Although the study was designed to investigate only the levels of noncompliance and not the causes and consequences of noncompliance, some useful indications of the factors associated with noncompliance were obtained. The results indicate that noncompliance is a significant factor in family planning programs and, as such, warrants further in-depth investigation." (Author's abstract)

492 Seaton B. Non-compliance among oral contraceptive acceptors in rural Bangladesh. *In*: Proceedings of the Bangladesh Fertility Research Programme Seventh Contributors Conference, held in Dhaka, on 8-9 December 1982. Dhaka: Bangladesh Fertility Research Programme, 1983:253-78

"The levels of non-compliance amongst 175 contraceptive acceptors in a area of Bangladesh were monitored for 3-4 months. Unexpectedly high levels of non-compliance were observed, including both under-consumption and over-consumption of oral contraceptive pill. Some indications of the causes and consequences of such non-compliance have been noted." (Author's abstract)

493 Shahid NS. Complications of measles in rural Bangladesh (long term complications in the under-two). Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1980. 38 p. (ICDDR,B thesis and dissertation, 3)

A retrospective case control study was carried out to identify long- and short-term complications of measles in a Bangladesh rural population aged under 2 years experiencing an epidemic of measles. The cases had been identified by another survey shortly after the epidemic. Controls had been matched for age, sex, socio-economic condition and level of mother's education and came from the same villages. Both measles and control cases were selected from areas far from and near to the hospital facilities at Matlab. Anthropometric measurements were carried out in both groups. The study showed that although measles had a high incidence among children aged under 2 years, complications were not as severe as those reported in the earlier literature. There was no relation between the duration or severity of the illness and sex. Complications were more common among children in the first year of life. Reporting for complications and hospitalisation rates were higher among cases who were closer to the Matlab field hospital. There were fewer complications among children who came from wealthy homes and whose mothers' education was of the level of class 6 and above. Children who had rash duration of 7 days or less developed more complications. No difference in the nutritional status was found between measles cases and controls. Watery diarrhoea was present more among children aged 6 months with measles. There was also significantly more conjunctival dryness and ear discharge present on examination among the measles cases. The recall ability of the mothers after 5 months was found to be good when results of the study were compared to those of the first survey carried out at the time of the epidemic. (Modified author's abstract)

494 Shahid NS, Clauquin P, Shaikh K, Zimicki S. Long-term complication of measles in rural Bangladesh. J Trop Med Hyg 1983 Apr;86(2):77-80

"A small retrospective study carried out in rural Bangladesh identified respiratory illness, diarrhoea and conjunctival dryness as complications of measles. A case-fatality rate of 1.3% was recorded. Association between length of diarrhoea and conjunctival dryness was noted. However, no difference was observed in the anthropometric data between cases and controls. The data suggest an association between measles, diarrhoea and clinical evidence of vitamin A deficiency, but fail to show an effect on growth in this small series." (Authors' abstract)

495 Shahid NS. Long term complications of measles in rural Bangladesh. *In*: Proceedings of the 1st Asian Conference on Diarrhoeal Disease, Dhaka, 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982:258-61

496 Shaikh K, Mostafa G, Sarder AM, Wojtyniak B. Demographic Surveillance System-Matlab. V. 12. Vital events and migration-tables, 1982. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1984. 61 p. (ICDDR,B scientific report, 62)

"This is the 12th volume in a series of scientific reports, published by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). It presents results of vital events and migrations for the year 1982 of the Demographic Surveillance System (DDS), in the Matlab area of Bangladesh. Since 1963, the ICDDR,B has been conducting a health-oriented research program in Matlab thana, Comilla District, about 45 km southeast of the country's capital, Dhaka. The DSS is 1 component of this field program. Since 1966, it has maintained a continuous registration of births, deaths, marriages and migrations, in addition to occasional censuses. Since 1978, the study area has been reduced to 149 villages, and some field operations modifications have been introduced. Beginning in October 1977, the data collection procedure was modified, in conjunction with the development of a village-based Maternal-Child Health and Family Planning program, in 70 DSS villages. The remaining villages were treated as compari-

son villages, and the demographic surveillance was continued using established field procedures." (POPLINE)

497 Shaikh K, Mostafa G, Bhuiya A, Sarder AM, Molla I, Wojtyniak B. Demographic Surveillance System – Matlab. V. 14. Vital events and migration – tables, 1983. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1985. 61 p. (ICDDR,B scientific report, 64)

"This is the 14th volume of a series of scientific reports, published by the International Centre for Diarrhoeal Disease Research, Bangladesh. It presents results of vital events and migrations for the year 1983 of the Demographic Surveillance System (DSS), in the Matlab area of Bangladesh." (Authors' abstract)

498 Shaikh K, Aziz KMA, Chowdhury AI. Differentials of fertility between polygynous and monogamous marriages in rural Bangladesh. J Biosoc Sci 1987 Jan;19(1):49 – 56

"This paper discusses polygynous marriages in rural Bangladesh, using marital status and birth registration data from the Demographic Surveillance System of the International Centre for Diarrhoeal Disease Research, for the period 1975 – 79. Of all the marriages recorded during this period about 5% were polygynous. To identify the women polygynously married, 1974 census data of the DSS area were used. The difference in age at marriage between the polygynous groom and his subsequent wife was 15 years on average. The socioeconomic indicators studied were education, occupation and area of dwelling space. In general, these indicators differentially influence polygynous marriage. The fertility differentials between women in monogamous marriages were significantly higher than between the women in polygynous unions." (Authors' abstract)

499 Shaikh K. Impact of population growth on demand for and cost of medical and health care facilities in Bangladesh. J Bangladesh Coll Phys Surg 1986 Aug;4(1):10 – 6

"The impact of population growth on health care facilities in Bangladesh and the demand for them is discussed. The data were collected from the ICDDR,B's Matlab DSS area and other published reports. In this paper, Bangladesh's population has been projected from 1975 to 2000 with the different assumption of population growth. Considering constant fertility and constant mortality at 1975 levels, the projected population for 2000 will be 163.1 million. However, the projected population is 151.4 million, declining fertility and declining mortality to the level TFR of 4.0 and expectation of life at birth 57.5 years to be reached by 2000 years. With the assumption of constant fertility and declining mortality at the level TFR of 6.0 and expectation of life at birth 57.5 years by the year 2000, the estimated population of Bangladesh will be 173.0 million. The cost and demand for the medical and health care facilities, number of doctors, nurses and hospital beds that will be needed for the growing population has also been estimated." (Author's abstract)

500 Shaikh K. Marriage and marriage dissolution in a rural area of Bangladesh. Canberra: Australian National University, 1982. 112 p. (MA thesis)

"The aim of this thesis is to study the age and sex patterns and differentials of marriage formation and marriage dissolution in rural Bangladesh, using a unique set of marital status registration data from the Demographic Surveillance System (DSS) of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) for the years 1975 – 1979. This study is the first of its kind in Bangladesh to use marital status registration data. In rural Bangladesh marriage is universal and early, especially for females. It appears from this study that female age at first marriage has been increasing somewhat during the past 5 years but for males age at marriage remains almost constant. A pronounced seasonality of marriages prevails in the rural areas of Bangladesh. As in other societies, education has a substantial effect on age at marriage of both males and females. Groom's occupation has only a slight effect on age at marriage. Divorce in

rural Bangladesh is frequent and largely occurs early in marriage. Age difference between groom and bride at marriage has a strong impact on the incidence of widowhood. It also has a marked effect on divorce. Education, husband's occupation and religion have a differential influence on the stability of marriage and on remarriage after divorce or widowhood." (Author's abstract)

501 Shaikh K. Marriage and mortality: a life table analysis. *In*: Kaliaperumal VG, Subbakrishna DK, Sundararaj N, eds. Biostatistics – issues in medical research; proceedings of the Fourth Annual Conference of the Indian Society for Medical Statistics, Bangalore, on 24–26 Oct 1986. Bangalore: Natinal Institute of Mental Health and Neuro Sciences, 1989:105–18

