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A REVIEW OF FINDINGS ON THE IMPACT OF HEALTH INTERVENTION PROGRAMMES IN TWO RURAL AREAS OF BANGLADESH

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PREFACE

The International Centre for Diarrhoeal Disease Research,
Bangladesh (ICDDR,B) is an autonomous, international, philan-
thropic and non-profit centre for research, education and
training as well as clinical service. The Centre is derived
from the Cholera Research Laboratory (CRL). The activities of
the institution are to undertake and promote study, research
and dissemination of knowledge in diarrhoeal diseases and
directly related subjects of nutrition and fertility with a
view to develop improved methods of health care and for the
prevention and control of diarrhoeal diseases and improvement
of public health programmes with special relevance to develop-
ing countries. ICDDR,B issues two types of papers: scientific
reports and working papers which demonstrate the type of
research activity currently in progress at ICDDR,B. The views
expressed in these papers are those of authors and do not
necessarily represent views of International Centre for
Diarrhoeal Disease Research, Bangladesh. They should not be
quoted without the permission of the authors.

ABSTRACT

This paper provides an overview of major health problems in Bangladesh, with a detailed analyses of the findings of some selected intervention programmes currently being developed by the ICDDR,B in its two field stations at Matlab and Teknaf.

One major health problem in Bangladesh is diarrhoeal disease, which accounts for about a third of all deaths. Given that present vaccines are only partially effective and that establishment, maintenance and supervision of a network of treatment centres would be beyond the immediate capacity of Bangladesh, a cost-effective approach to prevent deaths from diarrhoea may be a household programme introducing oral therapy packets in homes. The findings of the ICDDR,B village-based and domiciliary oral therapy distribution programmes have shown that not only will such an effort ensure wider service coverage, as evident from over 80% use rate (which could be still higher if there were no ICDDR,B treatment centres), but will also substantially reduce the case-fatality rate.

A second priority health problem in Bangladesh is tetanus neonatorum, accounting for about 40% of all neonatal deaths. The findings of the Matlab maternal tetanus immunization study clearly demonstrated the impact on neonatal mortality of active immunization of pregnant women with two tetanus injections. However, given the present low acceptance rate by pregnant women (33%), the impact of such a programme on the overall neonatal mortality rate in the community may not be significant. In the rural Bangladesh setting, our recommendations from the Matlab experience would be vaccine campaigns backed up by immunization during pregnancy.

Another important health problem in Bangladesh is high fertility. About one-third of all adult female deaths between the age of 15 and 44 years are maternity related. The results of the ICDDR,B maternal-child health and family planning programme suggest that substantial demand for family planning services exist provided such demand is satisfied with a full range of contraceptive methods to better meet the needs of individual women.

INTRODUCTION

As in many other developing regions of the world, the core health problems in Bangladesh are related to high fertility, malnutrition and communicable diseases, particularly those involving environmental sanitation and personal hygiene. Crowded into a country of only 55,000 square miles of land are some 90 million people; over 80 million of whom live in the countryside, making Bangladesh the most densely populated rural country in the world. The present crude growth rate is estimated to be 2.8 percent, the crude rates of births and deaths per 1,000 population being 45 and 17, respectively (Baldwin 1977). Almost half of the population is under-fifteen years of age and the dependency ratio is 105 (Government of the People's Republic of Bangladesh, 1978).

Available data on fertility show a long historical record of high rates in Bangladesh. According to a recent analysis of marriage registration data in the Matlab field study area of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), the effective reproductive life span of the "average women" is about 27 years and the average interval between two live births is 31-34 months (CRL, 1979). The analysis shows that currently married women aged 40 years and more who delivered a live birth in 1976 had experienced, on the average, eight previous pregnancies carried to term. In other words, an "average" rural woman in Bangladesh is either pregnant or nursing throughout most of her reproductive life. Given current environmental factors and the large number of high-parity births, it is not surprising to find an estimate that about one-third of all adult female deaths between the age of 15 and 44 years are maternity related (Chen 1974).

With the improvement of internal communications and transport links and the gradual eradication of malaria and smallpox from the country, there has been a steady decline in the mortality rate from about 30 per 1,000 population in 1950 to below 20 per 1,000 population by the early 1960s (Masihur Rahman Khan 1972). There seems to be no improvement, however, over the past decade. Instead, the Matlab vital registration data (Figure 1) suggests that mortality levels may have risen in the 1970s and plateaued a level that is slightly higher than levels prevailing in the last half of the 1960s (Chen 1980). Other project areas have reported infant mortality rates in the range of 140-170 in recent years and crude death rates in the range of 17-19 per 1,000 population (BRAC 1978; Shafiq 1980) -- rates that are higher than Matlab where there has been an intensive hospital programme to reduce deaths from diarrhoea.

Nutrition has been a crucial problem in Bangladesh throughout its recent history. In the best of times the food supply has been barely adequate for the needs of the population. Since local production was inadequate, between 11 and 23 percent of the total available for consumption was imported over the 1969-1975 period (Government of the People's Republic of Bangladesh, 1980). Per capita protein and calorie consumption, already at a very low level in the early 1960s, are estimated to have declined further between 1960 and 1980. According to a recent WHO survey, 46 percent of families in the rural areas

