Constraints to Knowledge Gain and Behavior Change in Response to a Multi-media Health Education Project in Gambia, West Africa

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Abstract

This dissertation examines the role of information in bringing about knowledge and behavior change in health in a developing country. It specifically considers the constraints to change provided by the physical, social, and cultural context in which this information is introduced. The primary questions asked were: Under what conditions and for whom does mass-mediated health information lead to knowledge and does knowledge lead to health behavior change? Conditions hypothesized included factors at the level of the individual (e.g., access to material goods and time, contact with health workers) and compound or village characteristics (e.g., compound wealth, social support, level of development in the village). The research studied a multi-media campaign providing information about the treatment of infant diarrhea in The Gambia, West Africa. The study used survey responses from a stratified sample of 677 rural mothers. The data base included responses from interviews done before and over the first eighteen months of the campaign. The analyses were performed in steps, first testing the relationship between knowledge and practice (or mass media exposure and knowledge) while controlling for possible interviewer bias and other extraneous factors, then examining the interaction effect of the independent variable and each of the hypothesized conditioning factors. Overall, most of the conditioning relationships were not statistically significant and, of those that were, most showed a pattern opposite to that hypothesized. For knowledge and behavior, the major finding was that level of development in the village is a condition significantly affecting the relationship between knowledge about an oral rehydration solution and its use. Social support, family literacy and mother's status also provided positive, although not statistically significant, conditions. For radio exposure and knowledge, mothers with interpersonal sources of information were expected to be more likely to learn from the radio than mothers without interpersonal sources. However, radio exposure only made a significant difference in knowledge for mothers without other sources of information, indicating that the mass media can act as alternative sources of information for those without access to other sources. The most important constraint to knowledge was access to information, rather than situational factors such as wealth, education, or village characteristics. (Abstract shortened with permission of author.)

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CONSTRAINTS TO KNOWLEDGE GAIN AND BEHAVIOR CHANGE IN RESPONSE TO A MULTI-MEDIA HEALTH EDUCATION PROJECT IN THE GAMBIA, WEST AFRICA

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BACKGROUND AND THEORY

Introduction

One of the major areas of activity in developing countries is in trying to improve the population's health. In developing regions as a whole, life expectancy at birth is 53.2 years, compared to 70.3 years in developed regions (World Bank, 1980, p. 11). Much of this discrepancy is due to the differences in infant and child mortality. Whereas the average infant mortality rate in developed countries is 15 per 1000 births, in the poorest regions of the world, half of all children may die before they reach the age of one. In developing countries, children between one and five are 12 to 15 times more likely to die than children in the same age group in developed countries. The problem is particularly acute in Africa, especially in the band across the middle of the continent, where the infant mortality rate is 100 per 1000 births and half of all deaths are those of children under five (World Bank, 1980, p. 10).

The expansion and improvement of health and nutrition services -- medical schools, hospitals, clinics and trained health and nutrition workers -- is one way in which local governments and international agencies have addressed the problems of poor health and high death rates in developing countries. In general, this has not been very successful in rural areas. Because it is an expensive solution, many of the necessary facilities cannot be built, nor the workers trained or supported. Furthermore, trained personnel often will not work in rural areas, preferring the status and better facilities of city jobs. Consequently, health and nutrition services have continued to be available to only a small part of the population.

With the current emphasis on more widespread primary health care extending to rural areas, one solution has been to educate people to prevent illness and malnutrition and treat some symptoms themselves, thus reducing the incidence of severe illness and the consequent need for formal health facilities. Campaigns using extension workers and/or the mass media have been developed to fulfill this function. Many have been successful in bringing about awareness of the messages of the campaign and in increasing people's knowledge (Zeitlin & Formacion, 1981; Hornik & Solomon, 1978; and Hornik, 1984). Some have also noted some behavior change (Hall & Dodds, 1977; Zeitlin & Formacion).

The major assumptions in these efforts are that <u>lack of knowledge</u> about proper health and nutrition practices is the major impediment to improved health and that, if people are provided with useful information and taught certain preventive or curative skills, they will use this new knowledge and change their behavior. This in turn is expected to improve their health and nutrition levels. However, the view that providing information will inevitably result in universal knowledge or that knowing will then lead to change in behavior has been questioned.

In the last two decades -- as researchers and theorists have noted the general lack of change in response to education programs in rural development, agricultural, health, and family planning -- assumptions about the opportunities for change, the process of change, and the role of communication in this process have shifted. In the past, communication of information (and mass communication in particular) were seen as an independent force that could provide the climate necessary for development and trigger an evolutionary change process. Blame for lack of change was assigned to individual traditionalism and resistance to change. Now, information and mass communication are seen as only one of many interrelated factors influencing knowledge and behavior and thus as having a much smaller role. Access to information, knowledge gain, and individual behavior change are seen as being constrained by the social, political, economic and physical context. In many situations, people cannot change or only certain groups can change.

This dissertation examines the role of information in bringing about knowledge and behavior change in a developing country. It specifically considers the influence of the physical, social, and cultural context in which this information is introduced. The primary question asked is: Under what conditions and for whom can information have an effect? The study examines the conditions under which mass-mediated information leads to knowledge and the conditions under which knowledge leads to behavior change in response to the USAID-funded Mass Media and Health Practices (MMHP) project on treatment of infant diarrhea in The Gambia, West Africa.

The research described in this dissertation is based on and borrows from the theory on world development and modernization and, particularly, on the role of communication in agricultural change. This section will first include a discussion of the changes in scholars' views on the role of information in development and agricultural behavior, then compare these views to the assumptions behind the practice of health and nutrition education. The Mass Media and Health Practices (MMHP) project will then be described, followed by a short description of life in The Gambia. Lastly, the hypotheses examined in this research will be presented and discussed.

Communication, Modernization and Agricultural Development

Scholars' and practitioners' views on how to bring about knowledge and individual behavior change in agriculture, health, family planning and nutrition in developing countries is part of the general theory on how modernization comes about and the role of communication within that. In the last twenty years, the dominant paradigm for development and modernization has shifted from a model based on the industrial development of the West to models that reflect more accurately the situation and constraints in developing countries today. The general shift has been away from a view of individual blame for lack of change (attributing lack of individual change, slow industrialization and general lack of development to the traditional views and fatalism of the inhabitants) to an examination of the constraints posed by the larger system (in the social system, the country or even at the global level). The theory about the role of communication in development has changed along with the shift in the larger paradigm.

In the past, development (with its improvements in working conditions, health, nutrition, and general standard of living) was seen as an evolutionary process similar to that experienced in the West during the industrial revolution, turning an agricultural society into a modern industrial society. If modernization could only be triggered in developing countries (through industrialization and urbanization), it would then go through the same stages as the economic, social and political modernization of the West (Black, 1966; Inkeles & Smith, 1974). If changes could be made in the cities and political centers then they would radiate out to the people in the rest of the country.

The individual was an essential component in this modernization process. An important means to the ultimate goal of a modern economy was the development of a modern individual to replace the tradition-bound, fatalistic natives. This modern person would then readily adopt new behavior, leading to improved health, lower population, and greater productivity.

Communication of new ideas, values, and practices was seen as essential in this process. Mass communication, in particular, was considered to play a large role in triggering modernization and providing a climate for development. In his study, The Passing of Traditional Society, Lerner (1958) proposed a model of modernization in which urbanization led to increased literacy and media exposure, which in turn led to economic and political participation (or modern behavior). At an individual level, this involved the creation of "empathy" or the capacity to identify with new ideas and thus keep up with the changing environment. The mass media played an essential role in developing this empathy through exposing the traditional masses to new ideas and experiences.

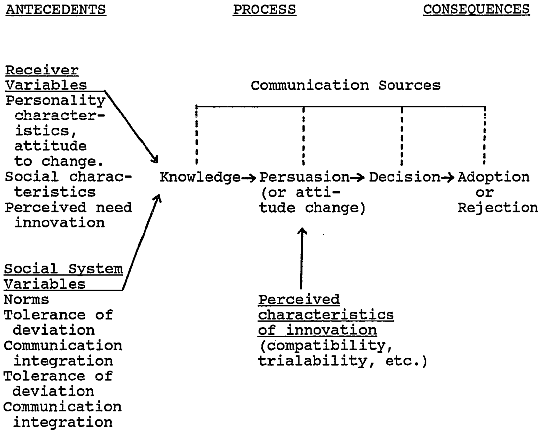
Schramm saw the interaction of communication and economics as dual "movers" in development (1963). Mass communication was perceived as contributing to all the preconditions for national development. Information was a trigger for change, first in the wealthy and powerful, then moving down to others. An individual requirement for change was the adoption of the Protestant Ethic to replace peasants' traditional fatalism. Schramm did stress limitations to the role of mass communication in local cultures, seeing communication as a direct influence in some situations and only as a helper in others.

Rogers looked at the process of modernization at the level of the behavior of individuals, using the diffusion of innovations model, a model that has been widely used in planning and evaluating agricultural projects, and has also been applied to family planning and health (Rogers, 1962; Rogers & Shoemaker, 1971; Rogers, 1973). This model was based primarily on research in the United States by rural sociologists on adoption of new seed varieties (see Rogers & Shoemaker).

The diffusion of innovations model described the psychological process an individual goes through in adopting an innovation and the forces influencing this process. The model is presented in Figure 1. The initial force (or trigger) in the adoption process was communication of information about a new, technologically appropriate innovation. When a new practice was introduced, it was

Figure 1

The Diffusion of Innovations Process
(Adapted from Rogers & Shoemaker, 1971, p. 102)



expected that all individuals would go through this process, as in a chain reaction. Lack of knowledge about new technologies was seen as the major inhibitor to change in behavior, and providing information was expected to produce this awareness and knowledge and start the process toward behavior change.

All individuals were expected eventually to have access to this information through a multi-step flow of information from the mass media through interpersonal channels. Those who did not hear about the innovation on the radio would hear about it through interactions with opinion leaders and early adopters, who would pass on the information and also influence others to adopt. Communication (providing information, persuading, motivating) was important at all stages of this process, but certain channels were more appropriate at each stage. Mass-mediated channels were seen as playing a larger role in knowledge gain and interpersonal sources were more important in persuasion and attitude change and in the decision to adopt the practice.

Other factors, such as receiver variables (the individual's personality and social background), social system variables (communication patterns and traditional versus modern social norms), and perceived characteristics of the innovation provided the context in which the innovation was introduced and acted either to hinder or aid the process at different stages. If a person went through the stages very slowly or stopped at an early stage (e.g., learned about an innovation but didn't go on to be persuaded to change his attitudes or behavior), this was attributed primarily to the individual's personality and social characteristics (age, low social status, lack of wealth, low education, traditional views, unfavorable attitude to risk, low mass media and interpersonal exposure). Although Rogers included social system variables in his model, his early work stressed the importance of receiver and communication variables in the process over the system variables.

To summarize, the major literature on communication and development until the early 1970's emphasized individual behavioral change and the creation of a "modern" person who was empathic and innovative. Mass communicated information was seen as essential to the development process and the provision of information was expected to trigger a process in which all individuals would learn about new techniques and those who knew would eventually adopt innovative agricultural, health, and family planning behavior. The blame for any failures in this process was attributed primarily to individual traits -- traditional views, fatalism, and resistance to change.

In the 1970's, the dominant paradigm of development and behavior change was criticized more and more. The major criticism was about the influence of differing structures and contexts on development. Developing countries were not developing at the rate expected and they did not seem to be going through the expected stages. Urbanization and communication were not triggering development. Putting the blame for lack of development on the traditionalism and resistance to change of individuals and cultures gave way to examinations of system blame. Today, development is seen as severely constrained by the global economic and political system and by the inequalities between the industrialized and developing countries (Frank, 1969; Eisenstadt, 1976; Harrington, 1977). Within a country or area, development is constrained by the physical, economic, social, and political system.

These changes in the dominant paradigm are also reflected in the literature on agricultural education and behavior change and are further supported by findings from empirical studies. Studies of agricultural mass media and extension programs showed that providing information did not necessarily lead to learning and often did not lead to behavior change. Lack of change was seen as not due to individual traits as much as to the individual's inability to change given the context. Wealth and political and social power determined whether change was possible. It was found that farmers who were already better off learned more, changed their behavior more, and gained higher agricultural productivity (Roling, Ascroft, & Chege, 1976; O'Sullivan, 1978; Contreras, 1979). Development authorities had provided more help to the minority of more innovative, wealthier, more educated farmers in the belief that the information would trickle down to others. This did not occur as expected, but instead further increased the knowledge and behavior gap between progressive and poor farmers (Roling, et al., 1976; Lapa & Mayfield, 1978).

Even if they have access to information, many farmers cannot adopt the practices recommended or use the information because of lack of access to other important factors. Contreras found that wealth (farm size) was the primary determinant of adoption of new farming techniques and also of access to what he called "second order" variables -- credit, mobility, education, and exposure to communication. O'Sullivan's study of Guatemalan farmers found that access and exposure to information made a significant difference in behavior and agricultural production only for wealthier farmers and not for subsistence farmers. The conclusions reached by these researchers were that behavior change in developing countries is greatly constrained by social, structural, and political factors, factors over which individuals have no control.

The early views of Schramm, Lerner, and Rogers are now seen as too narrow and as focusing too much on the individual's personality and on the transfer of information and knowledge and not enough on the historical and structural context. Galjart has defined three major constraints to change: ignorance, unwillingness, and inability (1971). He states that the diffusion researchers largely ignored the problem of inability and focused on lack of knowledge and proper attitudes. By concentrating on the constraints posed by the personal characteristics of traditional peasants instead of the constraints within the society, diffusionists had given communication a larger role in technological development and modernization than it deserved.

Now, mass communication is seen as only one of many influences and not as a trigger that can independently set off a chain of development or psychological processes. The structure of the social and political system is seen as a boundary limiting information access, knowledge gain, and behavior change (Beltran, 1976; McAnany, 1978; White, 1980; Rogers, 1983). Changes by individuals can only be made within these limits.

In the literature on agricultural development and behavior change, researchers have identified a variety of requirements for development, of which communication and information are only one aspect. Other requirements are: supplies and equipment, economic incentives, education, local research, and improved land (Schultz, 1964; Mosher, 1969; Feder, et al., 1981). To this list, Mosher

(1969) and McInerny (1978) added a support system or infrastructure conducive to change and an integrated system composed of markets, roads, credit facilities, and supplies of information. This context provides the conditions allowing behavior change.

An important point is that no one of these conditions is expected to be effective alone. Providing only one of the requirements, such as information alone, is not likely to bring about change. O'Sullivan (1978), Contreras (1979) and McDivitt (1981) found that situational and structural factors conditioned individuals' behavioral response to information (e.g., wealth or social power provided the conditions under which an individual farmer could respond to new information and change his behavior). The results of these studies suggest that there is an interactive relationship between new information or knowledge and the social-structural context. It is through the interaction of the components within the system that change is expected to take place.

Health and Nutrition Education

In the literature on health and nutrition education, one can see a similar shift from the view of communication as a sufficient influence or trigger for change in itself to that of communication as only one of many possible interrelated influences. Along with this has been a shift from blaming failures of programs on the individual to examining the system-level constraints and barriers to knowledge gain, behavior change and overall good health and nutrition.

Generally, health and nutrition educators have discussed behavior change as being caused by multiple factors. For many, however, the role of communication in informing and motivating people to change their health practices has been seen as the most important of these forces (Miller & Noyes, 1974; Philip, 1974; Matthews, 1975; Neumann, et al., 1976; Green, et al., 1978). In discussing change in nutrition behavior, Kanaaneh (1975) says the major cause of malnutrition is ignorance and that the role of nutrition education is to reshape deeply entrenched beliefs. Although they have developed a model including system-level barriers to change in health behavior, Green and colleagues see health educators as able to surmount these psychological, social, and physical barriers through communication, community organization, and training. In discussing past health education, Ranganathan stated "Too often, health education has been thought of simply as giving people correct information, and the assumption has been that with such information they will be ready to change their behavior to better health practices" (1974,

p. 468). The same was said about nutrition education by Jelliffe (1969, p. 98).

Health educators and scholars who do stress multiple causation of behavior tend to focus on the psychological barriers to behavior change, using models developed to explain health behavior in the West. The models most frequently discussed in the literature are based on Rosenstock's health belief model, the diffusion of innovations model, the knowledge-attitude-practice (KAP) model used primarily in family planning, or some combination of these. The diffusion of innovations model was discussed in the previous section. Rosenstock's model of health behavior (1966) lists three major prerequisites for health behavior: the individual's subjective state of readiness to take action (views of susceptibility and severity), evaluation of the health practices (their feasibility and effectiveness versus the physical, social, psychological and financial costs or barriers), and a trigger to action (the internal trigger of symptoms or the external trigger of communication). Factors which modify this process are demographic characteristics, knowledge, and social factors.

Family planning has been described as the field in health education with the greatest concern with the development of models of behavior (Simonds, 1976, p. 5), and it is possible that many health education programs are based on models of behavior change developed for family planning. The most common relationship studied in the evaluation of hundreds of family planning programs has been knowledge --> attitude change and motivation --> practice change (KAP). Although aware of correlations between fertility and system-level variables (education, urbanization, income, and culture), researchers have focused almost exclusively on the K-A-P relationship and not on its context. Bogue (1966) explained that this is due to the desire to achieve results "more quickly than would be possible if we waited for the solution along the lines of increased literacy - rising urbanization - improved level of living ...." (p. 724), suggesting that family planning educators tried to ignore system constraints to knowledge and behavior change.

Health and nutrition education (through mass-mediated and interpersonal communication) has been seen as having a powerful role in bringing about changes in behavior and, as in the literature on modernization and agricultural change, blame for lack of adoption tended to rest with the individual rather than the system. The primary requirements in many educators' lists for change in health and nutrition behavior are knowledge about health in general and about specific correct practices, change in beliefs and attitudes, motivation to practice new behavior, and the ability to change (accessibility of health services, money, time). All but the last of these requirements tend to focus on the individual's psychological processes in change and to give a large role to communication, which is seen as able to create awareness and knowledge of "correct" health, nutrition, and family planning practices, to stimulate interest and influence attitudes, and to motivate people to change. Failure of educational programs is often attributed to these same personal factors -- resistance to change, incorrect beliefs, or lack of motivation -- rather than to the overall system or an individual's lack of ability to change.

Other communication researchers and health and nutrition educators question the view that information alone can bring about change. They stress the importance of the societal context or situation in which the information is presented and in which the knowledge and behavior change are expected to take place. In some situations, the economic or social constraints are such that providing information is a useless strategy.

According to the World Bank, the primary cause of poor health and nutrition in developing countries is poverty--lack of income to buy enough food, clothing, medicine or to live in a sanitary, uncrowded neighborhood (World Bank, 1980a). This is a problem that cannot be alleviated through giving people information. It requires more basic economic and social changes. The World Bank further states that the improvement in health and nutrition levels in the West were due not to medical care or changes in knowledge or behavior, but rather to an overall rise in the standard of living and improved socio-economic status. Such changes will probably also be necessary to obtain high levels of good health and nutrition in developing countries. In these cases, providing information cannot help.

In other circumstances, information may be of use but information <u>alone</u> is not capable of bringing about change (Vertinsky, et al., 1972; Kar, 1974; Ranganathan, 1974; Solomon, et al., 1979; Ekeh, 1980; Gunuratne, 1980; Hornik, 1984). Reviews of programs providing information only (Hornik & Solomon, 1978 and Hornik, 1984) point out that the assumptions underlying programs which provide information only (rather than information with food or medicines) are that the current behavior is poorly adapted to the environment, that the people are lacking appropriate information, and that they are actually capable of making changes as individuals. People are assumed to be making inappropriate choices and using resources non-optimally.

However, one must consider that new information is coming into a system which has adapted to the existing physical, social, or economic conditions. Latham and Martin (1977) remind us that we are never providing solutions to health problems for which there are not already indigenous cures and solutions. We think our solutions are better. We may believe people are behaving incorrectly, but they are actually behaving consistently within their own situation.

Hornik and Solomon (1978) and Hornik (1984) suggest that the context in which health and nutrition information is communicated influences whether people will learn or change their behavior. A related viewpoint is seen in Kar's discussion of the interaction between personal and situational factors in determining health behavior (1977). Kar states that the environment must be supportive in order for the individual to be free to act.

A review of some of the literature on health and nutrition education programs and campaigns suggested the following categories of constraints to change in knowledge and behavior: economic and physical constraints, the social structure and customary behavior, beliefs and cultural environment, and ignorance or lack of knowledge.[1]

> Economic and Physical Constraints provide an absolute limit on what an individual can do. In many developing countries poverty, the climate and geography, population pressure, and the economic system and distribution of income present barriers to access to information and individual behavior change. Some of these conditions can't be changed; others require massive restructuring of the political and economic system and are unlikely to change. Others may differ between villages or individuals, for example, access to information from mass mediated and interpersonal sources,

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[1]Sources consulted were: Fraser (1963), Niehoff (1966), Gerlach (1969), Vertinsky, et al. (1972), Kar (1974), Ranganathan (1974), Djurfeldt & Lindbergh (1975), Anderson (1976), Orraca-Tetteh (1976), Berrigan (1977), Latham & Martin (1977), Hornik & Solomon (1978), Foote (1983), Hornik (1984).

availability of village services supporting nutrition and health change (availability of health facilities, schools, information on development issues, transportation), access to resources (wealth, availability of medical supplies or food, and access to time).

The Social Structure and Customary Behavior exert cultural constraints on the individual through the organization and customs and rules for behavior of the society. Women may not have access to information or resources because of their low status in the family and social system. Changes requiring time and resources may not be made for children in a culture in which the young have lower status than the old. Health and nutrition practices tend to be deeply rooted in the culture and customs of a society and are often appropriate within the social system. The culture may not be open to new ideas. There may be little social support for learning about practicing new methods of child care.

Beliefs and the Cultural Environment play an important part in how individuals perceive their situation and decide on action. Many nutritionists discuss food as culturally defined. Medical care, views on prevention, causation and cure also tend to be tightly linked to the culture. Group beliefs and norms will influence whether a mother has the social and cultural support to make a change.

Ignorance or Lack of Knowledge are one of the few constraints that can be relatively easily changed through providing information. In some cases, mothers are unable to recognize malnutrition or dehydration, they do not know about possible cures for illnesses or how to obtain them or prepare them, or they are unaware of the nutritive qualities of certain foods. As discussed previously, lack of knowledge is generally not the only constraint to change of a specific practice and is interrelated with other constraints. In addition, some of the same constraints to behavior change are also barriers to knowledge gain.

To summarize, the assumptions in the field of health and nutrition education have reflected the changes in the larger modernization paradigm and in the thinking on behavior and knowledge change in agriculture. Planners and researchers are now considering system or situational constraints to individual change and realizing that information alone may not be the answer. The study reported here applies the framework set up in the communication and agriculture research to communication of health and nutrition information. It examines the above-listed categories of constraints to knowledge gain and behavior change and specifically studies the interaction between information and knowledge and the context. The physical, economic, cultural, and social context has been found to condition an individual's response to exposure to information and to knowledge about new agricultural techniques. A similar relationship is expected for health and nutrition information.

The study here examines constraints to and conditions for knowledge gain and behavior change in the treatment and feeding of children with diarrhea. The subject of this study is the education campaign of the Mass Media and Health Practices (MMHP) program in The Gambia, West Africa. This research looks not only at whether the campaign taught women about treatments for diarrhea and whether women changed their behavior, but asks which groups of women learned and changed their practices, and what factors conditioned their learning and behavior.

Before detailing the specific constraining factors studied here, a description of the MMHP program and of life in The Gambia will provide a background for a better understanding of the relationships proposed and studied in this dissertation. The section after these descriptions will list and explain the hypotheses about conditioning effects used in the study.

Description of the Mass Media and Health Practices Project

The United Nations World Health Organization reports that diarrheal disease alone kills up to five million children under five every year in Africa, Asia, and Latin America (WHO, 1980, p. 3). The primary cause of death in these cases is dehydration. In the early 1970's, there was a breakthrough in the treatment of dehydration -- the development of a treatment a mother could give the child at home (Levine, 1981; Grant, 1982). Previously, dehydrated children had to be treated in a hospital. Now mothers can mix a packet of oral rehydration salts (including glucose, sodium, and electrolytes) or salt and sugar in water and administer the mixture to the child herself to prevent dehydration or to treat mild cases. WHO predicts that, if all women used oral rehydration therapy (ORT) when necessary, 67 percent of all diarrheal deaths could be prevented (WHO, 1980, p. 60). For this reason, promotion of ORT is an important component of the present WHO and UNICEF programs to reduce child morbidity and mortality in developing countries.

Diarrheal disease also contributes to deaths due to malnutrition. A second important component of the WHO diarrheal disease control program is proper feeding of children during and after diarrhea. Many women reduce the amount of food given to a child during diarrhea to try to stop the watery stools. Other women think breastmilk causes or exacerbates diarrhea or that solid foods make the diarrhea worse, so they switch to watery gruels with little nutritional value during and after diarrhea. These practices lead to increased malnutrition in a child already debilitated by illness and may contribute to death.

Grant reports that the average child in a poor community will have from six to sixteen bouts of diarrhea a year (1982). It is easy to see why the death rate from diarrhea is so high when one considers the many possibilities for dehydration and poor nutrition.

In 1978, the Offices of Health and Education of the Science and Technology Bureau of the U.S. Agency for International Development initiated the Mass Media and Health Practices program, an effort to develop and test strategies using mass communication to teach mothers to treat and prevent infant diarrhea in rural areas of developing countries. Project sites were established in two countries, Honduras (in January 1980) and The Gambia (in May 1981). Implementation of the projects was contracted to the Academy for Educational Development (AED) and evaluation of the projects to the Institute for Communication Research at Stanford University. Because the study reported in this dissertation was done in cooperation with the evaluation in The Gambia, only the project as it was implemented and evaluated in The Gambia will be described in the following pages.

Developmental Investigation in The Gambia

The first step in the AED implementation in The Gambia was a four-month investigation including interviews with groups of Gambian women about their beliefs about and treatments for infant diarrhea, about feeding and childcare practices, and about media use; observation of rural Gambian mothers; interviews with health ministry officials and health workers; mixing trials of sugar and salt solutions; review of the literature available; and radio reception studies. The major findings of this investigation, in terms of the design and implementation of the campaign, were:

> Diarrhea is seasonal in The Gambia, with intense bouts of rapidly dehydrating diarrhea during the dry season and a higher incidence of milder but longer bouts in the rainy season interacting with poor nutrition.

Women have an unequal share of the work and little free time, particularly during the rainy season, which is the period of heaviest work in the fields and which is also the time when children have chronic diarrhea and other illnesses.

Men control decision making in the family and also control women's access to the radio.

Many Gambian women had heard about a water, sugar,salt solution for diarrhea through government health programs, however the mixing trials showed them to be using incorrect and sometimes dangerous formulas for the mixture.

Discussions with government officials indicated that financial constraints precluded the distribution of UNICEF packets of rehydration salts for individual mothers to mix and give their children for every case of diarrhea.

The examination of the communication environment showed relatively good penetration of the government radio station into rural areas and high listening, widespread penetration of health services into rural areas, and a lack of printed and visual materials (with corresponding low ability of mothers to easily understand visual messages).

These findings guided all aspects of the campaign--choice of specific objectives, target groups, media used, and, eventually, the specific messages. An explanation of the rationale behind the choices made can be found in the implementation plan (AED, 1982). The specific objectives of the project were:

To substantially reduce the number of deaths of young children from diarrheal dehydration.

To teach rural women to properly mix and administer a water, sugar, salt solution from their own supplies and convince them to use this during diarrhea to prevent dehydration.

To teach women different regimens for dry-season and rainy-season diarrhea, stressing use of W-S-S in the dry season and proper nutrition during the rainy season.

To convince mothers to seek outside help if the child does show signs of dehydration.

To establish regular clean up of feces in the compound as a preventive measure.

The primary audience for the campaign was mothers, grandmothers, and older siblings responsible for the care of children five years and under. Messages were also expected to inform health workers, fathers of young children, and local leaders.

Radio broadcasts over the national radio system were used extensively because of radio's ability to reach large audiences. Graphic materials were designed to support and complement the radio messages and to provide women with a resource they could refer to at any time. Health workers and village volunteers were given special training and expected to be interpersonal sources of information and support.

Description of the MMHP Campaign

The campaign started in April 1982 with radio broadcasts (radio spots, mini-programs, and magazine format programs) in the two major Gambian languages during popular listening times. Messages concentrated on dehydration as a problem and introduced the elements of the special "diet for diarrhea" -- W-S-S, breast milk, and solid foods.

At the same time, 5-day training workshops were held for 146 rural health workers (nurses, health and leprosy inspectors, and midwives) from all parts of The Gambia. The workshops covered health education in general, W-S-S mixing and administration, treatment of moderate and severe diarrhea, and methods for teaching rural women to mix and administer W-S-S. Health workers were also given a manual on diarrheal management and two posters -- one covering treatment of all levels of dehydration and the other detailing the W-S-S mixing instructions and special diet.

Each of the health workers who traveled regularly to the villages (community health nurses, health inspectors and leprosy inspectors) was instructed to identify village volunteers in ten villages near their posts and to train them in proper mixing and administration of W-S-S and in other elements of the special diet. These volunteers were given the special diet poster for reference and a red "Happy Baby" flag to fly above the compound. For this reason, these individuals were called the Red Flag volunteers. Approximately 840 such volunteers were trained.

The third component of the campaign, print materials, consisted of the previously-mentioned posters given to the health workers and Red Flag volunteers, posters on feeding and hygiene, and two pictorial flyers to distribute to mothers. One flyer showed the instructions for mixing W-S-S using locally available materials (sugar, salt, water, a basin, a Julpearl soda bottle, and a bottle cap) and the other showed pictures of foods that would give a child extra power. A copy of the mixing flyer is in Appendix A.

These preliminary activities culminated in an intensive campaign from August to October 1982 to teach women to mix and administer W-S-S. To assure that women would have access to the radio and hear the messages, and to motivate them to get a copy of the flyer and learn the W-S-S formula, a mixing contest called the Happy Baby Lottery was held. The contest was open only to females and required radio listening and ownership of a mixing flyer, which was used as the lottery ticket. Prizes were bars of soap and plastic cups, and the grand prizes were radio-cassette players.

During August 1982, 200,000 flyers were distributed to rural women through the health system and Red Flag volunteers. At the same time, radio spots and programs publicized and explained the contest, directed women to the Red Flag volunteers for help, and gave instructions on how to mix and administer W-S-S and how to interpret the flyer. (See Appendix A for an example of one of the radio scripts). To win the lottery, women had to come to the closest participating village on an announced day with their flyer and be able to correctly mix W-S-S for a judge. AED reports that 6580 women participated in the contest. An estimated 11,000 participants and spectators were present at the lottery contests.

In the year following the Happy Baby Lottery, AED implemented two other major message phases. From November 1982 through March 1983, messages focused on treatment of dry-season diarrhea (requiring intensive administration of W-S-S), recognition of symptoms of dehydration and of what to do if a child becomes dehydrated, and prevention of diarrhea through feces cleanup. From April through October 1983, messages concentrated on proper feeding during and after diarrhea, because malnutrition has an important interaction with diarrhea during this season. These messages encouraged women to try to give children small amounts of food during diarrhea even if the child has little appetite. They also told mothers that the best foods during and after diarrhea were solids (rice and millet) and the more palatable protein-rich foods (e.g., groundnut porridge, milk, eggs). Mothers were told that children recovering from diarrhea should be given extra food for several days and should be given solid foods and "power" foods (fish, meat, groundnuts, milk, sugar, eggs, oil). Four popular Gambian dishes were specifically promoted as good foods. See Appendix A for more detail on the messages broadcast throughout the project.

Description of Life in The Gambia[2]

The Gambia is a small country running for 200 miles on either side of the Gambia River on the west coast of Africa. A preliminary 1983 census count estimated the population at 695,886, 80 percent of whom live in rural areas (Elmer, 1983, p. 83). The country has high population density, very limited land, no readily extractable resources, and its economy is dependent on a single crop, peanuts, which accounts for more than 90 percent of total exports (Elmer). Subsistence crops of rice, millet and sorghum cannot adequately feed the population, and food must be imported. The World Bank has classified The Gambia as one of the 35 "low income" countries of the world (those with a GNP of $300 or less): the Gambian GNP per capita in 1977 was $210 (World Bank, 1980, p. 84). According to

[2]This section attempts to give the reader a general sense of how rural Gambian women live. It should be noted that generalizations have been made which do not apply to all women in rural Gambia. The major sources of information for this section were Falade (1963), Paulme (1963), Gailey (1964), Shaffer (1980), AED (1982), Dey (1982), Elmer (1983), and personal interviews with MMHP project personnel, Gambians in the Medical and Health Department, and Peace Corps volunteers stationed in villages throughout The Gambia.

Kurian forty-five percent of the Gambian population lives in absolute poverty (1982, p. 638).

