CHILD SURVIVAL IN DEVELOPING COUNTRIES
CHANGING HEALTH RELATED BEHAVIORS ON A NATIONAL SCALE

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Behavior Analysis is helping design programs to save thousands of children each year. Social marketing experts are turning to behavior analysis to strengthen their skills through more detailed understanding of how new health practices are encouraged taught and maintained. Mass media is delivering more than just information to consumers, it is now a catalyst for individual and community change on a national level.

The results of this marriage: marketing and behavior analysis, is producing some exciting results. In the small West Africa country of The Gambia, the country's first Happy Baby Lottery produced dramatic differences between mother's who participated and those who did not. As shown in Exhibit A below, the 84 percent of mothers who did participate learned significantly more than those who did not. This paper describes the background for this success and shows how behavior analysis has made an important contribution.
It is estimated that some 16 million children die needlessly each year--four million from diarrheal disease, three to five million from immunizable disease, four million from respiratory infections, and some three million from low birthweight and malnutrition. Oral Rehydration Therapy, immunization, and other child survival technologies could save as many as 10 million of these children. But still these technologies remain unknown to many, resisted by some, and unused by the vast majority of those most in need.

Expanded programs of immunization (EPI) address six major killers of children. They focus on children under one year and provide a proven system for organizing and delivering immunization services. The principal obstacles to widespread coverage are logistics and education. Inadequate cold chain management and maintenance continue to plague national programs, as does consumer resistance to completing the full immunization cycle.

Diarrheal disease control (DDC) is another area of opportunity. New advances in oral rehydration therapy (ORT), coupled with the growing appreciation of the importance of adequate dietary management during diarrhea and prevention-related interventions, are now widely understood by health professionals. But again, effective service delivery lags behind. Programs must further develop physician support, design ORT production and delivery systems, train health providers, and change consumer practices in the home.

The Child Survival Commitment

The magnitude of the child survival problem and the availability of new health technologies such as oral rehydration therapy have made it possible to mobilize social concern around the issue of child survival. The international public health community, led by the World Health Organization, UNICEF and USAID have made ORT, immunization, breastfeeding, and other child survival interventions top priority for funding and support. Most developing countries in the world today have ORT or immunization programs, but most of these programs are not meeting their expected goals.

To help meet this challenge, USAID through its Office of Health and Office of Education within the Bureau for Science and Technology, has created a special program called Communication for Child Survival or HEALTHCOM. Over the next five years HEALTHCOM will work in up to 17 countries, using its research and development approach to create effective public education programs aimed at significant behavior change. HEALTHCOM is also committed to strengthening local institutional capacity to use communication more systematically and will provide both short-hand long-term technical assistance for training and development. Primary attention will be given to:

- Diarrheal Disease Control
- Immunization

Acute Infant Diarrhea

The World Health Organization estimates that there are as many as 500 million episodes of infant diarrhea, resulting in the death of four million children below the age of five in Africa, Asia, and Latin America each year. Most of these children may have as many as six to ten bouts of diarrhea a year, each lasting an average of three days. Diarrhea is also a significant contributor to malnourishment in those children who
survive. Prolonged or severe diarrhea will usually lead to dehydration. Dehydration in infants is particularly dangerous and the principal cause of diarrhea-related death. The physical signs of dehydration include the following: dryness of mouth, loss of appetite, decreased skin turgor, sunken fontanel and eyes, crying without tears, vomiting, and general listlessness. Death from diarrheal dehydration can occur within a matter of hours depending upon its severity. The mother's response to diarrhea is generally to withhold food, administer a laxative or administer an anti-diarrheal substance.

Oral Rehydration Therapy

Oral rehydration therapy, ORT, is now the recommended medical treatment for all but the most severe cases of diarrheal dehydration. ORT consists of the timely administration of a balanced electrolyte solution containing sodium, potassium, citrate, glucose, and water.

Oral rehydration fluid can be used to treat 85-95 percent of cases of dehydration from watery diarrhea in all age groups. ORT does not cure diarrhea, but prevents dehydration which leads to death. Two other factors are also important: adequate feeding during and after diarrheal bouts, continued breastfeeding of infants and the elimination of laxatives in the treatment of diarrhea.