"This paper discusses age at marriage and differential mortality of males and females responsible for the variation in the incidence of widowhood among males and females. A unique data set of marital status and death events registration from the Demographic Surveillance System of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) from 1974–1979 were used. Adult females had about the same or higher death rates than males during the period 1975–1979. By constructing abridged life tables, it was observed that the life expectation of males at the ages 0–4 and 60 years and above was higher than that of females. In contrast, in the age group of 5–55 years, females had a higher life expectation than males. However, the difference in life expectancy between males and females varied within the range of 0.4 to 2.2 years at the ages 0 to 65 years and over. Hence, by mortality differentials, the probability of males and females surviving the other spouse was approximately the same. But it has been found that widows were about ten times higher in number than widowers. To examine the probability of widowhood under a given regime of mortality, we considered the effect of age at marriage and the age difference between husband and wife. With a given age at marriage for males and females, the probability of surviving a given number of years was calculated and from this survival ratios, joint survival of husband and wife, probability of widowhood and widowerhood, and finally probability of both spouses dying were examined." (Author's abstract)

502 Shaikh K. Nuptiality pattern in rural Bangladesh. Demogr India 1984 Jan–Dec;13(1&2):42–53

503 Shaikh K. Nuptiality pattern in rural Bangladesh. *In*: Proceedings of the Second National Seminar of Bangladesh Population Association, Dhaka, 1984. Dhaka: Bangladesh Population Association, 1985:101–7

504 Shaikh K, Khan MU, Wojtyniak B. Pattern of diarrhoeal deaths in a rural area of Bangladesh: 1966–1982 [abstract]. *In*: Abstracts; proceedings of the Third Annual Conference of the Indian Society for Medical Statistics, Calcutta, 3–5 Dec 1985. Calcutta: Indian Statistical Institute, 1985:64

505 Shaikh K, Becker S. Socioeconomic status and fertility in rural Bangladesh. J Biosoc Sci 1985 Jan;17(1):81–9

"Using a unique set of birth registration data from the Demographic Surveillance System of the International Centre for Diarrhoeal Disease Research, Bangladesh, for the period 1974–77, and socioeconomic information collected in the 1974 census, fertility was studied in relation to occupation, size of dwelling, number of cows and number of boats owned. The total fertility rate was found to vary between 6 and 6.5 except in the famine year of 1975. There was no consistent relationship between fertility and education of women. Fertility differentials by occupation showed that the household heads who were farm labourers had relatively lower fertility compared to other occupational groups, except for the year 1977 where the families of service holders were found to have relatively lower fertility. There was a consistent direct relationship between the dwelling size and fertility for each of the years." (Authors' abstract)

506 Simmons R, Baqee L, Koenig MA, Phillips JF. Beyond supply: the importance of female family planning workers in rural Bangladesh. Stud Fam Plann 1988 Jan/Feb;19(1):29-38

"Using participant observation data on worker-client exchanges from Bangladesh, this article examines the interface between a government family planning program and the rural women it serves. Case material focuses first on the program function typically identified in the literature: meeting unmet demand for contraception by providing convenient supply. Functions that have been less recognized are then illustrated: (1) the worker's role in reducing fear of contraceptive technology; (2) her effort to address religious barriers, child mortality risks, and high fertility preferences; and (3) her role in mobilizing male support. The range of functions performed by the female family planning worker in the cases discussed here demonstrates that her role transcends the boundaries of what is conventionally implied by the concept of supply. She acts as an agent of change whose presence helps to shift reproductive decision-making away from passivity, exposing women long secluded by the tradition of purdah to the modern notion of deliberate choice." (Authors' abstract)

507 Simmons R, Koblinsky MA, Phillips JE. Client relations in South Asia: programmatic and societal determinants. Stud Fam Plann 1986 Nov-Dec;17(6,pt 1):257-68

"Despite their considerable importance, client relations constitute a neglected area of research in family planning (FP). This paper analyzes research findings on the nature of client relations and their determinants from northern India programs: 1) the Kanpur study, on FP in 1 division of Uttar Pradesh; 2) another from a smaller Uttar Pradesh project, on interactions between male and female workers and villagers; and Bangladesh: 3) a maternal-child health (MCH) and FP project of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) in Matlab; and 4) an ICDDR,B study of a MCH-FP extension project in 2 subdistricts. Additional information is reported from an earlier survey of 6 Bangladesh subdistricts. Important aspects of client encounters are initiation, medium, and setting of contact, and degree of dependence. Determinants of client relations are expressed in diagram form. Some survey studies of the quantity of FP contacts with villages reveal variation between villages, and between northern India and Bangladesh. Not only coverage but also degree of follow-up are shown to affect program performance. Worker density and work effort, as well as village accessibility, affect coverage. The managerial context and societal conditions are also important. Female workers are generally more effective because women are more responsive to the FP message and female to female communication is more culturally appropriate. Females are also less likely to be affected by political influences, lacking political connections, and are less likely to have alternative employment. Females with high status and access to patronage are more likely to be successful, and workers' integration into networks of status and influence lends social credibility to program activities. But aside from personnel characteristics, policy formulation and program implementation are constrained by patronage politics, dependence and poverty economics, and bureaucratic structures." (POPLINE)

508 Simmons R, Mita R, Koenig MA. The effect of the Matlab Project on women's status. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1988. 27 p. (Extension project working paper, 26)

509 Simmons R, Phillips JF. The integration of family planning with health and development. *In*: Lapham RJ, Simmons GB, eds. Organizing for effective family planning programs. Working Group on Family Planning Effectiveness of the Committee on Population, Commission on Behavioral and Social Sciences and Education of the National Research Council. Washington, DC: National Academy Press, 1987:185-211

"The theoretical justifications for the integration of family planning (FP) with other programs are multifaceted. It is argued that there are synergistic relationships among fertili-

ty, mortality, morbidity, and socioeconomic status; and the medical nature of modern contraception requires health sector involvement. Integration (the actual combining of organizations with differing functions) is differentiated from coordination (efficient smoothing of relationships of continuing, independent elements). Other definitions include 1) actual versus prescribed integration; 2) administrative versus service integration; 3) integration levels; 4) substantive networks across which integration occurs; 5) routine versus sporadic integration. Whether potential FP users respond better to integrated versus categorical service packages is examined from a demand side viewpoint by consideration of a number of experimental projects: Narangwal (India); 2 Matlab projects (Bangladesh); and 3 Danfa (Ghana) experimental projects. They range on a 6-package continuum from limited FP only (package 1) through FP and limited maternal-child health (4) to comprehensive FP and primary health care (6). Organizational capacity is important in any situation. FP programs at 1st had very low status in India: the response was institution of multipurpose and community health worker schemes. The necessity for considering the readiness of public health infrastructure to take on FP programs was demonstrated when integration took place in Bangladesh. Cases of Korea and Malaysia, Egypt and Indonesia show the need for a properly trained FP workforce prior to integration, and the capacity of FP integration to empower the health ministry. Political economy considerations enter into the debate. Implications for professional domain, resources, and power have politicized the debate. For example, the domination of the World Health Organization has biased its policies in favor of integration, which keeps FP under more centralized control." (POPLINE)

510 Simmons R, Phillips JF, Rahman M. Strengthening government health and family planning programs: findings from an action research project in rural Bangladesh. Stud Fam Plann 1984 Sep-Oct;15(5):212-21

"An ongoing study at the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) is based on the premise that public sector health and family planning programs can be improved through an assessment of the dysfunctional aspects of their operations, the development of problem-solving capabilities, and the transfer of strategies successfully tested in a small-scale pilot project. This paper reports findings from a field trial implemented in a subunit of the project area at an early stage of the project. Operational barriers to public sector program implementation are discussed with regard to the quantity of work, the quality of work, supplies and facilities, integration of health and family planning, and leadership, supervision, and decision making. Initial results of the ICDDR,B intervention on these managerial processes are also indicated." (Authors' abstract)

511 Snyder JD, Yunus M, Wahed MA, Chakraborty J. Home-administered oral therapy for diarrhoea: a laboratory study of safety and efficacy. Trans R Soc Trop Med Hyg 1982;76(3):329-33

