

Sadia Chowdhury

Sadia Chowdhury is a senior health specialist at the World Bank. Before joining the Bank in 1998, she worked as director of the Health and Population Division of the Bangladesh Rural Advancement Committee (BRAC), a nongovernmental development organization with an annual budget of US\$131 million and more than 25,000 full-time staff. Along with Oxfam, BRAC funded and ran a trial of the oral rehydration program. Bilateral donors funded the subsequent rollout of BRAC's large-scale program, run in three phases over 10 years.



Educating for Health

Using Incentive-Based Salaries to Teach Oral Rehydration Therapy

In Bangladesh an education program aimed at teaching mothers how to prepare and use oral rehydration solution to treat diarrhea relied on output-based incentives to ensure that the teaching was effective. The program tied field-workers' pay to fast-cycle feedback on performance against output indicators. Monitoring results show that the approach worked: the mothers learned effectively. Over 10 years the program reached 12 million households.

Diarrhea was the leading cause of infant mortality in Bangladesh during the 1980s. Diarrhea leads to the loss of fluids and electrolytes, resulting in mild to severe dehydration and, in some cases, death. Because it is the loss of fluids and electrolytes that causes illness and death, it is essential that they be replaced. Intravenous therapy is critical for treating cases of severe dehydration, but the means are expensive and difficult to transport. A severely dehydrated person would require 5–10 bags of saline. One bag cost 100 taka (Tk) in Bangladeshi villages in 1983, when the average income was Tk 1,500 a year (Chowdhury and Cash 1996; Shepard, Brenzel, and Kenneth 1985). Moreover, administering this therapy requires sterile fluid, needles, tubing, and trained professionals.

Choosing the solution

Seeking a solution, the Bangladesh Rural Advancement Committee (BRAC), a nongovernmental organization, realized that what

was needed was an inexpensive therapy that was available in the community and easily administered by nonprofessionals using no special equipment. BRAC saw that the best option was a fluid that could be given orally, which would eliminate the need for sterile equipment. An oral rehydration solution was developed in Bangladesh, clinically tested, and perfected so that it was effective in treating dehydration from all types of diarrhea in infants and children, even cases of severe dehydration, as long as the children were alert and could drink the fluid. To work, though, the solution needed to be available in the community and used effectively as soon as an episode of diarrhea began.

At this stage BRAC weighed several options for a diarrhea prevention program:

- Having trained personnel provide treatment at fixed government facilities.
- Providing safe water and sanitation.
- Making packets of oral rehydration solution broadly available through commercial outlets.

- Teaching mothers how to make the solution at home with commonly available ingredients.

A treatment program relying on trained personnel was rejected because there were too few facilities and health workers. An effort focused only on improving water and sanitation was also rejected, because experience with tubewell programs to supply safe drinking water showed that when the wells were broken, people resorted to unsafe sources of water.

Marketing packets of oral rehydration solution had many advantages. The product was easily identified, it was a complete mix, and it could be easily distributed to all small shops. But it was impossible for Bangladesh to produce the volume needed. Treating all episodes of diarrhea only in children under five—79 million in 1989—would require about 200 million packets a year. The government had the capacity to produce only about a third of that. Moreover, the annual cost of US\$16 million was onerous.

Commercial production and marketing of packets also appeared impractical, as people had limited purchasing power and the distribution system was weak. Moreover, the printed instructions for mixing and administering the solution could not be read by the 80 percent or so of the population who were illiterate. But the main flaw of a commercial initiative was that it would not include efforts to build people’s awareness of the deleterious effects of diarrhea and the effectiveness of oral rehydration solution in combating it—crucial in overcoming social and cultural barriers to the solution’s use.

For all these reasons, the option chosen was to teach mothers to prepare an oral rehydration solution and treat their children themselves. So in 1980 BRAC launched a pilot program supported by its own funds and by Oxfam. After the pilot the teaching program was rolled out in three phases over 10 years, with the US\$9.3 million cost funded by different donors. The donor funding was disbursed every quarter as a reimbursement of expenditures. The cost of teaching each household was estimated at US\$0.75.

Teaching mothers

The teaching program had three aims:

- To reduce diarrhea-related illness and deaths, particularly among children under five.

- To teach at least one woman in each household to prepare the oral rehydration solution.
- To raise awareness in the community about diarrhea prevention.

Using mainly one-on-one and group communication techniques, this program taught a 10-point health message, including how to prepare the solution using local ingredients and a simple but accurate measuring system (box 1). The solution is prepared from a three-finger pinch of lobon (common table salt) and one fistful of gur (unrefined brown sugar) in half a seer (467 cubic centimeters) of water. The lobon-gur solution has almost all the essential properties: it is simple, cheap, safe, effective, and readily available (BRAC 1980).

The female health workers teaching women how to prepare the solution first had to overcome some suspicion and confusion. They had to convince villagers that the solution was not harmful. And because the last time health workers had appeared in villages was to teach family planning, they had to overcome an assumption that the solution was a contraceptive.

In the program’s first phase most health workers were from the district where the program was being implemented. This allowed the health workers access to their families, and it eased communication with mothers, since the health workers could talk to them in their own dialect. The health workers had to be 20–35 years old and have at least 10 years of schooling.