ORT: The Behavior

At the first sign of prolonged diarrhea, the child's mother obtains a one-liter aluminum foil packet of pre-mixed oral rehydration salts (ORS). She adds these salts to a one litre container of the cleanest water available, not necessarily boiled water. She mixes the salts until dissolved and then uses a spoon to administer small amounts of the solution to her child over a 24-hour period. As she administers the solution, the child's stool volume may increase, potentially a sign to the mother that the solution is causing more diarrhea, and the child may begin vomiting. During the first 24-hour period, the mother gives the child all the breastmilk and/or plain water the child will take addition to the ORS. If the diarrhea continues after three days or if any signs of dehydration appear the mother should seek medical assistance. When the child's diarrhea stops the mother should continue to feed the child breastmilk and foods with which the child customarily eats, adding high calorie foods if possible for several days after the episode.

If the pre-mixed salts are not available the mother substitutes a formula of eight parts sugar and one part salt to the liter of water. She follows the same regimen described above.

Potential Obstacles

Over-concentration of sodium in infants can cause hypernatremia and lead to shock and subsequent death. If the mother mixes a full ORS packet in a single glass of water instead of a liter container, if the mother uses a liter container but adds two or three packets, believing the child needs a stronger dosage of the medicine, or if the mother mixes the wrong proportion of sugar to salt in the substitute solution, the child could receive dangerously high concentrations of sodium chloride.

In addition to incorrect mixing, there are a number of administration behaviors which, if improperly performed, could affect the efficacy although not necessarily the safety, of the home-based therapy. These include: continuing to administer some strong purge; giving too little of the Oral Rehydration solution because mothers feel the baby will not drink so much fluid; withholding water and/or breastmilk during therapy, thus
adding to the danger of high sodium concentrations, adding other substances to the ORS mix, boiling the mixture, over-diluting the mixture, and withholding food in the belief that the OR solution contains sufficient nutritional value.

Evidence from field trials suggests that mother's acceptance of ORS therapy may be negatively affected by at least three other factors: vomiting, increased stool volume after administering ORS, and mother's concern over the lack of color or taste to the solution. More recently, some concern has been expressed about the mother's possible unwillingness to give sufficient volume of the solution to the sick child.

The Behavioral Change Dimension

Within the context of child survival, the individual mother is faced with numerous decisions, such as:

- Why give up an existing practice for some new remedy?
- Why take a well child to a health center to be stuck with a needle and be fitful all night?
- How to remember the correct ingredients in a home ORS solution?
- How to determine whether the child is malnourished or just small?
- When to introduce weaning foods and how to determine which ones are best?
- How to discuss having fewer children when her husband wants another male child?

Each decision suggests a complex set of behavioral responses. New practices require new responses, many of which are not well understood, believed in, or practiced. The contribution of behavior analysis within this context has been to probe the reasons why a given practice continues and determine how a new practice might be best introduced and how such a practice can be configured, presented, and used to ensure it is maintained over time.

The systematic application of behavior analysis has enhanced HEALTHCOM programs by:

1. Promoting first trial of beneficial new practices,
2. Increasing the accuracy of behavior change,
3. Ensuring long-term maintenance of new behaviors.

Not all of the new practices which look promising in the laboratory are beneficial in real life. In addition to the cultural, economic, and technical difficulties encountered in moving a new health technology from the laboratory to the home, there are a number of behavioral considerations that influence the mothers' willingness and ability to adopt a new practice.

The experimental analyses of behavior suggest six circumstances that may contribute to the absence of desirable behavior, either singly or in combination. First, necessary skills or knowledge may be absent. For example, rural mothers in Honduras often knew that boiling water is good, but they did not understand that it actually kills
the parasites they fear. Second, discriminations which identify when to manifest the behavior may not be well formed. Mothers knew that some foods made their children ill. They did not know that the longer the food sat around after preparation the more likely it was to cause illness. Third, necessary materials or implements like the ORT packets may be unavailable. Fourth, there may be no positive consequences for engaging in the behavior. (Most of the behavior which we advocated produced no immediate results, but was beneficial in the long run.) Fifth, there may be positive consequences for engaging in incompatible behavior, such as not feeding during diarrhea. This behavior has a major impact on the primary symptom of the disease. Oral rehydration does not. And sixth, there may be punishing consequences which discourage the desired behavior pattern. During rehydration, a child may vomit, for example, and his diarrhea may appear to increase.