"Serum electrolytes were measured for persons treated for diarrhoea at home with prepackaged or locally available sugar and salt oral rehydration therapy (ORT) solutions and for persons with diarrhoea who received no ORT but were treated according to local customs. No detrimental effect was found for persons treated with ORT at home; no significant difference was found in the frequency at which members of the groups had hypernatraemia. The rates of hyponatraemia and hypokalaemia were significantly lower for persons who took estimated appropriate volumes of ORT than for those who took less than appropriate volumes or for persons treated according to local customs without ORT. These laboratory results indicate that ORT administered in rural homes in Bangladesh was safe and effective under the conditions of our study." (Authors' abstract)

512 Snyder JD, Black RE, Baqui AH, Sarder AM. Prevalence of residual paralysis from paralytic poliomyelitis in a rural population of Bangladesh. Am J Trop Med Hyg 1981 Mar;30(2):426-30

"To estimate the prevalence of residual paralysis from poliomyelitis in children in one area of rural Bangladesh, a survey of the amount and original cause of lameness was undertaken. The International Centre for Diarrhoeal Disease Research, Bangladesh Matlab field area, which has been under demographic surveillance for 13 years, provided the study population of 25,000 children aged 5 – 14 years. The cause of the lameness identified for a child in the survey was based on criteria obtained from a health history questionnaire and a physical examination performed by a physician. The prevalence rate for residual paralysis of poliomyelitis estimated from the lameness survey was 0.84/1,000 children aged 5 – 14 years. Since lower extremity paralysis occurs in only about 80% of children with paralytic poliomyelitis, the prevalence rate for all cases of residual paralysis of poliomyelitis was calculated to be 1.05/1,000 children in this age group." (Authors' abstract)

513 Sommer A, Mosley WH. Ineffectiveness of cholera vaccination as an epidemic control measure. Lancet 1973 Jun 2;1(7814):1232 – 5

"Analysis of the efficacy of cholera vaccines, the public – health structure of Bangladesh, and the epidemiology of cholera in rural Bengal indicates that mass vaccination programmes are an ineffective public – health measure. Under field conditions, vaccinating 5,000 individual village contacts of active cases requires a vaccinator to work full – time for 4 months, costs over $300, and prevents, at best, only 1 out of every 20 cases." (Authors' abstract)

514 Sommer A, Loewenstein MS. Nutritional status and mortality: a prospective validation of the QUAC stick. Am J Clin Nutr 1975 Mar;28(3):287 – 92

"In December 1970, 8,292 rural Bengali children between the ages of 1 and 9 had their height and arm circumference measured. Eighteen months later the fate of 98.8% of these children was ascertained. Overall, 2.3% of the children had died. Those below the 9th and between the 10th and 50th percentiles of arm circumference for height were at 3.4 and 1.5 times greater risk of dying, respectively, than those above the 50th percentiles. A gradient was present at every age, although it was greatest for the vulnerable 1 – to 4 – year age group, for whom the relative risks were 4.5, 1.6, and 1.0, respectively. The discriminant efficiency of these categories was greatest immediately following measurement and decreased with time. During the first postmeasurement month the risk of dying in the poorest nutritional category was 19.8 times that of the best, and for the first 3 months, 12.2 times. By the last 3 months of followup it was only twice that of the best. Females in all three categories fared slightly worse than males, being at 1.1 times the risk of dying. This same vulnerable group of 1 – to 4 – year olds could be identified without knowing their age. Limiting the analysis to children whose heights were between 65 and 89 cm resulted in relative risks, for the three categories, of 4.1, 1.6, and 1.0, respectively. These arm circumference to height categories and the QUAC stick survey technique for which they were devised appear to be valid tools of identifying nutritionally disadvantaged individuals and populations at high risk of death." (Authors' abstract)

515 Spira WM, Daniel RR, Ahmed QS, Huq A, Eusof A, Sack DA. Clinical features and pathogenicity of 0 Group 1 nonagglutinating *Vibrio cholerae* and other vibrios isolated from cases of diarrhoea in Dhaka, Bangladesh. *In*: Takeya T, Zinnaka Y eds. Symposium on Cholera; proceedings of the 14th Joint Conference, U.S. – Japan Cooperative Medical Science Program Cholera Panel, Karatsu, 27 – 29 Sep 1978:137 – 53

516 Spira WM. Environmental factors in diarrhea transmission: the ecology of *Vibrio cholerae* 01 and cholera. *In*: Holme T, Holmgren J, Merson MH, Mollby R, eds. Acute enteric infections in children: new prospects for treatment and prevention. Amsterdam: Elsevier, 1981:273 – 88

517 Spira WM, Khan MU, Saeed YA, Satter MA. Microbiological surveillance of intra –

neighbourhood El Tor cholera transmission in rural Bangladesh. Bull WHO 1980;58(5):731 - 40

"The apparent failure of handpump tubewells to reduce the incidence of cholera among users in the flooded rural area of Bangladesh has stimulated interest in defining precisely the means of *Vibrio cholerae* transmission during localized outbreaks. Cholera - infected neighbourhoods were placed under intensive microbiological surveillance to pinpoint contaminated sources and subsequent infections. The results show that cholera transmis - sion was via contaminated surface water, particularly water taken into households for cooking or drinking. Infections resulted from a daily dose not exceeding 105 organisms and the frequency of exposure appeared to be a major determinant of the infection rate. The importance of these data in environmental interventions and particularly in the provi - sion of tubewells is discussed." (Authors' abstract)

518 Spira WM, Khan MU, Saeed YA, Satter MA. Microbiological surveillance of intra - neighbourhood El Tor cholera transmission in rural Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1980. 39 p. (ICDDR,B scientific report, 35)

519 Stanton BF, Rowland MGM, Clemens JD. Oral rehydration solution - too little or too much? Lancet 1987 Jan 3;1(8523):33 - 4

The variations in currently practised oral rehydration therapy and the impact of different recommendations are discussed. To determine the adequacy of the volume of oral rehydration solution (ORS) per episode of diarrhoea in clinic settings, six completed studies of children with mild - to - severe diarrhoea were reviewed. In only two studies, the mean consumption of solution at all ages was at least equal to the minimum recommended dose - 50 ml/kg for initial rehydration in mild cases and 100 ml/kg.day for normal requirements. In Matlab, Bangladesh, 87% of children and 77% adults re - ceived a single pack (1 litre); 15% of adults received two and 8% received three packs. The pattern of home distribution of half - litre packs in urban slums in Bangladesh were analysed from January 1984 to June 1985. A litre pack was regarded as inadequate for a child of less than 24 months of age when initial dehydration was quite severe, when diarrhoeal losses was more copious or when ORS was required for the post - hydration period owing to prolonged losses. A single pack is less effective upon older patients with severe diarrhoea warranting use of ORS. In Bangladesh, there occurs 85 million episodes of diarrhoea a year. Treatment of only 5.1 million episodes of life - threatening diarrhoea with an average of 41 per episode would require 20 million packets only. About 90% of treated diarrhoeal episodes receive ORS packets in adequate quantities for mildly dehydrated or in inadequate amounts for dehydrated patients in developing coun - tries. There is a need to determine the symptomatic characteristics of diarrhoeal patients at risk of life - threatening dehydration to distinguish among those who may require inten - sive oral rehydration therapy from those who require no extraordinary measures.

