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UNITED NATIONS  
CHILD FUND  
AND  
POLYVALENT  
CENTRE FOR DIARRHOEAL DISEASE RESEARCH  
A STRATEGY FOR DIARRHOEAL DISEASE CONTROL

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A DISCUSSION PAPER  
REASSESSING THE ROLE OF WATER AND SANITATION  
IN THE CONTROL OF DIARRHOEA

Provision of water to a community is not an end in itself. It is a means to an end. The end is better health for children.

INTRODUCTION

1. In 1982, UNICEF spent around \$50 million on water. That year, 1982, there were no statistics produced which showed any tangible return for this outlay, for children.

2. Senior management is understandably rather concerned at the apparent lack of effect for this substantial investment. It is assumed that the Executive Board will wish to see some measurable return, too. Within country offices, however, there seems to be insufficient technical knowledge about the role which water and sanitation play in the developmental process for programming to be performed to provide a positive effect. New York is inadequately staffed to give more than general guidance in this field, and thus a number of personnel in Dhaka, together with individuals from the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), prepared this discussion paper to try to contribute to a remedy for this situation. It does not set out to define UNICEF's position.

PREVENTION, CONTROL OR MANAGEMENT?

3. The discussion which follows is based on the assumption that the provision of water and sanitation is aimed at reducing diarrhoea; thus it is the diarrhoea which must be addressed to discover whether this assumption is correct. Consensus has led us to prefer the word "control" of diarrhoea, since we are not in a position either completely to prevent or cure as the case study will indicate.

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HOW TO BUILD A STRATEGY?

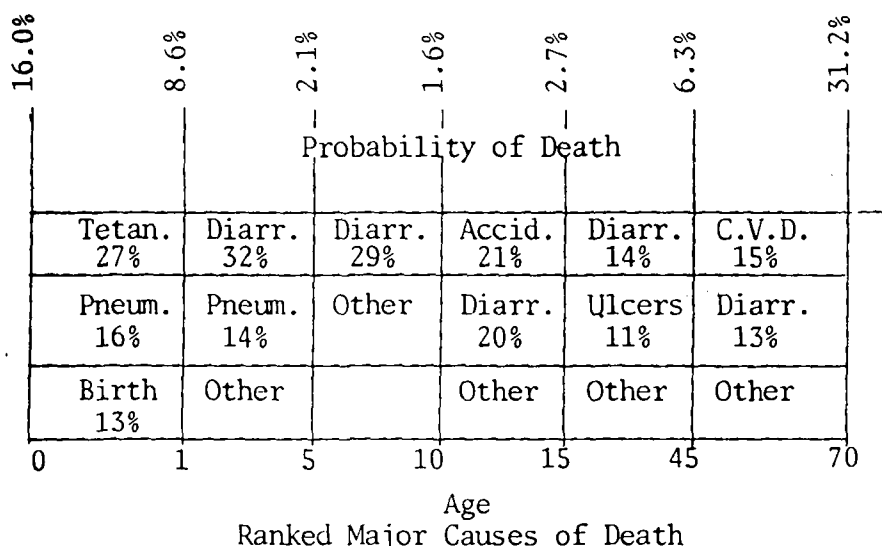
4. No strategy can be built in vacuo. The building of a strategy is usually an iterative process, where plans are made; tried; and the effects observed. Adjustments are made in response ~~to~~ differences between anticipated and actual results. From such a comparison, a strategy may be built. For our case, we present the problem (as we understand it) in Bangladesh, and what is considered to be a reasonable strategy in response to it.

Presentation has, of necessity, to be generalized, since the strategy addresses a whole range of pathogens whose behaviour differ from each other. However, since the individual diarrhoeal diseases are essentially epidemiologically identical from country to country - only the mix of diseases differ - it is felt the strategy might have a wider application than to Bangladesh alone.

THE STRATEGY BUILDUP

5. Table 1 and Fig. 1 attempt to show the major causes of mortality (ref.1), and the actual numbers of individuals involved for one particular survey (ref.2). Other surveys are available, but most show substantially the same profile. From these data, it can easily be seen that the control of diarrhoea would go a long way to reducing child mortality rates. Surprisingly, though much literature assumes that there is a high infant mortality from diarrhoea, this does not seem to be the case in Bangladesh, presumably because many women still breastfeed their children.