World Bank figures for 1974-1977 show the crude death rate to be 24 per 1000 population, the infant mortality rate to be 217 per 1000 live births, and the child mortality rate as 34 per 1000 (1980, pp. 454-455). Of the children who live to two years of age, two-thirds are considered to be malnourished in terms of international standards (Whitehead, 1979).

The Gambian population has varied origins. Seventy-six percent of the people come from the Mandinka, Fula, and Wolof ethnic groups. There are five other major tribes in the country. Each tribe has its own language and heritage, however some of the differences between the groups are smoothed over by a common religion and lifestyle.

The majority of rural Gambians are Islamic. Islam has reinforced the traditional hierarchical divisions in the society between males and females, and the old and the young. Older people have more status than younger adults and children; males have higher status than women. Polygyny is common, and an Islamic man may have up to four wives. In the family, the husband has the authority and his wives are expected to obey him. Another influence of Islam on Gambian life is a focus on communal solidarity and sharing.

Rural Gambian life revolves around agriculture. People live in villages made up of family compounds separated from each other and from the fields by head-high fences. Each compound contains a number of cement or mud huts with corrugated tin or thatched roofs and earthen floors. Most compounds have a latrine and many have a well. The huts open out into a large central communal living area. The kitchen is either outside or in another small hut.

The population of the compound includes the compound head and his wives and children. It may also include his sons and their wives and children, any unmarried daughters or sisters, his widowed mother or mother-in-law, and perhaps his younger brothers and their families. The compound head has the last word in compound decisions and disputes and controls the land, compound food and other resources.

Most women in The Gambia are married. Traditionally marriages are arranged by the families, and the groom must pay a bride price to the family of his wife. Marriage in The Gambia has been described as a union between two families and as an economic transaction in which love may play no part. Upon marriage, a woman will leave her family and go to live in her husband's compound. There she will be under the supervision of his senior wives or other older females of the compound. A man's first wife has a senior position in the family. Having more than one wife is a status symbol. A first wife may welcome another wife because the new wife will help with the compound work and also confer prestige on the first wife.

Men's and women's lives tend to be separated and, in some compounds, husbands and wives may have little interaction (Peace Corps volunteers; Shaffer, 1980; Dey, 1982). The men play a much larger role in the religious and political life of the village. There is a clearly defined division of labor. Men are responsible for the upkeep of the compound, and for the peanut, millet, and sorghum crops. The women are responsible for the rice fields, vegetable gardening and poultry, and also fetching water from the well, pounding grain and cooking, housework, laundry, and child care. Men are not responsible for the day-to-day care of children, however they make decisions about food and clinic visits if the clinic is in another village.

The daily life of a rural Gambian woman consists of hard work and little leisure. Women socialize with each other primarily at the well, the clinic, or in their few free moments in the evening. Although the women in a compound or the wives of each man in the compound tend to share the compound work (laundry, cooking, and sometimes child care), each woman works her own rice fields and keeps the crop or the profit from its sale. Sharing a husband is expected in the culture. In many cases, the cowives spend more time with each other than with their husband. In some families the cowives cooperate, share information, and like each other. In others, there is favoritism and resulting tension and rivalry among the wives. Co-wife rivalry is one of the most common themes in the traditional literature (Galloway, 1980).

There is strong pressure toward conformity in most Gambian villages. Overall, Islam is a conservative force in the villages. There is little privacy in a rural compound; all the women tend to know what the others do. Older women have higher status and may have a lot to say about what the younger women are doing. However, each mother has the primary responsibility for her own children and does have some latitude to raise her children differently from the other women in the compound.

The typical Gambian diet consists primarily of rice and millet with a small portion of fish, meat, groundnut or green leaf sauce. In the rainy season there tend to be acute shortages of food, and this time of year is called the "hungry season." Meals are eaten around communal bowls: a small family may share a bowl, or the men and older sons share one bowl and the females and young children another. Generally, the men are given more sauce and meat. Often the children receive the less nutritious parts of the meal, although sometimes an older family member will make sure the children get some meat. Children are rarely coaxed to eat.

Children usually eat the same foods as the rest of the family, although sick children may be given some special foods. Children are generally given only breastmilk for the first few months, given watery gruels at 4-5 months, boiled rice at 7-8 months, and groundnuts and sauces by 11 months (Thompson & Rahman, 1967). Most children are breastfed up to two years of age. The gruels given early in life have low nutritive value and are usually made with water that is contaminated, introducing diarrheal disease into the child's life at about 4 months (Barrell & Rowland, 1979).

The AED preliminary investigation found that diarrhea is very common among children in The Gambia and can be dangerous. Diarrhea is one of the most frequent reasons given for visiting a health center or nurse. Gastro-intestinal disease and malnutrition accounted for 21.3 percent of deaths reported in children under five in the capital city in 1978 (AED, 1982, p. 9). The preliminary investigation also found that Western medical treatments for diarrhea were well-accepted. A majority of the mothers reported going to the health center for diarrhea in their children, where they were given liquid medicines or pills. Mothers attributed diarrhea to dirt, inadequate child care, breastmilk, and spiritual and magical causes. When asked what foods should be given to a child with diarrhea, many mothers reported paps.

The health care system in The Gambia consists of two hospitals (one in the capital and the other in the center of the country), 12 health centers, and a system of 17 dispensaries and 55 subdispensaries which radiate out into the rural areas. Health centers and dispensaries operate every day, but the subdispensaries are visited by a health team only once a week or less. Maternal Child Health teams also visit some villages to provide care specifically for babies and pregnant women. The health services have the general problems of health centers throughout the developing world: problems of accessibility and transportation, erratic service and supplies, inadequate basic equipment, limited training and supervision of the health-workers and low pay (AED, 1982; Walker & Cham, 1981). Health facilities tend to be dark, cramped and poorly equipped. The health workers have a heavy work load and can usually spend only a few minutes with each patient. Because of this, there is a desire for a rapid solution to the patient's problem (e.g., giving the mother medicines instead of spending the time to educate her). This is reinforced by the mothers insisting on pills or injections.

Extensive training sessions were held by AED for health workers on child care, W-S-S, and feeding. Peace

Corps volunteers working with health workers generally reported attempts to include health education on W-S-S and feeding in the clinic experience. Factors working against this were the health workers' inexperience with the idea of health education instead of symptomatic treatment, their lack of training and experience as health educators and their lack of time. However, throughout the project, health workers were listed by mothers as one of their major sources of information about child care and treatment of diarrhea.

Another way in which clinics may promote the dissemination of health information is through the discussions of waiting mothers. Visits to the clinic may take the entire day while the mother waits in line. Clinics are social times, when the mothers relax and talk. Peace Corps volunteers noted that, although the mothers they knew didn't seem to talk much about health matters in the compound, in the clinics there was much sharing of information and discussion of the new flyers and treatments.

Hypotheses: Constraints to Knowledge and Behavior Change among Mothers in The Gambia

This dissertation examines two major questions: What are the conditions under which knowledge about W-S-S and feeding leads to actual behavior? What are the conditions under which mass-mediated information leads to knowledge about W-S-S and feeding? The hypothesized conditioning factors were expected to have a positive interactive effect with the independent variables (mass media exposure and knowledge) on the dependent variables (knowledge and practice). It was hypothesized that the curve representing the relationship between the independent and dependent variable would rise more steeply for mothers in high categories of the conditioning variables than for those in the low categories. For example, it was expected that the slope of the relationship between knowledge and practice would be steeper for mothers with health-worker contact than those without.

After reviewing the classes of constraints to knowledge and behavior change listed in the literature on health and nutrition education, details of the project implementation, and what was known about Gambian women's lives, eleven hypotheses were developed about conditioning influences on the relationship between mass-media exposure and knowledge and ten about the relationship between knowledge and behavior. Because access to information and knowledge and ability to change are often constrained by the same underlying factors, many of the conditions hypothesized are the same for the two relationships. The proposed conditioning factors hypothesized to influence the relationship between knowledge and behavior are: level of village development, compound wealth, experience with outside ideas, social support, access to material goods, access to time, status of the child, status of the mother, contact with health personnel, and salience of diarrhea to the mother. The hypothesized conditions influencing the relationship between mass media exposure and knowledge are: village development, compound wealth, experience with outside ideas, compound literacy, social support, access to material goods, access to time, contact with health personnel, prior information about W-S-S, salience of diarrhea, and pictorial skills. Figure 2 details the relationships hypothesized.

This dissertation was primarily a study of contextual constraints to change. In this research, these constraints include compound or village-level variables (e.g., village development, compound wealth, social support) and also individual-level variables. Here, most of the individual-level variables are considered to be situational constraints, because they are beyond the control of the individual mother. These include access to material goods and time, status of the child and mother, and pictorial skills. Contact with a health worker or Red Flag volunteer may be a sign of modernity or openness to change (and thus lead to an individual blame explanation of lack of change), but here it is seen as being highly constrained by mother's time and father's cooperation.

Figure 2

Diagram of Relationships to be Examined

<u>Control or Third Variables</u>

Access to Time and Material Resources
Interpersonal Contact with Health Worker
Social Support
Status of Mother
Experience with Outside Ideas
Level of Village Development
Salience of Diarrhea

EXPOSURE TO MASS MEDIA → KNOWLEDGE → PRACTICE

<u>Conditioning Variables: Individuals</u>

Access to Material Goods	Access to Material Goods
Access to Time	Access to Time
-----	Status of Child
-----	Status of Mother
Contact with Health Worker	Contact with Health Worker
Contact with Red Flag Volunteer	Contact with Red Flag Volunteer
Prior Information about W-S-S	-----
Salience of Diarrhea	Salience of Diarrhea
Pictorial Skills	-----

<u>Compound- or Village-Level Conditioning Variables</u>

Level of Village Development	Level of Village Development
Compound Wealth	Compound Wealth
Experience with Outside Ideas	Experience with Outside Ideas
Compound Literacy	Compound Literacy
Social Support	Social Support

An effort was made in designing this study to include variables representing each of the major classes of constraints listed in the previous section to try to explain behavior and knowledge change as fully as possible. The proposal for this study included a section on cultural beliefs about health and feeding. However, during exploratory interviews and pretesting of the questionnaires, it was found that women couldn't answer some of the questions measuring beliefs and that other questions elicited no variation in responses. For these reasons, although cultural beliefs are an important factor in knowledge and behavior change in health, the belief hypotheses were eliminated. The only belief measure that remains is that of salience of diarrhea to the mother.

Many of the variables were expected to be related to both the independent and dependent variables. For example, wealth is often correlated with all three major variables, mass media exposure, knowledge, and behavior. Thus it was possible that causal inferences made about the major relationships, between mass media exposure and knowledge, and between knowledge and behavior, would actually be spurious. If a significant relationship were found between knowledge and behavior, it might actually be due to both variables being related to a third variable, wealth. Wealthier people might be more likely to know about W-S-S and also more likely to use it. For this reason, a number of the conditioning variables were also examined as possible extraneous explanations[3] for the major relationships. These variables are listed at the top of Figure 2. The rest of this section describes each of the conditioning relationships hypothesized.

Level of Village Development

> Women who live in a more developed village (e.g., with a clinic, school, or nearby main road) are more likely to change their child care practices in response to new knowledge than women who live in a less developed village.
>
> Women who live in a more developed village are also more likely to learn about new practices from the mass media than are women in a village with less development.

Although the campaign recommended practices that are within the capabilities of most women to perform, it could be that they wouldn't learn about new practices or change their behavior unless they lived in a village that has reached a certain level of development or complexity. Some villages have more contact with the rest of the country through their proximity to roads, availability of transpor-

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[3]In the following sections of this dissertation, these factors are referred to as "third variables" (because they are a third factor which may explain the relationship between the first two) or as "control variables" (because their influence on the major relationship was controlled in the analysis design.

tation and contact with development projects. Some villages have a more highly developed system of services, with a health clinic, government school, and government agricultural and technical services.

Mosher (1969) and McInerny (1978) both stress that agricultural change requires an environment supportive of change -- one providing relevant information and techniques, necessary supplies, and backup services. Knowledge and behavior change in health may also require a supportive environment at the village or district level, including access to essential health care services and to information about new ideas, techniques and ways of life.

Compound Wealth/Access to Material Resources

> Women who have access to material goods and money are more likely to change their health practices if they know about new practices than women without access to resources.
>
> Women who have access to material goods are more likely to learn about a new practice from the mass media than women without access to resources.

In studies of agricultural campaigns, wealth has been found to have a strong conditioning effect on behavioral response to new information (O'Sullivan, 1978; Contreras, 1979, McDivitt, 1981). Wealth also tends to be highly correlated with knowledge. People with greater wealth (generally measured in terms of land ownership), learn about and adopt new agricultural techniques more readily than do subsistence farmers with little land and few resources.

Adoption of new practices often requires new resources or reallocation of existing resources. The AED campaign provided information only, promoting the use of resources existing in the home or village: sugar, salt, bottles, bottle caps, and common Gambian foods. Although women weren't required to buy new or unfamiliar goods, they were asked to reallocate resources from use for adults to children.

There are a number of issues related to access to resources and ability of the mother to adopt W-S-S or new feeding practices. In The Gambia, food, sugar, and salt tend to come from communal stores in the compound which are under the control of the compound head or head wife. An individual mother may not have ready access to these items for her own use. Generally men are given the best parts of a meal and children are often given what is left over. It may be difficult for a mother to give her child parts of the meal which are usually reserved for men. She may have to buy such foods herself rather than using the compound supplies. In this case, she needs money of her own.

At the compound level, one should consider that the interviews for this study were done during the rainy season, when food is in short supply and many Gambian families cannot afford protein-rich foods or sugar. Women in wealthier compounds may have access to a greater variety or amount of food at this time or may be more able to get money from their husbands. They may also find the information of the campaign more relevant within their overall economic context than poorer women and thus learn more readily.

Experience with Ideas from Outside the Village

> Women with greater experience with ideas from outside their village are more likely to change their child care behavior in response to knowledge than women with less outside experience.
>
> Women with more outside experience are more likely to learn about a new practice from the mass media than women with less outside experience.

Some women may be more able to incorporate new information and then change their behavior because of previous exposure to new information and different ways of life. Several Peace Corps volunteers mentioned that rural Gambian women don't change easily because they lack knowledge about other alternatives or situations, and they see their current way of life as the only possibility.

This hypothesis was developed from Lerner's concept of empathy as a step in a person's transition to being modern and also from Hornik's suggestion (1973) that exposure to information challenging a person's world view leads to a greater ability to integrate new information into his or her understanding of a problem or picture of the world. A person can enlarge his or her world view through travel, schooling, previous exposure to new practices or technologies, such as latrines, new agricultural implements or W-S-S. Formal education is seen as pushing back cultural limits and widening opportunities and the scope for decision-making (Schultz, 1973; Wharton, 1965).

Although, on the surface, exposure to outside experience seems like an individual blame hypothesis (perhaps similar to traditionalism), it is not being used as such in this study. Here it is similar to the village development variable. Rural Gambian women have few sources of information that others live differently. Because of their low status, they do not receive much education and they don't have the time or money to travel. This variable is a compound-level measure of the atmosphere for change. In compounds where other innovations have been adopted, where members are more educated, and where members have traveled abroad a mother may receive more information about change and also receive support which would influence her to remember new information and allow her to make some changes on her own.

Social Support

> Women who receive social support for new behavior from other members of the compound are more likely to change their behavior in response to knowledge about a new practice than women without support for the new practice.
>
> Women who have social support for new behavior are more likely to learn from the mass media than women without this social support.

The mass media do not work in a vacuum but within the context of interpersonal influences which may support or counter the mass-mediated messages. Katz and Lazarsfeld (1955) discussed personal relationships as a mediating factor between mass communication and opinion or behavior change. Two types of influence identified in the literature on social influence are normative social influence (pressure to conform to the expectations of others) and informational social influence (influence to accept information from others as evidence of reality). In the context of a mass media campaign from outside the society, relevant groups can exert pressure on individuals to conform to the prevailing group attitudes or behavior rather than following suggestions from outside. On the other hand, they may also provide positive support for change, as was found in the Coleman, Katz, & Menzel study of the diffusion of medical innovations (1966), in Lewin's study of woman's acceptance of new foods (1943), and in evaluations of projects including listening groups (Rogers, Brown, & Vermilion, 1977).

Health and nutrition behavior tend to be strongly rooted in the culture and social customs. In this sense, decision-making may be at the group rather than the individual level, particularly in a culture like that of The Gambia which stresses communal life and conformity to the group. Kar (1977) states that, although individuals may receive information, friends, neighbors and relatives influence the decision to act, even when the behavior is an individual not a group activity. Gambian women, because of their relatively low status, may need approval from their husband or the older women in the compound or village to give their child a new treatment or give the child solid foods rather than the customary paps during diarrhea. If such positive support is lacking, they may listen to the radio messages but not bother to remember them because they can't put the information to use.

A second function the group may serve besides providing social support or pressure is to further disseminate the information heard in the campaign. Communication scholars have suggested that the mass media do not reach everyone, and that much information originally broadcast on the mass media are learned or further discussed in social networks (Katz & Lazarsfeld, 1955; Rogers, 1962; Rogers & Shoemaker, 1971). The designers of the Gambian campaigns hoped that, because Gambian women listen to the radio in groups, conversations about the topics would be generated, thus further spreading the messages of the campaign, something that has been seen in clinic waiting areas.

Contact with the Health Worker or Red Flag Volunteer

> Mothers who have contact with trained interpersonal sources of information (health workers and Red Flag volunteers) are more likely to change their health practices if they have learned about new practices than mothers with no contact with interpersonal health-care sources.
>
> Mothers with interpersonal health-care sources are more likely to learn about new health practices from the mass media than mothers with no interpersonal health-care sources.

A major topic discussed in the literature on communication in developing countries is the differential role of the mass media and interpersonal communication in bringing about knowledge and behavior change (Schramm, 1964; Rogers & Shoemaker, 1971; Hornik & Solomon, 1978). The mass media are capable of reaching large numbers of people, with accurate and up-to-date information, and of repeating this information many times. The mass media can also legitimize a campaign (through the association of the mass media with the city and the government). However, the mass media are separated from their audience, they work in one direction only, they can be ignored, and they cannot provide tailor-made messages or demonstrations to individuals. Because of these qualities, the mass media are seen as more appropriate in creating awareness and knowledge of simple messages rather than knowledge of complex practices or actual behavior change.

Interpersonal sources of information, such as the health workers and Red Flag volunteers in this campaign, are seen to be more important than the mass media in helping people evaluate information and in persuading them to actually change. Interpersonal sources are less separated from the audience (socially and spatially). They can provide social support for new behavior and apply persuasion and pressure where there is resistance to change. Because a health worker and mother interact face to face, there can be a two-way exchange in which messages can be tailored to individuals, methods can be demonstrated, and questions can be answered, helping the mother better learn what she may have heard on the radio. However, health workers have a limited clientele and limited time, they can only reach a small proportion of the population. Also, they may not be well trained and may lack important and accurate information.

Because the mass media and interpersonal channels can serve different functions, a mix of the two is seen to be the most effective means for producing knowledge gain and behavior change (Schramm, 1963; Manoff, 1976; Cooke, 1976; Solomon, et al., 1979; Hornik, 1984). Multiple channels are seen as more effective because each channel can complement or facilitate the others in accordance with its strengths (Rogers, 1973; Kar, 1977; Hurst, 1978; Hornik, 1984). Radio can reach many people with accurate information, repeated at frequent intervals. Health workers can act as a bridge between the mass media and individual mothers, facilitating learning by answering questions, discussing the information from the broadcasts, and allaying fears (Kanaaneh, 1977; Hurst, 1978; Hornik, 1984). Health workers and other women in the village can also provide support or even some pressure to actually try a new practice. A specific channel, such as radio, may also be accessible to people who don't have other sources of new information.

The campaign in The Gambia deliberately used multiple media in a complementary and integrated way way, with each source providing the same information. This was expected to work in two ways. Primarily, each channel was expected to strengthen and support the others, radio teaching mothers and also generating interpersonal discussion, health workers providing in-depth amplification of what had been heard on the radio, and the flyers providing a physical reminder to help mothers remember (AED, 1982; Meyer, Block, & Ferguson, 1983). Radio was also expected to reach mothers who didn't go to the health center or who hadn't received a flyer and, thus, was expected to act as a sole source of information for some women.

The hypothesis examined in this study looks at the complementary, facilitating nature of a combination of mass media and health-worker communication. The practices taught by the radio and mixing flyer were difficult. It was expected that women who had help in understanding and interpreting the messages of the campaign, would be more likely to have more knowledge and those who had personal encouragement from a health worker or Red Flag volunteer would be more likely to change their behavior.

Access to Time

> Mothers with more time will be more likely to practice new health-care behavior if they know about it than mothers with less time available.
>
> Mothers with more time will be more likely to learn about new health practice from the mass media than mothers with less time.

Lack of time to learn about new practices or put them into effect are constraints to health and nutrition listed by Hornik & Solomon (1978) and by Hornik (1984). Women may be following current practices because they require a minimum of time. Preparing and administering W-S-S and giving special feeding attention to a child takes extra time in a Gambian woman's already busy life. Rural Gambian women have many tasks other than child care, many of which are very physically demanding (work in the rice fields, drawing water, pounding grain). The three months prior to the interview and the month of the interview are the busiest time of the year. Roberts and colleagues (1982) report that women's activity almost doubles during this time. During these months, when children are more likely to be suffering from diarrhea and malnutrition, their mothers have even less time and energy to provide extra care and, if they are away in the fields all day, children left behind will receive less care than usual (Roberts, et al.).

Status of the Mother and Child in the Family

> Mothers who have greater status in their compound will be more likely to change health behavior if they know about new practices than mothers of lower status.
>
> Mothers of higher status will be more likely to learn about new health practices from the mass media than will mothers of lower status.
>
> Women are more likely to change their child-care practices in response to new knowledge bout health care for a child with higher status in the family than for one of lower status.

Social status can constrain access to information and knowledge and behavior change because low status tends to reflect low political power in the society as a whole and in the family. Latham and Martin(1977), in discussing nutrition, state that responsiveness to change is directly related to an individual's position in the power structure. Agricultural studies have shown that subsistence farmers, who have low political status, have less access to relevant information and cannot use information to change (White, 1977; O'Sullivan, 1978; Contreras, 1979).

Within the family, status influences access to food and other resources. In many countries, as in The Gambia, men eat first and are given the more nutritious parts of the meal, while children receive what is left over (Hornik, 1984). It may be that boys, because they are male, would be more likely to receive special foods. They might also be given more special attention and be more likely to be given W-S-S.

The status of the mother may also make a difference in her knowledge and behavior. A Gambian man's first wife has more power, over resources and over later wives. Peace Corps volunteers have suggested that first wives have more power to do what they want and to change their behavior than do later wives.

Salience of Diarrhea to the Mother

> Mothers for whom diarrhea is a more salient issue will be more likely to change their behavior in treatment of diarrhea if they know about new practices than mother for whom diarrhea is a less salient issue.

> Mothers for whom diarrhea is a more salient issue will be more likely to learn about new diarrhea treatments from the mass media than mothers for whom diarrhea is a less important issue.

Beliefs and attitudes play a part in how an individual reacts to information or an innovation. Hornik and Solomon (1978) state that one must understand the beliefs and attitudes supporting current behavior and how this behavior is linked to the culture before trying to change it. At the start of this study, two major classes of beliefs relevant to the research were identified in some of the literature on determinants of health behavior (Rosenstock, 1966; Kasl & Cobb, 1966. These were: beliefs about the threat of the disease (the mother's perception of her child's susceptibility, the severity of the problem, and causes of diarrhea) and beliefs about the value of action (what the mother feels she should do, her attitudes toward Western medicine). As described previously, questions in these areas were explored. However, it was found that the women couldn't answer survey questions about some issues (e.g., causation) or that all the mothers questioned gave the same responses, a not unusual occurrence in a tightly-knit communal society.

The mothers' belief about the danger diarrhea presents to her child was measured and used in the study. This belief may influence to what information the mother will pay attention and how she will interpret it.

Compound Literacy, Pictorial Skills, and Prior Information

> Of the mothers who know about a new health practice, those who live in compounds with a literate member are more likely to change their behavior than those who live in nonliterate compounds.
>
> Of the women who are exposed to the mass media, those who are literate or have a compound member who is literate are more likely to learn the correct information and skills than women in nonliterate compounds.
>
> Mothers with greater pictorial skills are more likely to learn about new diarrheal practices from the mass media than women with lower skills.
>
> Women with prior awareness and information about the topics of a campaign are more likely to learn the correct knowledge from the mass media than are women without prior information.

These three variables are expected to work in similar ways to condition the mothers' ability to learn about W-S-S and feeding from the radio and the flyer. The campaign taught women about relatively complicated procedures and required them to memorize instructions and lists of ingredients. Vertinsky, and colleagues (1972) describe prior knowledge as providing a context into which the information of the message is introduced and accepted or rejected. A mother may be better able to learn about W-S-S from the radio if she is already familiar with basic mixing and administration. The mass media may serve to reinforce messages the woman has already heard and help her to remember them. The W-S-S mixing flyer may then be a reminder, not a sheet of paper with totally new information.

Literacy and pictorial skills are also factors that may help the mother learn about W-S-S through influencing her ability to interpret the flyer. Spain (1983) found that Gambian women with greater pictorial skills were able to interpret the W-S-S flyer with no extra training. Women with poor visual skills required training in "reading" the pictures on the flyer from the radio or a health worker. In the same way, if a mother lives in a compound where someone is literate, she has access to help in interpreting the flyer and learning about W-S-S.

CHAPTER 2

METHODOLOGY OF THE STUDY

This study was done in cooperation with the Mass Media and Health Practices evaluation in The Gambia, carried out by the Institute for Communication Research at Stanford University. The Stanford evaluation team began interviewing in March and April 1982 before the start of the campaign and interviewed a sample of mothers at one to two-month intervals until the summer of 1984. These interviews included questions on knowledge and practices related to diarrheal incidence, care of children with diarrhea, nutrition, sanitation, socio-economic factors, radio listening and exposure to the campaign messages. The interview designed for this study was included in the September/October 1983 interviews of the sample mothers. Data from the baseline and other Stanford interview sweeps was also used.

Sample[4]

The Stanford sample consisted of approximately 1000 rural women from twenty Gambian villages. The exact

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[4] The source of all the information on the sample is Foote, et al., 1984.

composition of the sample varied slightly with each interview sweep due to unavailability of mothers at different times. However, attempts were made to interview at least 800 women in each sweep.

Because of the lack of accurate census data, transportation problems, and the need for formal arrangements with each village leader in a sample village, a sample selected randomly at the national level was not possible. The following steps were used in selecting the stratified sample used.

1) A list of important control variables was compiled, and twenty communities were chosen reflecting the full range of variation in the communities (e.g., villages with different levels of health care, access to services and transportation, different tribes). Another important criterion was the need for geographical proximity between villages to facilitate interviewing. Villages were chosen so that they could be clustered into four groups of five villages.

2) A list of all the compounds in each community was made and twenty compounds were randomly selected from each.

3) All eligible women (those between 15 and 45 years of age or those of other ages who were the primary caretaker of a child up to five years old) in these compounds were

listed. The objective of the sampling procedure was to choose as many women as possible from each village, with a maximum number of forty per village, and to choose at least two women from each compound. The sampling method used was to select randomly from the twenty compounds one-half of the women from compounds with four or more eligible women, select two women from compounds with two or three eligible women, and one woman in compounds with only one eligible woman.

The sample used in this study was a subset of the sample questioned by Stanford University. Because the questions about behavior focused on a specific episode of diarrhea in a child under 6, women in the sample who were not yet mothers or whose children were over the age limit were not questioned. This reduced the sample from the 785 women interviewed overall in September and October 1983 to 677.

Table 1 summarizes some of the major characteristics of the sample villages. The women in the sample lived in compounds of from three to sixty-two people (the mean size of the compounds was 21 people and the median size was 17 people). Five women (less than one percent) were the head of the compound themselves, 62 percent of the women were married to the compound head, and 37 percent were married

Table 1

Characteristics of the Villages in the Sample

Division and Village	Number of Compounds	Health Facilities	Schools	Foreign Projects	Distance from Main Road
Western					
Gunjur	732	Full-time Health Center	Primary, Secondary, Technical	Yes	On main road
Berending	72	Part-time clinic	Primary	Yes	6 km.
Kachuma	12	None*	Primary	No	3 km.
Nyofelleh	85	None	None	No	5 km.
Jambanjelly	238	Part-time clinic	Primary	Yes	On main road
North Bank					
Kuntair	43	Dispensary, Part-time clinic	Primary	Yes	On main road
Ker Ngor	23	None*	None	No	5 km.
Kebbeh	17	None	None	Yes	5 km.
Jissa	37	None	Primary	No	7 km.
Kerewan	275	Full-time Health Center	Primary, Secondary, Technical	Yes	On main road, ferry stop
Lower River					
Bureng	47	Part-time clinic	Primary	Yes	4.5 km.
Jalangbereh	39	None*	None	No	1 km.
Jassong	38	None	None	Yes	4 km.
Budayell	11	None*	None	No	1 km.
Baro Kunda	40	None	Primary	No	5 km.
McCarthy Island					
Bansang	442	Hospital/Clinic	Primary, Secondary	Yes	On main road ferry stop
Medina Umfally	85	None	None	Yes	On main road
Nibrass	15	None	None	No	10 km.
Ndikiri Kunda	44	None	Primary	Yes	8 km.
Kunting	65	Part-time clinic	Primary	Yes	15 km. from ferry

* Village has no Red Flag Volunteer

to brothers, sons, nephews and other relatives of the compound head. The women lived in nuclear families with up to four wives (the legal limit of the Muslim religion). Thirty-six percent of the women were the only wife of their husband, 32 percent of the mothers lived in two-wife families, 14 percent in three-wife families, and 5 percent in four-wife families. Six percent of the sample mothers were married daughters still living in their father's compound. The mothers in the sample had from one to eight children under thirteen years of age. The distribution of number of children is in the table below.

Table 2

Number of Children under Thirteen

Number of Children	Percent of Sample Mothers
1	18.5
2	25.8
3	24.0
4	16.6
5	9.0
6	3.9
7	1.6
8	.6

The general educational level in the compounds was low. Males had more education than females (a mean of 1.2 years of public education among all males 6 years and above compared to a mean of .38 years for females). Seventy-three percent of the males had no public education and 88 percent of the females had no education. Thirty-six percent of the mothers lived in a compound where no member had any public education. The literacy level was even lower. Only 2.7 percent of the mothers themselves could read. Only 35 percent of the mothers lived in compounds where a member could read a simple sentence.

Instrument Development

The questionnaire used in the study was designed after several months' experience in The Gambia, reading local documents, and consulting with local project personnel, fieldworkers, Peace Corps volunteers, and village mothers. Investigative interviews were conducted with eighteen Peace Corps volunteers posted in health care facilities around the country. These interviews were open-ended and included questions about the role of healthworkers in diarrheal treatment and the protocol in health centers, feeding behavior, latitude for individual change in the society, cooperation and communication among women, the role of men in family life, and child raising. The information, although based on the anecdotal accounts of people with differing amounts of contact with villagers, did provide a general view of village life and health care. Similar interviews were conducted the two male Gambian counterparts on the project. In addition, information was gained from reading the notes from preliminary interviews conducted by Stanford University researchers of groups of villagers about illness, causation, and cures.

A final source of information during development of the questionnaire was an interview with a group of ten women in a village approximately thirty miles from the capital. These women were asked about causes of diarrhea and several other common childhood illnesses, mother's ability to cure diarrhea, attitudes to home versus health-center remedies, severity of diarrhea, and feeding of sick children. More such exploratory interviews were planned but could not be carried out because of scheduling problems and lack of a translator.

After the questionnaire was designed, it was translated into Mandinka and pretested by two of the fieldworkers with 24 women in two Mandinka villages that were not in the sample, one in the North Bank Division and the other in the Lower River Division. Several women in a Western Division villages were also interviewed by the researcher and a translator. Overall, the questions seemed to pose few problems for the interviewers or the mothers. Several questions were rewritten because they confused the mothers, several were eliminated because there was no variation in the responses, and several questions on the final questionnaire were replaced with almost identical questions from the concurrent Stanford interview. The pretests also identified areas needing special fieldworker training.

In its final version, the questionnaire included forty-nine questions. A copy of the questionnaire is in Appendix B. The questions were categorized into eight major groups: identification information, identification of the last diarrheal bout and its treatment, details of W-S-S use, feeding behavior, contact with the health system, general questions on objects owned and daily activities, knowledge about W-S-S and knowledge about feeding. Mothers were asked to identify a specific bout and name the child involved. This was an attempt to help the mother remember her treatment of the case. The questions about behavior were asked at the beginning of the interview and separated from the knowledge section by questions on other topics to try to avoid contamination of the practice responses with knowledge.