The behaviorist strategy is to try to identify existing behaviors that are compatible with the new ones, to look for approximations to the new behaviors already available in existing practices, and to evaluate the actual costs and benefits, both social and economic, of adopting the new behavior. Behavior analysts have helped identify positive consequences which follow a behavior and have suggested ways to avoid punishing results. They have stressed that, while there are many means of provoking a new behavior pattern, positive consequences are essential to maintain it. The strategy also involves determining whether the frequency and persistence with which a new behavior must be practiced are realistic within the rural context. All of these elements are weighed against the salience of the behavior. Some behaviors, clearly, would have a much greater impact than others.

The Happy Baby Lottery

One example of how HEALTHCOM has applied behavior analysis principles to large scale public health problems is the Happy Baby Lottery conducted in The Gambia during 1982.

In The Gambia, HEALTHCOM followed the lead of the Ministry's national diarrheal disease control policy, which advocates home use of a simple rehydration solution made from water, sugar, and salt in the home to prevent the most serious consequence of common acute diarrhea—dehydration. A standard formula for this solution was developed using a local soft drink (Julppearl) bottle and cap for measurement: 1 liter of the solution is made using 3 Julppearl bottles of water, 8 Julppearl caps of sugar, and 1 cap of salt.

To achieve these objectives in The Gambia, Africa's smallest country (just two miles wide by 250 miles long, with a population of around 640,000), three communication channels were identified for use: radio broadcasting (two-thirds of rural compounds in The Gambia have a working transistor radio), pictorial graphic materials (the rural population is predominantly illiterate), and face-to-face instruction by health workers and other rural opinion-leaders.

As part of its national campaign to educate rural mothers in the proper treatment of acute infant diarrhea, The Gambia's Medical and Health Department conducted a unique educational project—a national contest offering inexpensive but attractive prizes to mothers who learned how to mix correctly a simple oral rehydration solution.

The "Happy Baby Lottery" carried out during the months of September and October 1982 combined the use of a pictorial handbill showing how to mix the solution, face-to-face teaching by health workers, and an intensive schedule of instructional radio programs.
The central idea of the Lottery was to provide the vehicle for an intensive period of education on oral rehydration, using graphic materials, radio messages, face-to-face instructions, and some incentives—the Lottery prizes—to encourage mothers to participate in this educational process.

Specifically, the Lottery was designed to motivate mothers to seek out a colorful 8"x11" handbill (See Exhibit B) showing the Julpearl bottle and cap formula for the sugar-salt solution and to listen to a special series of radio programs which explained how to interpret the handbill and how to use it to mix and administer the solution. Four months of prior radio broadcasting had sensitized mothers to the special danger of diarrhea, namely dehydration, and had introduced the sugar-salt solution as a measure for preventing it. A series of training workshops for 150 key health personnel throughout the country also had been held to ensure that the campaign's radio message would receive interpersonal reinforcement from health workers in the field.
How the Lottery Worked.

Approximately 200,000 handbills, or "mixing-pictures" as they were called, were delivered by the Mass Media Project staff to approximately 20 health centers and dispensaries throughout the country. A portion of these were distributed to mothers at the health centers by the local government health workers, and the rest were delivered in turn to a network of some 500 village volunteers who had been trained by the health workers as village "diarrhea experts" following their own training at the Project's workshops.

During this same time an intensive publicity campaign about the Lottery was begun on Radio Gambia in four local languages—Wolof, Mandinka, Fula, and Serer—explaining that the mixing-picture was to be used as the ticket for entering the Lottery, and encouraging all women (only) to obtain one and to learn how to mix the sugar-salt solution. A series of radio programs interpreting the mixing-picture and explaining key points of administering the solution were aired throughout the Lottery period.