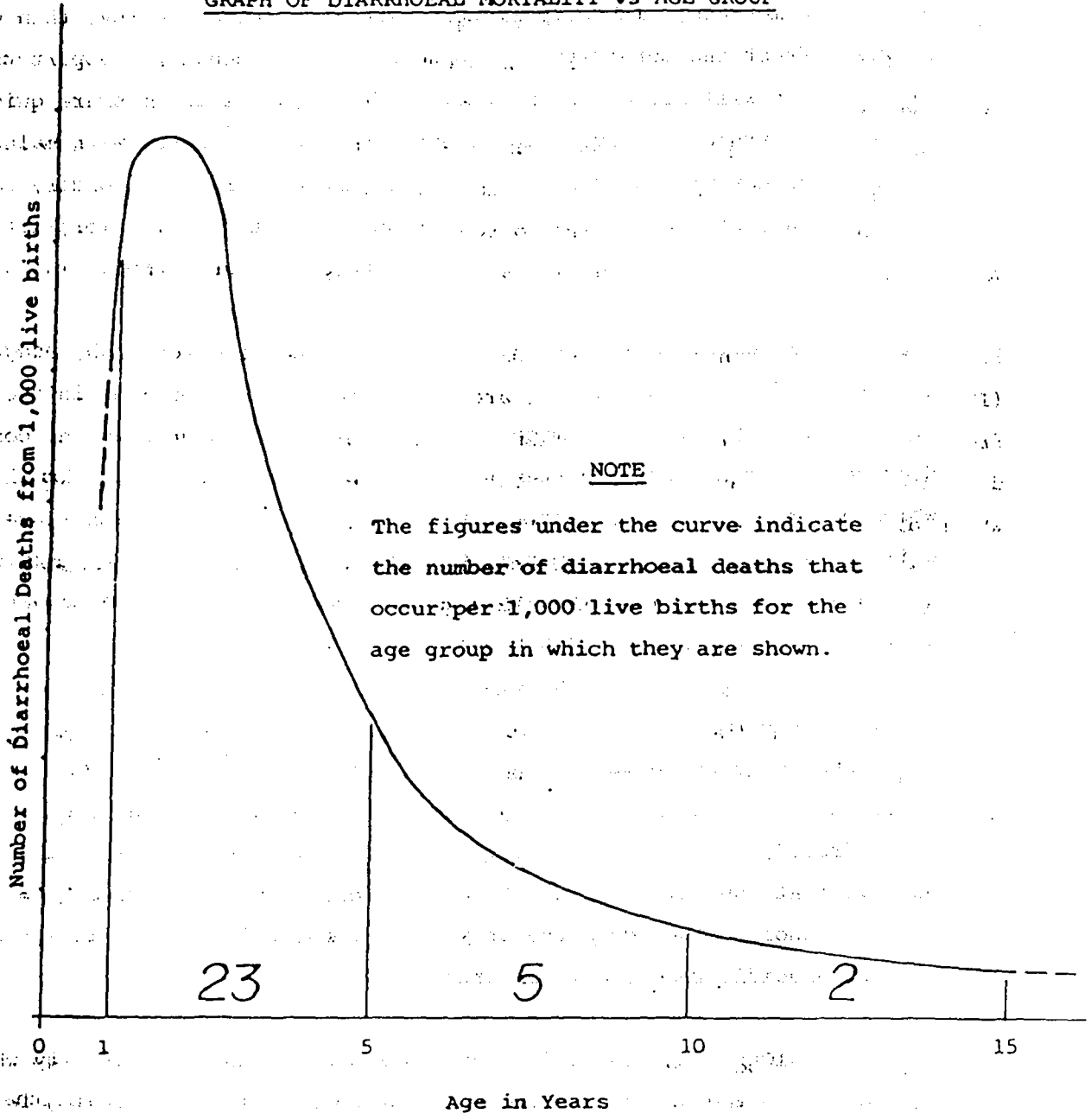
TABLE 1  
Mortality Profile



Note: There is a considerable percentage of infant and child deaths whose cause is not yet well known.