520 Stinson WS, Phillips JF, Rahman M, Chakraborty J. The demographic impact of the Contraceptive Distribution Project in Matlab, Bangladesh. Stud Fam Plann 1982 May;13(5):141 - 8

"This paper evaluates a study fielded in Bangladesh in 1975 to test the hypothesis that ubiquitous availability of pills and condoms in a rural, traditional, non - contracepting population would increase contraceptive use and reduce fertility. Treatment and compari - son areas were designated in Matlab, an area with accurate and complete demographic data. Use prevalence peaked at 18 percent in the first three months of the project and declined thereafter. Project activities continued until 1977. Results show that between - treatment fertility differentials were 10 percent in the first year of program impact, but that effects dissipated with time." (Authors' abstract)

521 Stoeckel J, Chowdhury A, Mosley WH. The effect of fecundity on fertility in rural

East Pakistan (Bangladesh). Soc Biol 1972 Jun;19(2):193 - 201

"An analysis of fecundity and its effect upon fertility in a rural area of East Pakistan in 1968 indicates that of 30,155 ever - married women over two - thirds were fecund. Their fecundity varied inversely with age, with the exception of the youngest age group (10 - 14), which had lower group. The proportions of "widowed" (N proportions fecund than the succeeding = 5,689) and "divorced or separated" (N = 592) who are fecund show a similar relation with age, but their proportions fecund are generally lower than those for married women "living with husbands". Fecundity of women "living with husbands" was also related to total number of living children; that is, those women with larger families had higher proportions fecund than those with smaller families. This relationship was most apparent in the older age groups. The effect of subfecundity on the total fertility rate was found to account for a reduction of about 0.8 births. The major reduction in age - specific fertility due to subfecundity occurred in the age groups making the lowest contribution to total fertility. In addition, an estimate of completed family size taking into account the mortality which would occur to all births and women indicated that irrespec - tive of subfecundity, if current fertility and mortality conditions persisted, completed family sizes would be of the order of 6 surviving children per surviving woman." (Authors' abstract)

522 Stoeckel J, Chowdhury AKMA. Fertility and socio - economic status in rural Bangladesh: differentials and linkages. Pop Stud 1980 Nov;34(3):519 - 24

"Socio - economic differentials in fertility are examined by using data collected from a daily registration system covering over 100,000 persons in rural Bangladesh during the period 1968 to 1970. The findings indicate that fertility was generally higher among women in the higher than in the lower socio - economic groups. Several factors associ - ated with high socio - economic status and their relation with the intermediate variables are discussed as providing the linkages with high fertility. These include, health status, breastfeeding, the enforcement of 'purdah' and migration." (Authors' abstract)

523 Stoeckel J, Chowdhury AKMA. Fertility and socio - economic status in rural Bangladesh: differentials and linkages. New York: Population Council, 1979. 14 p. (International programs working paper, 8)

This paper explores the relationship between socio - economic factors and fertility in Matlab Thana, a rural area of Bangladesh. The data on which it is based were collected between 1968 and 1970 through an unusual daily registration system of births and deaths that used local residents, field assistants, and sanitary inspectors as record keepers and supervisors. Results of the study indicate that fertility is actually higher among the higher socio - economic groups in rural Bangladesh than among the lower groups. The authors propose several factors as linkages with the intermediate variables that possibly produce this fertility effect, including the generally lower health and nutrition status of lower socio - economic groups, prolonged breast - feeding, involuntary abstinence because of migration of husbands of lower class women, and the less strict practice of seclusion and patterned modesty among women of the lower classes. (Modified authors' abstract)

524 Stoeckel J, Chowdhury AKMA. Neo - natal and post - neo - natal mortality in a rural area of Bangladesh. Pop Stud 1972 Mar;26(1):113 - 20

"An analysis of neo - natal and post - neo - natal mortality in 132 villages (population of 117,000) of Matlab thana indicates the following: (1) Neo - natal deaths accounted for 60% of the infant mortality rate of 125. This proportion was unexpectedly high since previous research had maintained that in countries with infant mortality rates over 100, neo - natal deaths account for less than one - third of all infant deaths. Since the present findings on the proportions of neo - natal deaths correspond exactly with results from an earlier registration system in East Pakistan, it is suggested that the long - ac - cepted proposition, 'less developed' areas are characterized by lower proportions of

neo-natal deaths than 'more developed' areas, be re-examined. (2) The infant death rate accounts for 36% of all deaths in the population. If the infant death rate were reduced by half the result would be a decrease in the current crude death rate from 16 to 13. Although this reduction would appear to be small, in the context of a current high growth rate of 3% (from 1966-67 to 1968-69) it exerts a sizeable impact. For example, it would take a reduction of eight points in the crude birth rate of 46 just to achieve a growth rate 2.5% under these circumstances. Obviously, continued efforts in death control without an effective birth control programme will perpetuate high rates of growth. (3) Neo-natal and post-neo-natal mortality exhibited the expected 'U' shaped pattern with parity, and generally varied as expected with age and family size, except in the oldest age group and largest family size where the risk was smaller than in the preceding groups. An explanation for these findings is presented, based on the effect that births to high-parity women with low child mortality have upon the total neo-natal and post-neo-natal mortality rates. It was found that these births exhibit a much lower mortality risk than births to women of comparable parities and higher child mortality, and that their numbers account for the lower risk to the births in the oldest age group and largest family size. It was concluded that women with a combination of high parity and low child mortality most probably represent a group with superior socio-economic and or health conditions which contribute to the lower risk of neo-natal and post-neo-natal death." (Authors' abstract)

525 Stoeckel J, Chowdhury AKMA, Aziz KMA. Out-migration from a rural area of Bangladesh. Rur Sociol 1972 Jun;37(2):236-45

526 Stoeckel J, Chowdhury AKMA. Pregnancy termination intervals in a rural area of Bangladesh. Demography 1974 May;11(2):207-14

"Pregnancy termination intervals, i.e., live birth to live birth (LB-LB), live birth to fetal loss (LB-FL), and fetal loss to live birth (FL-LB), are analyzed prospectively between 1966 and 1970 in a rural population (117,000) of Bangladesh. Results indicate that the mean LB-LB interval was almost 30 months, the LB-FL interval 27 months, and the FL-LB interval 18 months. In addition, postpartum amenorrhea was estimated to be about 13-14 months, and the time added by a fetal loss to a LB-LB interval about 15 months. No relationship was found between LB-LB intervals and the number of living or dead children." (Authors' abstract)

527 Stoeckel J, Chowdhury AKMA. Seasonal variation in births in rural East Pakistan. J Biosoc Sci 1972 Jan;4(1):107-16

528 Stoeckel J, Chowdhury AKMA. Spouse age difference and fertility in rural Bangladesh: implications for raising the age at marriage of females. Biol Soc 1984 Mar;1(1):139-43

"This study analyzed all births registered in 1968-71 in a population of 117,000 in 132 villages of Matlab Thana, Bangladesh, to test the hypothesis that there is an inverse relationship between spouse age difference and fertility. Marital age-specific and marital total fertility rates were calculated for spouse age difference categories. 73% of the women in the sample had husbands who were at least 10 years their senior, and in 21% of cases the husbands were 15 or more years older. However, the proportions of women whose husbands were more than 14 years older was higher among women in the older age groups. Throughout the age structure, fertility rates declined as the age difference from the husband increased. The total marital fertility rate was 7.3 among women 5-9 years younger than their husbands, 6.9 when there was a 10-14 year difference, 6.4 when the age difference was 15-19 years, and 5.5 when the age difference was 20 years or more. Also analyzed was the magnitude of the effect of the widespread difference in age between spouses in Bangladesh on the crude birth rate. If all women whose husbands are 15 or more years older were shifted to the group in which husbands are 10-14 years older, the crude birth rate would be 2.6% higher. If all

women whose husbands are 10 or more years older were shifted to the group in which husbands are 5 - 9 years older, the birth rate would increase by 5.4%. Overall, reduction of the age difference between spouses to 5 - 9 years would imply an additional 170,000 births that would have to be prevented to maintain the current crude birth rate in Bangladesh of 46. These findings have implications for population policies aimed at increasing the age at marriage of females. Such a policy is likely to produce a narrowing or reduction in the differences in ages between spouses as well as a reduction in the length of exposure for reproduction." (POPLINE)

529 Svennerholm A - M, Holmgren J. Oral combined B subunit - whole cell cholera vaccine. *In*: Holmgren J, Lindberg A, Mollby R, eds. Development of vaccines and drugs against diarrhea; proceedings of the 11th Nobel Conference, Stockholm, 1985. Lund: Studentlitteratur, 1986:33 - 43