Fig. 1: Trend in Infant (Neonatal and Postneonatal) Mortality Rate, Child 1-4 year Death Rate, and Crude Death Rate in Matlab, Bangladesh (1966-1976)
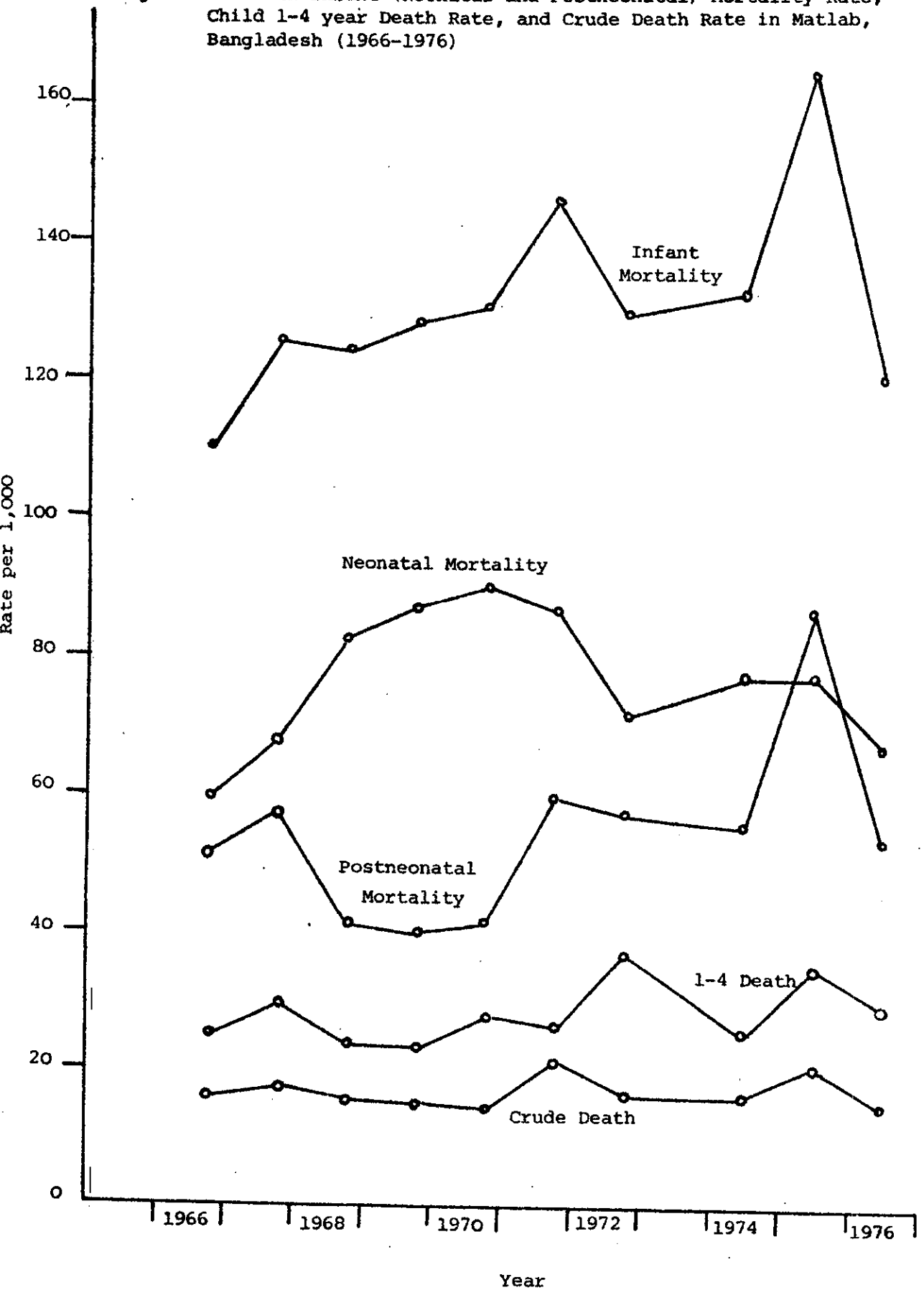
and 75 percent in the urban areas have calorie intakes below an acceptable level. Iron deficiency anaemia occurs in 92 percent of children under the age of two years, 40 percent of pregnant women and 10 percent of the men. The survey estimated roughly 30,000 persons aged 0-14 years to be blind in one or both eyes due to vitamin A deficiency (*ibid.*, 43).

The problem of malnutrition is seriously aggravated by the high prevalence of infectious diseases in the country. In the absence of precise nationwide morbidity and mortality statistics, data from the Matlab field station of the ICDDR,B may provide some information.

Table 1 shows that the largest contribution to present overall mortality is from diarrhoeal diseases, accounting for as much as a third of all deaths. Another fourth of all deaths resulted

TABLE 1

ADJUSTED PERCENTAGE DISTRIBUTION OF CAUSES OF DEATH,
MATLAB, BANGLADESH (1975-77)

Cause of death	Infant (0-11 months)	Children (1-4 years)	All ages
Diarrhoea	16.0	45.0	33.7
Tetanus	25.5	1.4	8.1
Respiratory	7.0	5.0	6.6
Fever	5.0	8.4	7.6
Measles	2.0	12.7	3.8
Others	44.5	27.5	40.2
All causes	100.0	100.0	100.0

from other infectious diseases for which medical science has a decisive preventive. A heavy burden of these diseases and death falls on children. About 30 percent of all deaths occur during infancy, at age 0-11 months, and another 25 percent during early childhood between ages 1-4 years (Ruzicka 1978).

Although the 10 million urban population is relatively well covered by Government and private health facilities, most of the 80 million rural population are deprived of modern health care. Rural health care is provided mainly by healers not qualified in allopathic medicine, i.e. the unqualified allopath, homeopath, spiritual healers, traditional midwives, ayurvedics and others. As of the end of 1977, the urban ratio of doctors to total population was 1:1200,

contrasting markedly with the rural ratio of 1:31000. Except for Thana Health Centre or Rural Health Centre beds, all Government and private hospital beds are in urban areas. The overall bed to population ratio is substantially below the ratio for many developing countries, 1 to 5,877 (Government of the People's Republic of Bangladesh, 1978).

A sample survey conducted by the Bangladesh Bureau of Statistics in 1973-74 showed that health expenditures (as defined from the point of view of the household) accounted for about 20 taka per household per month, or about four percent of total household expenditure. For households with monthly expenditures of less than 250 taka, the proportion was about 2.5 percent. For most households, health is a minor item of expenditure. Household expenditure is dominated by basic items such as clothing, rent and fuel, and above all food, which accounts for about 70 percent of expenditure in all rural households, and all urban households but the most prosperous (*ibid.*, 71). In a countrywide random sample survey by WHO in 1977, it was found that out of 896 diseased persons 27 percent did not seek any sort of medical assistance; only 11 percent consulted a Government health facility and 26.6 percent consulted qualified allopaths; the remaining 35.5 percent consulted unqualified allopaths, homeopaths or religious healers (*ibid.*, 69).

From the above it is clear that the demand for health care in Bangladesh far exceeds the capacity of present scarce and inequitable health resources. Given the adverse conditions of a large population and limitation of resources, the provision of basic health services to all the citizens in the near future remains unlikely. This has prompted the Government and some research and special health care projects in Bangladesh to test primary health care packages for preventing or treating selected health problems that are responsible for the most morbidity and mortality and for which interventions of proven efficacy exist. Logically, most of these projects have assigned high priority to the control of three major health problems, i.e. diarrhoeal diseases, tetanus neonatorum and high fertility. A review of studies of all health intervention projects in these three areas is beyond the scope of this paper. We review instead the intervention programmes currently being developed by the ICDDR,B in its two field stations at Matlab and Teknaf. The discussion will reflect some relevant findings available from other projects.