Administration of the Survey

The questionnaire was administered along with a Stanford University questionnaire on the most recent radio spots by the four fieldworkers employed by the evaluation team. The fieldworkers were local women able to speak, read and write at least English, Mandinka, and Wolof, and sometimes other local languages. The fieldworkers had been with the project from the start and had received extensive training and experience in interviewing during the course of the evaluation. Each fieldworker was posted in one division, lived in one of the sample villages, and traveled to the other four villages by motorcycle. The fieldworkers were well accepted by the villagers and were careful to maintain proper formal relations with the village leaders.

Two training sessions on the use of the questionnaire were held for the fieldworkers, including practice and role-playing in English, Mandinka, and Wolof. The pre-testing done by the researcher played an important part here, having identified possible strange responses and suggested problem areas of the questionnaire.

The fieldworkers were sent to the field at the beginning of September, returned to Banjul approximately two weeks later for a major Muslim holiday, then returned to complete their interviews. The interviews completed in the first half of the project were checked during the holiday and some problems identified and corrected. One fieldworker had malaria during the first half of the sweep and had completed only fifteen of her interviews. Inconsistencies in her responses could not be identified and corrected early, which created some problems in the analyses. Another fieldworker was required to stay in Banjul for several weeks during the holiday for medical tests and had less time to complete her interviews. There were some serious problems with some of her responses and, in some of the analyses, her interviews were eliminated. These problems are discussed in greater detail in the analysis sections in which they occur.

The answer sheets were brought back to the University of Pennsylvania and the responses were entered into the computer. The data from the interview were cleaned, then merged with data from previous interviews conducted by Stanford and supplied on a computer tape and with the data from the interviews by Sikandra Spain, another University of Pennsylvania student working with the project.

Interviewer Bias

Before starting the analysis, the variables and some of the hypothesized relationships were compared by geographical division. Because each fieldworker interviewed in a single division, this was also a measure of interviewer differences. This was done because of the nonrandom selection of the villages in the sample, which might lead to bias. In addition, Spain (1983), in her analysis of data collected from the same sample, had found unexplainable differences in her dependent variable, comprehension of the W-S-S flyer, by division/fieldworker. After testing for genuine division differences and explanations for the discrepancies between fieldworkers, she concluded that two of the interviewers were asking the questions or coding them differently from the others, and she removed their responses from her study.

Comparison of the variables in this study by division showed significant differences in the distribution of almost all the variables, including exposure to radio, knowledge, and adoption of W-S-S. Unlike the results obtained by Spain, no clear pattern was found for any individual fieldworker. In order to try to separate out possible interviewer effects from geographical division differences, a regression equation was designed using adoption of W-S-S as the dependent variable. The independent variable (knowledge) and applicable conditioning variables (both individual- and village-level) were entered into the regression equation first, then dummy variables for the divisions were entered and, last, interactions between individual control variables and division were entered. This analysis indicated that, even after variables explaining differences in division were accounted for, the division still added significantly to the explanation of adoption of W-S-S. A significant addition was also made by several of the interaction terms. This suggested that interviewer bias could not be ruled out, even though there was the possibility that there still were differences between the divisions about which we weren't familiar. Because of the possibility of interviewer bias, all the analyses included a variable controlling for division/interviewer.

General Description of the Analysis

The steps followed in the analysis of the relationship between knowledge and behavior and that between mass media exposure and knowledge are listed below.

Step 1: Examine the bivariate relationship between the independent and dependent variables, testing for significance and linearity.

Step 2: Identify hypothesized control variables with no significant relationship with either the independent or dependent variables. This was done to try to reduce the number of variables entered in each of the analysis equations and, particularly, to eliminate variables with large numbers of missing cases and no significant relationship with the main variables. If a variable with many missing cases was found not to be significantly related to the independent and dependent variables, it was not seen as a threat to causal inference about the main relationship and thus it was not entered as a control variable.

Step 3: Test the significance of the relationship between the independent and dependent variables after controlling for interviewer/division and other possible extraneous explanations.

Step 4: Test the hypotheses about conditioning effects by looking at the influence of the <u>interaction</u> between the independent variables and the proposed conditioning variables on the dependent variable.

CHAPTER 3
VARIABLES USED IN THE ANALYSES AND QUALITY OF MEASUREMENT

In this section, the variables used in the analyses and the methods used to construct them will be briefly described. Issues of quality of measurement will also be discussed. The majority of the measures were constructed from questions asked specifically for this study in September 1983. A copy of the questionnaire used is in Appendix B. Other variables were constructed from questions asked throughout the campaign by the Stanford evaluators. Many of the variables used to validate the September 1983 measures were questions asked by Stanford in 1982 and 1983. These questions are also included in Appendix B.

Independent and Dependent Variables

Exposure to Mass Media: Radio Gambia

The question measuring exposure to Radio Gambia was, "Do you listen to Radio Gambia." If so, "How many times a week?" The distribution of frequencies for the radio listening measure is included in Table 3.

Table 3

Frequency Distribution of Radio Listening

	Percent of Mothers
Every day	43.0
Several times a week	20.1
Once a week	4.1
Less than once a week	8.0
Never/doesn't listen	24.5
Doesn't know	0.4

The responses to this question were compared to those to a similar question asked in the Stanford interviews given before the start of the intervention. The relationship between the two was not as strong as one would wish if the two questions were measuring the same concept (gamma was .3, $p<.001$). The relationship was positive, which indicates that mothers who reported high listening before the intervention also tended to report higher listening in the September interview. However, a closer examination of the responses to the two questions showed a large number of inconsistencies (further explained in Appendix C).

The basic pattern of the results suggested that the full range of responses to the radio listening measure was not appropriate. Mothers seemed to have problems understanding the middle values of the distribution. During the course of this study, it became apparent that Gambian women have trouble with simple mathematics and with conceptualizing time as measured by a clock or calendar. The fieldworkers involved in pretesting the questions noted that women were often unable to answer a question about the time they went to their fields and came home in hours, but that they could give an approximation based on meal times, radio shows, or the Muslim prayer schedule (e.g., before the second prayer). Another illustration is that when mothers were asked how many times they had been to the health center since Ramadan, a major Muslim holiday, some could only answer, "every time the clinic was here."

It is known, from experience with other questions requiring numerical skills, that the women were prompted by the fieldworkers. Unfortunately, in the radio exposure question, it is not clear what form this prompting took. For example, if the woman answered, "a lot," did the fieldworker code the response as every day or several times a week? If she responded, "not very often," was this coded as once a week or less than once a week? Because it was uncertain what the middle values in the range actually meant to the mothers, especially in comparison to each other, it was decided to collapse the radio values into two categories, high and low. (See Table 4 for the frequency distribution).

Table 4
Distribution of the Radio Exposure
Variable Used in the Analyses

Radio Exposure	Number of Mothers	Percent
High	427	63.1
Low	247	36.5
Don't Know	3	.4

Women in the high listening group were those who reported listening every day or several times a week. The second value was in included in this group because, considering the high saturation of the radio with campaign messages, it is probable that the women in this group received a high level of exposure to the messages, which may require repetition in order to be fully understood and learned. Women who reported listening once a week or less than once a week were grouped with those who never listened, because it is likely that their exposure to the campaign messages was much less than those in the high group. A middle category including these two measures was considered, but the numbers of responses in these categories were too low to justify this.

The two-category radio listening variable was then tested for validity against previous measures of listening and awareness. The results, shown in Table 5, indicated that there were significant differences between mothers with low and high radio exposure in their reporting having heard campaign messages on the radio and that the low and high exposure measure was a valid measure of radio exposure.

<u>Exposure to Mass Media: Mixing Flyer</u>

The measure of exposure to the W-S-S mixing flyer was constructed from questions asked in August 1983 in the study conducted by Spain (1983). These questions asked whether the mother had seen the flyer before and whether she had ever had a copy of her own. If the mother said she had owned a copy, the fieldworker asked to see the flyer (the questions used are in Appendix B). The responses to these questions are shown in Table 6.

The flyer exposure variable constructed had two values: low exposure (had never seen the flyer, had seen but not owned the flyer, had owned the flyer but couldn't show a copy) and high exposure (showed the fieldworker a copy of the flyer) One can't be certain that having a copy

Table 5

Results of the Validation Tests for the Radio Exposure Variable

Question*		Significance of Chi Square	Gamma
Where have you learned what you know about the care of infants with diarrhea? (Mentioned radio/didn't mention).	July/Aug., 1982	p<.0001	.43
Since the start of the rains, have you heard any radio announcements about caring for children with diarrhea?	Sept./Oct., 1982	p<.0001	.83
	Dec., 1982	p<.0001	.71
Since the last time I talked with you, have you heard any messages on the radio about taking care of children with diarrhea?	Sept., 1983	p<.0001	.85
In the last month, have you heard any radio messages about giving foods to children recovering from diarrhea?	Sept., 1983	p<.0001	.60

*These questions were asked of all mothers, not just mothers who had reported listening to the radio.

Table 6

Responses to Questions about the Mixing Flyer

	Number of Mothers	Percent
Mother had never seen flyer	7	1.0
Mother had seen but not owned flyer	78	11.5
Mother had owned flyer, but doesn't show it	36	5.3
Mother showed flyer	511	75.5
Missing cases	46	6.8

of the flyer in her possession meant that the mother looked at it more often. However, she had the opportunity to do so, whereas women without copies did not. Eighteen percent of the women in the sample had low exposure to the flyer, 76 percent had high exposure, and seven percent (46) were missing because of differences in the samples interviewed in August and September.

Knowledge About W-S-S

AED designed the messages of the campaign to teach a specific set of instructions on mixing and administering the W-S-S solution. The present study focused on the instructions identified by the AED staff in The Gambia as the most important: correct proportions of water, sugar, and salt, how long to give the solution, how often to mix it, and the volumes to give children of different ages. The questions were derived from the scripts used in the radio broadcasts. A list of the messages used in the broadcasts is in Appendix A.

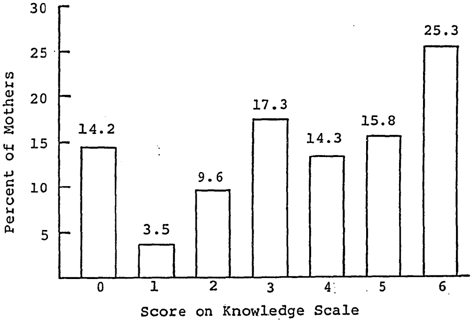
In the interview, the mothers were first asked if they knew about a medicine for diarrhea made at home with water, sugar and salt. If they said "no," they were not asked the rest of the knowledge questions. If they knew about W-S-S, they were asked questions about mixing proportions, how many days to give the solution, volume of the solution to give children of different ages, and how often to mix it. (All the knowledge questions used in this study can be seen in the copy of the questionnaire in Appendix B).

A summative scale of knowledge was constructed using the responses to this series of questions and found to be reliable, with a Cronbach's alpha of .82 (see Appendix C for details). The frequency distribution of this scale is in Figure 3.

This scale was not the final measure used in the analyses. When the analysis of the relationship between knowledge and use of W-S-S was started, it was found that

Figure 3

Frequency Distribution for
Scale of Knowledge About W-S-S



the six-point scale constructed was not an appropriate measure of knowledge about W-S-S. Inconsistencies were found in the relationship between knowledge and W-S-S use at the upper levels of the knowledge scale (possibly due to measurement bias). In addition, it seemed that the difference in knowledge was actually between knowing something about W-S-S and knowing nothing, rather than knowing more or less. There was little distinction in practice between a mother who knew the correct answer to one of the knowledge questions and one who knew the correct answer to all six questions. This is described in greater detail in the results chapter.

Therefore, the measure of knowledge of W-S-S used in the final analyses was a two-value variable. The frequencies are shown in Table 7.

Table 7

Frequency Distribution of W-S-S Knowledge Measure

W-S-S Knowledge	Percent of Mothers
0 - (mother didn't know about W-S-S or couldn't answer any questions correctly)	14.2
1 - (mother knew about W-S-S and could answer at least one question correctly)	85.8

Knowledge of Feeding Messages

The primary messages of the campaign about feeding were to continue to feed a child during diarrhea rather than stopping because the child has lost his or her appetite, to feed the child solid foods and protein rather than watery paps, and to give the child extra servings of solid and high protein foods after the diarrhea is over and the child has regained appetite. See Appendix A for a list of messages.

Three questions were used in the final measure of feeding knowledge: what foods a child should have during diarrhea, what foods a child should receive when recovering from diarrhea, and how much food a child should be given after diarrhea. Two other questions were considered and discarded. Appendix C discusses the responses to each of the five questions in detail and explains why two of the questions were not used in the final measure. Because the Stanford evaluators were measuring the effects of the new feeding campaign at the same time the interview for this study was being given, some of the questions designed by Stanford were used to avoid asking the women essentially the same question twice in one interview.

During the development of the feeding knowledge measure, it was found that the responses of one fieldworker were inconsistent. See Appendix C for details. Because her responses were untinterpretable, all her interviews were eliminated from the feeding analyses and the figures below correspond to only three-quarters of the original sample.

The feeding knowledge measure used in the analyses was a scale composed of the responses to the three items. Each variable was recoded into two categories, correct and incorrect (see Table 8). In the case of foods to give during diarrhea, the mother's response was considered correct if she mentioned either solid starches (rice or millet) or "power" foods (protein-rich foods). For foods given after diarrhea, the response was considered correct if the mother mentioned any of the power foods. Although rice and millet are not incorrect answers, the campaign had particularly stressed power foods. The correct response to the question on volume to give a child was "more."

Table 8

Responses to Feeding Knowledge Questions

Knowledge Item	Correct	Incorrect	Don't Know
Foods During Diarrhea	97.7	1.2	.4
Foods After Diarrhea	62.1	37.1	.8
Volume of Food After	22.7	77.1	.2

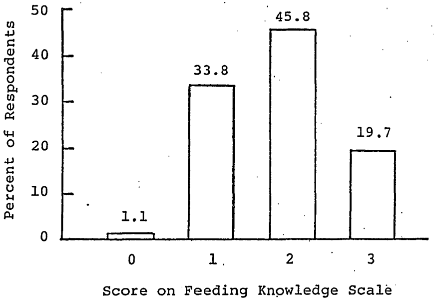
The feeding knowledge scale conformed to the Guttman scale model, with a coefficient of scalability of .9. The frequency distribution of this scale is in Figure 4. The scale ranged from 0 to 3, the mean score was 1.8 and the standard deviation .74.

W-S-S Practice

The questionnaire used in this survey was designed so that all women who had children five and under would be able to talk about their behavior during a child's diarrheal episode. Each mother was asked to think back to the last time one of her children had diarrhea that she treated. Children in The Gambia have mild bouts of diarrhea frequently during the season in which the interviewing took place and it is likely that mothers may have encountered a bout which they didn't treat in any way. In this study we were interested in knowing, when mothers treated diarrhea, how did they treat it? In order to fix the specific episode in her mind, the mother was asked the name of the child, and this name was inserted into some of the questions that followed (e.g., Child's name was how old when he/she had this diarrhea). Pretesting indicated that women were able to think back to a specific episode and talk about it.

Figure 4

Distribution of Scores on
Feeding Knowledge Scale



The women were then asked two questions about their treatment of the episode, what they did first and if they did anything else after this. In informal, open-ended interviews during questionnaire development, it was found that mothers often used more than one treatment. For example, when a mother was asked what she had done for an episode and she reported taking the child to the health center, further probing indicated that the health worker had given pills or recommended W-S-S, which the mother had done. It was not feasible to incorporate this type of probing into the questionnaire because of the limited abilities of the fieldworkers, thus all women were given two opportunities to name treatments used. After these questions, the women who reported using W-S-S were asked more specific questions about the child's treatment: number of days W-S-S was given, how the formula was mixed, how much the child took, number of days the child had diarrhea, and how often the mixture was prepared. The specific questions used are in Appendix B.

At the start of the analysis, it had been planned to look not only at whether mothers reported using W-S-S, but also whether they had used it correctly. A scale of correct behavior, using the series of questions about volume, number of days given, etc. was attempted as a measure of correct behavior. Tests for reliability showed that the items did not conform to either a summative or a Guttman scale model. Using the individual practices separately (e.g., looking at the relationship between knowledge and whether the mother reported making a new batch of W-S-S every day) was considered. However, the lack of reliability between the items, suggesting overall measurement problems, and specific problems with some of the individual items led to the conclusion that such analyses would not be worthwhile. See Appendix C for more detail on the individual practices and the attempts to make a practice scale.

Therefore, the W-S-S practice variable used in the analyses was the general measure of reported use. Sixty-two percent of the women reported that they had used W-S-S in the last case of child diarrhea they had treated. Forty-one percent reported using W-S-S as the first treatment, and thirty-one percent as the second treatment (some reported using W-S-S in answer to both questions).

Table 9

Distribution of W-S-S Practice Variable

Treatment	Percent of Mothers
Used W-S-S	61.5
Used Other Treatment	38.5

Feeding Practice

Mothers in the sample were asked four questions about feeding their child during the last treated bout of diarrhea, covering what the child was fed during diarrhea (paps or solids) and how much and what foods the child was given after the bout. The question about feeding during diarrhea was designed by the Stanford evaluators, who were assessing the impact of the special feeding messages in the same interview sweep. The responses to the individual questions are discussed in detail in Appendix C. As mentioned in the section on feeding knowledge, the responses from only three of the interviewers were used in the analysis of feeding children with diarrhea.

A scale measuring correct feeding practice was constructed of the three variables: correct foods given during diarrhea, more food given after diarrhea, and special foods given after diarrhea. Table 10 gives the distribution of correct responses to each question.

The scale was found to be internally consistent and unidimensional (based on the Guttman scale model), with a coefficient of scalability of .74. The frequency distribution of the scale is in Figure 5. The scores ranged from 0 to 3, most being in the middle ranges. The mean and median scores were 1.3, the standard deviation was .58.

Table 10

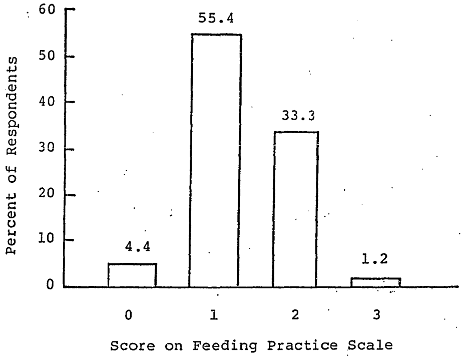
Distribution of Responses to Feeding Practice Questions (Percent of Mothers)

Feeding Practice	Correct	Incorrect	Don't Know
Foods During Bout (Solids or Adding to Pap)	92.3	7.7	0
Amount of Food After (More Food)	34.6	64.6	.8
Foods After Bout ("Power" Foods)	4.8	89.6	5.6

Because so few mothers had scores at the extremes of the scale, the final measure used in the analyses had two values: low feeding practice (0-1) and high practice (2-3).

Figure 5

Frequency Distribution of
Correct Feeding Practice



Conditioning and Control Variables

Contact with Interpersonal Sources of Information

Contact with a Health Worker

The questions used to measure contact with a health worker were "Have you visited any of the people who work in the clinic about the health of your children?" If the mother answered yes, she was asked, "Since the start of Ramadan, how many times?" Ramadan was chosen to delineate a time period because it is an important Muslim holiday that would stick in the mother's mind and because it marked off a time period of enough recency to be easily remembered. In 1983, Ramadan started June 11, approximately three months before the interviews. Because many children are sick with diarrhea and other illnesses during this period, the rainy season, it was felt that questions about health worker contact during this time would reflect overall low and high health worker contact during the other months of the campaign.

The responses ranged from no visits to the health worker in the last 3 months to three women reporting having been twice a week (or 39 times). The frequency distribution can be seen in Appendix C. However, because of problems with the mothers' ability to count and inconsistencies in their reports of health worker visits (as explained in

Appendix C), the variable measuring health worker contact that was used in the final analyses had only two values: no contact with a health worker since the beginning of Ramadan and one or more visits to the health worker. The frequency distribution of this variable is in Table 11.

Table 11

Frequency Distribution of Health-worker Contact

Level of Contact	Percent of Mothers
No health-worker contact	20.1
One or more visits	79.5
No response	.4

The answers to these questions were compared to the responses to the Stanford question, "Have you ever been taught by a health worker to make a medicine at home for diarrhea?" asked in March 1982, January 1983, and March/April 1983. The results are shown in Table 12.

Table 12

Comparison of Health-worker Measure with Stanford Question about Learning about W-S-S from a Health Worker

Date of Interview	Significance of Chi Square	Gamma
March 1982	$p<.07$	.22
January 1983	$p<.006$	.33
March/April 1983	$p<.03$	.30

Although the relationships were not as strong as expected, it was decided to accept the dichotomous health-worker contact variable as a valid measure of actual exposure to health workers. It is very possible that the low gammas were due to mothers who rarely visit a health center erroneously reporting that a health worker had taught them to make a medicine in order to please the interviewer or to a woman who goes to the health center relatively often not having received any instruction because her particular health worker didn't take the time to educate the women very often.

Contact with A Red Flag Volunteer

Another source of information through interpersonal channels in many of the villages was the Red Flag volunteer. These women had been given special training in mixing and administering W-S-S, and the mothers had been told to go and see them if they forgot the formula or if they needed help. Four villages of the twenty in the sample had no Red Flag volunteer.

Mothers in the sample were asked if they knew of the Red Flag volunteer, then were asked if they had ever visited her. Fifty-five percent of the mothers reported that they had not visited the Red Flag worker and 45 percent reported that they had.

This variable was compared to the responses to a question asked in December 1982 to determine if the women understood the meaning of the red flag. The relationship between reporting (in September 1983) that one had visited a Red Flag volunteer and correctly reporting (in December 1982) the function of the Red Flag volunteer was significant at $p<.0001$ and strong (gamma was .8). Therefore, this variable was used in the analyses.

Social Support for Use of W-S-S

At the start of the analysis, two measures of social support for use of W-S-S were planned, a measure of information dissemination and another behavioral measure. Unfortunately, no direct measure of the information dissemination aspect of social support was possible because the responses to a question about discussing child care with other mothers was found not to be a valid measure of sharing information (see Appendix C for details).

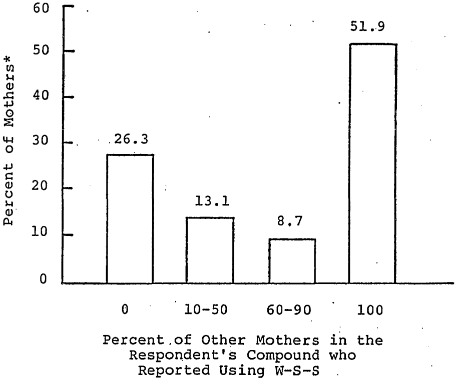
The variable measuring social support for the adoption and use of W-S-S was derived from the behavioral measures, "What did you do first to treat the child's diarrhea? What did you do next?" For each woman in a compound where there were two or more mothers in the sample, the proportion of the other women who used W-S-S was calculated. For example, if in a three-mother compound, mother 2 used W-S-S but mother 3 did not, mother 1 would be assigned .5 on the social support measure (half the other women in her compound used W-S-S).

The distribution of this variable can be seen in Figure 6. In the cases of 52 percent of the women (248), all the other women in the compound used W-S-S. For 26 percent of the women (125), none of the other women reported using W-S-S. Two hundred-forty cases of the 677 in the sample were treated as missing cases in the analyses. These included mothers in compounds with no other women and mothers who were the only member of their compound to be interviewed in this sweep.

It was hoped that the large number of missing cases could be reduced by using the responses to the question, "Do any of the other women in your compound or family use t his W-S-S solution for the diarrhea of their young

Figure 6

Frequency Distribution of Level of Social Support for Use of W-S-S



*240 cases are missing.

children?" In this way, we would have some kind of measure of social support for mothers without other women living in their compound, through their reports of their family's use or nonuse of W-S-S. This measure was crosstabulated with the behavioral measure and the relationship was found to be non-significant at $p<.58$. Examination of the cells of the table showed that there was a tendency for women to over-report use of W-S-S by other members of their compound and family. For example, 72 percent of the women in compounds where none of the other women reported W-S-S use reported that others in their compound and family did use W-S-S. Seventy-nine percent of those in compounds where all the other women used W-S-S reported that other women in their compound or family used W-S-S.

This measure could possibly have been useful as a measure of a mother's perception of social support for W-S-S use. However, we were not certain if the mothers actually believed other mothers used W-S-S or if they were trying to give an answer that would be agreeable. Because of the lack of relation between the two variables, the only social support variable used was that measuring proportion of others using W-S-S and the number of missing cases remained high.

Social Support for Feeding Practices

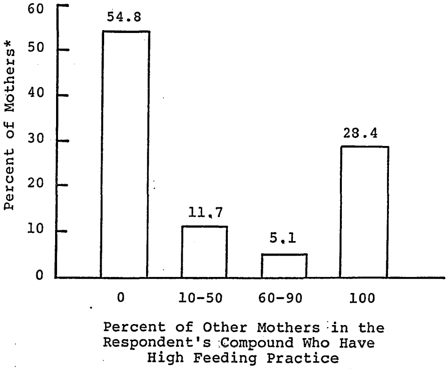
A similar behavioral measure was designed for social support of feeding practices. Scores on the feeding practice scale were recoded into low (0 and 1) and high (2 and 3). For each mother in a compound with two or more women in the sample, the percentage of other women in the compound with a high feeding practice score was determined.

The frequency distribution of social support for feeding can be seen in Figure 7. Over half the women lived in compounds where no other women had high scores on feeding practice, while 28 percent lived in compounds where all the other women had high feeding practice scores. One hundred and eighty-eight women in the sample were the only women in their compound (being members of small compounds with only one nuclear family), or were the only women interviewed in this sweep, and were considered as missing cases in the analyses.

This measure was compared to the responses to the question, "What do most of the women in your compound or family do when their children have diarrhea?" Most of the mothers reported that other women gave their children solids or both solids and pap (84 percent). Only 16 percent reported that other mothers they knew gave only liquids. When these responses were crosstabulated with the social support scores based on actual behavior of other women in

Figure 7

Frequency Distribution of
Social Support for Feeding Practice



* 240 cases were missing.

the compound, the relationship between the two was found to be nonsignificant ($p<.12$). Again, mothers overestimated other mothers' behavior. It is not known whether the mothers actually believed their friends and co-wives were feeding their sick children solids or if they were trying to give positive answers to the fieldworkers. The measure used in the analyses was the behavioral measure.

Access to Material Goods

One of the most frequently mentioned constraints to adoption of new techniques is inability to change because of lack of resources. Due to the importance of this constraint, it was attempted to measure wealth or access to material goods in several ways and at different levels. At the level of the individual mother, two measures were available: mother's access to the ingredients necessary to make W-S-S and mother's access to money of her own. Measures of compound-level wealth were determined through number of animals in the compound and nutrition of the mother. Only two of the measures could be used in the analyses: mother's personal income and compound wealth (animals). A discussion of why the other two variables were not used is in Appendix C.

Personal Income

One measure of whether an individual mother has the resources to buy salt and sugar or, in the case of feeding after diarrhea, to get special or extra foods is the woman's access to money of her own. In a communal social system such as that in The Gambia, wealth and food are generally shared within the family or compound. Access to sugar, salt and other foods tends to be controlled at the compound level by the head of the compound or the head wife. However, women do have sources of income of their own. Many women in the rural areas have their own rice fields from which they may sell the produce. Women from the Serahuli tribe in the eastern part of the country are known for having personal wealth which they keep in the form of large gold earrings. Other women may have an income from a small business. Thus, when a Gambian woman wants more food for her child or sugar and salt for W-S-S, she may try to get it from communal stores or buy it herself.

As there were no direct measures of a woman's ability to obtain special foods, the measure used in this study was having a personal income from the sale of crops or a small business. The women in the sample were asked whether they had any fields of their own and if they sold any of the crops from these fields. If the woman had no fields of her own, she was asked if she had a small business. Ninety percent of the women reported having a field of their own and three quarters of these women reported selling some of their crops. Only twenty-eight women reported having a business. The final variable used in the analyses had the following frequency distribution.

Table 13

Frequency Distribution of Personal Income Variable

	Number of Mothers	Percent Mothers
Woman Has Access to Own Money	508	75
Woman Doesn't Have Own Money	162	24
Missing Cases	7	1

Compound Wealth

As discussed previously, wealth of the family is often one of the most important factors explaining access to the mass media, level of knowledge, and innovative behavior. The best predictor of wealth in farming communities is amount of land owned. However, this is usually a very difficult question to ask because people are often unable to estimate the amount of land they own or they are unwilling to talk about it because of fears of taxation.

In The Gambia, an added problem is the communal ownership of land. In his study of the Mandinka people, the most populous tribe in The Gambia, Shaffer (1980) suggested number of animals as a measure of wealth. As part of the initial Stanford interviews, the mothers in the sample were asked in May, 1982 the question, "What animals do you own? How many?" As most of the animals in The Gambia are owned by men, it was assumed that the answers given were for number of animals owned by the nuclear family. This was supported when the answers of women with the same husband were compared and generally found to be the same.

The results were: 72 percent reported having poultry, 52 percent had goats, 50 percent had sheep, 44 percent had donkeys, 32 percent had cows, 15 percent had horses, and 9 percent had oxen. One-hundred and ten of the 677 women in the sample used in this study had not been asked this question because they were not interviewed in this sweep. They were considered missing on this variable. There was wide variation in the number of animals women reported, as can be seen in Table 14.

The variation is not surprising considering differences in geographical division. When ownership of animals was compared by division, significant differences ($p<.0001$) were found in ownership of poultry, cows, donkeys, oxen, and horses.

Table 14

Figures on Animal Ownership

Type of Animal	Numbers Owned (Range)	Mean Number	Standard Deviation	Number of Don't Knows
Poultry	0-98	6.4	8.9	54
Sheep	0-30	2.9	4.4	34
Goats	0-20	2.4	3.4	28
Cows	0-80	3.3	9.6	51
Donkeys	0-10	.9	1.4	0
Oxen	0-8	.3	1.1	0
Horses	0-5	.2	.6	0

Seventy-eight of the mothers responded "don't know" to one or more of the questions about the number of animals owned. Added to the 110 mothers who were not interviewed about animals, this would have resulted in 188 missing cases. Therefore, whenever possible, number of animals was estimated, using predictions based on the number of animals they did know (see Appendix C for details). Forty-nine cases were recovered in this way, reducing the number of missing cases to 139.

The next step in developing the wealth measure was to put the values in monetary terms by multiplying the number of animals by their price and adding the values for each woman to develop a scale of total animal wealth. This scale (displayed in Figure 8) ranged from zero to 24,760 Dalasis (approximately $10,000 U.S.). The mean of this scale was 1500 Dalasis, with a standard deviation of 3122 Dalasis. The median was 450 Dalasis.

When the scale was tested for inter-item reliability, the Cronbach's alpha was found to be .173. However, the standardized alpha was .59, the difference being due to the large difference in prices of animals, poultry costing 3 Dalasis, whereas horses cost 600 Dalasis. This approached the conventional minimum requirement of an alpha of .60, indicating that the Dalasi values of animals owned did measure the same underlying concept. Therefore, the compound animal wealth scale was used in the analyses.

The validity of this variable as a measure of wealth was tested by comparing it to the interviewers' assessments of the condition of the family's house in May 1982. The interviewers reported that 49 percent of the women lived in houses in very good condition, 47 percent lived in houses in average condition, and 4 percent lived in houses in poor condition. A Kruskal-Wallis one-way analysis of variance test[5] was done comparing the scale of wealth among women with very good housing and those with average or poor housing. The two groups were found to have significantly

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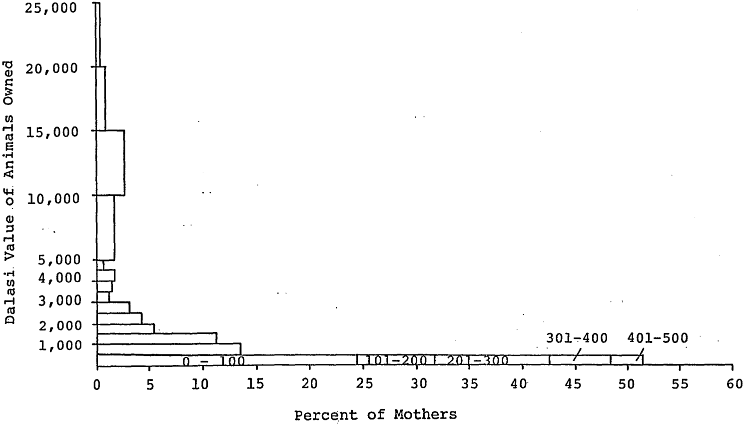
[5]This nonparametric test was used instead of one-way analysis of variance. The latter was not appropriate because the variances in the scores between the two groups were not homogeneous.

Figure 8

Frequency Distribution of Compound Wealth:

Value in Dalasis of Animals Owned by Mother's Compound



different ranks in scores on the wealth scale ($p<.02$). The mean value of animals in compounds with very good housing was 1784 Dalasis, whereas women in average or poor housing had a mean of 1258 Dalasis' worth of animals in the compound.