The distribution of the mixing-picture tickets was followed by the Lottery's core activity; after four weeks the names of 18 villages from all over the country were drawn randomly and announced over the radio. Each of these villages would be visited by a contest judge, one of the local health workers. Every woman in the village who came to the contest with a mixing-picture in hand was eligible to enter an initial drawing, conducted by a judge, who chose 20 women who then had a chance to demonstrate their mixing knowledge. Each of the 20 women who correctly demonstrated for the judge how to mix the sugar-salt solution won a prize—a one-liter plastic cup. If she could also correctly answer at least three out of five questions about how to administer the solution she would win a second prize as well, a bar of locally made soap. She would also then become eligible for the Grand Prize Drawing: a special one-hour program broadcast on Radio Gambia in which a Gambian VIP would draw and announce the winners of 15 radio-cassette players from among the village contest winners. Five community prizes, consisting of a 50-kg bag of sugar and 100-kg bag of rice each, also were awarded to the villages who had participated most actively in the village contests.

In choosing the contest prizes, project staff sought items that were locally available and inexpensive but useful and appealing to village mothers and, if possible, related to or consistent with project goals. The plastic cup, the most common vessel for drinking water and a convenient one-liter measure and the bar of local soap satisfied all of these criteria. To make them more colorful and attractive, both were decorated with a bright red decal with a picture of a happy baby (see Exhibit C).

Exhibit C
The more expensive grand prizes—radio-cassette players, which are highly valued possessions in rural villages—were offered to generate high interest in participating in the lottery and in following it on the radio. The community prizes, too, were planned to sustain wide interest and to encourage maximum participation. A 50-kg bag of sugar, which could be used to make the sugar-salt solution, and a 100-kg bag of rice, another commodity highly valued during the pre-harvest "hungry season" when the lottery was held, were selected after project staff had confirmed that traditional means of sharing such donated goods existed in the villages so that the prizes would not be monopolized by one or two village leaders.

Finally, the Lottery was planned to coincide with a time of the year when Gambia's hard-working women had free time to participate. September/October was chosen because it is a time when most of the women's rainy-season planting activities have been completed and they have some leisure time. It is also a time when rainy-season diarrhea is at its peak and the Lottery's educational messages could be expected to arouse high interest among the rural audience.

The Lottery proceeded almost entirely according to plan and with no serious hitches. The 72 village contest generated a great deal of excitement and enthusiasm in the rural areas. In some village, as many as 400-450 women turned out with mixing-pictures in hand ready to participate. Other village contests were accompanied by festive drumming and dancing, and in at least one village a sheep was purchased by the village elders and cooked to feed the contest participants.

The "Happy Baby Lottery" came to an exciting conclusion on October 9 when The Gambian President's wife, Lady N'Jaimeh Jawara, drew and announced the names of the grand prize winners in a special one-hour trilingual (English, Wolof, and Mandinka) broadcast on Radio Gambia.

During the two weeks that followed, the project staff was on the road again delivering radio-cassette players, bags of rice, and bags of sugar to the lucky Lottery winners all over The Gambia, while a series of post-Lottery spots began on the radio congratulating winners and consoling losers with the message that the real prizes in the Happy Baby Lottery, of course, were healthier, happier Gambian children.
Exhibit D illustrates how the Lottery worked: 1) the flyer with mixing instructions was made into a "Lottery ticket" to give it added value as an instructional device; 2) it was widely distributed through local chiefs, 3) it was used as the key to an instructional process carried out by radio. The key contingency decision was to link learning of the formula, as demonstrated at mass mixing contests, with a reinforcer of simple individual and community prizes.
Exhibit E shows an even more schematic illustration of the process principles. At point A, detailed field analysis of existing antecedent conditions, the mixing behavior itself, and relevant consequences which could be used, clearly showed that the mixing formula was complex; that radio was a more limited medium than hoped; that no strong distribution system existed; and that visual literacy, or the ability to immediately understand a two-dimensional drawing could not be assumed in the population.

At point B, the decision was made to address these problems by providing a strong incentive to listen (to learn the formula you had to listen to the radio), a strong incentive to acquire the flyer (you couldn't participate in the mixing contests unless you had a flyer), and an incentive to actually mix the formula (the public mixing contest itself). After the lottery, at point C on the exhibit, emphasis turned toward generalizing the reinforcement from the Lottery to the health benefits of oral rehydration therapy.

Exhibit E

The Happy Baby Lottery is only one example of how the principles of behavior modification are being applied successfully in HEALTHCOM and other international public health programs. To date, the contribution has been important but by no means all that it could be. More consistent applications of behavior analysis are planned and many lessons are yet to be learned.