Teams consisting of 14–16 health workers and a team coordinator worked together in a village (unless a village was small). They visited all the households, with each worker covering an average of 10 a day. Before leaving a household, they made sure that the mother had understood the messages by asking questions about each of the 10 points. Most important, they had the mother make the solution. The health workers reviewed the accuracy of the measurements and

Box What the program taught each mother

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- What diarrhea is and how it is transmitted.
- How to prepare the rehydration solution.
- What can go wrong if the quantities are not right (too much salt, too large a dose).
- When to consult a doctor.

then asked the woman to repeat the process. If a health worker was dissatisfied with the woman's level of understanding, she repeated the entire session. Each session took about 20–30 minutes. By December 1990 the health workers had reached two-thirds of the country's rural households—around 12 million.

Creating incentives through the salary system

There was concern that a normal monthly salary system would make the health workers more task oriented than results oriented, particularly as the program began to expand. So an incentive system was developed that linked their earnings to results—mothers' knowledge of diarrhea and their ability to prepare the solution.

A monitor visited 10 percent of the mothers a health worker had taught over the past month, asked them questions about the 10-point message, and had them prepare the solution. To determine the health worker's pay, the mothers' responses were graded from A to D and the number of mothers receiving each grade was multiplied by 10, since only 10 percent were interviewed. For each A the health worker received Tk 4, and for each D, nothing (table 1).

This salary system put the emphasis squarely on ensuring that mothers learned correctly. During the pilot phase health workers received Tk 600 a month on average (US\$40 at the 1980 exchange rate, a good income in rural areas). The range was Tk 400–700. With the minimum salary set at Tk 250, much of the pay was based on performance. (There was no incentive-based salary system for male workers, and questions were raised about gender bias.)

The incentive system improved teaching methods. Before it was introduced, only the health workers prepared the solution during a teaching session. But the performance-based

salary increased their incentives to ensure that the mothers had learned to prepare the solution correctly, so the health workers began to ask the mothers to demonstrate. This also increased the mothers' interest in the teaching session.

Monitoring and evaluating results

The program's results were monitored both internally and externally in all phases. Monitoring costs were estimated at about 4 percent of project costs.

Internal monitoring

The salary system required an effective, built-in monitoring system. During the pilot phase each health worker gave a list of the mothers she had taught that day to her supervisor, who randomly selected 10 percent of the mothers and assigned a monitor to interview them. Men were recruited to work as monitors, as the job required extensive travel.

In the expanded program the selection of mothers had to be done at a higher level and the monitors kept separate from the health worker teams to prevent collusion. The lists were sent to Dhaka, where monitors were randomly assigned to visit 5–10 percent of the mothers a month. One technique used to ensure the veracity and accuracy of the monitors' reports was to ask them to record the name of each mother's youngest child. This information was then compared with that collected by the health worker to confirm that the monitor had visited the right mother.

BRAC's Research and Evaluation Division played an invaluable role in helping the program to continually increase its effectiveness. An emphasis on evaluation as a means to improve results rather than to punish the workers helped to create a positive attitude. The divi-

Table Rate paid for each grade

Mother's performance	Grade	Rate (taka)
Remembered all 10 points and prepared the solution correctly	A	4
Remembered 7–9 points and prepared the solution correctly	B	2
Remembered fewer than 7 points but prepared the solution correctly	C	1
Failed to prepare the solution correctly	D	0

Note: In 1981 the rates for grades B and C were increased by Tk 1.
Source: Chowdhury and Cash 1996; BRAC 1984; Bhatia, Cash, and Cornaz 1983.

sion encouraged field-workers and supervisors to suggest ways to improve the system, and their ideas often led to research that helped to verify field observations.

External monitoring

The monitoring also required an analysis of the solutions prepared by the mothers. For this purpose, the International Center for Diarrheal Disease Research helped BRAC set up field laboratories. As a quality control measure, the center reanalyzed 10 percent of the samples. In addition, its staff made routine supervisory visits to the field laboratories (Chowdhury and Cash 1996).

During periodic visits a technical advisory committee of international experts provided valuable technical assistance to the program. And the donors conducted independent assessments of the program at the end of each phase.

Conclusion

Monitoring showed that 90 percent of mothers scored in the A and B categories. Two years later only 65 percent of these mothers scored A or B. To increase retention, follow-up education was introduced on local radio and television and in schools. Mortality rates fell after the program was implemented, but it is hard to isolate the effects of the oral therapy from other factors.

Analysis showed that the program had characteristics that allow scaling up: It dealt with a problem common to all of Bangladesh. The intervention was relatively simple. It was also inexpensive, requiring households to purchase only salt and gur. The training and messages built on existing skills and knowledge, such as cooking and child care, and were culturally acceptable. The health workers' performance could be measured through the knowledge acquired by mothers. Though the program was large, it was possible to put in place an administrative structure of checks and balances and rigorous supervision. Finally, the program had a clear goal and specific outcome indicators.

BRAC's experience with the output-based salary system shows that the approach can be successful in certain circumstances. First, the outcomes sought must be tangible and quantifiable. Second, there must be an independent monitoring unit, something that many organizations

may not have. And third, it must be possible to dismiss nonperforming employees rather than reassigning them to other positions, as required by labor laws in many countries. BRAC has only recently begun to use the technique again—in a community-based education program with four clearly defined HIV/AIDS messages.

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Sadia Chowdhury (schowdhury@worldbank.org).

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Telephone:
001 202 458 7281
Fax:
001 202 522 3181
Email:
ssmith7@worldbank.org

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