In the final analyses, two measures of access to material goods were used, the mother having an income of her own and a measure of compound wealth, based on ownership of animals.

Access to Time

Four measures of access to time were potentially available. As described previously, women in The Gambia tend to have very little free time overall because of the many duties they perform in the fields and the compound. However, it was thought that the following measures would distinguish some differences between individual mothers: season in which the child had diarrhea (women have more farm work during the rainy season), amount of time spent in the fields each day, number of young children requiring care, and help available. Only the last two were found to be valid measures, and they are discussed below. Season and time in the fields are discussed in Appendix C.

Number of Children Under Six Years

One possible distinction between mothers' availability of time was the number of small children in their care. Children under six need more care from the mother than children of older ages. Discussions with the fieldworkers and Peace Corps volunteers suggested that these are the years when children receive the most attention and care from adults. During the enumeration of compounds at the beginning of the evaluation, the Stanford team had collected information on all members of the sample compounds and their ages. Table 15 shows the frequency distribution of number of children under six.

Table 15
Frequency Distribution of
Number of Children Under Six

Number of Children Under Six Years Old	Percent of Mothers
1	35.9
2	37.1
3	20.2
4	4.4
5	0.6
6	0.7
Missing	1.0

These figures were used to develop a two-value measure of child-care time required from the mother: mother had one child under six (36 percent) and mother had more than one child under six (63 percent).

Help Available to the Mother

The literature and interviews with informants in The Gambia indicated that sources of help for a mother are her female children and co-wives. Daughters from eight to twelve years help their mothers with care of the younger children, while daughters thirteen and over help with work in the fields and with household chores. Co-wives tend not to help with child care or work in the fields. However, in families with more than one wife, the wives take turns with the cooking and taking care of their husband's laundry, cleaning his hut, and other jobs. As cooking takes a substantial amount of time, sharing cooking responsibilities frees up time for other activities.

A variable measuring whether the woman had help or not was developed from the Stanford enumeration data. A mother was distinguished as having some help if she had a daughter over eight or if she had a co-wife. The resulting variable showed that 70 percent of the mothers had some form of help with their work, 25 percent had no such help, and 5 percent could not be assigned because of missing values.

Another question considered for use here was the question asked in the September 1983 interview about whether the mother had anybody in her compound who could take care of her children if she had to be away. This was not used because it was a much more limited measure than the help available variable, measuring only access to help with child care rather than access to child care and help in the compound and the fields.

Status of the Mother and Child in the Family

Status of the mother in the family and the compound was a measure of a woman's ability to obtain special foods and her relative freedom to try new kinds of behavior. The Gambian social system is highly stratified, particularly along lines of age and sex. Men have higher status than women, older women have higher status than younger women, wives who have been in the compound longer generally have higher status than new wives. Probably the best measure of a woman's status in the family is whether she is the favorite wife. However, this is almost impossible to measure. Age of the woman was considered as a measure of status, however, it was discarded because of lack of knowledge about how age would work as a measure of status and because of women's uncertainty about their age.

The final measure used was whether the woman was the first wife of the compound head. In the nuclear family, whether she is the favorite or not, the first wife has status just from her position and has some control over the other wives in the family. Although all women's activities are highly constrained by tradition and a communal life-style with little privacy and little emphasis on individual action or thought, first wives do seem to have more decision-making power and may also have more access to information. The first wife of the compound head has special status in the compound, due to the position of her husband. When women were interviewed in pretesting, the interviewers were introduced first to the first wife of the head of the compound, who acted as hostess for the compound. Thirty-one percent of the women were first or only wives of the compound head and sixty-six percent were not. In this case, data for 23 women were missing.

For status of the child, as for status of the mother, the best measure would be whether the child is the mother or father's favorite child, something that is hard to measure. Two other possible measures were age of the child and sex. In studying use of W-S-S, age was not used as a measure of status because no variation was expected within the age range of 0-5 years. Discussions with Gambians working on the project and with Peace Corps volunteers suggested that very young children (under five) and older children (8 years and above, the age at which they start helping their parents with child care and work in the fields) are treated relatively well. The children with the lowest status in the compound are those from five to seven years old. It seemed that health treatment of a one-year old would not be different from that of a three-year old because of status differences. This is supported by Van Etten's study in Tanzania (1976), which showed high use of health services for children of all ages up to five years old, but little difference between children of different ages within this group.

The final measure used in the study was the gender of the child treated. Overall, females in The Gambia have lower status than males. Peace Corps volunteers reported that boys generally seem to be treated better than girls. The difference in status is also seen in the traditional food distribution patterns. Men and their older sons eat first, then the women, girls and younger children eat what is left, or, if the family eats together, often the men and older boys will have a different bowl in which there is a larger portion of sauce and protein.

Fifty-one percent of the children last treated for diarrhea were male and forty-nine percent were female. In two cases, the mother could not identify the child she had last treated, thus these cases were missing.

Experience with Outside Ideas and Techniques

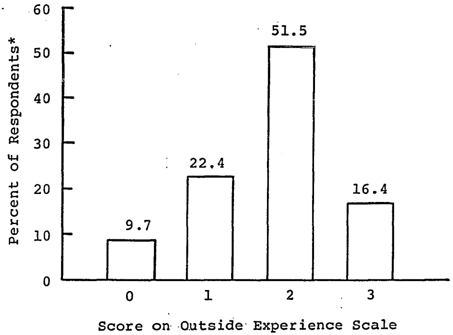
A number of questions asked during the campaign and in the interview for this study were possible measures of the mother's exposure to ideas and ways of doing things that are different from the traditional Gambian way. Some measured the individual mother's exposure to new ideas, others were compound-level measures. At the individual level, there were questions on whether the mother had been to Banjul (the capital city), whether she had seen a movie recently, whether she had seen pictures in a book, and her educational level. When the responses to these questions were examined, it was found that most mothers gave the same responses. These findings were not surprising. It had been expected that there might be little variation in women's experiences in a culture based on communal families and living.

Therefore, variables measuring compound-level experience were used: whether someone from the compound had been to Toubabadou (the West, including Europe and the U.S.A.), whether the people in the compound used a hoe or the more modern plow, whether there was a septic tank or a latrine in the compound, and the educational level of the compound members. It was expected that women in compounds where a member had been to the West would have heard about different lifestyles and ideas from the traveler. The education measure used was maximum number of years of schooling achieved by a member of the compound. Only education at the government schools, which are modeled on the Western school system, was considered. The Koranic schools primarily teach boys how to read the Koran and stress the conservative values of Islam, while in the secular government schools, in addition to learning to read, write, and figure, children are exposed to foreign languages (primarily English) and to geography and history of countries outside their own village and The Gambia.

A scale of these five items was attempted, but was not reliable (see Appendix C). The final measure used was a scale using three of the items, maximum years of education, (divided into 1-6 years and 7 or more years of education), having a latrine in the compound, and having a compound member who has been to the West. Although, this scale did not meet the requirements for a summative scale (Cronbach's alpha being .39), it was found to follow the Guttman scale model, the coefficient of scalability being .64. This resulted in an outside experience variable ranging from 0 to 3. See Figure 9 for the frequency distribution. The mean score on the outside experience scale was 1.7, with a standard deviation of .84.

Figure 9

Frequency Distribution for
Experience with Outside
Ideas and Techniques



* 91 cases were missing.

Pictorial Ability

The variable measuring the mother's ability to interpret the flyers and posters used in the campaign was developed by Sikandra Spain (1983). In her interviews, women were shown a set of drawings of several familiar objects (an eye drawn out of context, a magnified mosquito, a fire) and a scene of two women in a Gambian village going to the well. They were then asked twelve questions designed to test their ability to recognize items and to interpret a scene and action in the scene. After tests for reliability, Spain used seven of the twelve measures to create a scale of pictorial ability. These items were:

1) identification of the eye,
2) identification of the fire,
3) identification of the grass in the scene,
4) identification of the road,
5) inference that the woman in the scene was coming from, outside the picture,
6) recognition of the woman as closer to the front house, and
7) recognition of the two houses as equal in size.

The same seven-item scale was attempted for this study. However, when the scale was tested for inter-item reliability, it was found to be unreliable (Cronbach's alpha=.56). This was due to one of the items, (inference that the woman was coming from outside the picture) which did not correspond well with the other items and was removed. Spain had found this in her scale also, however, this item had not reduced the reliability to less than .60, as it had in this study. The difference is due to differences in the samples in Spain's study and this study. Because of possible interviewer bias in the measurement of her dependent variable, Spain had eliminated the interviews of two of the fieldworkers from her analyses.

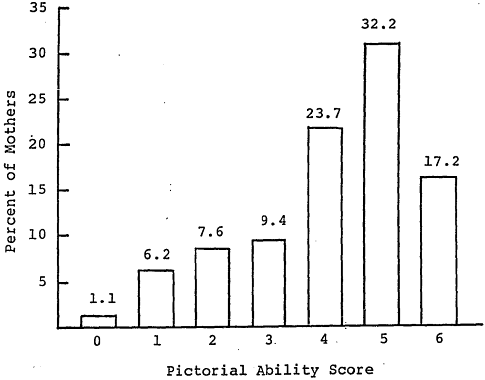
The pictorial ability scale used in this study ranged from zero to six, with 49 cases missing (see Figure 10). The mean score was 4.2 with a standard deviation of 1.5. Tests for reliability showed the scale to be reliable, with a Cronbach's alpha of .64.

Compound Literacy

Another measure of the woman's ability to understand or interpret the flyer was literacy. Before the campaign, the women in the sample were given a literacy test or, if they reported they couldn't read, someone they identified as being able to read was given the test. The individual could take the literacy test in Arabic, English, French, Wolof, or Mandinka. He or she was handed a card upside down with three lines of printing on it. The first line consisted of a letter, the second line was a word, and the third line was a sentence. In this study, the person was regarded as literate only if he or she turned the card, and read all three lines.

Figure 10

Frequency Distribution of Scores on Pictorial Ability Test



Only 18 women in the sample could read all three lines, thus a measure of the mother's reading ability wasn't possible. However, if another person in the compound could read, she would be able to call on him or her to help if she had trouble with the flyers. Twenty-seven percent of the mothers were either literate themselves or had someone in the compound who was literate. Forty-six percent of the mothers did not have someone in the compound who could read. Twenty-seven percent of the cases were missing because the person who could read was unavailable for the test (n=32) or because they had not been interviewed in the pre-intervention survey, when the literacy test was given (n=151).

The literacy variable was compared with the education variable to see if the two were essentially the same. Having a member of the compound with four or more years of education at a government school was significantly related to having someone in the compound who could read in one of the five languages ($p<.007$), however the relationship was not very strong (gamma was .25). This was due primarily to people having no secular education, but being able to read Arabic and Mandinka (which is written in Arabic) because they have been to a Koranic school. Compound literacy was used in the analyses, as well as education (as part of the outside experience scale), because it was decided that the two variables were not measuring the same thing.

Salience of Diarrhea

Salience of diarrhea as a problem was measured by the mother's perception of the danger of diarrhea. In March/April 1982, the mothers had been asked if diarrhea could kill. In August 1982, women were questioned about all their pregnancies and asked the cause of each child's death. This provided a measure of whether the woman had had a child that had died of diarrhea. Originally a three-value variable had been planned: mother said child can't die from diarrhea, mother said child can die but has not had a child of her own die from diarrhea, and mother has had a child die from diarrhea. This was not possible because almost all the mothers said a child could die of diarrhea.

The salience measure used was mother's report that one or more of her children had died from diarrhea. Forty-one percent of the mothers reported that a child had died of diarrhea and 48 percent reported other causes of death or had no children who had died. Seventy-four women were not questioned in this interview sweep and were considered as missing.

Prior Information about W-S-S

The health department in The Gambia had been recommending W-S-S for children with diarrhea before this concerted campaign. Therefore, some women were already aware of a medicine that could be made at home with common household supplies. In the pre-intervention interviews, the Stanford evaluators asked the mothers, "Do you know about a medicine for diarrhea that is made at home with water, sugar, and salt?" Forty-seven percent of the women reported that they did know of such a medicine, thirty-one percent did not, and 22 percent of the responses were missing.

Level of Village Development

Some villages may provide an atmosphere more conducive to behavior change among the individuals living in the village than others. A number of measures of relevant village characteristics were available in the Stanford interviews and from questions asked of the fieldworkers about the villages in which they were interviewing. These were:

- Size of the village (number of compounds and population)
- Availability of health care
- Proximity to a main road
- Schools (government and Islamic)
- Services (market, ferry, phone, public pickup of refuse)
- Outside aid projects (agriculture, education, and health projects in the village, presence of a Peace Corps volunteer)
- Government programs in the village (agricultural projects, fisheries)

After examination of these potential measures, it was decided to construct a village development scale using availability of health care, proximity to a main road, schools, and outside projects -- four characteristics that were expected to be the most important factors in supporting behavior change in health. All these characteristics relate to the availability of information about ideas, techniques, and ways of life different from that traditional to the village. Health services, schools and foreign projects bring in new ideas and techniques, while proximity to a road allows more outsiders to visit the village and the people of the village to travel more easily elsewhere.

Each village was coded as to whether or not it had a health center or was visited by a health team, had a school, had any foreign aid projects, and was on a main road. A summative scale was constructed and tested for inter-item reliability. The scale was found to be reliable, with a Cronbach's alpha of .71. The frequency distribution, shown in Figure 11, indicates that there was variation in the villages in terms of level of development and outside influences (as had been planned by Stanford in choosing the villages for the sample).

Figure 11

Frequency Distribution of Level of Village Development Measure

CHAPTER 4

RESULTS: KNOWLEDGE AND BEHAVIOR

The primary question of this dissertation was, Under what conditions does knowledge about health practices (W-S-S and feeding) lead to actual change in behavior? A second question was, Under what conditions can women learn this information from a radio campaign? In this chapter, the former question will be examined, first for W-S-S knowledge and use and then for feeding knowledge and behavior. The second question will be discussed in the next chapter. Because of the availability of all the Stanford data from before and during the campaign, it was possible to do analysis of the relationships over time in addition to cross-sectional analysis of the data collected in September 1983. This analysis was only done for W-S-S knowledge and behavior and not for feeding. Because of changes in the feeding messages during the campaign, equivalent measures across time could not be found. The results of the analyses will be presented in the order in which they were done, examining the bivariate relationship between knowledge and behavior, then entering the control variables, and finally examining the interaction of the conditioning factors and knowledge.

Knowledge about W-S-S and Use of W-S-S

Results of the Bivariate Analyses

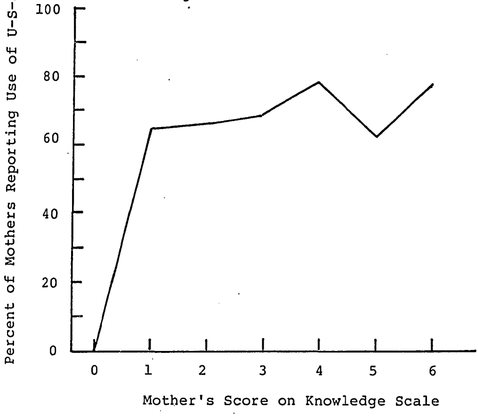
Relationship between Knowledge and Practice

The first step in the analysis was to test the significance and linearity of the relationship between knowledge (using the 7-point knowledge scale described in the previous chapter) and reported use of W-S-S for the last case of diarrhea. The test for linearity was done to determine whether multiple regression analysis would be appropriate. The results (shown in Figure 12) indicated that knowledge and W-S-S use were significantly and positively related (F was significant at $p<.0001$, r square was .15).

However, the relationship was not linear (significance of linearity and of deviance from linearity were both $p<.0001$). As can be seen in the figure, there was a steep increase in use of W-S-S between mothers who knew nothing about W-S-S and those who knew anything at all (who answered one question about W-S-S correctly). After this initial jump, use of W-S-S climbed slowly until a knowledge score of 5 was reached, when there was a drop in reported use which did not hold for women with perfect knowledge scores (six).

Figure 12

Bivariate Relationship Between
Knowledge Scale and Use of W-S-S



Linearity of the knowledge and practice relationship was tested for only those women with some knowledge (those represented in Figure 12 by the section of the line to the right of the initial increase from 0 to 1). This showed that the relationship between knowledge and practice among women with some knowledge of W-S-S was also not linear (significance of linearity was $p<.18$ and of deviance from linearity was $p<.002$).

These problems in linearity might have been overcome by condensing the knowledge scores into three groups: those with no knowledge, those with scores from 1-3 and those with scores from 4-6. However, this was not appropriate given the dip in W-S-S use for those with a knowledge score of 5. Thirty-seven percent of the women with a score of 5 reported that they didn't use W-S-S in the last case of diarrhea treated. The majority reported instead that they went to the health center.

These cases were examined to try to find an explanation for the dip. Almost all of these mothers were from two divisions, the North Bank and the Lower River divisions, and the largest numbers were from two villages, Ker Ngor (a Serere village off the main road on the North Bank, with no foreign projects) and Jassong (a Mandinka village, off the main road in the Lower River division and with a USAID farming project). From what is known about these villages, they didn't seem to be particularly different from other villages in the sample where mothers did use W-S-S. Overall, mothers with scores of five on the knowledge scale were much like women with scores of 6, except that a greater percentage reported not using W-S-S. It was thought that these mothers might also have inconsistent scores on the questions about feeding knowledge and behavior. However, when their responses were compared to those of the women in the rest of the sample, no difference was found in the feeding relationship.

The lack of clear differences between these mothers and other mothers in the sample suggests that the dip in W-S-S use was due to measurement bias. The interviewers in the two divisions identified had been ill during the interview sweep and had had less time to complete their interviews. The majority of the respondents who had high knowledge scores and but didn't use W-S-S were interviewed after the fieldworkers' illnesses, on days when the fieldworkers were completing large numbers of interviews each day (up to 15 or 17 a day). However, it was not possible to simply eliminate these cases from the analysis, because not all women interviewed in these villages on these days reported no use of W-S-S and because the cause of the inconsistent answers is not fully understood.

As can be seen in the figure, the difference in the proportion of users at the different levels of knowledge was not very great after the initial rise. The eta squared of the knowledge and practice relationship, using only women with knowledge scores from 1 through 6, was only .03. It seems that, if a mother could correctly answer one question about W-S-S (generally the question about the formula for making W-S-S), she was almost as likely to report using W-S-S as a woman who could answer all the knowledge questions. Because of the linearity problem and the lack of distinction at the higher levels of knowledge, the knowledge variable was condensed to two values, no knowledge (0) and some knowledge (1-6). The frequencies of the dichotomized variable are below.

Table 16

Frequencies of Dichotomized Knowledge Variable

Knowledge		Percent of Mothers
0	(mother hasn't heard of W-S-S or can't answer any questions correctly)	14.6
1	(Scores of 1-6 on previous knowledge scale)	85.4

The conclusion that the differences in knowledge scores from 1 to 6 had little implication for behavior was also supported by the results of tests of the relationship between radio exposure and knowledge. It was found that the correlation of the relationship between radio exposure and the full knowledge scale (r=.22) was almost exactly the same as that for radio exposure and knowledge when knowledge was dichotomized (r=.24).

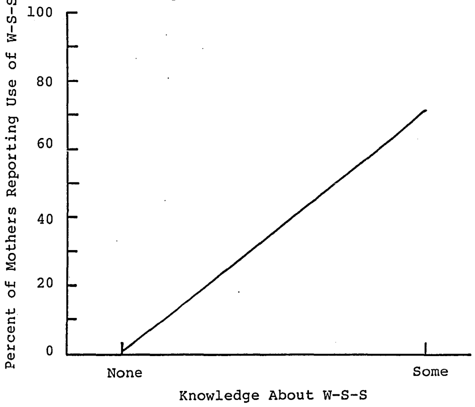
The relationship between knowledge and W-S-S use was tested again and found to be positive and significant (the correlation coefficient was .51, significant at p<.0001). The relationship can be seen in Figure 13. Not surprisingly, women who said they didn't know about W-S-S were unlikely to report having used it. Seventy-two percent of those who had some correct knowledge about W-S-S reported having used W-S-S. This is not a very interesting finding in itself. However, this basic relationship was only examined as one step in the process of examining differences between mothers who knew about W-S-S and used it and those who didn't use it.

Relationship between Main Variables and Control Variables

Other bivariate analyses performed were between knowledge, practice and the factors that might influence both, leading to spurious interpretations of the relationship: access to time and material resources, social support, health-worker contact, Red Flag volunteer contact, salience of diarrhea, compound literacy, mother's status, outside experience, and level of village development. Because several of these control measures had large numbers

Figure 13

Bivariate Relationship Between Two-value Knowledge Measure and Use of W-S-S



of missing cases, it was important to determine if they could be eliminated from the analyses to reduce the total number of missing cases.

All the control variables were crosstabulated with W-S-S knowledge and use. Tests for significance of the relationships indicated that all the variables had significant relationships ($p<.05$) with both knowledge or W-S-S use, except availability of help, status of the mother, salience of diarrhea, compound wealth, and compound literacy[6]. The last three had over 100 missing cases each, thus they were eliminated from the analyses. Status of the mother was also not included in the analyses because it resulted in the loss of 33 cases. A table giving the statistics for each of the crosstabulations is in Appendix D.

Results of the Multivariate Analyses

The analysis plan for this dissertation proposed multivariate analyses using stepwise multiple regression, controlling first for interviewer/division and possible

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[6]Although compound literacy had a highly significant relationship with W-S-S knowledge ($p<.002$), it was not included in the analyses because its use would have resulted in a loss of 125 cases. In order to insure that this elimination was not biasing the results, the analyses were performed using compound literacy, and the results were found to be essentially the same as for the analyses not including compound literacy.

extraneous factors explaining the relationship, then determining how much of the remaining variance in W-S-S use was explained by knowledge. Because both W-S-S knowledge and use became dichotomous variables (as described in Chapter 3 and the previous part of this chapter), multiple regression analysis was not appropriate.

The analytic method used was stepwise discriminant analysis, using the control variables and knowledge to discriminate between users and nonusers of W-S-S. Like multiple regression analysis, the discriminant procedure will enter variables in steps permitting the researcher to specify which variables to enter first (e.g., controls, then knowledge). At each step, the variables are tested against those already in the equation and against the other variables requested (taking inter-correlations into account) to see if they make a significant contribution to the discriminant function. This allows the researcher to test for the significance of each individual variable as a predictor, controlling for other variables, and to identify the variables which contribute most to the prediction or those which make no contribution.

The canonical correlation was the measure used to examine the association between the groups (users and nonusers) and the discriminant function composed of the hypothesized controls and knowledge. When the canonical correlation is squared, it can be thought of as a parallel measure to r squared in multiple regression analysis, which explains the proportion of variance in the dependent variable explained by the independent variables.[7]

Table 17 shows the results of the discriminant analysis on use or nonuse of W-S-S at each step. Each block of variables, interviewer/division, control variables, and knowledge, made a significant contribution to the discrimination between W-S-S users and nonusers. When knowledge was added to the discriminant function, it was found to make a significant contribution in the discrimination over and above the effects of the controls, increasing the variance explained by sixteen percent ($p<.001$).

The high discriminant function coefficients[8] for interviewer/division (reported in Appendix D) reinforced the finding that interviewer/division variables was an important predictor of W-S-S use, and that it had been necessary to remove this influence at the beginning of the analyses. Level of village development and health-worker

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[7]The canonical correlation "tells us how closely the function and the 'group variable' are related.... If we reverse the logic somewhat, we can interpret the canonical correlation squared as the proportion of variance in the discriminant function explained by the groups. (In one-way analysis of variance terminology, the canonical correlation would be called eta, the correlation ratio.)" (Klecka, 1975., p. 442).

[8]Discriminant function coefficients are analogous to beta weights in multiple regression and explain the relative contribution of the variable to the discriminant function.

Table 17

Results of the Discriminant Analysis for W-S-S Knowledge and Practice

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.17	p<.001
Control Variables Health-worker Contact Village Development Outside Experience Red Flag Contact Time (Number of Children under 6) (Not entered: Time [Help Available], Personal Income)	.23	-----*
Knowledge about W-S-S	.39	p<.001
(n=529)		

*The significance levels of the block of control variables will not be listed in the tables of discriminant analysis results. The disciminant analysis output provides statistics allowing one to determine the significance of the contribution of each individual control variable, but not of the contribution of the block as a whole. However, only variables that add significantly to the discrimination are added, thus we can assume that the block as a whole makes a significant additional contributuion at p<.05.

contact were the strongest predictors among the hypothesized controls. Two of the control variables, time (availability of help) and personal income were found not to predict significantly.

Social Support

There was a possibility that the relationship between W-S-S knowledge and behavior would actually be due to social support, thus the social support variable was included in the list of control or third variables. However, because the social support variable only applied to a subsample of the mothers interviewed (excluding women who were the only mother in the compound and women in compounds where none of the other wives in the sample had been interviewed in the September 1983 sweep), this variable was analyzed separately. The same discriminant analysis was repeated for the subsample, this time including level of social support in the control variables. The results were very similar to those from the analysis of the larger sample (see Table 18). Knowledge made a significant contribution to the discrimination over and above the controls ($p<.001$), adding sixteen percent to the variance explained. The control variable with the greatest discriminating power was social support; mothers were more likely to report using W-S-S if they lived in a compound

Table 18

Results of the Discriminant Analysis for W-S-S Knowledge and Practice (Including Social Support)

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.20	p<.001
Control Variables Health-worker Contact Social Support Village Development Outside Experience (Not entered: Contact with Red Flag, Time [Number of Children under 6 and Help Available], Personal Income)	.25	------
Knowledge about W-S-S	.41	p<.001

(n=352)

where other mothers used W-S-S. As with the larger analysis, availability of help and personal income were not significant discriminators. In this analysis, time available (number of children under six) and Red Flag worker contact also were not entered due to lack of discriminating power.

The major finding in this analysis and in the discriminant analysis of the larger sample was that knowledge was significantly associated with W-S-S use over and above the influence of the controls. However, of greater interest was whether knowledge influenced behavior only under certain conditions or for certain mothers. This question was examined next. These analyses also did not indicate whether knowledge led to behavior change or vice versa. This question was studied in the analyses over time.

Conditions for Adoption of W-S-S

The conditional variables examined were the interaction between knowledge and health-worker contact, Red Flag worker contact, mother's status, time available, experience with outside ideas, level of village development, compound literacy, and social support. The conditional relationships between knowledge and behavior were examined using analysis of variance.

The question here was, did the hypothesized conditioning variables add anything to the explanation of W-S-S practice <u>over and above</u> that explained by the control variables? Once the influence of possible third variables had been removed, did the interaction between knowledge and, for example, health-worker contact make a significant difference in use of W-S-S?

In these tests, the dependent variable was not simply use or nonuse of W-S-S, but the part of use or nonuse not already explained by interviewer/division and the control variables. This dependent variable consisted of the residuals from a multiple regression analysis, using W-S-S practice as the dependent variable and entering the fieldworker/division variables and the control variables as independent variables. Because many of the conditioning variables had also been hypothesized as possible control variables, a separate regression equation was made for each conditioning variable, in which it was excluded from the regression statement. For example, to calculate the residuals used in testing the interaction between health-worker contact and knowledge, W-S-S use was used as the dependent variable in the regression equation and all the controls except health-worker contact were entered as independent variables.

The significance of the relationship between the interaction of knowledge with the conditioning variables and W-S-S use was then tested using two-way analysis of variance with the use residuals as the dependent variable and knowledge and the conditioning variable of interest as the independent variables. The significance level of the interaction effect was then examined to determine if the variable in question had a conditioning effect on the relationship between knowledge and practice. Because the residual knowledge scores are difficult to interpret, the relationships of the significant conditioning variables will be illustrated here using graphs derived from cross-tabulating practice and knowledge while controlling for the other conditioning variable. In most cases, although the other controls are not included, this adequately represents the conditioning relationship. The figures using the residual knowledge scores are included in the appendices.

Only two interactions were found to be significant: personal income with knowledge ($p<.06$) and village development with knowledge ($p<.02$). (See Table 19 for the significance levels of each interaction tested). The conditioning effect of personal income on the relationship between knowledge and behavior was the opposite of what had been hypothesized. Instead of mothers with an income being <u>more</u> likely to use W-S-S if they knew about it, they were <u>less</u> likely to have used W-S-S for the last case of diarrhea treated. Women with no personal income from the sale of crops or handicrafts were more likely that the

Table 19

Results of the Significance Tests of the Conditioning Relationships between Knowledge and W-S-S Use

Conditioning Variable	F	Significance of F
W-S-S Knowledge with:		
Village Development	5.1	p<.02
Personal Income	3.5	p<.06
Compound Literacy	2.3	p<.13
Time (Help Avail.)	.72	p<.40
Social Support	.77	p<.46
Red Flag Contact	.50	p<.48
Status of Child	.31	p<.58
Compound Wealth	.26	p<.61
Status of Mother	.06	p<.82
Time (Num. Children)	.02	p<.90
Salience of Diarrhea	.02	p<.90
Health-worker Contact	.001	p<.98

others to use W-S-S if they knew about it. Figure 14 shows this relationship and the accompanying table gives the mean scores on the W-S-S residuals used in the tests for significance. (A graph of the relationship using the residual scores is in Appendix D).

A possible explanation for this finding is that women with money of their own can afford remedies that cost money (medicines and going to a local healer or marabout). The AED and Stanford preliminary investigations found that Gambian mothers preferred injections and pills as treatments for diarrhea and that they were willing to spend quite a lot of money on medicines and charms for their children. This explanation was checked by crosstabulating personal income with whether the mother gave her child a treatment with no cost (herbal teas, W-S-S, or a trip to the health center) or a treatment that cost money. The relationship was significant and positive ($p<.002$, gamma was .47), indicating that mothers with a personal income were more likely to use remedies that cost money than were mothers without a personal income.

Another issue here is that it may have been easier for mothers with no income to adopt W-S-S because this practice wasn't supplanting the previous practice of buying medicines. Using W-S-S is similar to using teas made at home for no cost and a visit to the health center during the campaign would result in a recommendation to use W-S-S.

Figure 14

Interaction Effect of Personal Income
and Knowledge on Use of W-S-S

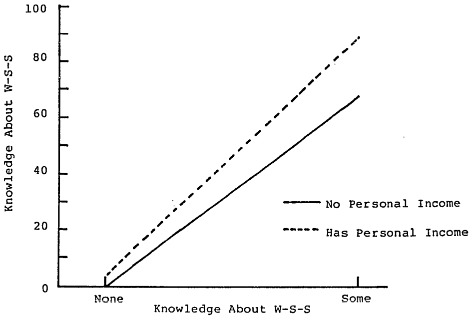


Table 20

Mean Scores on W-S-S Practice Residuals
by Knowledge Level and Level of Personal Income

Knowledge About W-S-S	Personal Income: No	Personal Income: Yes
None	-.48 (23)	-.35 (55)
Some	.16 (116)	.09 (355)

It seems that the campaign did not completely succeed at changing mothers' preferences for pills and medicines and in convincing them to use W-S-S instead. Even if she had information about W-S-S, if a mother had the money, she was likely to choose another remedy.

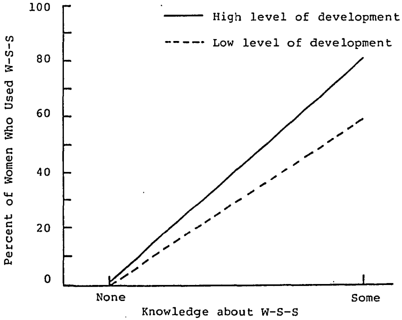
The second significant conditioning relationship was between knowledge and level of village development (having a health center, school, and foreign projects in the village and location on a main road). In this case, the hypothesis was supported: women in villages with more development were more likely to use W-S-S if they knew about it than women in villages with less development (see Figure 15 and Table 21 and Appendix D). This suggests that villages with schools, health centers and foreign projects and on a main road provide more support for change in behavior, perhaps because more new ideas are introduced into these villages and the inhabitants are more aware of the possibilities for change.

W-S-S Knowledge and Practice Over Time

The cross-sectional analysis showed that W-S-S knowledge and use in September 1983 were positively and significantly related, even after controls were introduced for spurious causal interpretations of the relationship.

Figure 15

Interaction Effect of Village Development and Knowledge on Use of W-S-S



<u>Table 21</u>

Mean Scores on W-S-S Practice Residuals by Knowledge Level and Level of Village Development

W-S-S Knowledge Level	Level of Village Development: Low	Level of Village Development: High
None	-.41 (33)	-.46 (45)
Some	-.02 (206)	.15 (265)

However, this did not give an indication of causal direction of the relationship. Did knowledge about W-S-S lead to use, or did people who already used W-S-S learn more about it? The cross-sectional analysis also looked at knowledge and practice after 1 1/2 years of the campaign and didn't give a sense of how quickly change had occurred. Analysis of the relationship between change in knowledge about W-S-S and change in behavior over time addressed these issues. It also attempted to provide more understanding of the conditions under which knowledge about W-S-S led to its reported use. Did certain women change their behavior in response to knowledge earlier than others?