FIG. 1

GRAPH OF DIARRHOEAL MORTALITY vs AGE GROUP



NOTE

The figures under the curve indicate the number of diarrhoeal deaths that occur per 1,000 live births for the age group in which they are shown.

6. There is a traditional belief amongst engineers that the provision of good quality drinking water to communities is sufficient to reduce or even eliminate diarrhoea. Unfortunately, there is very little evidence to support this belief. Even the provision of both water and latrines together appears to have only a small effect on reducing morbidity let alone mortality. Where water of a good quality in large, easily attainable quantities is available near the homestead, with no polluted competing sources nearby, then perhaps we can say it will affect the morbidity rate. We have little evidence to support the contention that it will reduce the mortality rate; and researchers are quick to point out that diarrhoea in developing countries is almost always linked with malnutrition, which, together with diarrhoea, is either the primary or secondary cause of death. Thus, if the objective is to reduce infant or child mortality, then water and sanitation appear, on the surface anyway, the wrong place to start.

7. The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), formerly the Cholera Research Laboratory, has been in the forefront of research into the mechanisms which govern the spread and control of diarrhoeas. They have undertaken much work aimed to elucidate knowledge on which diarrhoeas occur, quantitatively, and their transmission routes; and while it is not easy to summarize their findings in a few lines, it would appear that they believe that the strategy for the control of diarrhoea should be on a much wider front than purely the provision of good water and sanitation. There is reason to suspect, for instance, that a large percentage of clinical cases of diarrhoea are caused by rotavirus (ref.3), which appears to be spread by some route other than water. Dr. Feachon of the Ross Institute has called into question the belief that cholera in general is water borne (ref.4). It has been pointed out (ref.5) that there is reason to believe that education appears to play a more significant role in preventing cases of cholera than does the provision of tubewells. The list grows longer as more specific research is undertaken.

8. In UNICEF today there is a continuing debate on the strategy which should be adopted for the control of diarrhoea. What is emerging is that mortality should be addressed as vigorously as morbidity (ref.6). This implies simply that oral rehydration therapy (ORT) should be supported as a primary control measure. It is noted that this therapy only prevents death due to dehydration allowing for a natural cure. In parallel with ORT,

measures aimed at prevention of diarrhoea should be undertaken, such as good nutrition, education, improved hygiene and the like. Water, long regarded as a good preventive intervention, thus apparently becomes less important. However, in the process of development, there are more needs to address than solely diarrhoeal disease control, and the role of water in the society should be viewed from all the benefits that can accrue from its provision. In many societies, reducing the time and energy that women spend collecting water can be of crucial importance in allowing them time for education, or for devoting to the immediate needs of their children. Also, if more emphasis is being placed on personal hygiene through education, it is a little difficult to achieve this without reasonable quality water in sufficient quantities. While ORS can be mixed with dubious water as an emergency measure, most of us believe it should always be made with good water. Even food of good quality can be wasted when prepared with polluted water. Thus the importance of water can be said to be firmly established, even if for reasons other than traditionally accepted.

9. The complexities of the transmission routes of different diarrhoeas; the complicated nature of social behaviour; and the intricacies of achieving a balance between factors which can each achieve a reduction in diarrhoeas makes a rigid hierarchy of interventions of limited relevance. In addition, even if a theoretical balance could be achieved, it might not be possible to implement such a strategy, since delivery of a service is as important as the service itself. Hence Table 2 presents only a general listing of primary and secondary interventions.

TABLE 2

<u>Primary</u> <u>ORT/ORS</u>	- Prevents death due to dehydration and effective for <u>all</u> diarrhoeas.
<u>Secondary</u> <u>Food</u>	- Balanced, adequate diet allows for normal growth and adequate build up of immunological response.
Breast-feeding	- For infant group, avoids use of dirty water and utensils. Good nutrition; immunological benefit.
Immunization	- Prevents some diarrhoeal related diseases, such as measles.
Deworming	- Raises nutrition absorption rates.

Table 2 (Cont...)