"An oral cholera vaccine has been developed which consists of purified B subunit and formalin as well as heat - inactivated cholera vibrios (classical and El Tor organisms expressing i.a. Inaba and Ogawa lipopolysaccharides and fucose - binding and mannose - binding hemagglutinins). This B - subunit whole cell cholera vaccine (B + WCV) has proved to be completely safe in Swedish, Bangladeshi and American volunteers. Studies in Bangladesh have shown that immunization with B + WCV stimulated gut mucosal IgA antitoxin and antibacterial (anti - lipopolysaccharide) antibody formation and local immunological memory comparable to the immune response induced by cholera disease itself. In addition, as evident from a field - based family study orally administered B subunit alone in doses of 1 - 2 mg gave rise to rapid non - immunological partial protection against disease in cholera - infected individuals by blocking cholera toxin receptors ($p = 0.08$ vs placebo). In American volunteers who received three oral immunizations with B + WCV, the vaccine - induced immune response was associated with protection ($p < 0.01$) against challenge with an ID100 dose of live cholera vibrios. A field trial in Matlab, Bangladesh by ICDDR,B has been initiated to (i) evaluate the protective efficacy and duration of protection against cholera afforded by both the oral combined B + WCV and its whole - cell component (WCV) alone versus an *Escherichia coli* K 12 placebo vaccine, (ii) assess the cross - protection against disease caused by LT - producing Escherichia coli and other toxigenic organisms (e.g. *V. cholerae* non - O1 and *V. mimicus*) that may be afforded by the B subunit in the combined vaccine, and (iii) determine vaccine - induced cholera antibody titer rises in breastmilk in lactating mothers as these may provide protection for the breast - fed child." (Authors' abstract)

530 Swenson I. Early childhood survivorship related to the subsequent inter - pregnancy interval and outcome of the subsequent pregnancy. Dhaka: Cholera Research Laboratory, 1977. 18 p. (CRL scientific report, 4)

531 Swenson I. Early childhood survivorship related to the subsequent interpregnancy interval and outcome of the subsequent pregnancy. J Trop Pediatr 1978 Jun;24(3):103 - 6

"Childhood mortality is significantly higher among children whose birth is followed by another pregnancy in less than 12 months compared to children whose birth is followed by another pregnancy in greater than 12 months. This observation is true both when the second pregnancy of the interval results in a live or a non - live birth. Among children followed by intervals less than 12 months, there are no significant differences between those followed by another live birth or a non - live birth. These results suggest that the shorter intervals are associated with a lower survivorship of the older child; however, the period of competition from the second closely spaced pregnancy does not appear to have a significant effect on the survivorship of the older child." (Author's abstract)

532 Swenson I. Expected reductions in fetal and infant mortality by prolonged pregnancy spacing in rural Bangladesh. Bangladesh Dev Stud 1977 Jan;5(1):1 - 16

"The effect of pregnancy spacing on fetal and infant survivorship is explored using a life table method. The proportions of detected pregnancies surviving to term and to the beginning of the second year of life are calculated by different lengths of preceding interval, age of the mother, pregnancy order, and the mother's fertility history. The study population consists of the second pregnancies in 9295 intervals recorded in Matlab than between 1966 - 71. Results indicate that if all pregnancies were preceded by an inter-pregnancy interval longer than 24 months, about 5% more would survive to the second year of life. The corresponding gain would be 2% with an interval of 12 - 24 months. Pregnancies following intervals of less than 12 months and a surviving live birth experience the poorest survivorship: lower than first order pregnancies, pregnancies to women over 39, or pregnancies of women with a history or 2 or more pregnancy or child losses. If all second and above order pregnancies were preceded by an interval longer than 24 months, the expected early fetal wastage rate would decline by about 42%. If all second and above order pregnancies were preceded by intervals longer than 24 months, postneonatal mortality would be expected to decline by about 44%. Results of the analysis indicate that the impact of pregnancy spacing in decreasing early fetal and postneonatal mortality greatly exceeds that of averting births in the high-risk subclasses for other maternal factors." (POPLINE)

533 Swenson I, Khan AR. Final report: comparative oral contraceptive studies. Dhaka: Johns Hopkins University Fertility Research Project, 1977. 12 p. (FRP report, 12)

"1045 women from 6 Dhaka city hospitals and the rural Matlab Family Planning Clinic were involved in field trials of 3 oral contraceptives - Norinyl, a combination estrogen + progesterone pill; Modicon, a sequential preparation; and Micronor, a continuous low-dose progesterone. 66% of the Dhaka and 83% of the Matlab clients were breast-feeding at the time they started the contraceptives. (An appendix gives a detailed account of the study design.) 3.6% of the breast-feeding Matlab clients and 28.7% of the Dhaka clients had a child under age 6 months. Almost 2/3 of the Matlab clients were amenorrheic when 1st accepting the pills, compared with 3.4% of the Dhaka clients. A larger proportion of Norinyl clients experienced regular menstruation than those on the other 2 preparations; the Modicon group the highest incidence of irregularity. The higher number of women from Dhaka menstruating at time the study started is probably due to their greater reliance on supplemental feeding; these women continued to report regular menstruation. Initially only 1 - 3% reported decreased milk flow, but by the 3rd visit, 20% of the Modicon, 24% of the Norinyl, and 29% of the Micronor group reported less milk flow. Major finding was the irregular use or early discontinuance of the pills. Most women gave no reason. Of those who gave reasons, most cited such side effects as nausea, dizziness, and weakness. In rural areas husband's objections were most important, generally because the side effects interfered with the woman's housework. Interestingly, continuation was higher among rural clients, 38.6% for Norinyl, 43.6% for Micronor, and 26.6% for Modicon at 12 months compared with Dhaka's rates of 20.2% for Norinyl and 25.8% for Micronor. Pregnancy rates were high, but at 3-month follow-up more than 1/3 of the women reported missing more than 4 pills and only a small percent missed 0 - 1 pills. Most of the women discontinuing rejected alternate forms of contraception; <a few chose injectables." (POPLINE)

534 Swenson I, Khan AR. Final report of the Johns Hopkins University Fertility Research Project study of injectables in the model clinic, Dhaka, and the Matlab clinic. Dhaka: Johns Hopkins University Fertility Research Project, 1977. 26 p.

535 Swenson I, Khan AR. Final report: study of injectables in the Model Clinic, Dhaka and the Matlab clinic. Dhaka: Johns Hopkins University Fertility Research Project, 1977. 8 p. (FRP report, 13).

"285 women were followed in the rural Matlab clinic and 239 in the Model Clinic of Dhaka to assess the characteristics of injectable clients and to determine side effects and acceptability of this contraceptive method. 90% of the Matlab and 50% of the Dhaka

clients were breast-feeding. More than 90% of the lactating Dhaka women were under 30 years of age, compared with 40% of the Matlab group. The Dhaka women had significantly more educated husbands and higher socioeconomic status. 64.2% of the rural and 61.5% of the Dhaka group had never used any contraception before starting this study. Most of the Matlab clients who had used contraception had been on the pill; the Dhaka group was split between the pill and condoms. 82.8% of Matlab and 62.5% of Dhaka clients said they did not want any more children. Since a higher proportion of the urban women were menstruating at time of injection, both among the lactating and the nonlactating group, they were more aware of menstrual irregularities. The number of Matlab women reporting irregular bleeding with Depo-Provera, the only preparation used in this clinic, ranged from 10 to 17% even after 3rd and 4th visits. Among women who were not breast-feeding, irregular menses increased with each visit until by the 3rd visit, 60% of rural women were reported irregular or no menses, 90% of Dhaka women on Depo-Provera, and 83% on Norigest reported menstrual irregularity or cessation. Main reasons for discontinuation were nausea, dizziness, or husband's objection. 4 women were pregnant at time of study but concealed the fact because they thought the injection was an abortifacient. 80% of the women accepted 2 injections, about 20% of Dhaka and 10% of Matlab accepted 4 injections (12 months of protection)." (POPLINE)

536 Swenson I, Harper PA. High risk maternal factors related to fetal wastage in rural Bangladesh. J Biosoc Sci 1979 Oct;11(4):465-71

"In rural Bangladesh, early fetal wastage and stillbirth are higher among pregnancy orders one and six or higher than among orders two and three. The increased risk is particularly apparent among those pregnancies following two or more previous fetal deaths. Women in the higher pregnancy orders who have not experienced previous fetal deaths or only one fetal death have only a slight increase in the risk of fetal death compared to women in pregnancy orders two and three. The virtual absence of obstetric care and the high maternal mortality in this Bengali population may allow only women without reproductive impairments to reach the higher pregnancy orders." (Authors' abstract)