Data for this analysis were available from four time periods: March/April 1982 (Time 1), January 1983 (Time 2), March/April 1983 (Time 3), and September 1983 (Time 4). For Times 1 through 3, the responses used were to the Stanford questions:

- "Do you know about a medicine for diarrhea that is made at home with water, sugar, and salt?"

- "What did you do with your youngest child the last time that child had diarrhea?" If the mother said she treated the child herself, she was asked, "How did you treat the diarrhea yourself?"

For Time 4 the two-value knowledge and W-S-S practice measures used in the cross-sectional analysis were used.

The distribution of the W-S-S knowledge and use variables over time is presented in Figure 16. This shows a dramatic increase in both knowledge and reported practice between Times 1 and 2, with knowledge leveling off after this, while reported practice dipped at Time 3 then rose to a slightly higher level than at Time 2.

The dip in practice at Time 3 was unexpected and was further examined by looking at knowledge and practice over time for each division. The findings, presented in Figures 17 and 18, show that the results from Division 3 (Lower River) were very different from those of the other three divisions. Whereas knowledge over time in the other divisions increased up to Time 3 then decreased, in Division 3 there was a drop in knowledge at Time 3 (only 2 months after Time 2) and then a sharp increase at Time 4. The decrease in knowledge about W-S-S in the other three divisions toward the end of the campaign can be explained by loss of interest in the campaign or, perhaps, in being interviewed and also by a lower level of radio messages about W-S-S after Time 3. However, a drop in knowledge about W-S-S only two months after an interview in which a high proportion of the mothers knew about W-S-S, and then an increase at Time 4 to levels higher than those for the

Figure 16

Distribution of W-S-S Knowledge and Use Over Time

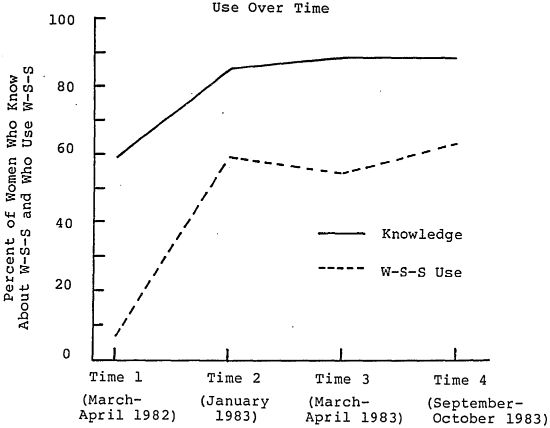


Figure 17 - W-S-S Knowledge Over Time for Each Division

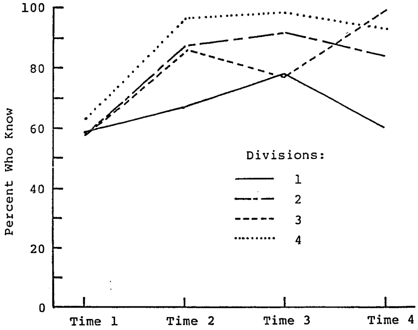
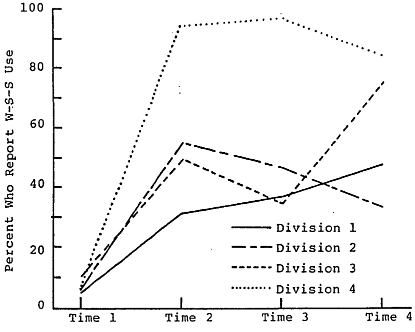


Figure 18 - W-S-S Practice Over Time for Each Division



other divisions, cannot be easily explained except by measurement bias.

The same type of pattern is seen with reported use of W-S-S. Although the pattern of responses over time was not the same for each division, in the other three divisions the patterns were internally consistent. In Division 3 it was not, with a dip at Time 3, then an increase to a very high level at Time 4. Because of other problems encountered with the interviews done by the fieldworker in Division 3, it was decided to eliminate the responses from this division from the analyses over time.[9]

The overall distribution of knowledge and practice over time for the three remaining divisions (480 mothers) is in Figure 19. Knowledge and practice increased drama-

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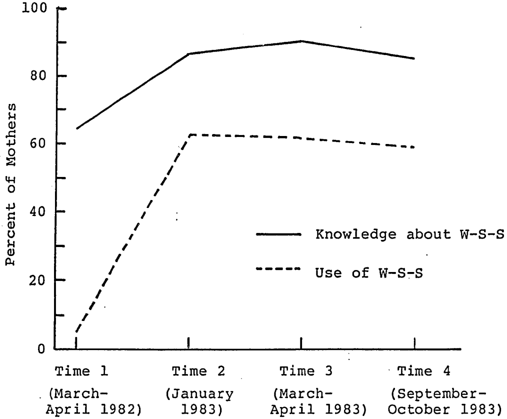
[9]The question then arises as to why the responses from Division 3 were not removed from the cross-sectional analyses also. This was considered. During the analyses for this dissertation, every attempt was made to retain as many cases as possible. In some analyses, up to half the available cases were lost due to missing values and differences in the parts of the sample interviewed at different times. The analyses over time were more sensitive to the possible bias introduced in the responses from Division 3 than were the cross-sectional analyses. As can be seen in the figures presented above, the results from Division 3 changed the overall frequency distribution of knowledge and, especially, practice over time. It is likely that use of the responses from Division 3 in the cross-sectional analyses inflated the knowledge and practice figures slightly, however, it did not seem to influence the relationship between the two. This was tested by trying the cross-sectional discriminant analyses using only the responses from Divisions 1, 2, and 4. The results were found to be essentially the same as those using the full sample. Thus, use of the entire sample for the cross-sectional analyses was felt to be justified.

Figure 19

W-S-S Knowledge and Practice Over Time
for Three Divisions



tically between Times 1 and 2, when the campaign focused on W-S-S. Knowledge reached a peak at Time 3, then began to decline. Reported use of W-S-S peaked at Time 2 and gradually decreased to a slightly lower level.

Results of the Bivariate and Multivariate Analyses

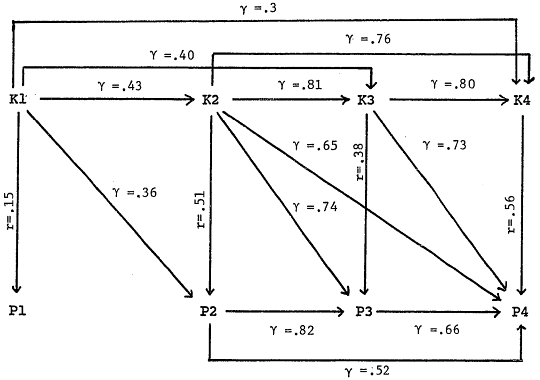
In developing the analysis plan, it was useful to design a visual representation of the possible relationships between the variables. The figure below presents this, indicating only the significant relationships between the variables (at $p<.05$) and giving the gammas. Also not labelled are the relationships between earlier practice and later knowledge (e.g., P1 -->K2). These relationships were not examined because they were not of interest to this study.

Although knowledge at Time 1 was significantly related to practice at Time 2 (gamma=.36), it was not related to practice at Times 3 or 4. Use of W-S-S at Time 1 was not significantly related to use at any of the later times, due to the very large number of women not using W-S-S before the campaign (96 percent).

As was expected, knowledge and practice within each time frame were significantly and highly related. However, these were not the relationships of interest. The major question here was, did change in knowledge over time lead

Figure 20

Significant Relationships between the W-S-S Knowledge and Practice Variables Over Time



to a subsequent change in practice? If early change in knowledge led to later change in behavior, there would be support for causation running from knowledge to practice.

This was studied using three step-wise discriminant analyses, one to study practice at Time 2, another for Time 3, and the third for Time 4. Only the responses of the 255 mothers who had been interviewed all four times were used.

Taking the analysis of behavior at Time 4 as an example, one can see the steps used in the discriminant equation below.

Dependent variable: W-S-S use at Time 4 (P4)

Step 1: Enter interviewer/division controls.

Step 2: Enter other control variables.

Step 3: Enter P1,P2, and P3 to remove the direct effect of early action on later action.

Step 4: Enter K1

Step 5: Enter K2 to see the effect of knowledge change between Time 1 and Time 2 on change in practice between the first three waves of interviews (P1, P2, P3) and the fourth wave (P4).

Step 6: Enter K3 to see the effects of change in knowledge between Time 2 and Time 3 on subsequent change in practice between Time 3 and Time 4.

Step 7: Examine the contribution that would b made by the conditioning variables if they were to be entered next.

Practice at Time 2

The results of the discriminant analysis indicated that the bivariate relationship between knowledge at Time 1 and practice at Time 2 was caused by third factors. Previous knowledge of W-S-S made no further significant contribution to later practice over and above the control variables (see Table 22). Interviewer/division made the greatest contribution to the discrimination between users and nonusers at Time 2, accounting for 25 percent of the variance.

Practice at Time 3

Examination of the relationship between change in knowledge about W-S-S from Time 1 to 2 and W-S-S use at Time 3 showed similar results: K1 was not associated with the later behavior, and the change in knowledge between Times 1 and 2 also made no significant addition to the variance explained over and above that explained by the controls and previous practice. Again, interviewer/division was the most important factor in discriminating between women who reported W-S-S use at Time 3 and those who didn't. This is shown in Table 23.

Table 22

Results of the Discriminant Analysis for Earlier W-S-S Knowledge and Practice at Time 2

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.25	p<.001
Control Variables		
Outside Experience Time (Help Available) Salience of Diarrhea Compound Literacy (Not entered: Red Flag Contact, Time [Number of Children under 6], Health-worker Contact, Village Development, Personal Income)	.31	------
Previous W-S-S Use (at Time 1)	.31	Not significant
Knowledge about W-S-S at Time 1	.31	Not significant
(n=255)		

Table 23

Results of the Discriminant Analysis for Earlier W-S-S Knowledge and Practice at Time 3

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.30	p<.001
Control Variables		
Compound Literacy Salience of Diarrhea Health-worker Contact Time (Number of children under 6) Personal Income Village Development (Not entered: Red Flag Contact, Outside Experience, Time [Help Available])	.36	------
Previous W-S-S Use (at Times 2 & 1)	.42	------
Knowledge about W-S-S at Time 1	.42	Not significant
Knowledge about W-S-S at Time 2	.42	Not significant

(n=255)

Practice at Time 4

In this analysis, the discriminant analysis results indicated that only the change in knowledge between Time 1 and Time 2 added significantly to the discrimination between nonusers and users at Time 4, explaining an additional 2 percent of the variance over and above that explained by the controls and previous behavior (significant at $p<.001$). After this, additional change in knowledge about W-S-S (between Time 2 and Time 3) did not influence behavior at Time 4. As can be seen in Figure 19, by Time 4, reported W-S-S practice was decreasing, which might suggest that learning about W-S-S between Times 1 and 2 led to decreased practice at Time 4. However, the positive discriminant function coefficient for knowledge at Time 2 indicated that the contribution of the change in knowledge between Times 1 and 2 had a positive effect on reported practice at the later time (see Appendix D for the standardized discriminant function coefficients). Table 24 shows the results of the analysis.

Change in Knowledge and Simultaneous Change in Practice

A fourth discriminant analysis was done to examine whether change in knowledge led to a <u>corresponding</u> (or simultaneous) change in practice. This was examined only

Table 24

Results of the Discriminant Analysis for Earlier W-S-S Knowledge and Practice at Time 4

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.17	p<.001
Control Variables		
Health-worker Contact Village Development Outside Experience Compound Literacy Time (Number of children under 6) (Not entered: Red Flag Contact, Salience of Diarrhea, Personal Income, Time [Help Available])	.30	------
Previous W-S-S Use (at Times 3, 2 & 1)	.32	------
Knowledge about W-S-S at Time 1	.32	Not significant
Knowledge about W-S-S at Time 2	.34	p<.001
Knowledge about W-S-S at Time 3	.35	Not significant
(n=255)		

between Time 1 to Time 2, as change after that was not very great. As can be seen in Table 25, the increase in knowledge of W-S-S by Time 2 explained another fourteen percent of the variance in the discrimination (significant at $p<.001$).

These results suggest that Gambian mothers learned about and began to use W-S-S at about the same time. However, it must be kept in mind that nine months elapsed between the measures at Time 1 and Time 2, and we do not have a very clear picture of mother's learning and behavior during this time.

The results do provide increased evidence that the relationship between knowledge about W-S-S and practice was a causal relationship and not due to a third factor. The control variables entered in this analysis were stable factors -- outside experience, availability of help, salience of diarrhea, and compound literacy -- characteristics that wouldn't change during the eight months between Time 1 and Time 2. If the overall relationship between W-S-S knowledge and practice were really due to a third factor, we would not have seen this significant pattern of simultaneous change.

Table 25

Results of the Discriminant Analysis for Simultaneous Change in Knowledge and W-S-S Practice by Time 2

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.25	p<.001
Control Variables Outside Experience Time (Help Available) Salience of Diarrhea Compound Literacy (Not entered: Health-worker Contact, Red Flag Contact, Time [Number of Children under 6], Personal Income, Village Development)	.31	------
Previous W-S-S Use (at Time 1)	.31	Not significant
Knowledge about W-S-S at Time 1	.31	Not significant
Knowledge about W-S-S at Time 2	.45	p<.001
(n=255)		

Summary and Discussion of Findings

The findings of the analysis over time provided minimal evidence that causal direction ran from knowledge to practice. Change in knowledge between Time 1 and Time 2 was found to be significantly related only to subsequent change in behavior to Time 4. Support for this would have been stronger if change from K1 to K2 had significantly influenced change in practice to Time 3, or if change in knowledge between Times 2 and 3 had resulted in subsequent practice change.

The major problem in examining early knowledge change affecting later practice change was that there were not enough measures over time to show any clear pattern of the relationship between knowledge and behavior change. Most of the change in W-S-S knowledge and practice occurred between Time 1 (March/April 1982) and Time 2 (January 1983). After the first phase of the campaign, further change in knowledge and practice was very small and did not allow us to see any significant patterns. It is possible that there was a ceiling on further increase in knowledge and practice after this initial jump.

For this study, it would have been useful to have had measurement points several times during these nine months to document the changes at the beginning of the campaign in more detail. During this time, knowledge and practice questions were being asked by Stanford University, but unfortunately the responses could not be adapted for use in this study.

The analysis over time also provides additional support for the finding in the cross-sectional analyses that the relationship between knowledge and practice is causal and not due to a joint association with a third variable, such as wealth or health-worker contact. Initial change in knowledge was found to be strongly linked with a corresponding change in practice during the first nine months of the campaign. Here, again, measurement at several points during the nine months would have been useful to determine if learning and reported use of W-S-S were concurrent or if adoption of wss followed learning by several months.

Conditioning Relationships

The final step in examining the results of the discriminant analyses was to determine if any of the hypothesized conditioning variables would make a significant contribution to understanding change in behavior over time. This was done by looking at the discriminant analysis output after the control, practice, and knowledge variables had been entered and before the conditioning variables were to be entered into the discriminant function. At this stage, the output displayed the F statistic of the contribution each conditioning variable would add to the discrimination at the next step. For conditioning variables with significant F's, the standardized discriminant function coefficient (analogous to the standardized regression coefficients in a multiple regression analysis) was examined to determine if the relationship between the conditioning variable and practice was positive or negative. A positive coefficient indicated that the conditioning hypothesis was supported (i.e., an increase in knowledge and in the conditioning variable led to a multiplicative increase in later practice).

The results of this analysis were difficult to interpret because only one of the conditioning variables was significantly related to practice across more than one time period. Most of the conditioning relationships were not significant at any time. Table 26 presents those that were significant at $p<.10$.

Time available, as measured by number of children under six, was found to significantly and negatively condition the relationship between K1/K2 change and P3 and between K2/K3 change and P4. This is the opposite of the result hypothesized in which mothers with more time (only one child under six) were expected to respond more quickly over time in response to knowledge gain than women with less time. It is probable that number of children under six

Table 26

Significant Conditioning Relationships
Over Time for W-S-S Knowledge and Practice

Relationship	Conditioning Variable	Significance of F	Direction of Relationship
Change in Knowledge between Times 1 & 2 with Change in Practice between Times 2 & 3	Compound Literacy	p<.10	Negative
	Village Development	p<.10	Positive
	Time (No. of Young Children)	p<.05	Negative
Change in Knowledge between Times 2 & 3 with Change in Practice between Times 3 & 4	Outside Experience	p<.10	Negative
	Time (No. of Young Children)	p<.10	Negative

is not a very good measure of time available but is more a measure of salience of diarrhea as a problem. Women with several children under six probably handled more diarrheal episodes during the course of the campaign than women with only one child in the relevant age group. As the campaign progressed, the women with more young children may have been more open to trying W-S-S if they knew about it than mothers with only one young child.

The other significant conditioning relationships will not be discussed here because they only influenced the knowledge and practice relationship at one time. The same problem of minimal change after the initial increase in knowledge and practice at Time 2 was encountered and, again, the solution would have been to have more responses from between Time 1 and Time 2.

The conditional variables were also tested for the influence of change in knowledge between Times 1 and 2 on simultaneous change in practice (at Time 2). None had a significant relationship with practice at Time 2, suggesting that any woman who learned about W-S-S was likely to report using it or that, by 9 months after the start of the campaign, any inequities had evened out.

The influence of prior information about W-S-S on behavior change in response to the campaign can be seen in the results of the discriminant analyses for the main relationships (Tables 22, 23, and 24). Knowing about W-S-S at Time 1 (before the campaign) had no significant effect on subsequent behavior at Times 2, 3 or 4. Although not expected, this finding is not surprising. Before the campaign, information about W-S-S had been supplied primarily by government health workers, who had little training about W-S-S or in how to educate others and little incentive for taking the time to educate women rather than giving them pills. Women who knew about W-S-S before the campaign would have to have been to a health center where the health worker knew about W-S-S and at a time the health worker was giving a discussion on treatment of diarrhea. It is likely that many health workers never recommended or discussed W-S-S before the campaign.

Women who had known about W-S-S before the campaign were different from women who didn't know. They tended to have more experience with outside ideas and to be from literate compounds, and thus they may have had more access to information from health workers. The campaign made information about W-S-S much more widely available, through a variety of sources, and in a format created for easy understanding and learning. The campaign also included special training and reinforcement for health workers to influence them to recommend W-S-S for diarrhea. The increased information on W-S-S on the radio, through health workers, and through the lottery, seems to have equally influenced reported adoption by previous knowers and nonknowers.

Knowledge and Behavior Change in Feeding

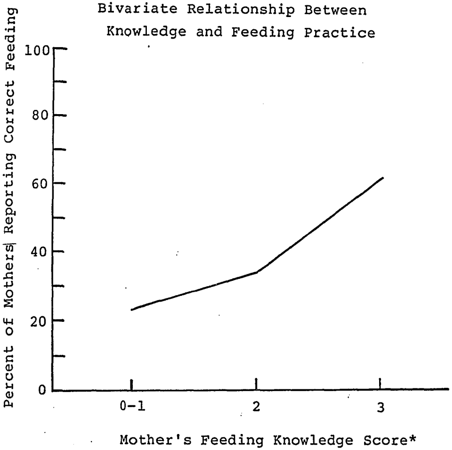
The second subject area of the campaign studied for this dissertation was feeding of children with diarrhea. The measures available, as described previously, were a scale of knowledge about feeding (with values from 0 to 3) and a dichotomous measure of practice (low feeding practice and high practice). As described in Chapter 3, the responses from the Lower River Division were eliminated and the analyses were performed only on the remaining 480 cases.

Tests for linearity indicated that the relationship between feeding knowledge and practice was positive and curvilinear, as can be seen in Figure 21. The significance of the linearity of the relationship was <.0001, and of deviation from linearity was P<.054. The correlation between knowledge and behavior was .28.

When the feeding knowledge and practice variables were crosstabulated with the hypothesized control variables, the results showed that number of children under six and salience of diarrhea had non-significant (at p<.05) relationships with both knowledge and practice (see Appendix D). They were not included in the analysis. A

Figure 21

Bivariate Relationship Between
Knowledge and Feeding Practice



*(Because only 5 mothers had zero on the knowledge scale, the zero and 1 scores were combined).

third variable, compound literacy, was also eliminated from the analyses as it had a very large number of missing cases (121) and was not related significantly to feeding practice ($p<.16$) and only marginally significantly related to knowledge ($p<.07$).

Results of the Multivariate Analyses

The results of the discriminant analysis for feeding knowledge and practice indicated that knowledge made no significant contribution to the discrimination over and above that of the controls (see Table 27). Actually, none of the variables discriminated particularly well between low and high feeding practice. All the control variables together (including interviewer/division) explained only 16 percent of the variance. The largest contribution to the discrimination between mothers with low and high feeding practice was made by interviewer/ division. The discriminant function coefficients showed that all of the control variables entered discriminated almost equally (see Appendix D).

The analysis repeated with social support gave essentially the same results for the smaller sample (see Table 28). Knowledge did not contribute significantly to the discrimination over and above the control variables. The significant control variables were social support,

Table 27

Results of the Discriminant Analysis for Feeding Knowledge and Practice

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.11	p<.001
Control Variables		
Village Development Mother is Sole Wife* Outside Experience Compound Wealth Personal Income (Not entered: Health-worker Contact, Status of Mother, Time (Help Available)	.16	------
Knowledge about Feeding	.16	Not significant

(n=297)

*This variable was included to control for size of family in using the mother's status variable.

Table 28

Results of the Discriminant Analysis for
Feeding Knowledge and Practice
(Including Social Support)

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.10	p<.001
Control Variables		
Social Support Status of Mother Village Development (Not entered: Health-worker Contact, Outside Experience, Time [Help Available], Personal Income, Compound Wealth)	.20	------
Knowledge about Feeding	.20	Not significant

(n=179)

village development, and mother's status. Of the controls, social support discriminated the best (see Appendix D).

Conditioning Relationships

The relationships were tested between feeding practice and the interaction of knowledge with the following conditioning variables: status of the mother, time available (number of children under six and availability of help), compound literacy, salience of diarrhea, status of the child, health-worker contact, village development, outside experience, personal income, compound wealth, and social support. Only mother's status and salience of diarrhea were shown to have a significant conditioning effect on the relationship between feeding knowledge and practice, and this only at $p<.09$ (see Table 29). As was done for the cross-sectional W-S-S interactions, the significance of these relationships was tested using analysis of variance with residual feeding practice scores as the dependent variable.

Although the two conditional relationships were marginally significant, they were hard to interpret. For a mother of higher status, a rise in knowledge from 1 to 2 resulted in a drop in high feeding practice (performing 2 or 3 of the correct feeding practices), while for mothers of lower status, high feeding practice increased very

Table 29

Results of the Significance Tests
of the Conditioning Relationships
between Feeding Knowledge and Practice

Conditioning Variable	F	Significance of F
Feeding Knowledge with:		
Status of Mother	2.4	p<.09
Salience of Diarrhea	2.4	p<.09
Status of Child	2.2	p<.11
Compound Wealth	1.8	p<.16
Time (No. of Children)	.96	p<.38
Compound Literacy	.94	p<.39
Outside Experience	.85	p<.43
Time (Help Available)	.83	p<.44
Health-worker Contact	.66	p<.52
Mother is Sole Wife	.42	p<.66
Village Development	.38	p<.68
Personal Income	.17	p<.85

slightly. However, for high status mothers moving from the middle to the highest score on knowledge, correct feeding practice increased dramatically, while for low status mothers, it dropped. See Figure 22 and Table 30 for illustration. (In this case, the figure using the feeding practice residuals is displayed here rather than in the appendix because the figure in which controls had not been accounted for produced a very different relationship, as can be seen in Appendix D).

The same type of relationship was seen for salience of diarrhea, where women who had a child which had died from diarrhea were only very slightly more likely to report high correct practice if they had a middle score on feeding knowledge and were much more likely to do so if they had a high score (see Figure 23 and Table 31). This finding would have provided some support for the hypothesis, except for the drop in behavior for mothers with no children dead from diarrhea. The precipitous drop for these mothers who had the highest level of knowledge was not interpretable.

Although status and salience of diarrhea seem to provide significant conditions for response to knowledge about proper feeding during diarrhea, the results were so confusing that no meaningful interpretation could be made explaining these relationships.

Figure 22

Interaction Effect of Mother's Status and Knowledge on Feeding Practice (Using Practice Residuals)

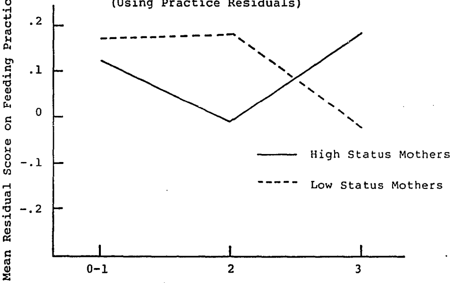


Table 30

Mean Scores on Feeding Practice Residuals by Knowledge Level and Mother's Status

Mother's Status	Score on Feeding Knowledge Scale: 0-1	2	3
Low	.17 (60)	.18 (88)	-.02 (35)
High	.12 (47)	-.01 (52)	.18 (15)

Figure 23

Interaction Effect of Salience of Diarrhea
and Knowledge on Feeding Practice
(Using Practice Residuals)

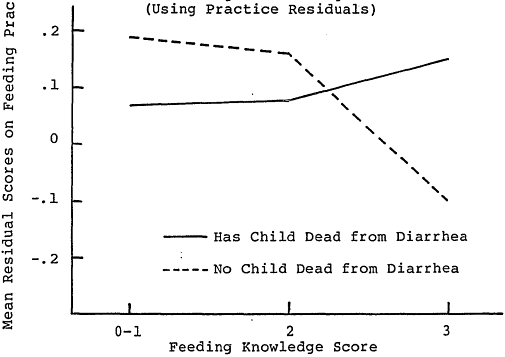


Table 31

Mean Scores on Feeding Practice Residuals
by Knowledge and Salience of Diarrhea

Has Child Dead from Diarrhea	Feeding Knowledge Score 0-1	2	3
No	.19 (62)	.16 (66)	-.10 (26)
Yes	.07 (43)	.08 (70)	.15 (24)

Summary of the Findings

The results of the analyses of the relationship between knowledge and behavior showed that knowledge about W-S-S was significantly related to its use even after interviewer/division and other factors were controlled. Of the control variables, those with the strongest influence on W-S-S use were interviewer/division, level of village development, health-worker contact, and social support. Factors found to condition mothers' response to knowledge were village development and personal income. The hypothesis about village development was supported; mothers living in villages with more development were more likely to use W-S-S if they knew something about it than mothers in less developed villages. Personal income was found to have the opposite effect from that expected; mothers with a personal income were less likely to report using W-S-S if they knew about it than mothers with no income. An explanation for this is that mothers with an income tend to buy medicines and charms rather than using treatments with no cost. For them, use of W-S-S may have been replacement treatment, rather than a modification of a treatment already used, as would be the case for mothers who previously used teas, a no-cost treatment.

Analysis of the relationship between knowledge and behavior over time provided minimal evidence that causal direction ran from knowledge to practice. An increase in mothers' knowledge about W-S-S between Times 1 and 2 was found to be significantly related only to subsequent change in behavior between Times 3 and 4. Most of the change in both knowledge and practice occurred in the first part of the project, from Time 1 to Time 2. Further analysis indicated that change in knowledge between Time 1 and Time 2 was significantly related to concurrent change in practice.

Only one factor was found to significantly condition the relationship between knowledge and behavior over time. Mothers with one child under six (more time) were <u>less</u> likely to change their practice over time in response to a change in knowledge about W-S-S than mothers with more than one young child (less time). It may be that number of young children is a better measure of salience of diarrhea to the mother than of time available.

The relationship between knowledge about feeding and feeding practices during diarrhea was found to be non-significant after control variables had been entered. None of the variables used in the analyses discriminated very well between mothers with low and high practice, although the largest contributions were made by interviewer/division and social support. Two marginally significant conditioning variables (mother's status and salience of diarrhea) were hard to interpret and did not add to a greater understanding of the relationship between knowledge and behavior.

CHAPTER 5

RESULTS: MASS MEDIA EXPOSURE AND KNOWLEDGE GAIN

An important assumption in the MMHP campaign was that the mass media can be used to teach something as complicated as mixing and administering W-S-S and to teach mothers about new feeding practices. The second major question in this study was whether exposure to radio and the mixing flyer led to increased knowledge about W-S-S and feeding practice and, if so, under what conditions. In this chapter, W-S-S knowledge will be discussed first and feeding knowledge second. For W-S-S knowledge, the influence of two channels will be studied: radio exposure and mixing flyer exposure.

Relationship between Exposure to Radio Gambia and Knowledge about W-S-S

As described in Chapter 3, radio exposure and W-S-S knowledge were dichotomous variables. Radio exposure was categorized as low (listening once a week or less) and high (listening several times a week or more). Knowledge was categorized as no W-S-S knowledge (mother didn't know about W-S-S or couldn't answer any questions about W-S-S correctly) and some knowledge (mother could answer at least one question correctly).

The relationship between radio exposure and knowledge about W-S-S was significant and positive ($p<.0001$, gamma was .59). As can be seen in Figure 24, women who listened to the radio several times a week or more were more likely to know about W-S-S and to be able to correctly answer at least one question about it.

As was done in the analysis of knowledge to practice, the relationships between radio exposure, knowledge, and the hypothesized control variables were examined to identify possible variables for elimination from the analysis to reduce the number of missing cases. The results showed that two variables with large numbers of missing cases, salience of diarrhea and the compound wealth scale, were not significantly related to either radio exposure or knowledge. For this reason, they were not used in the analyses. A table showing the significance levels and statistics for each relationship is in Appendix E.

Results of the Multivariate Analyses

Discriminant analyses were performed using interviewer/division, the control variables, and radio exposure to discriminate between mothers who did and did not know something about W-S-S. Table 32 shows the results of these analyses, which indicate that the variables chosen discriminated significantly between levels of knowledge.

Figure 24

Relationship Between Radio Exposure
and Knowledge about W-S-S

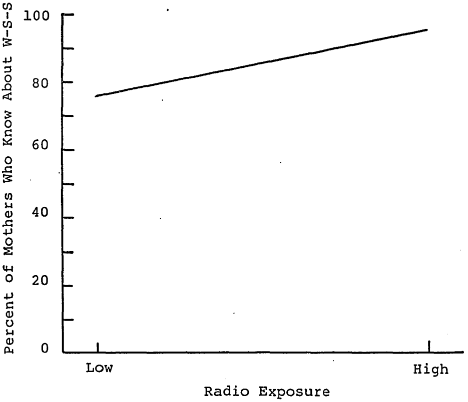


Table 32

Results of the Discriminant Analysis for Radio Exposure and W-S-S Knowledge

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.13	p<.001
Control Variables		
Health-worker Contact Red Flag Vol. Contact Outside Experience Village Development Compound Literacy (Not entered: Time [Number of Children under 6 and Help Available], Personal Income)	.23	------
Radio Exposure	.25	p<.001
(n=420)		

Radio exposure was found to significantly discriminate between no knowledge and some knowledge over and above the discrimination by interviewer/division and the controls, adding two percent to the variance explained ($p<.001$).

The standardized discriminant function coefficients suggested that, besides interviewer/division, health-worker contact and Red Flag volunteer contact had the greatest distinguishing capacity of the control variables (see Appendix E). Access to time (availability of help and number of children under six) and personal income did not add significantly to the discrimination between knowledge levels.

The same analyses including the social support variable also showed that radio contributed significantly ($p<.001$) to the discrimination between the two categories of knowledge, adding two percent to the variance explained after the controls had been entered. Of these controls, health-worker contact, social support, and outside experience contributed the most to the discrimination. For details, see Table 33 and Appendix E.

Conditioning Relationships

When the interactions between radio exposure and the hypothesized conditioning variables were tested, health-worker contact, Red Flag volunteer contact, social support,

Table 33

Results of the Discriminant Analysis for Radio Exposure and W-S-S Knowledge (Including Social Support)

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.09	p<.001
Control Variables		
Health-worker Contact Outside Experience Social Support Compound Literacy Time (No. of Children) Time (Help Available) Village Development (Not entered: Red Flag Volunteer Contact, Personal Income)	.22	------
Radio Exposure	.24	p<.05
(n=268)		

and status of the mother were found to influence significantly the relationship between radio exposure and knowledge (see Table 34). Analysis of the interaction between radio listening and visits to the health center showed their joint effect on knowledge to be the opposite of the hypothesis that women who went to the health center would be more likely to learn about W-S-S from the radio than women who didn't go to the health center. Instead, the results show that, for women who went to the health center, radio listening made no difference in knowledge. By this point in the campaign, over a year after the start, knowledge about W-S-S seemed to have reached a ceiling for mothers who visited the health worker and radio listening could not push them beyond that ceiling. However, for women who didn't go to the health center, radio exposure made a difference. Those who listened to the radio were more likely to know something about W-S-S than those who didn't. (See Figure 25, Table 35, and Appendix E). It may be that, in the beginning stages of the campaign, health workers did help mothers to learn about W-S-S from the radio and we might have seen the relationship hypothesized. However, by the time of the interview for this study, this was not the case.