FINDINGS

A. Interventions in the Treatment and Control of Diarrhoeal Diseases

In Bangladesh, diarrhoeal diseases are not only the major causes of death, but also play a significant role in delaying the normal growth and quality of life because of their frequent occurrence. Recent surveillance in rural areas affords an estimate of 100 to 200 episodes of diarrhoea per 1,000 persons per year (CRL,* 1977). The case fatality ratio among untreated individuals varies

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* Cholera Research Laboratory called ICDDR,B since 1979. To avoid confusion the new name will be utilized in the text irrespective of dates.

depending on the type of illness considered. If only severely ill patients are included, the case fatality ratio among untreated patients is approximately 50 percent (McCormack 1973).

To address this major health problem of Bangladesh and other developing countries of the world, the ICDDR,B established its research laboratory in Dacca, the capital city of Bangladesh, in 1960. In 1963 its first field research station was set up in a rural riverine cholera endemic area situated about 45 miles southeast of Dacca, known as Matlab, with the basic aim of field-testing cholera vaccines. A diarrhoea treatment unit was established, and a fleet of small speedboats was maintained to transport patients and to support the field work. In 1974, the ICDDR,B opened another field station and a treatment centre at Teknaf, a rural area near the southeastern tip of Bangladesh. The population in both field research areas has been maintained under demographic surveillance, and under disease surveillance for several research programmes.

1. Hospital-based therapy

Between 1963 and 1974 the ICDDR,B conducted five large-scale cholera vaccine field trials in its Matlab field station area. The results of these trials confirmed that the available vaccines were partially effective and their protection was short-lived (ibid., 72). The conclusion derived from these studies was that until such time that a truly effective vaccine was available, hospital-based therapy would be more effective.

A major activity of ICDDR,B has remained, therefore, to provide free treatment for diarrhoea in its treatment centres at Dacca, Matlab and Teknaf. In the year 1978, these three centres treated a total of 118,421 diarrhoeal cases; 98,315 were seen in Dacca, 15,597 in Matlab, and 4,509 in Teknaf. The estimated case-fatality rate among the treated patients was less than one percent. Through a review of clinical records, it was estimated that about 47 percent of the in-patients would have died in the absence of ICDDR,B treatment facilities. The percentage ranged from 63 percent for infants to less than 40 for adults (Chen 1980).

While clinical services and research remain an important activity of ICDDR,B community-based studies have become increasingly important in recent years. This growing emphasis on rural health is linked with the observation that the establishment, maintenance and supervision of a network of treatment centres may demand resources that are beyond the immediate capacity of Bangladesh. An evaluation of the ICDDR,B treatment centre at Teknaf, for example; suggests that given the transportation problem of rural areas, treatment centres located further than four miles apart are unlikely to have a significant impact on diarrhoeal mortality in the population. Figure 2 illustrates that over 90 percent of reported diarrhoeal patients living within one mile of the Teknaf treatment centre utilized its

Fig. 2:   Influence of Distance on Attendance in Teknaf, 1977
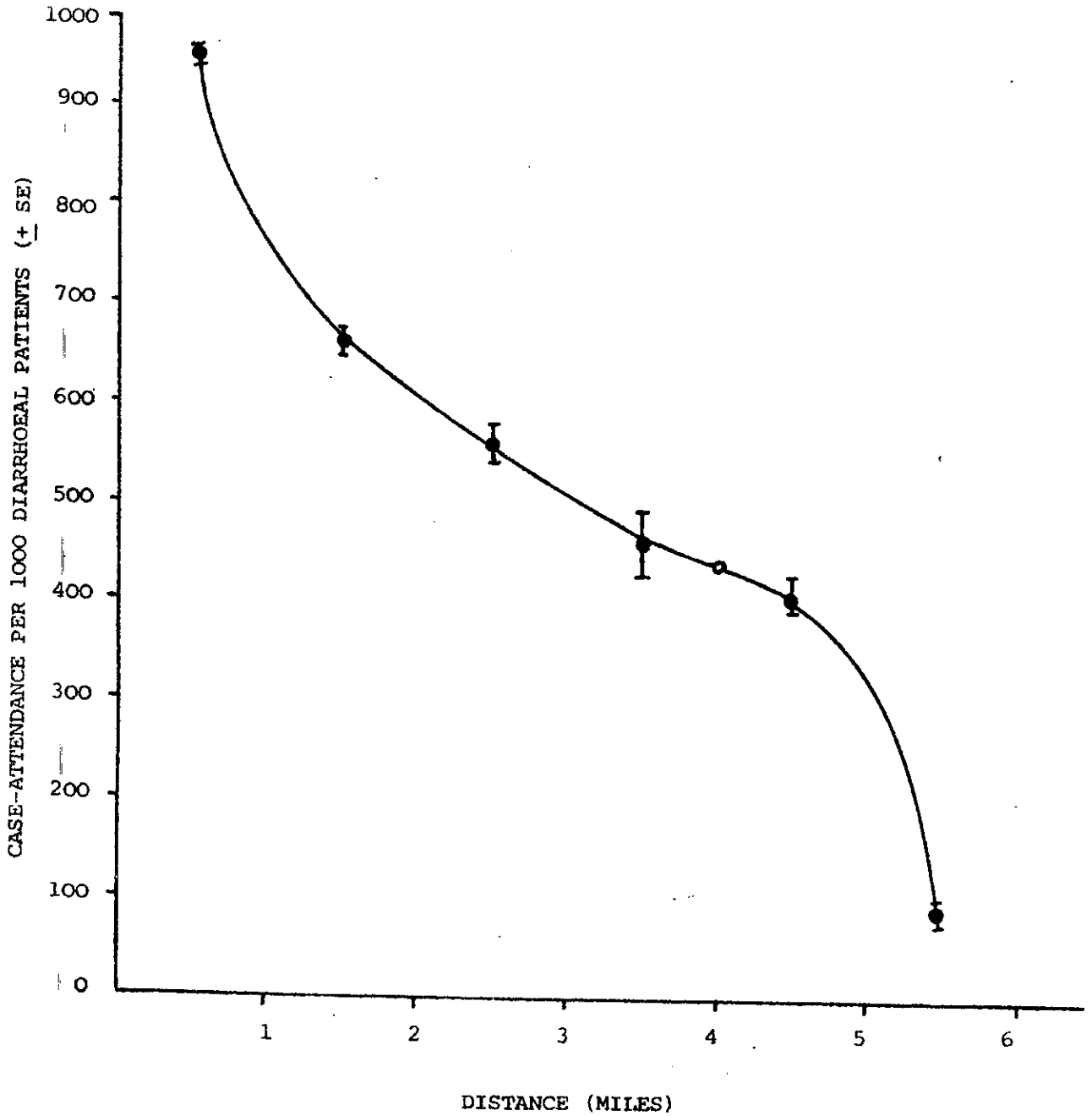
DISTANCE (MILES)

services. The attendance rate fell to nearly 60 percent for patients
located within two miles distance. The rate fell further to approxi-
mately 40 percent when the distance extended to three miles (Mujibur
Rahaman 1979).