Education	-	Improves knowledge of factors affecting diarrhoea, and of the necessity for better personal and community hygiene.
Water ) Sanitation ) Soap )	-	Can substantially reduce exposure to pathogens when used properly. Most effective only with other complementary interventions.
Basic drugs	-	Simple drugs for treatment, e.g. Ampicillin for shigella and tetracycline for cholera.
Income generation	-	Allows for better access to food, water, drugs, etc.
Technology	-	Fuel efficient stoves to reduce expenditure and time.

10. There are some surprising items in the listing. What should be understood is that no single measure can be viewed as effective alone. For instance, ICDDR,B is currently working on a hypothesis that soap (or ash in its absence) can be highly effective control measure during diarrhoeal epidemics. However, without clean water and sensible excreta disposal, soap alone is of limited value. Personal and community hygiene appears to play a vital role in diarrhoeal disease transmission, and this seems to be linked as closely with the level of education as it does with the use of water and correct disposal of excreta. Thus it is the author's view that water and sanitation cannot be used as diarrhoeal disease control measures without a number of other complementary functions being undertaken at the same time. This is primarily because the transmission routes for differing diarrhoeas are different and complex. Hence, no simple control measure will be effective alone.

CONCLUSION : THE STRATEGY

11. If UNICEF requires that the needs of children and women be addressed effectively, then the mix of necessary inputs bears some readjustment with respect to diarrhoeal mortality and morbidity. Water and sanitation form an important part of our diarrhoeal disease control strategy; but much more attention requires to be paid to certain items such as nutrition, deworming, (health) education and hygiene (soap?). Without such an emphasis, the benefits from water and sanitation are likely to remain marginal.

#### TRANSLATION OF THE STRATEGY INTO ACTION

12. It has been stated that delivery, function and use of a service is as important as the service itself. A few facts of the Bangladesh and Pakistan programmes are discussed below, to illustrate this point; and to throw some light on how the strategy may be translated into action - or may be affected.

#### THE SOCIOLOGY OF THE TECHNOLOGY OF WATER

13. It has been demonstrated that quantity of water (even of slightly dubious quality) plays a far more significant role (refs. 7,8,9,10) than quality itself in reduction of incidence of diarrhoea. Thus it is the task of the programmer delivering the service to ensure that the technologies employed, give communities every incentive to use more water. Field investigations (ref.11) show that items such as pump or tapstand siting, platform size and design, privacy at the waterpoint, position vis-a-vis competing polluted sources, pump yield, water taste and sociological stress factors can greatly affect the per caput utilization of water. Achievement of the objective of reduction in diarrhoea may depend far more on these factors than achieving a correct and precise balance between necessary complementary interventions aimed at improved health care.

#### USER GROUP SIZE FOR A HAND-PUMP

14. While there is no definitive work to show the optimum user group size for a hand tubewell, it is normally accepted that for the No.6 pump, no more than 75 people should use one pump. This has been derived by balancing the following factors against each other: yield, collection patterns, observations of the effect of per caput utilization on diarrhoea rates, and availability of finance. Presently, the average user group size is around 200 people per working hand tubewell. Estimates show that to achieve "adequate" coverage, a further 1 million hand tubewells will be necessary. With a working life of around 15 years, however, after adequate coverage has been achieved, a replacement of around 100,000 hand tubewells will be required annually. Presently, only 40,000 units are being palced per year.

#### SANITATION: A VILLAGER'S PERCEPTION

15. Sanitation in the rural seeting of Bangladesh is not viewed with the importance that others might accord it, for obvious reasons. A villager in need of a square meal is unlikely to spend \$6 to buy a very basic latrine, since that sum might feed himself and his family for as long as a week.

### LATRINES : HEALTH IMPACT

16. While the direct health implications of placing latrines cannot be measured, the fact that people are buying them is, in itself, a very good indication that educational efforts are paying off slowly. If attitudes are being modified, then hygienic practices will follow. One of the greatest frustrations of promoting the use of latrines is the knowledge that children up to the age of six are unlikely to use the latrines on a regular basis. It is this age group that excretes the most dangerous faeces since their stomachs are insufficiently well developed to reduce pathogens to the same level as those in adult excreta. Also, since over 85% of children at age five carry a medium or heavy helminthic load, the only alternative appears to be deworming.