Although this finding did not support the hypothesis about the conditioning effect of health-worker contact, it did provide support for a view frequently seen in the

Table 34

Results of the Significance Tests
of the Conditioning Relationships
between Radio Exposure and W-S-S Knowledge

Conditioning Variable	F	Significance of F
Radio Exposure with:		
Health-worker Contact	13.2	p<.0001
Status of Mother	8.7	p<.003
Red Flag Vol. Contact	6.6	p<.01
Social Support	4.3	p<.02
Time (No. of Children)	2.4	p<.13
Time (Help Available)	1.3	p<.26
Compound Wealth	1.3	p<.26
Salience of Diarrhea	.98	p<.32
Compound Literacy	.97	p<.33
Village Development	.01	p<.91
Personal Income	.01	p<.94
Outside Experience	.00	p<.98

Figure 25

Interaction Effect of Healthworker Contact and Radio Exposure on Knowledge of W-S-S

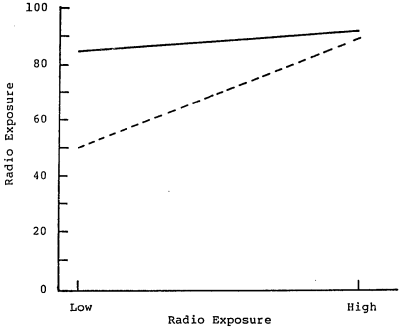


Table 35

Mean Scores on Knowledge Residuals by Radio Exposure and Level of Healthworker Contact

Radio Exposure	Healthworker Contact: Low	Healthworker Contact: High
Low	-.29 (36)	.05 (127)
High	-.02 (38)	.05 (231)

literature: that multiple channels are important in a campaign. Over the course of the MMHP campaign, women with access to at least one source of information (health worker or radio) learned about W-S-S. Those who did not learn were those without radio exposure <u>or</u> interpersonal contact with a health worker.

The findings for the interaction between seeing a Red Flag volunteer and radio exposure on knowledge are similar. They show that, for women who had seen a Red Flag volunteer, radio exposure made no difference in knowledge about W-S-S. Here knowledge about W-S-S reached a ceiling of almost 100 percent. As with health-worker contact, by the time of this interview, there seemed to be a substitution effect. If mothers hadn't visited a Red Flag volunteer, those who listened to the radio were significantly more likely to know something about W-S-S than those who had neither source of information (see Figure 26 and Table 36). This is opposite to the hypothesis that seeing a Red Flag worker would help the mother to learn about W-S-S. It is possible that Red Flag volunteers helped mothers to learn about W-S-S at the beginning of the campaign and that such conditioning effects leveled out toward the end of the campaign and thus cannot be seen here.

The results for social support also are the opposite of what was originally predicted (see Figure 27 and Table

Figure 26

Interaction Effect of Contact with Red Flag Worker and Radio Exposure on Knowledge About W-S-S

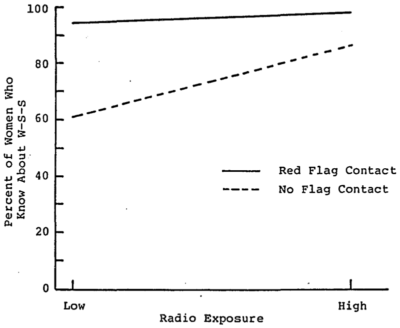


Table 36

Mean Scores on Knowledge Residuals by Radio Exposure and Contact with a Red Flag Worker

Radio Exposure	Contact with Red Flag Worker: No	Contact with Red Flag Worker: Yes
Low	-.08 (96)	.06 (67)
High	.04 (144)	.03 (125)

37). It was hypothesized that women with greater social support for use of W-S-S (other mothers in the compound using W-S-S) would be more likely to learn from the radio than mothers without social support. If a mother did not have social support for use of W-S-S, she might listen to the radio but have little reason to learn about W-S-S.

The findings show that, in compounds where all the other women in the sample used W-S-S, radio listening was unrelated to knowledge. In compounds where some of the other women used W-S-S (from 10 to 90 percent), radio listening was positively related to knowledge. However, in compounds where no other women used W-S-S, this positive relationship was even stronger. This finding suggests that interpersonal interaction with other mothers in the compound was an important source of information about W-S-S. A good way for a mother to learn about W-S-S was if another woman in the compound used it. Women who lived in compounds where others had not adopted W-S-S didn't have this source of information, a gap that could be filled by listening to the radio.

The fourth significant conditioning variable was status of the mother, whether she was the first or only wife of the compound head or not. Here, the analyses were performed only for women who lived in compounds where there were other wives and mothers. The findings supported the hypothesis that mothers of higher status in the family

Figure 27

Interaction Effect of Social Support and Radio Exposure on Knowledge about W-S-S

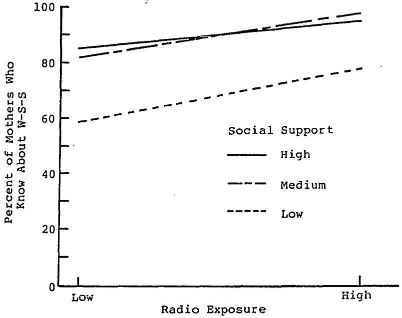


Table 37

Mean Scores on Knowledge Residuals by Radio Exposure and Level of Social Support

Radio Exposure	Percent of Mothers in Compound Using W-S-S: 0	10-90	100
Low	-.13 (23)	-.03 (10)	.05 (64)
High	.10 (53)	.02 (48)	.04 (80)

would be more likely to learn about W-S-S if they listened to the radio than mothers of lower status. For mothers of lower status, radio listening seemed to make little difference in knowledge. Figure 28 and Table 38 illustrate this. (The figure using the residual knowledge scores has been presented here rather than the figure detailing percent of mothers who know because the lack of control variables in the latter confuses the relationship).

An unexpected finding was that higher status women who didn't listen to the radio had lower knowledge about W-S-S than lower status non-listeners. Women who were the first or only wife of the compound head seemed to depend heavily on radio to learn about W-S-S. It may be that higher status women will learn only from a higher status source (e.g., radio, a source of information from the capital city). They may be less open to suggestions from local healthworkers, the Red Flag volunteers, or other (lower status) women in the compound.

Exposure to Radio and W-S-S Knowledge over Time

Learning about W-S-S from the radio was examined over time by comparing knowledge of mothers with low and high radio exposure at four time periods. The measures of knowledge of W-S-S were the same four used in the analysis of knowledge and behavior over time. The reduced sample of

Figure 28

Interaction Effect of Mother's Status and Radio Exposure on Knowledge about W-S-S (Using Knowledge Residuals)

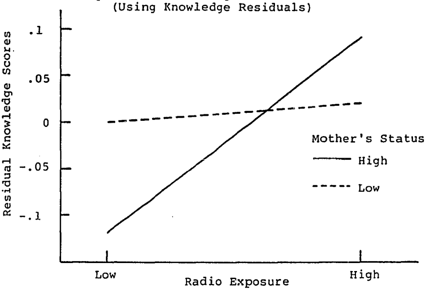


Table 38

Mean Scores on Knowledge Residuals by Radio Exposure and Mother's Status

Radio Exposure	Mother's Status: Low	Mother's Status: High
Low	0 (83)	-.12 (48)
High	.02 (181)	.09 (65)

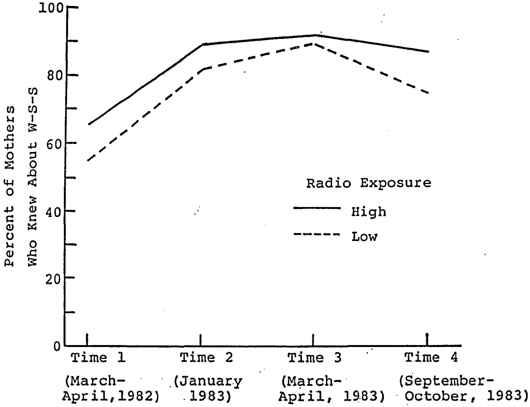
three divisions used in the previous over-time analyses was also used here.

Figure 29 shows the distribution of knowledge about W-S-S over time for the two radio exposure groups. Mothers with low radio exposure were less likely to know something about W-S-S than those with high exposure over all four time periods. However, mothers who didn't listen to the radio did have relatively high knowledge. The relationship between radio exposure and knowledge was significant within each time period, except at Time 3 (significance levels were: at Time 1 $p<.06$, at Time 2 $p<.04$, at Time 3 $p<.4$, and at Time 4 $p<.002$). One year after the start of the campaign (at Time 3), knowledge about W-S-S seems to have reached a peak, then started to decline slightly. More mothers with low radio listening forgot about W-S-S between March and September 1983 than did mothers with high listening.

The significance of the relationship between radio exposure and knowledge about W-S-S over time was tested using the same discriminant analysis design as in the analyses of the relationship between knowledge and practice. The results, shown in Tables 39 to 41, indicate that radio exposure made no significant contribution to the discrimination between mothers who did and did not learn about W-S-S between Times 1 and 2, between Times 2 and 3, and between Times 3 and 4. Even the control variables

Figure 29

Distribution of Radio Exposure and Knowledge of W-S-S Over Time*



*This figure includes mothers from only three divisions. The responses from one division were eliminated because of possible interviewer error. Because of this, the percentages of mothers with low and high radio exposure at Time 4 do not match those for the same time period seen in Figure 24.

Table 39

Results of the Discriminant Analysis for
Radio Exposure and W-S-S Knowledge at Time 2

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.06	p<.001
Control Variables		
Health-worker Contact Time (No. of Children) (Not entered: Red Flag Vol. Contact, Personal Income, Outside Experience, Pictorial Ability, Village Development, Compound Literacy)	.09	------
Previous Knowledge (At Time 1)	.09	Not significant
Radio Exposure	.10	Not significant
(n=261)		

Table 40

Results of the Discriminant Analysis for
Radio Exposure and W-S-S Knowledge at Time 3

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.04	p<.001
Control Variables Village Development Outside Experience Health-worker Contact Personal Income Time (No. of Children) (Not entered: Red Flag Vol. Contact, Pictorial Ability, Compound Literacy)	.10	------
Previous Knowledge (At Times 2 & 1)	.20	p<.001
Radio Exposure	.20	Not significant
(n=261)		

Table 41

Results of the Discriminant Analysis for
Radio Exposure and W-S-S Knowledge at Time 4

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.05	p<.001
Control Variables		
Health-worker Contact Compound Literacy Village Development Red Flag Vol. Contact (Not entered: Time [No. of Children], Pictorial Ability, Personal Income, Outside Experience)	.24	------
Previous Knowledge (At Times 1, 2 & 3)	.35	p<.001
Radio Exposure	.35	Not significant
(n=261)		

explained very little of the variance in the change in knowledge between Time 1 and Time 2, the period in which knowledge had its greatest increase, explaining only nine percent of the discrimination in knowledge categories.

The findings about radio exposure are not surprising. The campaign used radio broadcasts, but also relied heavily on interpersonal communication through health workers and on the printed flyers. In the first year in particular, when the Happy Baby Lottery was held, mothers had the opportunity to learn about W-S-S from a number of sources.

The possible contribution of the hypothesized conditioning variables to each discrimination was examined and none of the conditioning variables was found to make a significant contribution. This suggests that the campaign succeeded in cutting across barriers of status, education, and information access in informing women about W-S-S. Once again, the greatest change in knowledge was found at the beginning of the campaign and other measurement points between Time 1 and Time 2 would perhaps have been useful.[10] Of particular interest would have been comparison of learning before and after the massive publicity of the Happy Baby Lottery.

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[10] This does not imply that the Stanford evaluators were not measuring knowledge during this crucial time. Many interviews measuring knowledge were done after the start of the campaign, but their responses couldn't be adapted for use in this study.

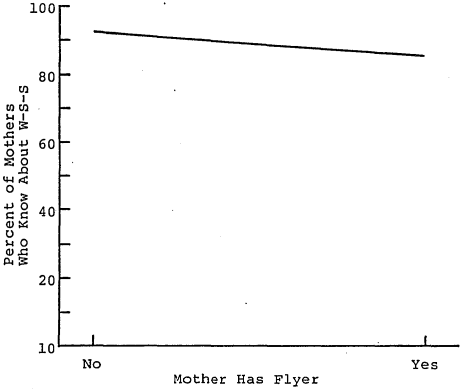
Exposure to Mixing Flyer and W-S-S Knowledge

Another important channel used in the MMHP project was print materials. A pictorial flyer was designed to teach mothers how to properly mix W-S-S. The relationship between exposure to the mixing flyer (measured by whether the mother could show the fieldworker a copy of the flyer) and W-S-S knowledge was unexpected. As can be seen in Figure 30, women who did not have a copy of the flyer were more likely to know about W-S-S and be able to answer questions about it than women who could show a copy of the flyer. The relationship was significant only at $p<.06$ and was negative (gamma was -.35). Seventy-four mothers who could show the flyer said they didn't know about W-S-S or were unable to answer any of the knowledge questions correctly.

This leads one to question whether the women who said they didn't know about W-S-S were telling the truth (perhaps to avoid more questions) or if they interpreted the wording of the question differently than was intended. The question, "Do you know about a medicine for diarrhea made of water, sugar, and salt?" was intended to determine if the mother had ever heard about W-S-S. When mothers were asked if they had ever heard of W-S-S by Sikandra Spain in August 1983, almost all reported that they had. It is possible that mothers actually interpreted "Do you know

Figure 30

Relationship Between Flyer Ownership and and Knowledge About W-S-S



about W-S-S?" as "Do you know something about W-S-S (other than its existence)?" This suggests that all mothers should have been asked the knowledge questions rather than skipping them for women who reported not knowing about W-S-S.

The bivariate analyses of the relationship of flyer ownership with the hypothesized control variables showed that two variables with large numbers of missing cases (salience of diarrhea and status of the mother) did not have significant relationships with either flyer ownership or W-S-S knowledge (see Appendix E). Although compound wealth was significantly related to flyer ownership ($p<.02$), it was not used because it resulted in 139 missing cases and was not significantly related to the dependent variable, W-S-S knowledge.

The results of the discriminant analyses indicated that flyer ownership made no significant addition to the discrimination between mothers who did and did not know something about W-S-S over and above the controls (see Table 42). These results were the same for the main sample and for the part of the sample used in the social support analyses (see Table 43). The discriminant function coefficients (in Appendix E) indicated that health-worker contact, village development, compound literacy, and Red Flag volunteer contact contributed the most to the discrimination.

Table 42

Results of the Discriminant Analysis for Flyer Ownership and W-S-S Knowledge

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.09	p<.001
Control Variables		
Health-worker Contact Village Development Compound Literacy Red Flag Vol. Contact Outside Experience (Not entered: Time [No. of Children], Personal Income, Pictorial Ability)	.20	------
Flyer Ownership	.21	Not significant
(n=401)		

Table 43

Results of the Discriminant Analysis for Flyer Ownership and W-S-S Knowledge (Including Social Support)

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.07	$p<.001$
Control Variables		
Health-worker Contact Social Support Compound Literacy Pictorial Ability (Not entered: Red Flag Vol. Contact, Time [No. of Children], Personal Income, Outside Experience)	.18	------
Flyer Ownership	.18	Not significant

(n=260)

This indicates that the somewhat confusing negative relationship seen between flyer ownership and knowledge about W-S-S was actually due to the relationship of other factors with the two variables. Overall, having a flyer made no difference in whether mothers had some knowledge about W-S-S.

Conditioning Relationships

The interaction between flyer ownership and the hypothesized conditioning factors was examined to see if it had an influence on knowledge. Two conditions were found to influence the relationship between flyer ownership and knowledge about W-S-S, village development and contact with the health worker (see Table 44). Neither of these relationships was significant at $p<.05$, but at $p<.06$ (village development) and $p<.07$ (health-worker contact). Both relationships were difficult to interpret.

The conditioning effect of level of village development was the opposite of that hypothesized. Instead of women from villages with high development being more likely to know about W-S-S if they had a flyer than women from villages of low development, mothers from high development villages were <u>less</u> likely to know about W-S-S if they had a flyer and women from villages with low development

Table 44

Results of the Significance Tests
of the Conditioning Relationships
between Flyer Ownership and W-S-S Knowledge

Conditioning Variable	F	Significance of F
Flyer Ownership with:		
Village Development	3.5	p<.06
Health-worker Contact	3.4	p<.07
Salience of Diarrhea	2.7	p<.10
Pictorial Ability	1.3	p<.27
Status of Mother	1.0	p<.32
Outside Experience	.87	p<.35
Compound Wealth	.29	p<.59
Compound Literacy	.27	p<.60
Red Flag Vol. Contact	.20	p<.65
Personal Income	.12	p<.73
Social Support	.06	p<.85
Time (Help Available)	.02	p<.89
Time (No. of Children)	.00	p<.98

were <u>more</u> likely to know if they had a flyer. See Figure 31 and Table 45 for illustration.

It seems that part of the negative relationship between flyer and knowledge is coming from mothers from high development villages. A possible explanation is that mothers in villages with less development attached more importance to owning a flyer, because they generally receive less attention or information from outside the village (e.g., have no schools, health centers, or foreign projects, or see fewer people because of poor access to main roads). They may have paid more attention to the flyer because they saw it as something special. It may also be that, in villages with a lower level of development, women who received a flyer had made a special attempt to obtain one and also to learn about W-S-S.

The lower knowledge seen in Figure 31 for flyer owners in high development villages is confusing. One could more easily understand if flyer ownership made no difference for these mothers rather than being associated with lower knowledge than that seen among nonowners.

The interaction relationship of health-worker contact with flyer ownership is also somewhat confusing. As can be seen in the Figure 32 and Table 46, as hypothesized, women with more health-worker contact were more likely to know something about W-S-S if they had a flyer than women who had no health-worker contact. However, women with no

Figure 31

Interaction Effect of Village Development and Flyer Ownership on Knowledge About W-S-S (Using Knowledge Residuals)

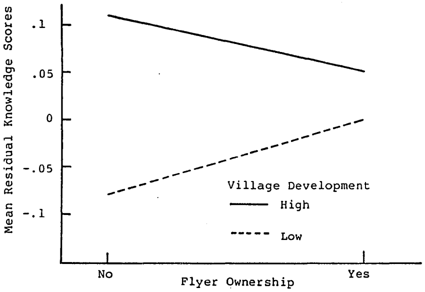


Table 45

Mean Scores on Knowledge Residuals by Flyer Ownership and Level of Village Development

Mother Owns Flyer	Level of Village Development: Low	High
No	-.08 (36)	.11 (38)
Yes	.00 (139)	.05 (188)

Figure 32

Interaction Effect of Health-worker Contact and Flyer Ownership on Knowledge About W-S-S (Using Knowledge Residuals)

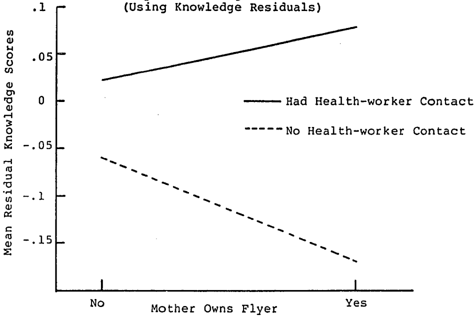


Table 46

Mean Scores on Knowledge Residuals by Flyer Ownership and Health-worker Contact

Flyer Ownership	Healthworker Contact: No	Healthworker Contact: Yes
No	-.06 (17)	.02 (57)
Yes	-.17 (54)	.08 (273)

health-worker contact were less likely to know about W-S-S if they _had_ a flyer than if they did not. One must be careful in over-interpreting this finding because of the small numbers involved: only seventeen mothers had low health-worker contact and no flyer.

Perhaps more than anything else, these findings point out problems in measurement. As mentioned in the section on measurement, owning a flyer is not necessarily an indication of actual exposure to the flyer. It is very likely that many mothers did not consult the flyer. Peace Corps volunteers and the fieldworkers reported that women kept their flyers with their children's medical cards in a special envelope rather than displaying them on the wall or where they could be easily seen and consulted.

Exposure to Radio and Knowledge about Feeding

In this section, the relationship between exposure to Radio Gambia and knowledge about correct feeding during and after diarrhea will be discussed. The measure of feeding knowledge used was a three-value scale ranging from one to three. As only six women had received a zero on the scale, they were grouped with the women with scores of one. The sample used included responses from three divisions only, as discussed previously in the section on feeding behavior.

Four hundred and eighty women were included in this sample.

The bivariate relationship between radio exposure and feeding knowledge was significant ($p<.0001$) and negative, with a gamma of -.26 (see Figure 33). This suggests that, before controlling for other possible explanation of the relationship, women who had high radio exposure had lower feeding knowledge scores than women with less exposure to the radio.

Before testing for alternative explanations for this unexpected relationship, the relationships between radio exposure and the control variables and feeding knowledge and the controls were examined. Salience of diarrhea and access to time (number of children under six and help available) were not significantly related to radio exposure or feeding knowledge (see Appendix E). They were not used as control variables in the multivariate analyses.

Results of the Multivariate Analyses

Discriminant analyses were performed using the control variables and radio exposure to discriminate between mothers at the three knowledge levels. Table 47 shows that interviewer/division accounted for most of the variance in the discrimination and that radio exposure contributed nothing over and above the control variables.

Figure 33

Bivariate Relationship Between Radio Exposure and Knowledge About Feeding

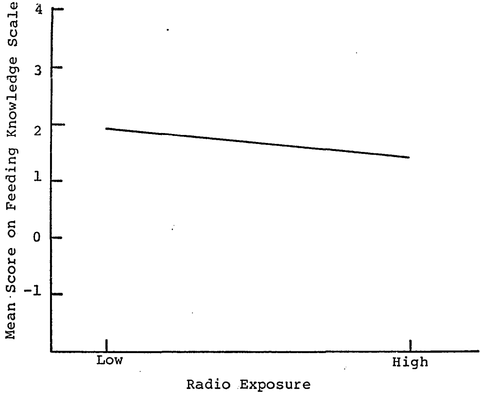


Table 47

Results of the Discriminant Analysis for Radio Exposure and Knowledge about Feeding

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.46	$p<.001$
Control Variables		
Outside Experience Personal Income Village Development (Not entered: Compound Literacy, Health-worker Contact, Status of Mother, Compound Wealth)	.50	------
Radio Exposure	.50	Not significant
(n=255)		

The negative relationship between radio exposure and feeding knowledge seems to be primarily due to both variables' relationship with interviewer/division. The standardized discriminant functions indicated that, among the other control variables, outside experience and village development had the greatest influence on the discrimination. The results of the analyses using the social support variable were very similar, radio exposure did not account for any of the variance over and above the controls (see Table 48).

The results of these analyses reinforce the decision to control for interviewer/division. In this case in particular, it is hard to know whether the responses differed because of interviewer bias or genuine division differences. Feeding practices and availability of certain foods differed by region of the country. This is an area in which more research would be useful.

Conditioning Relationships

Analysis of variance tests of the interactions between radio exposure and the hypothesized conditioning variables showed that village development, compound wealth, and compound literacy were significant conditioning influences on feeding knowledge. Table 49 gives details of the results of these tests.

Table 48

Results of the Discriminant Analysis for Radio Exposure and Knowledge about Feeding (Including Social Support)

Variables	Canonical Correlation Squared	Significance of Additional Contribution to the Discrimination
Interviewer/ Division	.40	$p<.001$
Control Variables		
Health-worker Contact Outside Experience Compound Literacy Village Development (Not entered: Personal Income, Social Support, Status of Mother, Compound Wealth)	.46	------
Radio Exposure	.47	Not significant

(n=145)

Table 49

Results of the Significance Tests
of the Conditioning Relationships
between Radio Exposure and Feeding Knowledge

Conditioning Variable	F	Significance of F
Radio Exposure with:		
Compound Wealth	3.8	p<.05
Village Development	3.8	p<.05
Compound Literacy	3.1	p<.08
Time (Help Available)	2.1	p<.15
Salience of Diarrhea	1.5	p<.22
Outside Experience	1.3	p<.26
Health-worker Contact	1.1	p<.30
Personal Income	.40	p<.53
Status of Mother	.33	p<.57
Social Support	.05	p<.83
Time (No. of Children)	.02	p<.88

The joint effect of radio exposure and village development was found to be the opposite of that hypothesized -- that women in more developed villages would be more likely to learn about feeding from the radio than women from villages with less development (see Figure 34 and Table 50). Instead, the results showed that, for women in more developed villages, radio exposure had no influence on knowledge about feeding practice. In less developed villages, mothers with high radio exposure had much higher feeding knowledge scores than mothers who listened to the radio less frequently.

It may be that, in villages with schools, health centers, and foreign projects, information about feeding practices during diarrhea was available from many other sources and that, in villages without these services and institutions, radio was a more important source of information. Thus, women who listened to the radio would be more likely to know the correct feeding practices than those who didn't listen. It is also possible that women in more developed villages had copies of the new feeding flyer listing important foods to give and that women in less developed villages did not have easy access to these flyers. This flyer would give mothers more information on feeding during diarrhea and perhaps also make the issue more salient. Unfortunately, ownership of the feeding flyer was not checked during the interview.

Figure 34

Interaction Effect of Level of Village Development and Radio Exposure on Knowledge About Feeding (Using Knowledge Residuals)

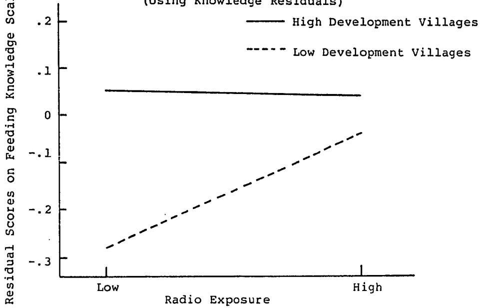


Table 50

Mean Scores on Knowledge Residuals by Radio Exposure and Level of Village Development

Radio Exposure	Level of Village Development: Low	Level of Village Development: High
Low	-.28 (40)	.05 (114)
High	-.04 (75)	.04 (73)

The other two significant conditioning relationships were confusing to interpret. As can be seen in Figure 35 and Table 51, women in wealthier compounds (with 501 to 25,000 Dalasis' worth of animals) were more likely to have high feeding knowledge scores if they listened to the radio. However, the results don't follow the relationship hypothesized because, in poorer compounds, there was a negative relationship with radio exposure. Mothers in poorer compounds were less likely to have high feeding knowledge if they listened to the radio than if they didn't listen. The hypothesis suggested that the relationship would be positive for both groups, although not as strong as for women in wealthier compounds.

The same type of relationship was seen for the interaction between radio exposure and compound literacy. Women from literate compounds were more likely to learn about feeding from the radio and women from nonliterate compounds were less likely to learn if they listened to the radio (see Figure 36 and Table 52). The similarity in the relationships is not surprising as the two variables were interrelated (gamma was .53, p<.0001). Eighty percent of the mothers from poorer compounds also had no literate members in the compound. Poorer compounds may not be able to afford to send a child to school due to the extra expenses of schooling and the loss of a farm worker.

Figure 35

Interaction Effect of Compound Wealth and Radio Exposure on Feeding Knowledge (Using Knowledge Residuals)

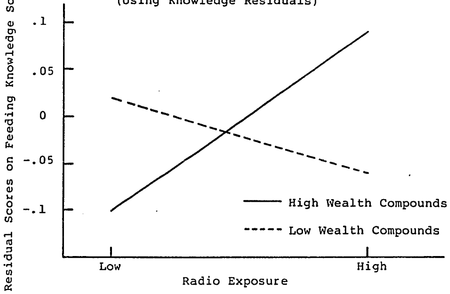


Table 51

Mean Scores on Feeding Knowledge Residuals by Radio Exposure and Compound Wealth

Radio Exposure	Compound Wealth Low	Compound Wealth High
Low	.02 (64)	-.10 (56)
High	-.06 (51)	.09 (75)

Figure 36

Interaction Effect of Compound Literacy and Radio Exposure on Feeding Knowledge (Using Knowledge Residuals)

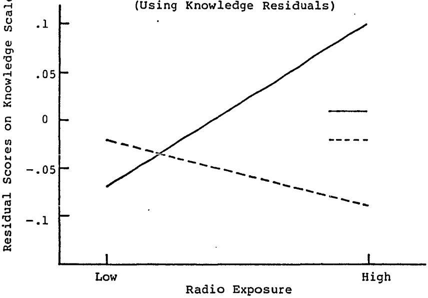


Table 52

Mean Scores on Feeding Knowledge Residuals by Radio Exposure and Compound Literacy

Radio Exposure	Compound Literacy Low	Compound Literacy High
Low	-.02 (124)	-.07 (30)
High	-.09 (81)	.10 (67)

In summary, part of the hypothesized relationship is seen here -- mothers from wealthier or literate compounds were more likely to know about feeding if they listened to the radio than mothers from poorer or nonliterate compounds. However, the finding that radio listeners among mothers in poorer or nonliterate compounds were less likely to learn about feeding than nonlisteners makes any interpretation of this relationship questionable.

Summary of the Findings

The cross-sectional relationship between radio exposure and knowledge about W-S-S was found to be positive and significant over and above the contributions by interviewer/division and the other control variables. Of the control variables, interviewer/division, health-worker contact, Red Flag volunteer contact, and social support were most strongly related to knowledge. Analysis of the relationship between radio exposure and changes in knowledge about W-S-S over time showed no significant results. Overall, the relationship between radio exposure and W-S-S knowledge was not very large. In the cross-sectional analyses, radio exposure only accounted for an extra two percent of the variance. This is probably because radio was only one channel of a multi-channel campaign.

Social status of the mother was found to significantly and positively condition the mother's learning from the radio. Contact with the health worker or Red Flag worker and social support had negative interaction effects with radio exposure on knowledge about W-S-S. MOthers with <u>low</u> health-worker or Red Flag volunteer contact or with <u>low</u> social support were more likely to learn from the radio than women with high contact or support. Women with interpersonal sources of information seemed to have reached a ceiling in knowledge levels, and radio exposure didn't push them above this. Women without interpersonal sources of information had room for improvements in knowledge, and radio exposure did increase their knowledge.

The relationship between the second measure of mass media exposure, ownership of the mixing flyer, and knowledge was found to be due to the effects of third variables. Having a copy of the flyer made no significant addition to the discrimination between mothers who did and did not know about W-S-S over and above the controls. Two marginally significant negative interaction relationships were identified. Mothers from villages with more development were <u>less</u> likely to know about W-S-S if they owned a flyer than women from villages with low levels of development. The joint effect of flyer ownership and health-worker contact on knowledge about W-S-S was uninterpretable.

The relationship between radio exposure and knowledge about feeding was also found to be due to the effects of other variables; most of the relationship between the two was accounted for by interviewer/division. Other important variables in the discrimination were outside experience and village development.

Three significant conditioning effects on feeding knowledge were found -- the joint effect of radio exposure with compound wealth, compound literacy, and level of village development. The first two conditioning variables were interrelated and showed the same effect on the relationship between radio exposure and knowledge about feeding. Women in wealthier or literate compounds were more likely to learn about feeding from the radio than women in poorer or nonliterate compounds. However, an unexpected and unexplainable finding was that mothers from poor, nonliterate compounds were less likely to know about correct feeding practices if they did listen to the radio than if they didn't. For mothers in high development villages, radio exposure made no difference in feeding knowledge. In low infrastructure villages, mothers had higher knowledge if they listened to the radio.

CHAPTER 6

SUMMARY AND DISCUSSION

The primary purpose of this dissertation was to study conditions affecting the success of communication campaigns in developing countries in teaching mothers about new health practices and in bringing about change in health behavior. The literature on the use of communication for development, particularly for change in agricultural knowledge and behavior, has shown that new information is only one of many interrelated influences on people in developing countries, rather than a primary force or trigger for change by itself. Access to information, gain in knowledge, and change in behavior are seen as being constrained by the physical, political, economic, social and cultural context, and not just by individuals' traditionalism or refusal to change. Providing new information may have little effect unless this context supports the change.

Several studies of agricultural communication programs have suggested that the relationship between contextual factors and knowledge gain and use for behavior change is an <u>interactive</u> relationship (O'Sullivan, 1978; Contreras, 1979; McDivitt, 1981). An interactive or conditioning relationship between information and behavior change has also been discussed for health and nutrition education. Hornik & Solomon (1978) and Hornik (1984) distinguish between changes in health practices that can be made in response to information alone and those which require other changes in the context (e.g., new resources, change in beliefs) along with the new information.

This study applied the above ideas from the agricultural literature to health and nutrition, hypothesizing that the context constrains knowledge gain and behavior change and that information has an interactive relationship with contextual factors. Another way of stating this is that the context conditions (or provides the conditions for) people's learning of new information and their change in health and nutrition behavior.