Thus, it has become apparent that developing low cost rural treat-
ment programmes represents a high priority research issue. There
have been two significant ICDDR,B achievements in recent years to that
end: (1) the centre has demonstrated the practicability of management
of diarrhoea by para-professionals with little or no supervision of
physicians; (2) the centre has demonstrated that permanent facilities
are not essential to the treatment of diarrhoeal diseases. These have
been possible for recent advances, of ICDDR,B, in oral therapy, which
has simplified management of diarrhoea. The current research of ICDDR,B
now extends to the rural areas where a variety of strategies to provide
oral therapy at the village and household level's are being tested. The
following section provides a brief description of some of these inter-
ventions.

2.   Village-based oral therapy programme

Two different approaches are being examined by ICDDR,B to determine
the feasibility and effectiveness of a village-based distribution
programme for oral therapy. One approach utilizes the community-based
female village workers of ICDDR,B and another utilizes the indigenous
village practitioners.

a) Female village workers - Matlab. In early 1978, the ICDDR,B
initiated the local production of sucrose-electrolyte oral therapy
packets at Matlab Centre utilizing food-grade ingredients purch-
ased from the local market. One hundred sixty female village
workers who normally conduct vital registration and other work
covering an estimated population of approximately 157,000 were
given two and half days instruction in the indications and use of
the oral therapy packets in treating diarrhoea cases. A comparison
area with 134,000 population was delineated where this distribution
programme was not initiated because another field study of oral
therapy, integrated into a community-based maternal-child health
and family planning programme, was planned to be initiated in
the area after a few months.

Evaluation of a four-month trial revealed that the village-
based distribution of oral therapy packets produced a high level
of service coverage. Each worker distributed an average of
70 packets per month and the monthly field-treatment rate was 56
per 1,000. A comparison of hospitalization rates in the two areas
(Table 2) indicated that while the treatment area saw a reduction
of the hospitalization rate of 45%, the comparison area saw only

TABLE 2

DIARRHOEAL HOSPITALIZATION RATE (CASE/1,OOO POPULATION/4 MONTHS) IN ORAL
THERAPY AND COMPARISON AREA (IN MAY-AUGUST 1977 AND 1978)

	Oral Therapy	Comparison
1977 (Pre-distribution year)		
Estimated Population	153,241	130,796
Hospital cases	1,259	1,874
Rate	8.2	14.3
1978 (Year of distribution)		
Estimated Population	157,260	134,249
Hospital cases	790	1,612
Rate	4.5	12.0
Percent change in hospitalization rate over the period	-45.0	-16.0

16 percent (Chen, 1980). Since effective hospital treatment for
acute diarrhoea was available to both the distribution and
comparison populations and since death due to acute watery
diarrhoea and been virtually eliminated in the Matlab area, the
mortality-reducing effect of this village-based oral therapy
distribution programme could not be examined.

b) Indigenous practitioners - Chandpur. A different village-
based distribution strategy is being tested in thanas adjacent
to Matlab in the Chandpur subdivision. A survey in these
areas, which are not directly served by the Matlab treatment
centre, revealed that most diarrhoeal cases are treated by
indigenous practitioners generally using ineffective methods.
In early 1979, the ICDDR,B, trained 90 village practitioners

scattered in an area with a population of roughly 60 thousand inhabitants. The training consisted of a one-week practical demonstration on oral rehydration and management of diarrhoea.

A preliminary evaluation of post-training results showed that about 3,503 diarrhoeal patients were treated by these trained practitioners in three months, of whom eighty percent were treated with only oral rehydration. The case fatality rate among the patients treated by the trained practitioners was low, being less than 0.02 percent (ICDDR,B, 1980).

3. <u>Home-based oral rehydration programme</u>

Under the second service delivery strategy of oral therapy for diarrhoea the ICDDR,B has undertaken two field investigations -- one in Teknaf and another in Matlab. The main objective of these two investigations is to assess the feasibility of oral therapy as a domiciliary programme in rural areas.

a) <u>Family depot holders - Teknaf</u>. In mid-1976, in one village of approximately 7,000 persons in the Teknaf project area, 18 families were recruited to serve as depot holders for oral fluid packets and were trained in the proper administration of oral therapy by village-based field workers of ICDDR,B. In an adjacent village of approximately 4,000 persons, the village-based workers provided oral therapy directly to the patients during the course of their bi-weekly rounds.

A two-year follow-up of this activity revealed that although the incidence of diarrhoeal disease in the two villages was approximately the same, consumption of oral rehydration solution during diarrhoeal attacks was eighty percent in the village with depot holders and thirty-eight percent in the village without depot holders (Table 3). The overall case fatality rates in the depot holders village and the comparison village were 0.5 percent and 2.4 percent, respectively, and diarrhoeal mortality rates per 1,000 population were 0.6 and 2.9, respectively (Mujibur Rahaman 1979). The preliminary findings of this study suggest that readily available oral rehydration can prevent shock among patients, thereby reducing diarrhoeal mortality in the population even though diarrhoeal attack rates are unaffected.

TABLE 3

CONSUMPTION OF ORAL REHYDRATION SALT PACKETS AFTER DIARRHOEAL
ATTACKS, CASE FATALITY, AND DIARRHOEAL MORTALITY IN DEPOT
HOLDER VILLAGE AND COMPARISON VILLAGE, TEKNAF (1977-1978)

	Depot holder	Comparison
Use of Oral Rehydration Salt Packets	80	38
Diarrhoeal Case Fatality Rate (per 1,000)	0.5	2.4
Diarrhoeal Mortality Rate (per 1,000)	0.6	2.9

b) Bari-mothers - Matlab. In the Matlab area, an ongoing home-based oral therapy programme is being introduced over a much larger area, covering a population of 80,000. In this project, one mother in each *bari* (a *bari* is a group of patrilineally-related families) -- or 1,400 women in all -- is trained to mix and administer oral therapy and provide the materials to *bari* members as needed. The objective is to assess the acceptability and effectiveness of this programmatic approach in reducing the need for hospitalization and intravenous therapy.