### RESULTS OF ALTERNATIVE ACTIONS

17. Interestingly, a recent review of health programmes in four countries/states indicated that it was possible in their cases (Ref 12) to achieve a substantial reduction in IMR/CMR at relatively low cost without having obtained more than an average "coverage" for water supplies compared with other developing countries. As the population concerned in the review is over one quarter of the World's population, this data may well warrant closer study. Included are China, Sri Lanka, Kerala State in India and Costa Rica. Could it be that the mechanisms relating to the transmission of a wide range of diarrhoeas have more to do with the way that water is handled irrespective of the source; rather than simply the supply of the water?

### OPPORTUNITY COST FOR ALTERNATIVES

18. In a recent review of the "Water" input to the Pakistan Programme, undertaken because it was felt that the strategy was possibly ineffective in answering the priority needs of children in that country, it was suggested that varying options might be available to tackle the problem of child deaths due to diarrhoea. Esrey, Feachem and Hughes have hypothesized that the annualised per caput cost to provide an adequate "water" service to reduce diarrhoeal mortality by 30%, is around \$14 (Ref 13).



Julian Lambert has computed that to provide a programme to promote breastfeeding and O.R.T. using the same bases would cost 40c and 20c respectively to achieve 30% and 60% reductions in diarrhoeal mortality, respectively. Inevitably, there will be overlapping in those two interventions, but even taken together, the "opportunity cost" is an order of magnitude different (Ref 14). It is to be remembered that the two options are not mutually exclusive; but may well affect the mix of programme inputs for Pakistan, assuming that the basis for the water intervention is diarrhoeal disease control.

#### CONCLUSION : THE PROGRAMME

19. Each programme has to be individually tailored to the needs of the country or area. We do not presume to do more than highlight facets of our own programme to indicate some of the difficulties we face, and which might be faced by others.

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Ken Gibbs.  
Nancy Terreri.

#### REFERENCES

1. UNICEF Bangladesh, Statistical Profile of Children and Mothers in Bangladesh, 1981, 26.
2. Ibid, 16.
3. KHAN M and GREENOUGH W, Epidemiology of Diarrhoeal Diseases in Bangladesh, Glimpse (ICDDR,B Newsletter) Vol.4, Feb. 1982, 2.
4. FEACHAM R, Environmental Aspects of Cholera Epidemiology, Parts I, II & III, Tropical Diseases Bulletin, August 1981, October 1981 and January 1982, Pages 675-698, 865-880 and 1-47.
5. LEVINE R et al, Failure of Sanitary Wells to Project Against Cholera and Other Diarrhoeas in Bangladesh, The Lancet, July 10, 1976, 86-89.
6. GRANT J, The State of the World's Children 1982-1983, UNICEF, 1982.
7. DWORKIN D and DWORKIN J, Water Supply and Diarrhoea, Department of Hydrology and Water Resources, University of Arizona, July, 1980, 1.
8. RAHMAN M, A Strategy for the Control of Shigellosis (Dysentery) in Teknaf - a Rural Bangladesh Village, Dhaka, Cholera Research Laboratory, 1979.

9. SKODA J, MENDIS J and CHIA M, A Survey in Rural Bangladesh on Diarrhoeal Morbidity, Water Usage and Related Factors, First Report, Dhaka, UNICEF, June 1977.
10. Ibid, Final Report, July 1979.
11. AHMED F, Design Parameters for Rural Water Supplies in Bangladesh, Bangladesh University of Engineering and Technology, October, 1981.
12. HUGHES, WARREN & WALSH, Good Health at Low Cost, Bellagio, Italy, 1985.
13. ESREY, FEACHEM & HUGHES, Interventions for the Control of Diarrhoeal Diseases among Young Children: Improving Water Supplies and Excreta Disposal Facilities, 1985. (Proposed for WHO Bulletin, Sept., 1985).
14. LAMBERT, J, Child Mortality and Morbidity in Pakistan with Special Emphasis on Diarrhoeal Diseases, Islamabad, April, 1986.