537 Swenson I, Harper PA. The relationship between fetal wastage and pregnancy spacing in Bangladesh. Soc Biol 1978 Fall;25(3):251-7

"The relationship between early fetal wastage or stillbirth and pregnancy spacing was examined in a population characterized by prolonged lactation, minimal nutrition, and high fertility and mortality. The highest risk of early fetal death was found among those pregnancies conceived less than twelve months after the birth of a surviving breast-fed infant. Lactation as a possible causal factor is discussed. A significant inverse relationship was apparent for second trimester fetal deaths and pregnancy intervals, but not for third trimester deaths. This finding is surprising when one considers that fetal weight gain, and presumably nutrient demand, increases most rapidly during the third trimester." (Authors' abstract)

538 Talukder KA, Ahmad QS, Halder K, Huq MI. Prevalence of different serotypes of *Shigella flexneri* and *Shigella boydii* in Bangladesh [abstract]. *In*: Programme and abstracts; proceedings of the 6th Annual Conference of Bangladesh Society of Microbiologists, Dhaka, 20-21 Mar 1987. Dhaka: Bangladesh Society of Microbiologists, 1987:2

539 Taylor PR, Merson MH, Black RE, Rahman ASMM, Yunus M, Alim ARMA, Yolken RH. Oral rehydration therapy for treatment of rotavirus diarrhoea in a rural treatment centre in Bangladesh. Arch Dis Child 1980 May;55(5):376-9

"In November 1977, an enzyme-linked immunosorbent assay for detecting rotavirus antigen was introduced in the laboratory of a rural treatment centre in Bangladesh. During the next 40 days rotavirus without other pathogens was found in the stools of 216 (45%) of 480 children under age 5 years who visited the centre with a gastrointestinal illness. 188 (87%) of these children were treated with oral rehydration alone, using

the solution currently recommended by the World Health Organisation, while 28 (13%) also required some intravenous rehydration; there were no deaths. Oral rehydration treatment was judged successful in 205 (95%) of the rotavirus patients and was not associated with any serious side effects. Oral rehydration treatment, with this solution, has been used extensively and successfully in the treatment of enterotoxin-mediated diarrhoea and can also safely be used for treating rotavirus diarrhoea in infants and young children." (Authors' abstract)

540 Thomas DB, McCormack WM, Arita I, Khan MM, Islam MS, Mack TM. Endemic smallpox in rural East Pakistan. I. Methodology, clinical and epidemiologic characteristics of cases, and intervillage transmission. Am J Epidemiol 1971 May;93(5):361-83

"During one year, 119 cases of variola major, representing 30 outbreaks, occurred in 27 villages of a rural study area in East Pakistan. Nearly one fourth of those afflicted died, the majority during the second week of illness. Pre-exposure vaccination reduced mortality. The case fatality ratio was highest for the nearly completely unimmunized children under age 5, and within this group was higher for those under 1 than from 1 to 4. The density of lesions on the arms and face of unvaccinated cases varied widely; previously immunized cases tended to have relatively sparse lesions. Highest attack rates were noted for the unvaccinated, especially 5- to 14-year-old males, and children not attending school. Most cases occurred in the spring. All were a result of introductions into the study area, primarily by landless adult males who frequently came from jobs in large cities where only 5% of the people in East Pakistan reside. Smallpox was introduced into villages with a frequency directly related to their population size. Selective vaccination procedures based on these findings can reduce the potential for intravillage smallpox spread, and diminish the probability of introductions into rural communities." (Authors' abstract)

541 Wahed MA, Aziz KMS, Chowdhury AKMA, Rahaman MM. Occurrence of two electrophoretically distinct albumins in human serum [abstract]. *In*: Proceedings of the Third Bangladesh Science Conference, Chittagong, 8-12 Jan 1978:148

542 Wasserheit JN, Harris JR, Chakraborty J, Kay BA, Mason KJ. Reproductive tract infections in a family planning population in rural Bangladesh. Stud Fam Plann 1989 Mar-Apr;20(2):69-79

"In contrast to social, religious, and economic determinants of acceptance and sustained use of family planning in developing countries, perceived side effects resulting from reproductive tract infections can usually be ameliorated easily and expeditiously. This population-based study examines the magnitude and nature of morbidity due to reproductive tract infections among users of various contraceptive methods and among nonusers in a rural community in Bangladesh. Overall, 22 percent of the 2,929 women surveyed reported symptoms of reproductive tract infection. Of the 472 symptomatic women examined, 68 percent had clinical or laboratory evidence of infection. Users of intrauterine devices and tubectomy were each approximately four times as likely to report symptoms and seven times as likely to have examination-confirmed infection as nonusers. The epidemiology of reproductive tract infections in this population is addressed, and the findings are discussed in terms of their potential programmatic impact." (Authors' abstract)

543 Wasserheit JN, Harris JR, Chakraborty J, Kay BA. Vaginitis: a common finding among family planning users in Bangladesh [abstract]. *In*: Program and abstracts; proceedings of the 26th Interscience Conference on Antimicrobial Agents and Chemotherapy, New Orleans, Louisiana, 28 Sep-01 Oct 1986. New York: American Society for Microbiology, 1986:227

544 Woodward WE. Cholera reinfection in man. J Infect Dis 1971 Jan;123(1):61-6

"Fourteen documented instances of reinfection with *Vibrio cholerae* in man are reported. They were recognized during the course of surveillance of a rural population in East Pakistan, where field trials of cholera vaccine were being conducted. The duration of immunity derived from cholera infection is short, especially in persons whose subsequent reinfection is due to heterologous organisms. The risk of reinfection with *V. cholerae* is probably only slightly less than the risk of initial infection. The relatively high frequency of 6 reinfection indicates that an effective cholera vaccine will need to stimulate greater immunity than does the natural disease." (Author's abstract)

545 Woodward WE, Mosley WH, McCormack WM. The spectrum of cholera in rural East Pakistan. I. Correlation of bacteriologic and serologic results. J Infect Dis 1970 May;121(5 suppl):S10 – 6

"A group of 107 children was studied intensely throughout the course of a large epidemic of cholera in 1 village of East Pakistan. The overall rate of infection was 18.7%, and infection rates decreased with increasing age. The ratio of non – hospitalized to hospitalized infections was 5:1. The percentage of detectable titers of vibriocidal antibody in blood specimens obtained before the epidemic increased markedly with age, while that of toxin – neutralization antibody titers declined slightly. Detectable, initial vibriocidal titers were associated with a lower rate of infection than were undetectable titers. The situation was reversed with regard to toxin – neutralization levels, although the presence of detectable titers tended to be associated with milder disease. All 20 infections were discovered by daily rectal swab cultures, while a 4 – fold increase in vibriocidal titer was present in only 12 of these individuals, and an absolute rise of 20 or more antitoxin units/ml was present in 10. The duration of excretion of vibrios was significantly less in individuals who did not convert serologically." (Authors' abstract)

546 Yunus M, Rahman ASMM, Faruque ASG, Glass RI. A clinical trial of ampicillin versus trimethoprim – sulfamethoxazole in the treatment of *Shigella* dysentery. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 11 p. (ICDDR,B scientific report, 53)

547 Yunus M, Rahman ASMM, Farooque ASG, Glass RI. Clinical trial of ampicillin v. trimethoprim – sulphamethoxazole in the treatment of *Shigella* dysentery. J Trop Med Hyg 1982 Oct;85(5):195 – 9

"Following a nationwide outbreak of *Shigella* dysentery type 1 and the recognition of *Shigella* isolates resistant to ampicillin, the drug of choice, we conducted a clinical trial to compare the efficacy of ampicillin v. trimethoprim – sulphamethoxazole for the treatment of *Shigella* dysentery. Patients with symptoms of dysentery and no other complicating illness were randomised into one of two treatment groups. Patients in the two groups were comparable at the time of hospital admission with regard to age, sex, presenting complaints and *Shigella* strains. They responded well with both regimens and there was no significant difference in the mean time until stool became culture negative (1.4 days), temperatures returned to normal (2.7 days) and faecal leucocytes disappeared (3.0 days); abdominal pain, tenesmus and stool blood and mucus improved significantly more rapidly with trimethoprim – sulphamethoxazole than with ampicillin. There was no evidence of toxicity with either drug. While both drugs are effective for the treatment of *Shigella* dysentery, trimethoprim – sulphamethoxazole was considered to be superior." (Authors' abstract)