Three months after the initiation of the programme, about 85% of people reporting diarrhoea to field workers also report using ORS. During the first year of the programme there were fewer patients hospitalized from both treatment and control areas than during the baseline year, 1978. However, this reduction was significantly greater for the treatment areas (Zimicki 1980).

B. Maternal Tetanus Immunization Programme

We have said above, that tetanus is a major cause of infant death in Bangladesh. The data from the ICDDR,B vital registration system in Matlab has revealed that approximately half of all infant deaths are neonatal deaths. Based on the villager's report of the symptoms leading to death, the data appears to show that approximately forty percent of these neo-natal deaths are caused by tetanus, a disease that is transmitted by contamination of the umbilical cord at the time of delivery.

One strategy for prevention of tetanus is to improve the quality of obstetrical services. But this is difficult in settings where almost all the deliveries occur at home, unattended by qualified midwives. Another approach is the active immunization of women before or during pregnancy with tetanus toxoid, a vaccine with proven high efficacy. The work at Matlab provided an opportunity to study the neonatal mortality impact of the latter approach.

1. Immunization of non-pregnant women

In 1974, the ICDDR,B conducted a field trial of cholera vaccine among children 1-14 years old and non-pregnant women 15 years old and older in the entire surveillance population of Matlab. Among the vaccines, one randomly selected group received 2 doses (.05 ml) of aluminum-absorbed tetanus toxoid as a placebo. About fifty-five percent of the selected women accepted two tetanus injections and fifteen percent one injection. The following table summarizes the neonatal mortality experiences in women having received one or two injections of tetanus toxoid as compared to those receiving cholera vaccine (Black 1979).

TABLE 4

NEONATAL MORTALITY RATE BY VACCINE STATUS OF WOMEN WHO
PARTICIPATED IN THE 1974 CHOLERA VACCINE FIELD TRIAL[a]

| Birth Cohort | Cholera Toxoid (1 or 2 injections) Rate[b] | Tetanus Toxoid | | | |
| | | One Injec. | | Two Injec. | |
		Rate	P Value[d]	Rate	P Value
April 1975 – March 1976	68.4 (1652)[c]	33.6 (536)	< .01	44.1 (1044)	< .025
April 1976 – March 1977	54.5 (2734)	49.4	NS	37.5 (1946)	< .025
	59.7 (4386)	43.5 (1263)		39.8 (2990)	

a Injections given in July-August 1974

b Per 1,000 related live births

c Number of live births given in parentheses

d Significance level compared with cholera toxoid group

NS = Not Significant

The data in the table show that for infants whose mothers had received two tetanus injections 9-32 months before giving birth, the neonatal death rate was about 20 per 1,000 live births lower than the rate for infants whose mother did not receive tetanus immunization. A later analysis confirmed that even after an average of four and half years (48-64 months), the immunized group had a neonatal mortality rate 15.5 per 1,000 live births lower than that for the non-immunized group (Makhlisur Rahman 1980). One injection of tetanus toxoid seems to have an effect in the first year, which seems to have disappeared in the second year.

The findings of the study are consistent with the clinical assumption that a high proportion of neonatal deaths in this population are in fact due to neonatal tetanus. Further, the acceptance of two injections of tetanus toxoid by over 55% assigned women confirms the beneficial effects that can be expected from a nationwide maternal immunization programme.

2. Immunization during pregnancy

In October 1977, the ICDDR,B restructured a non-clinical village-based family planning programme into an integrated village-based maternal-child health and family planning (MCH-FP) programme in 70 villages (about 80,000 population) of the Matlab field surveillance area. Initially, only family planning services were offered, but as the programme matured other selected health services (immunization, oral therapy for diarrhoea and nutrition education) were introduced. In June 1978, immunization of pregnant women with two injections of an aluminum-absorbed tetanus toxoid was initiated on a schedule of 0.5 ml any time after the fifth month of pregnancy and another 0.5 ml at a minimum of 4 weeks apart, preferably before one month of the delivery date.

Analysis of the results of the first two years of the programme has shown that about one-third of the eligible women during this period accepted full immunization (2 injections) and about 5% accepted partial immunization (one injection). The data in the following table show the impact of immunization on neonatal mortality (Makhlisur Rahman 1980).

The findings in Table 5 provide a clear documentation of the impact on neonatal mortality from active immunization of pregnant women. Full immunization of pregnant women with two tetanus injections reduced neonatal mortality rates by about one-half and neonatal mortality between day 4-14 by about 70%. Given the apparent homogeneity of immunized and never-immunized groups of women in respect to their socio-demographic characteristics and the fact that almost all births in Matlab area are delivered at home in attendance of untrained midwives and relatives, maternal immunization probably explains the major portion of this significant reduction in neonatal mortality.

TABLE 5

NEONATAL AND 4-14 DAY MORTALITY AMONG LIVE BIRTH COHORTS
(SEPTEMBER 1978 - DECEMBER 1979) ACCORDING TO
MATERNAL TETANUS IMMUNIZATION STATUS, MATLAB

	Immunized[a] Group		Never-Immunized Group		
	No.	Rate	No.	Rate[b]	
Live births	934		2379		
0-28 days death	40	42.8	199	83.6	p<0.01
4-14 days death	10	10.7	82	34.5	p<0.01

a   Received 2 injections of tetanus toxoid

b   Per 1,000 related live births

     One disturbing fact about this study is the failure of the
acceptance rate to increase with time as the programme matured. The
acceptance rate remained almost stable, around 33%, during the whole
two years period of observation. Reasons for non-acceptance as
reported by the women were husband or in-law's objection, fears of
harming the fetus and failure of workers to inform pregnant women
about vaccination early enough (Makhlisur Rahman 1980). The most
important factor inhibiting a positive trend in acceptance rate was
the community's imprecise diagnosis and perception of tetanus deaths,
thereby resulting in neonatal tetanus deaths among vaccinees from
causes of death which, according to local nomenclature, overlap with
that of true tetanus. In the study area, the clinical syndrome of
neonatal tetanus may be described by the terms *alga, takuria,* or
dhanustonkar. While the vaccine substantially reduced neonatal
deaths attributed to all these three causes, many mothers who
accepted the vaccine nevertheless reported *alga, takuria,* or
dhanustonkar deaths among their newborns even after immunization.