This study looked at two relationships, examining the conditions under which mass-mediated information leads to knowledge gain and the conditions under which knowledge is turned into actual behavior change. To provide some comparisons, knowledge and practice for two topics were examined, for a water, sugar, and salt oral rehydration solution (W-S-S) and for feeding during diarrhea. The research was done in cooperation with the Stanford University evaluation of the USAID-funded Mass Media and Health Practices Project in The Gambia.

The literature on health and nutrition education was reviewed to identify possible categories of constraints to change in knowledge and behavior. These were: economic and physical constraints (e.g., access to resources and information), social structure and customary behavior (e.g., status and literacy), and beliefs and cultural environment. The literature was also examined for mention of specific constraints to health knowledge and behavior change and a list was compiled. The constraining or conditioning factors examined in this study are listed in Figure 2 in Chapter 1.

The hypothesized conditioning factors were expected to have a positive interactive effect with the independent variables (mass media exposure and knowledge) on the dependent variables (knowledge and practice). It was hypothesized that the curve representing the relationship between the independent and dependent variable would rise more steeply for mothers in high categories of the conditioning variables than those in the low categories. For example, it was expected that the slope of the relationship between knowledge and practice would be steeper for mothers living in more developed villages than those in less developed villages (see Figure 15 in Chapter 4). Mothers in developed villages would have more support to turn knowledge into behavior than mothers in villages with less development.

After interviews with people in The Gambia (project personnel, Peace Corps volunteers, Medical and Health employees, and village mothers), a questionnaire was developed with questions measuring each of the variables on this list. Some variables had already been measured in previous Stanford interviews and were not measured again here. The interviews were administered by the Stanford fieldworkers along with a Stanford questionnaire in September and the beginning of October 1983. The final data base used for the analyses included data from all the previous Stanford interviews (starting in March 1982), data from a study conducted in August 1983 by Sikandra Spain (1983), and the data from the two interviews given in September and October 1983.

The analyses followed a series of steps in which the bivariate relationship between the independent and dependent variable was first tested, then the relationship was examined after possible extraneous factors were controlled, and, last, the joint effect of the independent variable and each of the proposed conditioning variables was tested. The last step was the crucial part of the analysis to test the hypotheses. The method of analysis used was discriminant analysis.

Summary of the Results

Many of the results obtained were not expected. Most of the conditioning relationships were not significant and, of those which were, most showed a pattern opposite to that hypothesized. The interaction terms were expected to be positively related to the dependent variable. This was seen in two cases: for the joint effect of village development and knowledge about W-S-S on use of W-S-S and for the joint effect of mother's status and radio exposure on knowledge about W-S-S. Each of these findings will be discussed in more detail below.

Seven of the conditioning relationships were negative, the opposite of what was hypothesized. In these cases, mothers with <u>low</u> values on the conditioning variable showed a steeper curve for the relationship between the independent and dependent variable than mothers with <u>high</u> values on the conditioning variables. The significant findings are summarized in Table 53.

Little comparison could be done by subject area because there were few significant results for the analyses for feeding knowledge or practice. Therefore, most of the discussion will focus on W-S-S knowledge and behavior. In the following sections, the results for knowledge and behavior will be discussed first and then the results for the mass media exposure and knowledge relationship will be presented.

Table 53

Significant Conditioning Effects Seen in the Analyses

		Direction of Relationship
Knowledge and Practice Relationships		
Joint effect of:		
Village development and W-S-S knowledge	on W-S-S use	positive
Personal income and W-S-S knowledge	on W-S-S use	negative
Time available (number of young children) and W-S-S knowledge	on subsequent W-S-S use	negative
Mass Media Exposure and Knowledge Relationships		
Joint effect of:		
Health-worker contact and radio exposure	on W-S-S knowledge	negative
Red Flag volunteer contact and radio exposure	on W-S-S knowledge	negative
Social support and radio exposure	on W-S-S knowledge	negative
Status of mother and radio exposure	on W-S-S knowledge	positive
Village development and flyer ownership	on W-S-S knowledge	negative
Village development and radio exposure	on feeding knowledge	negative

Conditions for Turning Knowledge into Behavior Change

Overall, there was a strong, significant association between knowledge about W-S-S and its reported use -- knowledge accounted for an additional 16 percent of the variance explained over and above that explained by the control variables. After controlling for division/interviewer, wealth, status, level of village development, outside experience, and other factors, it was found that women who could give at least one correct answer to questions about W-S-S mixing or administration were significantly more likely to report using W-S-S in the last case of diarrhea treated. Other variables that showed a significant relationship with W-S-S use were level of village development (schools, health care services, foreign projects, roads), health-worker contact, outside experience, and social support. These findings suggest that the major requirements for W-S-S practice are system-level support (village services and outside experience of the compound), informational or personal support (health-worker contact and social support), and knowledge.

The relationship between knowledge about feeding and feeding practice was positive and curvilinear. However, when the control variables were entered, the relationship disappeared. The feeding knowledge and practice relationship seems to be primarily due to the effects of interviewer or division, and could reflect interviewer problems with these questions or actual division differences which we don't clearly understand.

Of more interest in this study were the effects of the conditioning variables on the relationship between knowledge and behavior. The following factors were expected to provide a context in which mothers who knew about correct behavior could change related child-care practices.

- Level of village development
- Compound wealth
- Experience with outside ideas
- Social support
- Personal income
- Access to time
- Status of the child (sex)
- Status of the mother
- Contact with health personnel (healthworkers or Red Flag volunteers)
- Salience of diarrhea to the mother

Of these, village development was a significant and positive influence (as hypothesized) and personal income and access to time (number of children under 6) were significant, but negative, influences. Each of these findings will be discussed further below.

Conditioning Effect of Village Development

The results showed that mothers in villages with more development (with a school, health services, foreign projects, and close proximity to a main road) were more likely to use W-S-S if they knew about it than mothers who lived in villages with a lower level of development. This finding provides some evidence that behavior change in health practices, as in agricultural practices, can be aided or constrained by structural factors beyond the individual's control. As suggested by Mosher (1969) and McInerny (1978) for agriculture, individual behavior change in health may also require an integrated infrastructure of services and connections with the rest of the country to support it.

System-level support for behavior seems to be more important than individual traits. In this study, seeing a health worker, living in a literate compound, or living in a compound with more experience with outside ideas made no difference in the relationship between knowledge and practice. However, village development -- composed of overall access to health care, schools, and outside ideas through foreign projects or contact with people from other villages or divisions -- did make a difference.

The way in which village development may work here is by providing an atmosphere or context in which change is possible. Several Peace Corps volunteers remarked that some villages are very conservative and others are more open to change as a whole, and that it is easier to introduce new practices in the latter. In a communal rural society like that of The Gambia, villagers (and women in particular) have little latitude for individual change. However, if there is support for change at the village level, individuals may be able to change. If different ideas come into the village (through the school, foreigners, or through visits to or visitors from other areas) the village as a whole may be more open to individuals trying different behavior.

Conditioning Effect of Wealth or Personal Income

In studies of agricultural behavior change, wealth of the farmer has been found to be a major condition determining whether farmers will use their new knowledge to change their behavior. This type of relationship was hypothesized for health and nutrition behavior as well. The results of this analysis did not provide support for this view. Compound wealth (dalasi value of the animals owned by the compound) did not interact significantly with knowledge and W-S-S or feeding practice.

The practices recommended by the campaign were chosen partly because of their low cost. In this case, wealth of the family may not matter because the practice is affordable to all. There also may have been a measurement problem; number of animals may not be a good measure of the expendable income in a Gambian compound and thus may not be related to ability to obtain sugar, salt, or special foods.

Personal income of the mother did have a significant joint effect with knowledge on use of W-S-S. However, the relationship was the opposite of that expected. Mothers who did not have an income of their own, from sale of their own crops or a business, were more likely to use W-S-S if they knew something about it than mothers who did have an income.

This result may be due to the constraint of mother's customary behavior. The literature indicates, and AED was aware in designing the campaign, that it is more difficult to replace current behavior with new practices than to modify practices that already exist. The campaign may have been trying to supplant a substantially different customary practice for the group with some expendable income, but only modify existing practice for women with no money of their own. As described previously, mothers with an income were more likely to buy medicines from local shops or a charm from an Islamic marabout. For these mothers, preparing a home remedy from common household items may have been too different from simply giving medicines or from using a spiritual treatment. These mothers may also have been reluctant to adopt a home-made mixture because it was free and thus of lower status.

Joint Effect of Number of Children Under Six

Having more than one child under six was one of the measures of mother's availability of time to learn about and try new health practices. It was hypothesized that mothers with more time would be more likely to turn knowledge into practice than mothers with less time. This variable did not have a significant joint effect with knowledge in the cross-sectional analyses. However, it was the only significant factor explaining subsequent behavior in the analyses over time.

The joint effect of number of young children and early knowledge on later use of W-S-S was the opposite of that hypothesized. Mothers with more than one young child (less time) were <u>more</u> likely to turn knowledge gained at one time into use of W-S-S at a later time than were mothers with only one young child (or more time). The most likely explanation for this is that number of young children is not a good measure of time available. It is probably a better measure of salience of diarrhea to the mother. Mothers with more children during the time of the campaign would be experiencing more cases of their children's diarrhea, would have had more opportunities to try W-S-S, and may have been more open to trying W-S-S if they had learned something about it.

Discussion

It is hard to make any strong conclusions based on the findings presented above. Only one of the conditions hypothesized, village development, was significant and in the direction hypothesized. A closer examination of the analyses for the remaining conditioning variables indicated that other compound-level variables -- mother's status, compound literacy, and social support -- although not statistically significant, did condition the relationship between W-S-S knowledge and behavior in the direction hypothesized. The lack of significance for the compound literacy and social support interactions may be due to the loss of large numbers of cases when these variables were used. With the smaller number of cases, statistical significance of a small relationship is more difficult to achieve.

Village development, compound literacy, and social support are all factors that are out of the control of the individual mother. The positive conditioning effects of these factors and of mother's status suggest that social structural factors are an important influence on the relationship between W-S-S knowledge and behavior for Gambian women. These mothers seem to require support from others and a conducive context at the compound or village level for adoption of W-S-S.

In the literature on health education, providing information or knowledge about new practices is seen as a very important factor in bringing about change. Many studies have found, however, that it is easier to teach people about new practices than to actually influence them to change their behavior. The results from this study show a high level of learning about W-S-S and also a high level of use, indicating that an information-only campaign can result in behavior change.

However, the findings also indicate that knowledge was not the only factor influencing the use of W-S-S. Village and compound factors and contact with interpersonal sources were also highly related to W-S-S use. In addition, the compound and village context interacted with knowledge in predicting W-S-S use, indicating that system-level factors provide positive or negative conditions for mothers' behavioral responses to new knowledge. The view in agricultural communication that the context constrains and conditions the relationship between knowledge and behavior can also be applied to health communication to provide a more detailed understanding of how health communication does or doesn't work.

More research is needed on the joint effects of contextual factors with knowledge. The results of this study can only suggest which factors are important, but they provide only a small amount of evidence. Much of this may be due to problems in the study; some of the variables were found to be poor indicators of the concepts they were measuring and in many of the analyses a large number of cases were lost. Additional studies should be done on different health topics (e.g., immunizations for children, feeding practices) to see if the results found here apply to more than just adoption of W-S-S. Also, more research on conditioning effects over time, particularly during the first stages of a campaign, would be useful.

Conditions for Learning from the Mass Media

In the cross-sectional analyses, radio listening was found to have a significant association with knowledge about W-S-S over and above interviewer/division and the control variables. This suggests that everyone had a chance to learn from the campaign and that radio messages cut across status, wealth and compound differences in providing knowledge. The association was not very large, radio adding only two percent to the variance explained, probably because the campaign used multiple media -- print, health workers and Red Flag volunteers, as well as radio.

When we look at learning over time, we see that most of the learning about W-S-S took place during the Happy Baby Lottery, an intensive campaign making heavy use of all three media (see Figure 19 in Chapter 4). The discriminant analyses over time showed that radio exposure made no independent contribution to knowledge differences during this time of high learning. The lack of significant contribution may be due to the campaign's heavy use of all three communication channels. This is suggested by the finding that the control variables found to most strongly influence knowledge about W-S-S were those measuring exposure to interpersonal sources of information (health worker and Red Flag worker) and support at the compound or village level (social support, compound literacy, village development).

As the campaign progressed, once the lottery had been over for months, the main function of the radio may have been to keep mothers from forgetting about W-S-S. As can be seen in Figure 19, after July 1983, as the campaign moved on and began to focus on other topics, mothers were starting to forget about W-S-S. However, the knowledge of mothers with high radio exposure was declining less.

The flyer, another important part of the campaign, was found not to be a significant factor in mother's knowledge about W-S-S. Once possible extraneous factors had been controlled, flyer ownership was not significantly related to knowing something about W-S-S. The analyses performed here were probably not a good test of the relationship between flyer exposure and knowledge. Having a flyer is only a measure of possible exposure. We don't know if mothers who had flyers ever consulted them.

The relationship between radio listening and feeding knowledge was explained almost completely by interviewer/division. As described earlier, the field-workers seemed to have trouble with the feeding questions, but there are probably real division differences also.

The primary analyses were those examining the joint effect of mass media exposure and other situational factors on knowledge. The following factors were expected to condition the relationship between mass media exposure and knowledge were:

- Access to material goods
- Access to time
- Status of the mother
- Contact with a health worker or Red Flag volunteer
- Prior information about W-S-S
- Salience of Diarrhea
- Pictorial ability

Most of the conditioning relationships were not significant and those that were showed the opposite relationship to that hypothesized. The major finding in these analyses was that for the joint effect of mass media exposure with health-worker contact, Red Flag volunteer contact, and social support, discussed below.

Joint Effect of Access to Information

The cross-sectional analyses of the relationship between mass media exposure and knowledge about W-S-S and feeding, using the conditioning variables, produced unexpected, but very interesting findings. The interaction of health-worker and Red Flag contact, social support, village development with mass media exposure had the opposite effects from those which were expected. Women with low health-worker or Red Flag contact and low social support were found to be more likely to learn about W-S-S from radio exposure than women with high health-worker or Red Flag volunteer contact and high social support. Mothers in low development villages were found to be more likely to learn about feeding messages from radio exposure than women in villages with more development.

In all four of these cases, the underlying factor at work may be access to information. Women with access to multiple sources of information about new practices (health worker and radio, or other compound women using W-S-S and radio) were more likely to know something about W-S-S than women with radio exposure only. Mothers who weren't able to get information from the health worker or others in their compound, or mothers who live in villages where there are no schools or health services or which are a long distance from other villages, may have to learn from the radio because they have few other sources of information. Those with neither radio exposure nor contact with one of the other sources of information, tended not to know at all.

Interpersonal sources of information, such as extension or health workers, often reach only a few people and often those who are already better off and who have other sources of information. Radio is a channel which can cut across some of these boundaries and reach large numbers of people who would otherwise have little contact with outside information (Meyer, Block, & Ferguson, 1984; Hornik, 1984). These findings suggest that radio was important in reaching a segment of the population who weren't receiving W-S-S information from other sources and in helping to close a gap in health knowledge.

It was hypothesized that the mass media and interpersonal sources work in a complementary way to bring about learning about health and nutrition, each channel reinforcing[11] the others. Interpersonal contact about W-S-S was expected to facilitate learning about W-S-S from the radio

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[11]The term "reinforcing" is not used here as it is in the psychological literature. Here it means supporting or strengthening. Contact with interpersonal channels was expected to strengthen the effects of radio exposure on knowledge about W-S-S or feeding.

(e.g., mothers with higher interpersonal contact about W-S-S would be more likely to learn from the radio than mothers with less interpersonal contact about W-S-S). This is a common view in the literature and was one of the principles behind AED's use of multiple channels.

However, these findings do not support this view. Instead of radio and interpersonal channels acting together to reinforce each other's influence on knowledge about W-S-S, radio acted as an alternative source, compensating for the lack of information in the absence of interpersonal sources. This supports the view proposed by Chaffee (1979), in his discussion of mass media and interpersonal channels, that the most important factor in an individual's use of a particular channel is <u>accessibility</u> of the channel rather than its special characteristics.

This is another area where more research would be helpful. The lack of a facilitating or conditioning relationship between interpersonal channels and radio seen in this study may be partly due to the timing of the questionnaire used in the cross-sectional analyses. By September 1983, mothers with interpersonal contacts had reached a ceiling in knowledge about W-S-S. The only mothers who could change in response to radio exposure were those with no interpersonal contact. It is possible that, in the early months of the campaign when the ideas presented were new, contact with interpersonal sources helped mothers learn from the mass media. Therefore, research on the joint effects of the mass media and interpersonal channels in the first months of a campaign or program should be done.

Conclusions

This study attempted to provide some evidence about how knowledge and behavior change take place in a developing country in response to new information. Adapting an approach used in studying agricultural communication, the analyses tried to determine what contextual factors facilitate or constrain knowledge gain or behavior change and how these factors interact with mass media exposure and knowledge.

The findings from this study suggest that the processes of knowledge gain and behavior change are different. The most important constraint to knowledge about W-S-S was access to information (health worker, radio, other women in the compound). The tests of the conditioning relationships found that none of the contextual factors interacted positively with mass media exposure as expected. Instead, providing multiple channels of information allowed the campaign to reach people who would not have learned if only one channel had been available. This provides some explanation of why evaluations of health and nutrition projects find relatively high levels of knowledge change. If people have access to the information, they are likely to learn. In this campaign, wealth, education, and village-level factors did not constrain mothers' ability to learn the information.

More research needs to be done on whether interpersonal and mass media channels act to reinforce each other, as presumed in much of the literature, or whether they act as substitutes. This study suggests the latter, however, because of the ceiling on knowledge reached by those with interpersonal contact, we don't see a true substitution effect. We don't have a clear picture of what happened during the time mothers were first introduced to W-S-S, when there may have been a conditioning relationship between mass media and interpersonal communication.

For behavior (use of W-S-S), we did see some conditioning effect of contextual factors. Only level of village development had a significant conditioning effect, but several compound-level factors -- mother's status, compound literacy, and social support -- also showed a conditioning influence (although not statistically significant). This indicates that, as in agricultural change, situational factors that are out of the control of the individual are important in determining whether the individual can act in a certain way. It also suggests that there is an interactive relationship between knowledge and the context in bringing about change in practice.

We cannot make very strong statements about conditioning effects on health behavior because these relationships were only seen for one topic (W-S-S) and at one time. The analysis of knowledge and W-S-S use over time and of feeding knowledge and practice did not show significant conditioning effects. However, this may be due more to measurement and time analysis problems, rather than to an actual lack of conditioning effects. The findings for W-S-S suggest that conditioning effects are at work for health behavior change and indicate the need for more study of the interaction of factors influencing health behavior. Study of conditioning relationships has been found to be important in agriculture and these results suggest this approach is also important for a better understanding of health behavior.

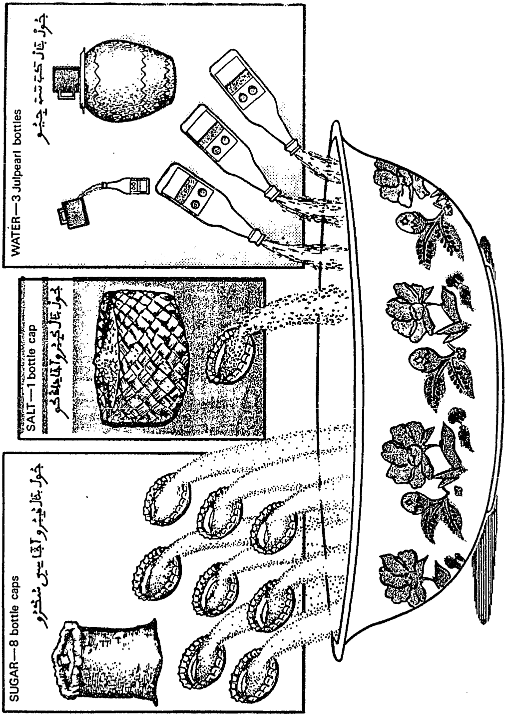
This study applied ideas from agricultural communication to health communication. Some of the categories of constraints or the individual constraints may not be appropriate for health and nutrition. More work in health and nutrition is needed to identify the issues are important to this specific area.

This study indicates that, in health communication, as in agricultural communication, more than just information may be required for behavior change. It suggests that in any situation in which one is using communication to try to change behavior in developing countries (not just agriculture and health), contextual barriers to change should be identified, considered and studied to try to determine what may be limiting change. In development campaigns, educators should consider the context in which the information is being disseminated and how it might interact with communication to facilitate or hinder change.

APPENDIX A

Examples of Print and Radio Materials Used in the Campaign

FRONT SIDE OF MIXING FLYER



HAPPY BABY LOTTERY RADIO SPOT

Listen everyone, here is some VERY IMPORTANT INFORMATION about the HAPPY BABY LOTTERY.

Mothers - do you have your copy of the free Mixing Picture yet? If so, you should have the picture in front of you as you listen to this programme. I am going to tell you how to use the Mixing Picture to make the Sugar and Salt Mixture correctly. The is ONE thing you'll need to know to be in the Lottery.

Look at the coloured side of the Mixing Picture now.

Can you see the clean mixing bowl at the bottom of the picture? That is how you start the mixing - with a CLEAN mixing bowl.

Now, the coloured pictures tell you what you must put in the bowl to make the mixture correctly.

The RED picture tells you to add 3 Julpearl bottles of CLEAN water. The Julpearl bottle must be filled TO THE TOP each time.

The YELLOW picture tells you to add one level Julpearl cap of salt.

The BLUE picture tells you to add 8 level Julpearl caps of sugar.

Now - turn the picture over to the other side.

On the other side, you will see hands using a chew stick to level off the sugar and salt in the Julpearl caps. This is the correct way to measure the sugar and salt: One LEVEL

Julpearl cap of salt and 8 LEVEL Julpearl caps of sugar. When you have put the sugar and salt in the water, you stir it until it is completely dissolved.

AND REMEMBER - if you are using coarse salt or cubed sugar, you must crush it before you add it to the water.

Making the mixture correctly is ONE thing you need to know to have a chance to be a winner in the HAPPY BABY LOTTERY. The other thing you must know is the right way to GIVE the mixture.

So listen carefully while I tell you the 5 important points about GIVING THE MIXTURE CORRECTLY:

ONE - MAKE a fresh batch of the mixture every day.

TWO - GIVE the mixture slowly, using a clean cup and spoon.

THREE - GIVE the other parts of the DIET THAT STOPS DRYNESS as well: breast milk, and solid foods if the baby is old enough for them.

FIVE - GIVE the right amount:

A baby under 6 months old should have 1 Julpearl bottle TAKEN FROM THE MIXTURE, every 24 hours.

A baby 6 to 18 months should have 2 Julpearl bottles TAKEN FROM THE MIXTURE, every 24 hours.

A baby over 18 months should have 3 Julpearl bottles, or ALL the mixture every 24 hours.

These are the things every mother should know if she wants to keep her baby happy and healthy and free from diarrhoea. An they are the things that every mother should know if she wants to have a chance to be a winner in the HAPPY BABY LOTTERY.

RADIO MESSAGES ABOUT W-S-S
AND DEHYDRATION (Paraphrased)

Phase 1: April-June 1982

Diarrhea can be serious, can lead to dehydration ("dryness") and malnutrition.

There is a special diet for dryness: give W-S-S, continue breastfeeding, give solid adult foods, as much as possible.

Radio Gambia is a good source of information on diarrhea.

A mother can learn to mix and administer W-S-S by going to the health center.

W-S-S will prevent dryness.

Dryness is caused by diarrhea. The child becomes weak from lack of food and liquid.

Diarrhea makes children very thirsty. Children with diarrhea need water, tea, and juices.

Signs of dehydration were detailed. If the mother sees the signs of dryness, she should go to the health center right away.

The red flag teaches about dryness. Go there for help.

Instructions for W-S-S: mix 3 Julpearl bottles of water, one level Julpearl cap of salt, and eight level caps of sugar; give small amounts regularly; use a clean bowl and clean water.

Phase 2: July-October 1982 (rainy season)

Publicity for lottery: where to get the free mixing picture, prizes, need to learn how to make W-S-S.

Continued explanation of diet for dryness, the way to keep babies free from diarrhea.

Intensive instructions on W-S-S mixing and how to read the flyer.

W-S-S helps prevent dryness.

Always mix W-S-S with three bottles filled to the top and mix the solution until the ingredients are dissolved.

The amount to give depends on the age of the child: under 6 months should have one bottle a day, 6-18 months should have 2 bottles a day, over 18 months should have 3 bottles a day.

The rest of the W-S-S mixed can be added to the child's food.

It is very important to give W-S-S correctly.

W-S-S should be mixed fresh every day.

Give W-S-S slowly with a clean cup and spoon.

Give W-S-S regularly even if the child vomits it up.

Messages about feces and causation of diarrhea.

Phase 3: November 1982-March 1983 (dry season)

Signs of dehydration.

If child gets diarrhea, start giving W-S-S immediately.

Give at least the minimum amount for the child's age.

When the child has diarrhea, give W-S-S. When the mother sees signs of dehydration, go to the health center.

If the child has diarrhea for more than three days, go to the health center.

RADIO MESSAGES ABOUT FEEDING (Paraphrased)

Phase 1: April-June 1982

Continue breastfeeding during diarrhea.

Solid adult foods (boiled rice, millet or findi) are good. Give as much as possible. Give small quantities at any one time.

The child should drink a lot during diarrhea -- W-S-S, fruit juice, tea, milk.

Put the child back on solid food as soon as possible after the diarrhea, as soon as the child will take them.

Give the child grain food, rice, cherreh (millet), and rice with groundnut porridge during diarrhea.

Don't give foods that are too watery. Give boiled rice, rice and groundnut porridge, cherreh, add oil or beans or fish if the child is old enough to eat them.

When the diarrhea stops, give extra adult foods.

Phase 2: July-October 1982

Give the child good solid food if he's old enough to have it.

Give extra good food as soon as the child is well: boiled rice, cherreh, rice and groundnut porridge, add oil or fish or egg.

During diarrhea, give the child whatever he is used to.

Give solid food only to children who are already eating solids.

Encourage the child to eat again as soon as she feels like it.

Phase 4: April-October 1983

When the child is sick, try to feed him small amounts of food.

While the child has diarrhea, coax him to eat rice and groundnut porridge, and make coos porridge (pap) more palatable with milk and sugar.

Continue to breastfeed the child.

When the child is recovering, to restore power, give solid foods like nyankatango, nyelengo, futo, and mani fajiringo. These foods contain more power than watery paps.

Foods that give extra power are dried fish, palm oil, groundnuts, meat, milk, sugar, and eggs.

As soon as he is recovering and his appetite returns, give solids like (lists those already mentioned). Add groundnut sauce or palm oil to make the food more palatable.

APPENDIX B

Questions Used to Develop the Measures for the Analyses

English Fieldworker ____

ANNENBERG: CONDITIONS FOR KNOWLEDGE AND BEHAVIOR CHANGE

A. 1. Village name ____________________
2. Village number ____________________
3. Compound number ____________________
4. Woman's name ____________________
5. Woman's number ____________________
6. Date of interview ________________
7. Language of interview ____________
8. Rank of woman in family __________
(1=only wife, 2=first wife, 3=second, third or fourth wife, 4=other, specify)

B. Sometimes when a child has diarrhea, it isn't very serious and so the mother decides that nothing needs to be done. Other times, the mother treats the child (for example, with things like leaves, tree barks, sugar and salt, or taking the child to local herbalists, marabouts, or the health nurse).

9. When is the last time one of your children had diarrhea that you treated? Which child was this? Child's name _____________
10. Sex of child (1=male, 2=female) _____________
11. <u>(Child's name)</u> was how many years (or how many months) old when he (she) had this diarrhea? ______
12. Was this during the rainy season or the dry season ? ________
(1=rainy season, 2=dry season, 9=doesn't remember)

13. What did you do <u>first</u> this time that <u>(child's name)</u> had diarrhea? __________

1 = Gave W-S-S
2 = Gave local teas (leaves or barks)
3 = Gave pills or liquid medicines
4 = Went to the local herbalist
5 = Went to the marabout
6 = Went to the health nurse or hospital
7 = Other (specify)
9 = DK

14. Did you do anything else after this? _______

1 = Gave W-S-S
2 = Gave local teas
3 = Gave pills or liquid medicines
4 = Went to the local herbalist
5 = Went to the marabout
6 = Went to the health nurse or hospital
7 = Nothing else
8 = Other (specify)
9 = DK

C. <u>W-S-S Use.</u> If the mother gave the child W-S-S (see questions 14 and 15), ask these questions. If she didn't use W-S-S, go to D.

15. Did you give the W-S-S medicine for one day or more than one day? _______ (1 = one day)
    If more than one day: For how many days did you give it?_____ (9=DK)
16. How did you mix it each day? How much water did you use? (write mother's answer, 9=DK)
17. Some women can get sugar and salt easily. Others cannot.
    a. How much sugar were you able to put in this mixture?
    b. How much salt? (write answers, 9=DK)

18. Sometimes a baby doesn't want to drink all the medicine you want him to drink. How much was the child able to drink in one day? (write answer, 9=DK) __________

    * If the mother does not answer in teaspoons, cups, bottles, etc., ask: Did the child drink all, half, more than half, or less than half of what you mixed?

19. For how many days did (child's name) have diarrhea?

    1 = One day Go to D.
    More than one day (write number of days) _____
    9 = DK

20. At times, the W-S-S mixed cannot be finished in one day. Did you continue giving the child the same mixture the next day or did you prepare a new batch?

    1 = Continued on next day
    2 = Made every day
    9 = DK

D. Now I would like to ask you some questions about what Child's name ate during this time.

21. At the age that ________ had the bout of diarrhea we discussing, when he (she) was well, before the diarrhea, was ________ eating solid foods, liquid foods, or breastfeeding only? (1=yes, 2=no)

    Eating solid foods _____
    Eating liquid foods _____
    Breastfeeding __________

22. When a child has diarrhea, some mothers give solid foods even while the diarrhea continues; other mothers give only pap until the diarrhea stops. When <u>child's name</u> had diarrhea, did you give solids or did you give pap? ________

    1 = solids (Go to 22a)
    2 = pap (Go to 22b)
    3 = both (Go to 22a and 22b)
    7 = breastmilk only
    9 = DK (Go to 23)

    22a. If "solids," what did you give? (write answer)

    22b. If "pap," did you add anything to the pap?

    1 = yes
    2 = no
    9 = DK (Go to 23)

    22c. If mother added to the pap, what? (write answer)

23. <u>After</u> the diarrhea was over and _______ was recovering, did he (she) eat more food or milk than <u>before</u> the diarrhea, the same amount, or less?
    (*If the child has diarrhea now, ask: When a child's diarrhea has stopped and he is recovering, some mothers feed the child less than normal, other give normal amounts of food to the child, and others give more food than usual to the child. What do you do?)

    1 = Less food or milk
    2 = Same (or normal) amount
    3 = More food
    9 = DK

24. Did you give the child special foods when the diarrhea stopped, or did you continue to give him (her) the same foods as before the diarrhea?

    a. 1 = Special foods (Go to b)
    2 = Same foods as before
    3 = Diarrhea hasn't stopped yet
    9 = DK

    b. What foods were these? (write answer)

E. Contact with health system.

25. Have you visited any of the people who work in the clinic about the health of your children?

    1 = yes
    2 = no (Go to 27)

26. Since the start of Ramadan, how many times have you taken any of your children to see them?_______

    (99 = DK)

27. Do you know of a Red Flag volunteer in this area?

    1 = yes
    2 = no (Go to F)

28. Have you ever been to her to ask for advice on how to treat your child's diarrhea? ___________

    (1 = yes, 2 = no, 9 = DK)

F. Now I would like to know about some objects you might have in your compound and about some of your daily activities.

29. Do you listen to Radio Gambia? If so, how many days each week? _______

    1 = Every day
    2 = Several times a week
    3 = Once a week
    4 = Less than one time a week
    5 = Never, doesn't listen
    9 = DK

30. Do you have any files or a garden of your own? ____

    1 = Yes (Go to a)

    2 = No (Go to b)

    a. Do you sell any of the crops you grow on your land? __________ (1 = yes, 2 = no)

    b. Do you have a business of your own, for example handicrafts or a small shop? ________

       (1 = yes, 2 = no)

31a. On a usual day, when you go to the fields or the garden (or to you shop), at what time do you leave your compound to go to work? _______

b. At what time do you come home? ______

(If the woman says it depends on whether she is making lunch that day, ask her these questions about the days she doesn't make lunch).