548 Yunus M, Chakraborty J, Zimicki S. The impact of a home – based distribution of oral rehydration solution on the nutritional status of children [abstract]. *In*: Proceedings of the XIIth International Congress of Nutrition, San Diego, California, 16 – 21 Aug 1981:177

549 Yunus M, Chakraborty J, Zimicki S. The impact of a home – based distribution of oral rehydration solution on the nutritional status of children [abstract]. *In*: Programme,

papers and abstracts of the Third Asian Conference on Diarrhoeal Diseases, Bangkok, 10 – 14 Jun 1985:239

550 Yunus M, Chakraborty J, Zimicki S. The impact of a home – based distribution of oral rehydration on the nutritional status of children [abstract]. *In*: Programme and abstract of the Third Asian Congress of Nutrition, Jakarta, 6 – 10 Oct 1980:119 – 20

551 Yunus M. The impact of a home – based distribution of oral rehydration solution on the nutritional status of children. London: London School of Hygiene and Tropical Medicine, University of London, 1982. 89 p. (M.Sc. thesis)

552 Yunus M, Chakraborty J. Matlab oral therapy field trial manual for treatment and prevention of diarrhoea. Dhaka: Cholera Research Laboratory, 1978. 20 p. (Text in Bengali)

553 Yunus M, Chakraborty J. Matlab oral therapy field trial training manual for treatment and prevention of diarrhoea. Dhaka: Cholera Research Laboratory, 1978. 29 p.

"Diarrhea is characterized by an increase of water in the stool and vomiting. Indications of diarrhea are easily observed with the eyes. Diarrhea causes loss of body salts, reduction of blood volume, increase in blood density, and if untreated, may cause death from hypovolumic shock. The treatment of diarrhea is through rehydration, the process of replacing the body salts as saline in equivalent to the quantity of stool discharged. Rehydration is carried out either through the intravenous or the oral method. Dietary management for diarrhea patients should be adopted: 1) breast feeding children should continue breast feeding; 2) bottle feeding babies should continue, but the milk may be diluted with water; 3) other food may be allowed if the baby is habituated to it; 4) as soon as baby is recovered from diarrhea it should be given extra food to replace energy and strength lost during illness; 5) diet for adult patients should be soft, digestible and have no spices; and, 6) normal feeding should be restored as soon as possible. Preventive measures against diarrhea include taking warm instead of cold food; avoiding rotten or stale food; and discharging stool at a particular place regularly using germicides and insecticides to decontaminate the area where the stool is made." (POPLINE)

554 Yunus M, Chakraborty J. Role of mothers in an oral rehydration programme [abstract]. *In*: Proceedings of the National Workshop on Oral Rehydration, Dhaka, 26 – 28 Sep 1979. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1980:10

555 Yunus M, Zimicki S, Baqui AH, Hossain KMB, Blaser MJ. *Salmonella* food poisoning in Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1981. 6 p. (ICDDR,B scientific report, 51).

"In an outbreak of food poisoning in March, 1980, 10 of 11 members of a family who ate a food called jalar jao experienced acute gastroenteritis within 4 – 12 hours. All 10 patients were hospitalized at the International Centre For Diarrheal Disease Research, Bangladesh (ICDDR,B) field hospital at Matlab. The investigation of the outbreak included the testing of water and food samples from the family's compound, the river, the family's chickens, and similar samples from neighboring families. *Salmonella java*, a pathogen whose prevalence in Bangladesh is low in comparison with that of other causes of diarrhea, was isolated from rectal swabs from 4 patients. The technic of preparation (consisting of the addition of cold rice powder that had been processed on the ground, to the heated rice with molasses and coconut), the history of eating the jalar jao (the fact that all the family members who ate the jalar jao became ill, while 1 daughter who did not remained well), the short interval between eating and the onset of the illness, and the culture results suggest that the jalar jao was the vehicle. Jalar jao, which unlike most foods eaten in Bangladesh, is traditionally eaten cold by rural people during hot summer months, may be an important vehicle for transmitting pathogenic organisms in a

country where such organisms are generally rare." (POPLINE)

556 Yunus M, Zimicki S, Baqui AH, Hossain KMB, Blaser MJ. *Salmonella* food poisoning in Bangladesh. Bangladesh Med J 1984 Apr-Jul;13(2-3):52-4

"In an outbreak of food poisoning investigated in March 1980, 10 of 11 members of a family who ate a special food locally named jalar jao developed acute gastroenteritis within 4 to 12 hours. All the 10 patients were hospitalized at the ICDDR,B field hospital at Matlab. *Salmonella java* was isolated from rectal swabs taken from 4 patients. Epidemiological investigation was carried out in the family to find the possible source and mode of transmission of the disease. The technique of preparation and the history of ingestion of the special food, the short interval between the ingestion and the onset of the illness, and the culture results suggest that the jalar jao contaminated by chicken was responsible for the sickness in the family. The jalar jao which is traditionally taken by rural people during hot summer months may be of public health importance." (Authors' abstract)

557 Zaman K, Yunus M, Hossain KMB. Changing pattern of bio and serotypes of *Vibrio cholerae* 01 in rural Bangladesh [letter]. J Pak Med Assoc 1987 Feb;37(2):57

'Till 1962, classical cholera had been prevailing in India and Bangladesh. ElTor cholera which began to spread from Indonesia in a pandemic form from 1961 entered India in 1964 and had eliminated the classical biotype in 1966. However, in Bangladesh, a few ElTor strains were first detected in Chittagong in 1963 and in Dhaka in 1964, and then disappeared in 1966, but were seen again in 1968. Ultimately, the ElTor biotype completely replaced the classical biotype in 1973. In urban areas, this change may be due to migration of people from the ElTor endemic areas. To see whether this change had also occurred in rural areas, the authors analysed the bio- and serotypes of isolates from cholera patients admitted from 1966 to 1985 at the Matlab Hospital, a rural treatment centre of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). This centre treats 10,000-12,000 diarrhoeal patients a year, of whom 12-14% have bacteriologically confirmed cholera. In 1973, ElTor replaced the classical biotype. Again in 1982, the classical biotype displaced the ElTor as the main epidemic strain in Bangladesh. The shift from classical to ElTor and again the return of the classical form still remains a mystery. Presently, a majority of the cholera patients are infected with ElTor, Ogawa. Why and how these changes occur require further research, particularly on body immunity, environmental and ecological factors which might influence these changes." (POPLINE)

558 Zaman K, Islam MR, Baqui AH, Huq E, Yunus M. Clinical presentation of hypokalaemia in children attending a rural diarrhoeal treatment centre in Bangladesh [abstract]. *In*: Proceedings of the 2nd Asian Conference on Diarrhoeal Diseases, Calcutta, 1983:70

559 Zaman K, Yunus M, Baqui AH, Hossain KMB, Khan MU. Co-trimoxazole-resistant *Shigella dysenteriae* type 1 outbreak in a family in rural Bangladesh [letter]. Lancet 1983 Oct 1;2(8353):796-7

560 Zaman K, Baqui AH, Yunus M. Hypokalaemia and urinary anomalies in children with diarrhoea in rural Bangladesh [letter]. J Pak Med Assoc 1986 Jan;36(1):20-1

561 Zaman K, Islam MR, Baqui AH, Yunus M. Hypokalaemia in children with diarrhoea in rural Bangladesh. Indian J Med Res 1985 Feb;81:169-74