C.   Fertility Control Services

     Bangladesh has had a national family planning programme since the early
1960s. However, the 1968 National Impact Survey and other local surveys
conducted in the early 1970s revealed that earlier efforts to influence
fertility were not successful. A crucial hypothesis underscored by these

studies was that lack of information about contraceptive and their general availability were major constraints to programme success. In order to test this hypothesis, the ICDDR,B in collaboration with the Bangladesh Ministry of Health and Population Control initiated a simplified fertility control project in late 1975. This involved the free distribution of oral contraceptives and condoms on a house-to-house basis to half the population (130,000) in the Matlab field surveillance area.

Figure 3 shows that the house-to-house distribution campaign was effective in recruiting almost 25% of the eligible women as contraceptive acceptors (Makhlisur Rahman 1979). The maintenance phase of this project involved hastily trained village women (*dais*) to serve as depot holders. During this phase the new acceptance rate declined to low levels. The figure also illustrates that this inundation campaign resulted in a measureable decline in the birth rate nine months after the programme was started. The net reduction in fertility in the distribution area over an 18-month period following the programme was approximately 10.5%. However, as the figure illustrates, most of the programme effect occurred in the early months. This pattern of effect is consistent with the fact that most of the acceptors were recruited very early in the programme and as the programme continued it experienced a steady decline in use prevalence rates due to declining acceptance rates and low continuation rates.

Several studies were undertaken to ascertain why the achievements of the simple house-to-house distribution programme were so moderate. These studies revealed that availability of a single method choice, side-effects, inadequate medical back-up, lack of encouragement for continued use, inefficient female field workers, and inadequate supervision were responsible for programme deterioration (Makhlisur Rahman 1980). To overcome the deficiencies of the simple contraceptive distribution programme, the project was restructured in mid-1977. The restructured programme envisaged replacement of *dais* by a cadre of better educated and better trained local female village workers; distribution of a wider array of contraceptives by these workers, backed by strong supervision and technical staff; upgrading of the centralized clinic facility in Matlab to provide the full range of fertility services; and provision of selected medical services, both supportive for contraceptive acceptors and for general maternal and child health care.

The effect of the restructured programme (Table 6) was a prompt and continuing rise in contraceptive use-prevalence (Bhatia 1980). At the end of one year, the current use rate rose to above 32 percent and thereafter reached a plateau level of about 33% by the end of second year where it remains to date. Preliminary analysis of the birth and death rate from this project area in comparison with the remaining Matlab population indicates that this effort is having a definite impact on fertility. The crude birth and death rates in the project and comparison area were 34.7 and 46.9 per 1,000 population, respectively. A long term follow-up will be needed to fully assess the impact of this comprehensive fertility control programme.
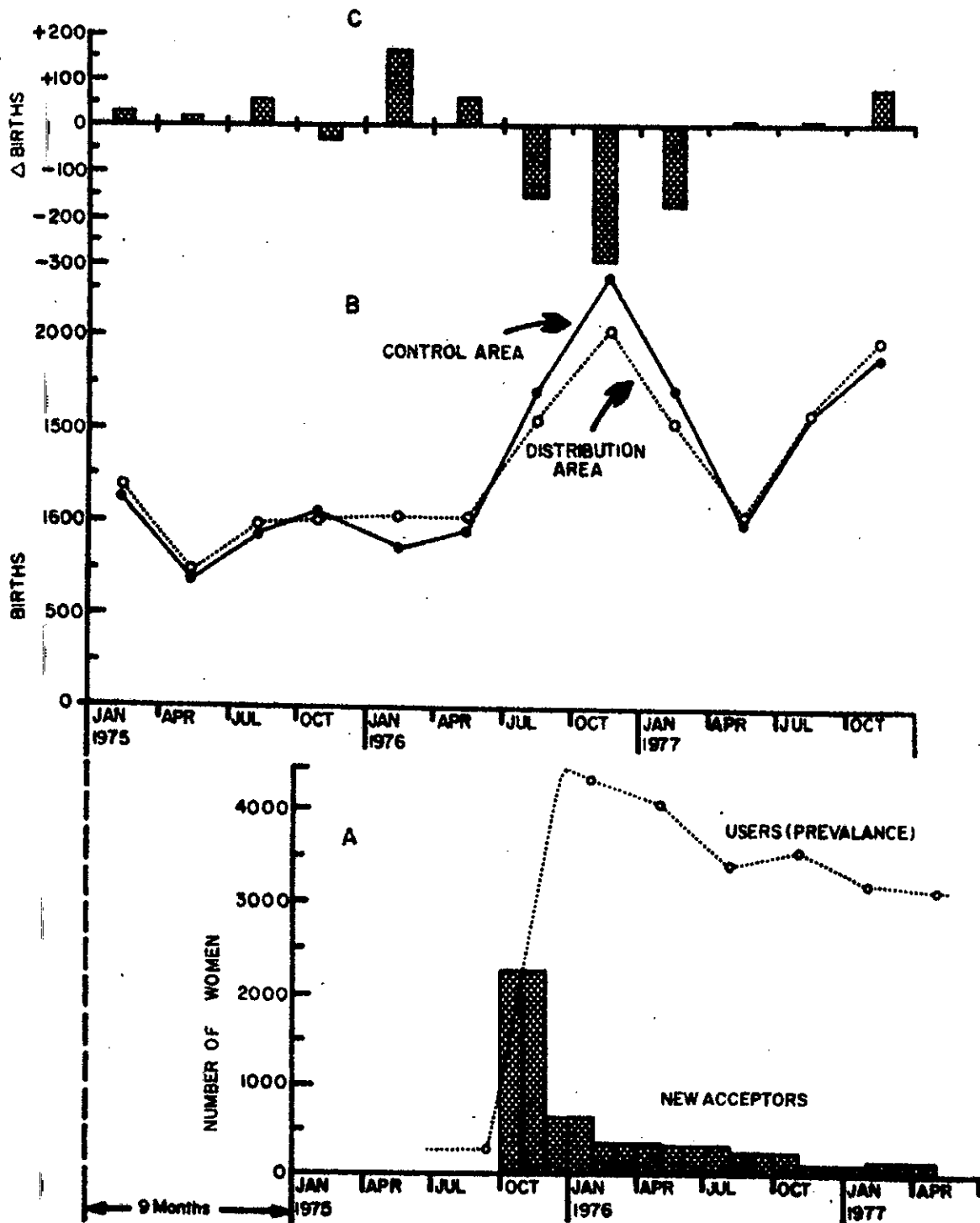
FIGURE 3. Household contraceptive distribution project. A. Pattern of acceptance and use of pills and condoms. B. Trends in births for distribution and control area by 3 month periods. C. Net difference in births (control area - distribution area).

TABLE 6

CUMMULATIVE CONTRACEPTIVE ACCEPTANCE RATES AND CURRENT USE RATES
AMONG MARRIED WOMEN AGED 15-44, MATLAB FAMILY PLANNING -
HEALTH SERVICES PROJECT, SEPT. '77 - APR. '79

Date	% Cummulative Acceptors	% Current Users	% Cumulative Acceptors Still Using a Method
September 1977	6.9	6.9	
January 1978	21.2	20.7	97.3
April 1978	29.1	25.8	88.4
July 1978	34.5	29.1	84.3
October 1978	39.2	31.8	81.2
January 1979	42.5	32.5	76.5
April 1979	45.1	33.5	74.3

DISCUSSION

In the face of adverse health conditions represented by high fertility
and limited resources, the Government of Bangladesh is attempting to develop a
health system which de-emphasises highly specialized medical care and is geared
to the needs of the rural population. It is thus appropriate to introduce those
elements of primary health care for preventing or treating the few health prob-
lems that are responsible for the greatest mortality and morbidity in the
country and for which interventions of proven efficacy exist.

The provision of sanitation and safe drinking water is a pre-requisite for
improvement of health status, in general, and for control of diarrhoeal
diseases, in particular. An effort to provide safe drinking water, underway
in Bangladesh, is the rural tubewell water improvement programme. The Govern-
ment, with the assistance of UNICEF, has launched a massive programme of
providing handpump tubewells to all rural villages of the country. However, a
preliminary analysis based on one-year observation of water use and diarrhoeal
incidence in twelve villages of the Matlab study area suggests that the use of
surface water is an integral part of rural culture and that the limited
protection afforded by drinking tubewell water is neutralized by the use of

polluted surface water for bathing, cooking, washing and other domestic purposes (Curlin 1978). This pollution is due principally to human excrement. The most commonly found type of latrine in the rural areas is the open latrine, usually constructed on the edge of a pond or stream. Efforts to introduce sanitary latrines into village settings have been unsuccessful (Government of People's Republic of Bangladesh, 1978).

Given this observation, it becomes clear that it will be difficult to improve current sanitation conditions sufficiently in the immediate future to reduce the high incidence of diarrhoea in Bangladesh. Present vaccines, as evidenced by the ICDDR,B field trials, are partially effective. Until such time that a truly effective vaccine or improved sanitation facilities are available, the present therapeutic approach remains more effective in preventing deaths from diarrhoea.

Modern treatment of diarrhoea consists primarily of the intravenous or oral replacement of diarrhoeal water and electrolyte losses. ICDDR,B experience has shown that in a treatment centre diarrhoeal patients have a case fatality rate of less than one percent. However, given the poor transport system of rural areas, distance is a serious impediment to obtaining care provided by such static treatment centres. As evident from the findings of the Teknaf study (Figure 2), very few can attend a diarrhoeal treatment centre if it is located at a distance of more than 4 miles. More important, the establishment, maintenance and supervision of a network of treatment centres may be beyond the immediate capacity of Bangladesh.

A cost-effective approach for treatment of diarrhoea in rural areas may be a household programme introducing oral therapy packets in homes. The findings of the ICDDR,B village-based and domiciliary oral therapy distribution programmes have shown that not only will such an effort ensure wider service coverage, as evident from over 80% use rate (which could still be higher if there were no ICDDR,B treatment centres), but will also reduce the case fatality rate to a level substantially lower than that observed in a treatment centre. The lower case fatality rate among the patients treated in their homes indicates that timely rehydration by an auxiliary health worker or trained volunteer close by is more effective than belated rehydration at a distant hospital.

One strategy for the household use of oral therapy packets may be their distribution through village-based government health workers. Presently, the Government has two types of village-based health workers, one from the Health Division (called Family Welfare Worker) and the other from the Population Control Division (called Family Welfare Assistant), to serve a population of about 6,000 in the neighbourhood of their residence. Experience of the Companigonj Thana Health Project[1] suggests that domiciliary services of oral rehydration by the village-based government health workers resulted in a reduction of more

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[1] An integrated health and family planning project sponsored jointly by the Bangladesh Ministry of Health and Population Control and the Christian Commission for Development in Bangladesh (CCDB).

than 60% in diarrhoeal mortality rate in the project areas in 3 years time (Shafiq 1980). Similar results are reported by some special health care service projects, like Bangladesh Rural Advancement Committee, Savar *Gonoshyastho Kendro* (People Health Centre) and Joydebpur Thana Health Complex, which have been providing oral therapy services through their community-based multipurpose health workers.

Given the low frequency of home visits by the village-based government health workers, the distribution of oral therapy packets alone may not be sufficient to ensure readily available treatment. The findings of the Teknaf depot holders study have shown that in the village with depot holders more than 80% of the diarrhoeal patients received oral therapy treatment, while in the comparison village less than 40% received treatment, primarily due to the infrequency of home visits by the field workers.

A second strategy, complementary to the first one, may be to provide training to village practitioners and volunteers to serve as depot holders of oral therapy packets in their respective areas. A 1977 national probability sample survey showed that the ratio of health care providers (excluding qualified allopathic practitioners) to population is 1:1,000 in rural areas (Claquin 1980). The results of the Chandpur village practitioners training programme suggest that most of these health care providers will be interested in receiving training and that they will use oral therapy packets to treat their diarrhoeal patients. The Government has undertaken a scheme of providing one-year training to *Palli Chikitsaks* or rural practitioners, one for each village. Given the ICDDR,B research findings on oral therapy, it is reasonable to integrate oral therapy of diarrhoea with the *Palli Chikitsaks* training programme.

A problem may be the availability and cost of an adequate supply of oral therapy packets. Our experience of the Matlab oral therapy distribution programme suggests that after a one-day training period, production of packets by villagers using ingredients purchased from the local market is feasible. Based on the cost and use-rate data of this distribution programme, a health centre in Bangladesh serving a population of 10,000 would use about 84,000 packets annually. This would generate labour costs equivalent to three full-time jobs.