"A total of 307 children under 5 yr of age, suffering from diarrhoea were studied prospectively from March to September, 1982 in a rural centre for diarrhoea treatment in Bangladesh to estimate the prevalence of hypokalaemia, its relationship with degree of dehydration, duration of diarrhoea, nutritional state and to document the signs of hypokalaemia. Thirty nine per cent of children had mild, 26 per cent moderate and 2 per cent

severe hypokalaemia. Patients with dehydration had significantly lower percentage of normal plasma potassium. Prevalence of hypokalaemia between the patients with history of watery and non-watery diarrhoea was not significantly different. Mild hypokalaemia was more common in patients with diarrhoeal illness of four days or less, whereas moderate hypokalaemia was more frequently seen with diarrhoeal illness lasting five days or more. Prevalence of hypokalaemia was significantly higher in malnourished children than in relatively healthy children. All 7 patients with severe hypokalaemia were severely malnourished. Lethargy, muscular weakness were significantly higher in hypokalaemic patients. The findings of the study suggest that hypokalaemia is not a serious complication of diarrhoea in children if appropriate therapy is initiated." (Authors' abstract)

562 Zaman K, Islam MR, Baqui AH, Yunus M. Nutritional status and electrolyte anomalies in children with diarrhoea in rural Bangladesh. Nutr Rep Int 1984 Oct;30(4):865-71

"Plasma electrolyte were measured in 285 children with diarrhoea to study the electrolyte anomalies during March through September, 1982 in a rural diarrhoea treatment centre in Bangladesh. One hundred nineteen (42%) children were severely malnourished (weight for age <60% of Harvard mean), 97 (34%) were moderately malnourished (weight for age 61-75% of Harvard mean) and 69 (24%) were >76% weight for age of Harvard mean. Nine patients (3%) had hyponatremia (plasma Na <130 mmol/L and 16 (6%) had hypernatremia (plasma Na >150 mmol/L). Hypokalemia (plasma K <3.5 mmol/L) encountered in 132 (46%) children and hyperkalemia (plasma K >5.5 mmol/L) in only 2 (0.7%) cases. Two hundred fourteen (75%) children were acidotic (plasma HCO_3 <17 mmol/L) and none were alkalotic (plasma HCO_3 >27 mmol/L). There was no significant difference in the prevalence of hypokalemia among dehydrated and non-dehydrated patients. Prevalence of acidosis increased significantly with the degree of dehydration. Hypernatremia and acidosis were not significantly more common in malnourished children but prevalence of hypokalemia was significantly higher in malnourished children (61% vs. 30%, p <.001). These results show that hypokalemia and acidosis are common metabolic abnormalities in children with diarrhoea in rural Bangladesh." (Authors' abstract)

563 Zaman K, Islam MR, Baqui AH, Yunus M. Nutritional status and electrolyte anomalies in children with diarrhoea in rural Bangladesh [abstract]. *In*: Programme, papers and abstracts of the Third Asian Conference on Diarrhoeal Diseases, Bangkok, 10-14 Jun 1985:269

564 Zaman K, Yunus M, Baqui AH. 100 years of cholera. The Pulse (Dhaka) 1984 Apr;53:11-12

565 Zaman K, Yunus M, Baqui AH, Hussain KMB. Surveillance of shigellosis in rural Bangladesh: a 10-year review [abstract]. *In*: Kager PA, Polderman AM, eds. Abstracts; proceedings of the XIIth International Congress for Tropical Medicine and Malaria, Amsterdam, 18-23 Sep 1988:213

566 Zimicki S, Nahar L, Sarder AM, D'Souza S. Demographic Surveillance System-Matlab. V. 13. Cause of death reporting in Matlab. Source book of cause-specific mortality rates, 1975-1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1985. 103 p. (ICDDR,B scientific report, 63)

"This paper describes the system for cause of death reporting as it has evolved since 1966 in the context of the Matlab Demographic Surveillance System [in Bangladesh]. The validity of the reporting system is evaluated: the sources of potential bias are identified and their importance examined. Cause categories are reviewed to establish their relation to local descriptions and the possible medical diagnoses which might be subsumed by them." (POPLINE)

567 Zimicki S, Wahed MA, Yunus M, Chakraborty J. Variation in glucose and electro-

lyte content of oral rehydration solutions prepared at home. *In*: Proceedings of the 1st Asian Conference on Diarrhoeal Disease, Dhaka, 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982:229–36

INDEX TO CO-AUTHORS

Langsten R 279, 422
Larrick J 267
Lee JV 259, 260
Leridon H 040
Levine RJ 208, 213, 214, 219, 220, 298, 299, 301
Lindenbaum J 268
Lockman HA 379
Loewenstein MS 514
Lowell S 292

McCormack WM 014, 017, 395, 397, 398, 406, 540, 545
McLaughlin JC 414, 480
Mack TM 540
Mahmud S 044, 045, 046
Maloney C 010
Martin AR 395, 397
Mason KJ 542
Menken JA 253, 255, 256, 321
Merson MH 081, 084, 085, 086, 087, 088, 089, 095, 141, 259, 417, 480, 485, 486, 539
Meyer P 076
Miah AL 389
Mita R 508
Mitra AK 030
Molla I 497
Molla M 416
Mosley WH 003, 013, 014, 017, 049, 061, 131, 134, 135, 149, 150, 288, 293, 294, 349, 355, 356, 368, 375, 376, 377, 378, 422, 423, 444, 445, 450, 456, 513, 521, 545
Mostafa G 189, 190, 311, 312, 496, 497

Nahar L 074, 075, 297, 566
Nahar S 038, 109
Nalin DR 118, 120, 371, 372
Neogi PK 193, 198
Northrup RS 121

Oseasohn RO 049, 050
Osteria T 058, 066, 456

Palmer DL 218, 365
Parry L 114, 115
Patwari Y 318
Paul SR 352
Peterson J 412
Phillips JF 004, 024, 143, 153, 154, 155, 156, 157, 158, 159, 160, 222, 270, 358, 359, 364, 409, 449, 471, 506, 507, 509, 510, 520
Phillips RA 119, 377, 395, 397
Potter RG 368

Rabbani GH 473
Rahaman M see Rahaman MM
Rahaman MM 318, 414, 472, 541
Rahman AS 481
Rahman ASMM 086, 087, 095, 118, 121, 208, 213, 214, 220, 242, 300, 353, 377, 378, 393, 395, 396, 397, 399, 417, 480, 488, 539, 546, 547
Rahman M 128, 132, 154, 173, 179, 237, 238, 274, 275, 276, 278, 280, 281, 284, 285, 318, 326, 327, 406, 413, 422, 427, 428, 485, 486, 510, 520
Rahman R 005, 203, 303
Rajan MM 112, 113
Rao MR 191, 193, 194, 196, 198, 199, 200, 201, 203
Razzaque A 032, 187, 188, 189, 407
Reller LB 118, 416
Remmers EF 379 Rob U 027
Robertson AD 111
Rochat R 118, 416
Rohde JE 374
Rowe B 084, 086, 087, 260
Rowland MGM 101, 102, 519
Ruzicka LT 060, 062, 443, 457

Sack DA 084, 086, 087, 088, 094, 185, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 202, 203, 267, 345, 389, 480, 515
Saeed YA 517, 518
Samadi AR 348
Sarder AM 032, 046, 128, 129, 132, 141, 187, 188, 189, 190, 349, 355, 356, 453, 458, 487, 496, 497, 512, 566
Sardar MA 041
Sarker PC 382, 383
Satter MA 517, 518
Satterthwaite AP 004
Sawyer J 110
Shahid NS 309, 310, 311, 312, 488
Shahidullah M 157, 362
Shaikh AK 074, 075, 144, 145, 159, 160, 227, 335, 487, 494
Shaikh K see Shaikh AK
Simmons GB 027, 434
Simmons RS 222, 358, 364, 429, 430, 431, 432, 434
Simpson NK 286
Smith C 329, 330, 331
Spira WM 379
Stanton BF 192, 193, 195, 196, 197, 198, 199, 200, 201, 202, 203
Stinson WS 427, 428
Stoll BJ 257, 259, 261, 262
Streatfield K 076
Streble P 291
Strife J 109
Stupp PW 426
Svennerholm A-M 191, 192, 193, 196, 197, 198, 199, 200, 202, 203, 257, 261, 264
Sykes ZM 289
Szmuness W 267

Tamplin ML 100
Taylor PR 084, 086, 087, 088

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