In view of the importance of the intensive household distribution of oral therapy for diarrhoea, the Bangladesh Ministry of Health and Population Control, in consultation with the ICDDR,B, has launched a national oral rehydration programme (NORP). The programme envisages training of field level workers of the various community development institutions, including health and population control. It also envisages training of local community volunteers to serve as depot holders for oral rehydration salt packets. The voluntary agency BRAC has also initiated a nation-wide programme using informal "measures" for preparing the oral solution adapted to the local rural culture. The ICDDR,B will assist in the evaluation of the BRAC approach.

Experience of the People's Republic of China suggests that the effectiveness of health care is limited to the proximity of services -- both geographically and culturally -- to the community. As such, responsibility for the

treatments of diarrhoeal diseases lies with the villagers themselves. One such example of this, is the *Sataki* diarrhoeal treatment centre. Sataki is a rural union in Matlab thana, but not directly served by the Matlab diarrhoeal treatment centre. The chairman of this union has set up a diarrhoeal treatment centre in a public building with the support and initiative of the local people. The centre is managed by some locally recruited trained volunteers working for a small honorarium. The ICDDR,B provided training on management of diarrhoeal and initial supplies of some simple equipment and oral therapy packets. Since the centre opened only one year ago, it is too early to comment on its success in reducing diarrhoeal mortality in the community. It has nevertheless been observed that local people have welcomed this programme and have been fully utilizing the treatment centre.

The ICDDR,B experience suggests that an effective programme for management of diarrhoea needs to be backed by a programme of personal and household hygiene health education. Results of a simple intervention providing soap along with instructions in hand washing showed that the secondary infection rate and case rate among contacts in the study families were only about one-third and one-fifth, respectively, of that observed in the control families (Khan 1980). Dietary restrictions during diarrhoa -- particularly the refusal of breast milk to infants -- are prevalent in the country. These practices are also considered by many traditional practitioners to be integral parts of diarrhoea treatment. The health education programme should be directed at removing these practices.

The second priority health problem is tetanus neonatorum, accounting for 40% of all neonatal deaths in Bangladesh, for which an effective vaccine is available. The findings of the Matlab maternal tetanus immunization study have provided clear documentation of the impact on neonatal mortality of active immunization of pregnant women with two tetanus injections. However, given the present low acceptance rate by pregnant women (33%), the impact of such a programme on the overall neonatal mortality rate in the community may not be significant. An additional limitation is that identification of pregnant women and contacting them in time for vaccination will be problematic in the absence of a system of recording menstrual history for every married woman and continuous updating of the information through regular personal interview, at least once a month.

The Bangladesh Ministry of Health and Population Control has initiated a maternal tetanus immunization programme on a pilot basis in Tangail District. It has been observed that the Government village-based health workers can identify less than 50 percent of the pregnant women. Recently, the project has changed its strategy to one of immunizing all women of reproductive age -- an approach which holds better prospects for service coverage. However, from the findings of our study on immunization of non-pregnant women, the strategy of mass immunization covering non-pregnant women may require booster immunization within 4 years of the initial immunization. Nevertheless there is every indication in the literature that this would be a cost-effective intervention which could have a significant impact on mortality in this region.

The importance of providing family planning services along with the selected primary health items needs to be emphasized. The results of ICDDR,B contraceptive distribution project have clearly confirmed a substantial demand for contraceptives in rural areas of Bangladesh. However, a programme involving a simple house-to-house distribution of one or two contraceptive methods proved insufficient to meet this demand. A strategy of meeting each woman's contracep- tive needs with a full range of services proved much more effective in helping the women continuing contraceptive practices. The Government of Bangladesh has adopted a similar programmatic approach and developed a comparable infra- structure of field workers for household delivery of contraceptives. It may be assumed that the national family planning programme can eventually achieve a similar level of contraceptive practice in the country. However, our experience with the Matlab project to date suggests that the validity of this assumption will depend mainly on the success of establishing a continuing relationship of confidence between the service providers and acceptors.

The few interventions described in some detail in this review represent the changing health-care focus of the former Cholera Research Laboratory to the present International Centre for Diarrhoeal Disease Research, Bangladesh. At the inception of the institution, health care was primarily set within a vaccine trial framework for research purposes; now, the present limited health interven- tions in Maternal and Child Health – Family Planning area constitute a serious attempt to combine service and research goals. Nutrition studies have been done but major nutritional interventions apart from education have not been carried out. A recent study has documented an inverse relationship between mortality and socioeconomic status (D'Souza 1980). Education, especially of the mother, is an important indicator of mortality differentials. During the difficult years of 1974-77, children under three years of age of mothers with no education were liable to mortality rates five times higher than children of mothers with seven years or more of education. Evaluation of the Companigonj Health Project, with ICDDR,B assistance, shows similar results. It would thus appear that health care delivery systems have to take into account the social stratification of the community. A national policy will have to focus on selected health care items that reach the economically lower segments of the population which have the highest mortality rates. In terms of development models the Chinese is of great relevance.

Further, as seen earlier, some input may have to be in education rather than in new medical approaches. It has been shown in the Matlab area that within a given health care system, female children have significantly higher mortality rates than male children for all age groups except during the neonatal period (D'Souza 1980). The need to improve health delivery systems must be linked to education and possible changes in cultural value systems embedded for centuries in particular populations.

At the ICDDR,B, plans are underway to establish better surveillance and evaluation techniques by which the effect of programmes introduced by the Centre and others in Bangladesh can be properly assessed. This would include cost- benefit analyses as well as the more classical methods of evaluation for

effectiveness of an intervention against a health problem. A major goal is to transfer -- those elements of primary health care which can be taught to the mother -- into the family and out of the hands of doctors, nurses, paramedics and any other health professionals or para-professionals. For measures that are to be provided by health personnel, a hierarchy of effectiveness must be established so that a proper choice can be made that will be of maximum benefit to people in developing countries. The most responsible approach to effective primary health care is the choice of a few things that can be effectively carried out by health workers with relatively little training and delivered in conjunction with effective measures for control of family size. The term "primary health care" must be defined and made operational by specifying in each area what are the main causes of death and disability to the population and what are the interventions available that are effective enough to warrant the cost of providing them. The ICDDR,B research efforts hope to provide some answers to these important areas of health problems.

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