32. Do you have anybody at your compound to take care of your children that are five years old or younger when you have to be away, for example, when you go to the fields or to visit someone? (1 = yes, 2 = no)

33. When you are with other women of the village or from neighboring villages, for example, in the compound, at the well, at the clinic, or in the fields, have you talked among yourselves about how to keep you children healthy? _____ (1 = yes, 2 = no, 9 = DK)

34. Does anyone in your compound use a plow to work in fields or does everyone use a hoe? ______

    1 = Plow
    2 = Hoe
    3 = Plow and hoe
    4 = Nobody in the compound farms
    5 = Other (specify) ______
    9 = DK

35. Have you ever been to Banjul? If no, what is the largest town or village you have been to?

a. 1 = yes (Go to 36)

   2 = no (Go to b)

b. Name of largest town visited __________

36. Has anyone from your <u>compound or family</u> ever been to Tubabudou? ____ (1= yes, 2 = no, 9 = DK)

G. Now I would like to know about your opinions about some treatments for diarrhea.

37. Do you know about a medicine for diarrhea that is made at home with water, sugar, and salt? ______

    1 = Yes

    2 = No (Go to H)

38. How much water, how much sugar, and how much salt are needed to make this medicine? (write mother's answer. If she doesn't know, write DK)

    Water ________

    Sugar ________

    Salt _________

39. How much sugar-salt medicine is the minimum needed in 24 hours by a baby <u>under 6 months</u> old? (write mother's answer. If she doesn't know = DK) _________

40. How often should a fresh batch of this water-sugar-salt medicine be prepared?

    1 = More than once every 24 hours
    2 = Every 24 hours
    3 = Every 2 days
    4 = When the first batch is used up
    5 = Other (specify _______

41. How much sugar-salt solution is the minimum needed in 24 hours by a baby <u>over 18 months</u>? (write mother's answer, don't know = DK) _________

42. For how many days should the child be given the W-S-S medicine?

    Number of days ______

    88 = Until the diarrhea stops

43. How much of the sugar-salt solution should a child <u>between 6 and 18 months</u> drink in one day? (write answer, don't know = DK) ________

44. Do any of the other women in your <u>compound or your family</u> use this W-S-S solution for the diarrhea of their young children? _____

    1 = Yes

    2 = No

    9 = DK (Go to H)

45. Would you say few, some, or most of the women use it? _____

    1 = Few
    2 = Some
    3 = Most
    9 = DK

H. Now I would like to ask you some questions about feeding babies in The Gambia.

46. If a child is old enough to eat solid foods like rice or millet, what specific foods should he eat when he has diarrhea? (write mother's answer, don't know = DK)

47. Some people say that, if a child is old enough to eat solid foods like rice or millet, it is good for him to have solid foods during the diarrhea. Others say it is not good. What do you think? _______

    1 = Good
    2 = Not good

48. After the diarrhea is over, should a child eat less food, the same amount, or more than he did before the diarrhea?

    1 = Less
    2 = Same amount
    3 = More
    9 = DK

49. Now I would like to ask you about what the women you know feed their babies when they have diarrhea. When a child has diarrhea, some mothers continue to give him solid foods. Other women give their child only liquid foods. What do most of the women in your <u>compound or family</u> do when their children have diarrhea?

    1 = Give solids
    2 = Give liquids
    3 = Other (specify)
    9 = DK

QUESTIONS USED OR CONSIDERED FOR ANALYSES
OR VALIDATION OF MEASURES - LISTED
ACCORDING TO THE VARIABLE MEASURED

Each question is listed as it was in the original questionnaire, including the coding instructions, except for those asked in the survey designed for this dissertation. The questionnaire designed for this dissertation is included as Appendix * and only the questions themselves (and not the possible range of responses are included here). After each question is the source of the question and the date or dates it was asked. Questions for this dissertation are initialed "JM," those from the Stanford interviews "SU," and those from the study done by Sikandra Spain, by "SS."

<u>Mass Media Exposure</u>

Radio

Do you listen to Radio Gambia? If so, how many days each week? (JM, 9/83)

Do listen to RAdio Gambia? If so, how often? (SU, 3/82)
Every day______
Several times a week ______
Once a week ______
Less than once a week ______
Never ______

Where have you learned what you know about the care of infants with diarrhea? (SU, 7/82)
(check all that apply)
Radio ______
Health worker ______
Family members ______
Friends ______
Other ______

Since the start of the rains, have you heard any radio announcements about caring for children with diarrhea?
(SU, 9/82 & 12/82)
1 = yes 2 = no 9 = DK

Since the last time I talked with you, have you heard any message on the radio about taking care of children with diarrhea? (SU, 9/83)
1 = yes 2 = no 9 = DK

In the last month, have you heard any radio messages about giving foods to children recovering from diarrhea? (SU, 9/83)
1 = yes 2 = no 9 = DK

Flyer

(Show flyer) Have you ever seen a copy of this picture before? (SU< 12/82)
1 = yes 2 = no 9 = DK

Have you ever seen this picture before, other than in previous interviews? (SS, 8/83)
1 = yes 2 = no 9 = DK

Have you ever had one of these pictures yourself? (SU, 12/82 & SS 8/83)
1 = yes 2 = no 9 = DK

Can you show it to me now? (SU, 12/82 & SS, 8/83)
1 = shown 2 = not shown

Knowledge about W-S-S

Do you know about a medicine for diarrhea that is made at home with water, sugar, and salt? (SU, 3/82, 1/83, 3/83, & JM 9/83)

How much water, how much sugar, and how much salt are needed to make this medicine? (JM, 9/83)

How much sugar-salt medicine is the minimum needed in 24 hours by a baby under 6 months old? between 6 and 18 months? over 18 months? (JM, 9/83)

How often should a fresh batch of this water-sugar-salt medicine be prepared? (JM, 9/83)

For how many days should the child be give the W-S-S medicine? (JM, 9/83)

Knowledge about Feeding

If a chid is old enough to eat solid foods like rice or millet, what specific foods should he eat when he has diarrhea? (JM, 9/83)

Some people say that, if a child is old enough to eat solid foods like rice of millet, it is good for him to have solid foods during the diarrhea. What do you think? (JM, 9/83)

When a child's diarrhea has stopped and he is recovering, what foods should a mother feed the child? SU, 9/83)

Which foods give more power to a child recovering from diarrhea -- paps or solids? (SU, 9/83)
1 = paps 2 = solids 9 = DK

After the diarrhea is over, should a child eat less food, the same amount, or more than he did before the diarrhea? (JM, 9/83)

W-S-S Practice

What did you do first this time that (child's name) had diarrhea? (JM, 9/83)

Did you do anything else after this? (JM, 9/83)

Did you give the W-S-S medicine for one day or more than one day? If more than one day, how many days did you give it? (JM, 9/83)

How did you mix it each day? How much water did you use? (JM, 9/83)

Some women can get sugar and salt easily. Other cannot.
a. How much sugar were you able to put in this mixture?
b. How much salt? (JM, 9/83)

Sometimes a baby doesn't want to drink all the medicine you want him to drink. How much was the child able to drink in one day? (JM, 9/83)

For how many days did (child's name) have diarrhea? (JM, 9/83)

At times, the W-S-S mixed cannot be finished in one day. Did you continue giving the child the same mixture the next day or did you prepare a new batch? (JM, 9/83)

Mothers in The Gambia deal with their children's diarrhea in different ways. Some treat the child themselves. Some take the child to a local healer. Some take the child to a health center. What did you do with your youngest child the last time that child had diarrhea? 1 = yes 2 = no (SU, 3/82, 1/83, 3/83)

Treated the child myself _____
Took the child to a local healer ______
Took the child to a health center ______
Did nothing ______
Other (specify) ______

How did you treat the diarrhea yourself? (SU, 3/82, 1/83, 3/83)

Herbal tea______ Which herbs? ______
Bought medicine at pharmacy _____Which medicine?___
Water, sugar and salt ______
Koran water ______
Purge ______ What kind of purge? ______
Other (specify) ______
Don't recall ______

Feeding Practice

At the age that (child's name) had the bout of diarrhea we are discussing, when he (she) was well, before the diarrhea, was (child's name) eating solid foods, liquid foods, or breastfeeding only? (JM, 9/83)

When a child has diarrhea, some mothers give solid foods even while the diarrhea continues; other mothers give only pap until the diarrhea stops. When (child's name) had diarrhea, did you give solids or did you give pap? If "solids," what did you give? If "pap," did you add anything to the pap? (SU, 9/83)

After the diarrhea was over and (child's name) was recovering, did he (she) eat more food or milk than before the diarrhea, the same amount, or less? (JM, 9/83)

Did you give the child special foods when the diarrhea stopped, or did you continue to give him (her) the same foods as before the diarrhea? What foods were these? (JM, 9/83)

Health-worker Contact

Have you visited any of the people who work in the clinic about the health of your children (JM, 9/83)

Since the start of Ramadan, how many times have you taken any of your children to see them? (JM, 9/83)

Have you ever been taught by a health worker to make a medicine at home for diarrhea? (SU, 3/82, 1/83, 3/83)
Yes _____ Which? _____
No ______

Red Flag Volunteer Contact

Do you know of a Red Flag volunteer in this area? (JM, 9/83)

Have you ever been to see her for advice on how to treat your child's diarrhea? (JM, 9/83)

Do you know any compound in this village marked by a red flag? (SU, 12/82)
1 = yes 2 = no 9 = DK

(If yes) What does this red flag mean? (Red flag identifies a person who knows how to mix sugar-salt medicine properly). (SU, 12/82)
1 = correct 2 = incorrect 9 = DK

Social Support for W-S-S Adoption

What did you do first this time that (child's name) had diarrhea? (JM, 9/83)

Did you do anything else after this? (JM, 9/83)

Do any of the other women in your compound or family use this W-S-S solution for the diarrhea of their young children? Would you say few, some or most of the women use it? (JM, 9/83)

When you are with the other women of the village or from neighboring villages, for example, in the compound, at the well, at the clinic, or in the fields, have you talked among yourselves about how to keep your children healthy? (JM, 9/83)

Do you talk with other people about what you have leaned about the care of children with diarrhea? (SU, 7/82) 1 = yes 2 = no

If yes, with how many people? _____

Since the start of the rains, have you heard any radio announcements about caring for children with diarrhea? (SU, 9/82, 12/82)
1 = yes 2 = no 9 = DK

Have you talked about these announcements with other people? 1 = yes 2 = no 9 = DK

Social Support for Feeding Practice

At the age that (child's name) had the bout of diarrhea we are discussing, when he (she) was well, before the diarrhea, was (child's name) eating solid foods, liquid foods, or breastfeeding only? (JM, 9/83)

When a child has diarrhea, some mothers give solid foods even while the diarrhea continues; other mothers give only pap until the diarrhea stops. When (child's name) had diarrhea, did you give solids or did you give pap? If "solids," what did you give? If "pap," did you add anything to the pap? (SU, 9/83)

After the diarrhea was over and (child's name) was recovering, did he (she) eat more food or milk than before the diarrhea, the same amount, or less? (JM, 9/83)

Did you give the child special foods when the diarrhea stopped, or did you continue to give him (her) the same foods as before the diarrhea? What foods were these? (JM, 9/83)

When a child has diarrhea, some mothers continue to give him solid foods. Other women give their child only liquid foods. What do most of the women in your compound or family do when their children have diarrhea? (JM, 9/83)

Access to Material Goods

What animals do you own? How many? (SU, 5/82)

poultry _____
cows ________
sheep________
goats _______
donkeys _____
oxen ________
horses ______

(General condition of this house as compared to others in this village - observe) (SU, 5/82)
Very good _____
Average _______
Poor _________

Do you have any fields or a garden of your own? (M, 9/83)

Do you sell any of the crops you grow on your land? (JM, 9/83)

Do you have a business of your own, for example, handicrafts or a small shop? (JM, 9/83)

Do you have sugar in your home today? (SU, 3/82, 1/83, 3/83) 1 = yes 2 = no 9 = DK

Could you get sugar to make this medicine? (SU, 3/82, 1/83, 3/83) 1 - yes 2 = no 9 = DK

Do you have salt in your home today? (SU, 3/82, 1/83, 3/83) 1 = yes 2 = no 9 = DK

Could you get salt to make this medicine? (SU, 3/82, 1/83, 3/83) 1 = yes 2 = no 9 = DK

Could you get a Julpearl or small mineral bottle right now? (ask to see it) (SU, 3/82, 1/83, 3/83)
1 = shown 2 = not shown 9 = DK

Could you get a bottle cap right now? (ask to see it) (SU, 3/82, 1/83, 3/83) 1 = shown 2 = not shown 9 = DK

How many times did you eat fish last week? (SU, 3/82, 8/82)

How many times did you eat meat last week? (SU, 3/82, 8/82)

How many times did you eat eggs last week? (SU, 3/82, 8/82)

How many times did you eat meals made with groundnuts last week? (SU, 3/82, 8/82)

Access to Time

Number of children under six years: from SU enumeration of compounds.

Daughters over 8 years and co-wives: from SU enumeration of compounds.

Do you have anybody at your compound to take care of your children that are five years old or younger when you have to be away, for example, when you go to the fields or to visit someone? (JM, 9/83)

When you go to the fields or garden (or to your shop), at what time do you leave the compound to go to work? At what time do you come home? (JM, 9/83)

Was this [diarrhea bout] during the rainy season or the dry season? (JM, 9/83)

Status of the Mother and Child

Mother is a first wife.
Mother is the first wife of the compound head. (SU enumeration of compounds, 2/82)

(Child's name) was how many years/how many months old when he (she) had this diarrhea? (JM, 9/83)

Experience with Outside Ideas and Techniques

Have you ever been to Banjul? If no, what is the largest town or village you have been to? (JM, 9/83)

Have you looked at any pictures in magazines, newspapers, or books this year? (SS, 8/83)

Have you seen a film this year? (SS, 8/83)

Has anyone from your compound or family ever been to Toubabudou? (JM, 9/83)

Does anyone in your compound use a plow to work in the fields or does everyone use a how? (JM, 9/83)

Is there a latrine in this compound? (SU, 7/82)
1 = yes 2 = no

Does the compound have a septic tank? (SU, 3/82)
1 = yes 2 = no 9 = DK

Maximum years of secular education attained by a member of the compound (SU enumeration of compounds, 2/82)

Pictorial Ability (SS, 8/83)

What is this? (pointing to eye)
1 = eye
2 = other

What is this? (pointing to fire)
1 = fire
2 = other

What is this? (pointing to grass)
1 = grass/weeds/plants
2 = other

What is this? (pointing to road)
1 = road
2 = other

Do you think the woman is coming from one of the houses in the picture or from some place outside the picture?
1 = one of the houses
2 = some place outside the picture

Look at these two women. (pointing) Which one is closer to this house? (pointing to house in front)
1 = woman with baby
2 = other woman

Look at these two houses. (pointing to round houses) Do you think more people, fewer people, or the same number of people could fit in this one (pointing to house in front) as in this one? (pointing to house in compound)
1 = the same number
2 = more or fewer

Compound Literacy

(Show the literacy card and test the respondent. Mark which language is used (Arabic, English, Wolof, Mandinka, French) Does not turn it _____
Turns it ____________
First line ___________
Second line __________
Third line ___________

Is there someone in the compound who reads well? (give them the literacy test)

Salience of Diarrhea

Can a child die from diarrhea? (Su, 3/82)
1 = yes 2 = no 9 = DK

We would like to ask you today about the pregnancies that you have had, beginning with the first right up to your most recent pregnancy. We are seeking to learn more about the health of mothers and their children, so that the Medical and Health Department can serve you better. (SU, 8/82)

a. First pregnancy:
1 = miscarried
2 = died at birth
3 = born alive, but now dead
4 = born alive, still alive
9 = no pregnancies to date

b. Cause of death
1 = God
2 = Satan, witches
3 = Diarrhea
4 = Fever
5 = Kris/jarala
6 = pneumonia, chest ailments
7 = yellow fever
8 = measles
9 = premature
10 = boils
11 = other (specify) ___________

(Repeated for all pregnancies)

Prior Information about W-S-S

Do you know about a medicine for diarrhea that is made at home with water, sugar, and salt? (SU, 3/82)
1 = yes 2 = no 9 = DK

Level of Village Development

Provided in SU sampling information and by the field-workers.

APPENDIX C

Further Discussion on the Development of the Measures Used in the Analyses

Radio Exposure

Validation Against Stanford Radio Measure

Two measures of exposure to Radio Gambia were available -- the Stanford question in the pre-intervention sweep carried out in March and April of 1982 and an almost identical question asked in September, 1983. Both questions asked, "Do you listen to Radio Gambia?" The Stanford question then asked, "If so, how often?" whereas the question used in September 1983 asked, "If so, how many times a week?" Both questions provided the following categories for coding of responses: Every day, Several times a week, Once a week, Less than once a week, and Never.

It was hoped that the Stanford measure could be used to validate the later measure. However, although the two measures were found to be significantly related ($p<.001$), their relation was not as strong as one would expect if the questions were measuring the same thing (gamma= .3). In addition, there was no consistent pattern in the change in responses. One might expect mothers who at first reported frequent listening to report less frequent listening in September, the busiest time of the year in the fields, or one might expect mothers who originally reported low listening to report more frequent listening later in the campaign, either because access to radio was increasing or in order to please the fieldworkers, who are known to be attached to a radio project. However, in this case, both changes were seen, creating problems in interpretation.

The lack of correspondence between the responses to the two questions required that a choice be made to use one or the other. Both questions were validated against measures of awareness of the messages of the campaign asked throughout the campaign (e.g., "Since the start of the rains, have you heard any radio announcements about caring for children with diarrhea?") The two radio measures were crosstabulated with the responses to five awareness measures taken throughout the campaign. The results showed that the relationships between the 1983 radio measure and awareness had higher levels of significance and were stronger than the relationships between the 1982 radio measure and awareness. Gammas for the 1983/awareness relationships ranged from .43 to .85 and for the 1982/awareness relationships ranged from .20 to .36. (See Table C-1). Therefore, it was decided to use the responses to the 1983 question. Another factor in this decision was that, because slightly different parts of the sample were interviewed in the March 1982 sweep as compared to the September 1983 sweep, use of the Stanford measure would have resulted in a large number of missing cases for this variable.

Table C-1

Results of Validation Tests of the 1982 Stanford and the 1983 Radio Measures

Question	1982 Signif. of X2	1982 Gamma	1983 Signif. of X2	1983 Gamma
Where learned what know about care of infants with diarrhea? (Mentioned radio/didn't mention)				
July, 1982	p<.05	.2	p<.0001	.43
Heard radio messages about care of children with diarrhea?				
September, 1982	p<.0002	.36	p<.0001	.83
December, 1982	p<.02	.23	p<.0001	.71
September, 1983	p<.02	.23	p<.0001	.85
Heard radio messages about giving foods to recovering children?				
September, 1983	p<.02	.23	p<.0001	.60

Knowledge about W-S-S

Development of Questions

In order to be able to compare levels of knowledge over time, using the data collected by Stanford, an attempt was made to use the same questions used by Stanford or to develop as close an approximation as possible. However, there were several problems with this.

The knowledge questions used in the Stanford questionnaires were sometimes open-ended and sometimes true-false questions. Some of the open-ended questions provided the correct answer in parentheses and required the interviewer to decide whether the woman's answer was correct or not and to code it as such. After an examination of the data gathered in previous interviews, it was decided to use only open-ended questions and to require that the fieldworkers write down the actual answer given rather than coding it as correct or incorrect. This limited the comparisons that could be made with the earlier Stanford data, but was necessary to ensure greater reliability of the answers.

True-false questions allowed the respondents a greater chance of getting a correct answer if they guessed. There was also some indication that women were answering "true" because they associated it with positive qualities and they wanted to please the interviewers. When a true-false question on how often the W-S-S solution should be made was asked in which the correct answer was "true," from 74 to 91 percent of the women gave the correct answer. However, when an open-ended question was used in a later interview, only 17 to 24 percent of the women gave the correct answer.

The decision not to provide the correct answers to the fieldworkers was based on similar considerations. In some of the Stanford interviews, the correct answer was provided for the fieldworker to use in coding the mother's response to questions about volume of W-S-S to give a child. An example of this is, "How much sugar-salt solution is the minimum needed in 24 hours by a baby under 6 months? (one Julpearl bottle)." In interviews completed in December 1982, from 42 to 48 percent of the women were coded as answering correctly and, in April 1983, from 54 to 70 percent were recorded as giving the correct answer. However, in another interview in January 1983, with an open-ended question on the same topic, only 9 percent of the women gave a correct answer.

Another consideration in designing the questionnaire was to avoid asking the questions in such a way that the mothers could merely recite a formula learned by rote from the radio. The question about the formula for making W-S-S asked about amounts of water, sugar, then salt whereas the campaign messages presented the information in the following order: water, salt, sugar. The questions about volume of W-S-S to give children of different ages were separated from each other by other items and also were not asked in the same order as they were presented in the radio spots. The radio messages say 1 bottle for a child under six months, 2 bottles for a child six to eighteen months, and three bottles for a child over eighteen months. It was felt that asking for the proportions out of sequence would better approximate the situation in which a mother faced with a child with diarrhea would decide how much W-S-S to give.

Responses to the Knowledge Questions

The majority (86.4 percent) of the respondents knew about a medicine made at home with water, sugar, and salt. Correct knowledge about W-S-S mixing and administration varied considerably. Almost all the women who knew about W-S-S, could give the proper amounts of water (96.2 percent), sugar (95.2 percent), and salt (95.9 percent) in the formula. A smaller, but still high proportion of the women who knew about W-S-S knew that it should be administered until the diarrhea stopped (71.6 percent) and that it should be made every day (59.8 percent). In the latter case, 140 women (24 percent) were overzealous and reported that the mixture should be made more than once a day. Although making W-S-S more that once a day is not strictly a correct answer in that the radio messages said to make W-S-S once a day, the behavior itself is not incorrect and was considered as a correct answer.

The women in the sample had the greatest difficulty with the questions about how much W-S-S to give children of certain ages. Seventy-two percent of the women aware of W-S-S gave the correct answer of 1 Julpearl bottle a day for a child under 6 months, 51.5 percent correctly responded 2 Julpearl bottles a day for a child 6 to 18 months, and 49.7 percent identified 3 Julpearl bottles a day as the correct amount for a child over 18 months. The order of the questions did seem to have weeded out women who might have guessed the correct answer if the questions had been in sequence. A quarter of the women incorrectly said children between six and eighteen months should have 3 bottles and 32 percent incorrectly answered that children over 18 months should have 2 bottles. One of the field-workers was asked if the women understood the questions and if she was asking them correctly and carefully. Her explanation was that the women didn't really know the correct answer and were guessing.

The distributions of correct and incorrect answers for each question asked of the mothers who knew about W-S-S are in Table C-2 below.

Table C-2

Distribution of Responses to W-S-S Knowledge Questions

Knowledge Item	Correct	Incorrect	Don't Know
Amount of water	96.2	3.0	.9
Amount of sugar	95.2	3.9	.9
Amount of salt	95.9	3.2	.9
Number of days of W-S-S	71.6	25.7	2.7
How often to make	72.2	21.8	6.0
Amount for under 6 mos.	71.7	8.5	20.4
Amount for 6-18 mos.	51.5	30.3	18.2
Amount for over 18 mos.	49.7	33.9	16.4

Development of Knowledge Scale

The measure expected to be used for W-S-S knowledge was a summative scale. The responses to all the questions were coded as 0 (incorrect, doesn't know, or doesn't know about W-S-S) and 1 (correct). Because knowing the correct amount of water, sugar, and salt required to make W-S-S were so highly intercorrelated (.85 to .87), a single variable was constructed measuring correct knowledge of all three parts of the formula. Ninety-two percent of the mothers answered all three questions correctly.

A scale was constructed adding the values of all six questions. The resulting knowledge scale ranged from zero to six. Mothers who reported not knowing about W-S-S received a score of zero. (See the figure in the text for the frequency distribution). The mean score was 3.6 with a standard deviation of 2.0 and the median was 3.9. The scale was tested for inter-item reliability and found to be reliable, with a Cronbach's alpha of .82.

Knowledge of Feeding Messages

Responses to Feeding Knowledge Questions

For feeding of children during diarrhea, mothers were asked what foods a child should eat when he has diarrhea (if he is old enough to eat solid foods) and if it is good for a child who already eats solid foods to have them when he has diarrhea. When asked about foods a child should have, the mothers were prompted with the question, "Anything else?" after each food listed. Most mothers named only one or two foods, but some named up to five foods. The questions as they were asked to the mothers are included in the questionnaire in Appendix B.

When asked if solids are good for a child if he is old enough to eat solids, ninety-two percent of the mothers said yes and eight percent said no (for five women the response was missing). When asked specifically what a child old enough to eat solids should eat during diarrhea, the responses are in the table below. The majority of the mothers (92 percent) reported that such a child should be given rice or millet. Only a small percent, six percent, mentioned protein-rich foods, such as eggs, fish, or meat, in their list of foods to give a child with diarrhea. Two percent of the mothers still believed that a child with diarrhea should be given only watery foods and paps.

Table C-3

Feeding During Diarrhea

Foods Child Should Be Given During Diarrhea *	Percent of Mothers
Pap only	1.6
Rice or millet	91.7
Protein-rich foods	6.0

* Note: These figures were derived from up to five foods named in the following way: if a mother only responded pap, she was assigned to the pap only category; if she named pap and boiled rice as good foods, she was assigned to the rice or millet category; any mother who mentioned protein-rich foods, was assigned to the highest category, even if she also mentioned pap.

Three questions were asked about feeding after diarrhea: what foods should a child have when he is recovering from diarrhea, which foods give more power to a child recovering, paps or solids, and should he have more, the same, or less food than during the diarrhea. The responses from the first two questions were obtained from the Stanford interview done at the same time in September 1983. The last question was asked in the interview done for this study. In the interviews, the fieldworkers asked the questions for this study first, then administered the Stanford interview. It is possible that some of the responses to questions in the first interview influenced the responses in the second interview.

A large proportion of the mothers (62.1 percent) reported that children should be given "power" foods, listing fish, meat, milk, eggs, groundnuts, or oil as good foods for recovering children. Thirty-four percent listed rice or millet as good foods, but didn't mention any of the power foods, and only three percent of the mothers said a recovering child should only have pap.

Table C-4

Feeding After Diarrhea

Foods Child Should Be Given After Diarrhea	Percent of Mothers
Pap Only	3.1
Rice or Millet	34.0
Power Foods	62.1

However, when asked whether paps or solids give more power to a child recovering from diarrhea, although the majority (56 percent) of the mothers answered "solids," a large proportion (41 percent) believed that paps gave more power. It is uncertain what this means. The question about actual foods that should be given may be measuring rote knowledge of the campaign messages, while the question about power may be reflecting continued beliefs in the benefit of paps for sick children. The third question asked to measure knowledge about feeding was whether a child should have more, the same, or less food after a bout. Many women answered this incorrectly: only 22.7 percent reported that the child needed more food than during the bout, 39 percent thought the child should have the same amount of food, and 38 percent thought the child should have less.

Feeding Knowledge Scale

As had been done with the individual W-S-S knowledge questions, a summative scale of knowledge about feeding was attempted. All five variables were recoded into two categories, correct and incorrect. In the case of foods to give during diarrhea, the mother's response was considered correct if she mentioned either solid starches (rice or millet) or protein-rich foods. For foods given after diarrhea, the response was considered correct if the mother mentioned any of the power foods. Although rice and millet are not incorrect answers, the campaign had been particularly stressing power foods. Tests for inter-item reliability of the scale showed that it was not reliable (Cronbach's alpha was -.06). Examination of the accompanying statistics showed that most of the five variables were poorly correlated with each other and that removing any one item from the scale would not improve its reliability.

The scale was then tested to see if it conformed to the Guttman Scale model. A scale including all five variables did not meet the requirements of a cumulative and unidimensional scale, the coefficient of scalability being .17. Examination of the statistics produced when making the scale showed that the inclusion of the item measuring which foods give more power resulted in a large number of errors in the composition of the scale. In addition, the question asking for names of foods to give during diarrhea and that asking if solids were good seemed to be almost identical and were highly intercorrelated (Yule's Q was .86). When a scale was made eliminating the questions about power foods and whether solids are good, the coefficient of scalability increased to .9. Therefore, a three-item scale using knowledge of foods to give during and after diarrhea and knowledge of amount to give was constructed and used in the analyses.

Problems with Responses

Inconsistencies found in some of the responses during the analysis of the feeding knowledge and practice measures, led to an examination of each item by division/interviewer. It was found that the responses from one interviewer were causing problems. Half of the women in this fieldworker's interviews reported that children should have only pap during diarrhea. However, these same women reported giving their child protein-rich foods during the last bout of diarrhea. This led to inaccuracies in the overall feeding knowledge measure. In addition, on one of the behavioral questions about feeding special foods after diarrhea, the same interviewer received a much larger number of "don't know" answers than the other fieldworkers, which led to half her cases being coded as missing. Because her responses were uninterpretable, all the interviews done by this fieldworker were eliminated from the feeding analyses and the figures reported below correspond to only three-quarters of the original sample.

W-S-S Practice

Design of W-S-S Practice Questions

One of the biggest issues in designing the practice questions and determining their order in the questionnaire was that the women might not be truthful because they knew the correct practice, they had been interviewed about W-S-S many times, and they generally tried to please the researchers. It was hoped that by asking the practice questions about a specific child and episode that mothers would be more likely to talk about what they actually did rather than what they thought they should do. Other strategies were to word the questions in such a way as to allow the women to say they had not done the correct thing (e.g., Some people do x, others don't, what did you do?), to stress in the training of the fieldworkers that there were no correct answers and that it was important to know what women actually did, and to separate questions that might contaminate each other (e.g., number of days the child had diarrhea from how many days W-S-S was given). In addition, the practice questions were asked at the beginning of the questionnaire and the knowledge questions at the end, separated by questions about use of the health system, radio listening, travel, and other habits.

It is uncertain how well these strategies worked. However, not all women answered that they used W-S-S, even though they had been asked about W-S-S for the last 1 1/2 years, and not all women who knew the correct answers to W-S-S knowledge questions reported correct behavior.

Correct W-S-S Practice

Frequencies for the variables measuring correct use of W-S-S are in the following table (these responses only include the 63 percent of the sample who reported using W-S-S).

Table C-5

Frequencies of Correct Responses to Individual Practice Questions

Activity	Correct	Incorrect
Mixing of formula	92.5	7.5
How often W-S-S made	83.1	16.9
Number of days given*	63.8	36.2
Amount of W-S-S given**	21.6	78.4

* Eighty-six cases are missing because women responded "Don't know."
** This variable only includes data from three districts as one fieldworker consistently asked the question incorrectly.

The majority of women who used W-S-S reported mixing the formula with three bottles of water, 8 caps of sugar, and 1 cap of salt (93 percent) and reported making W-S-S every day (83 percent). The two other variables measuring W-S-S practice had large numbers of missing cases because of problems in understanding the questions. Despite the attempts to aid women's recall, 12.7 percent of the W-S-S users (86 women) were unable to report how many days their child was given W-S-S, although most were able to recall the number of days the child had diarrhea. Of the non-missing cases, 64 percent reported giving W-S-S for the same number of days that the child was ill.

The variable measuring amount of W-S-S given for a child of a specific age had a more severe problem. When the first sets of interviews were checked for errors, it was found that one fieldworker was receiving the response "in a cup" to the question, "How much was the child able to drink in one day," leading to the conclusion that the fieldworker was asking a different question than that on the questionnaire. This problem had not come up in pretesting or back translation, although it was seen in several interviews by other fieldworkers. Although the fieldworker in question was notified of this problem and given further training on this question, she continued to receive the same responses. Therefore, almost all of her responses to this question had to be coded as missing cases and the figures for this variable represent only three of the four divisions. A small proportion of the women using W-S-S (21.6 percent) reported giving the correct amount of W-S-S to the child treated.

It was hoped that a summative scale of W-S-S practice similar to that of W-S-S knowledge could be constructed for the women who used W-S-S. Each variable was coded 0 (incorrect) or 1 (correct). Tests for inter-item reliability indicated that such a scale was not reliable (Cronbach's alpha was .32). Because some of the activities are more difficult than others, the items were then tested to see if they conformed to a Guttman scale. However, this was also not the case, the coefficient of scalability being .49.

Feeding Practice

Mothers were first asked what their children were normally eating at the time they had the diarrhea, solids or liquid foods or breast milk only. This was to avoid coding as incorrect mothers who reported giving paps to children who were not yet on solid foods and to identify women whose children were reduced to paps when they were usually eating solid foods. The mothers were then asked if they had given their child solids or paps when the child had diarrhea, requested to list solid foods given, and asked if they had added anything to pap and what.

Of the 480 women in the three divisions used in the feeding analyses, 37.9 percent reported giving their children solids, 46.5 percent gave their children both solids and pap, 14.6 gave their children pap, and 1 percent breastfed the child only. When these figures were examined by the child's age group, it was found that most of the women reported giving appropriate types of foods (see table below). When women who gave solids were asked to list foods given, 98 percent reported giving starches (primarily rice) and 2 percent reported giving protein-rich foods such as groundnut porridge, meat, fish, or eggs.

Table C-6

Foods Given to Child During Diarrhea
Compared to Foods Given When Not Ill

Foods Given During Diarrhea	Foods Child was Eating at Age Had Diarrhea			
	Breast Only	Liquids Only	Solids	Total
Breast Only	4 (57.1)	1 (1.6)	0	5 (1.0)
Pap	1 (14.3)	59 (93.7)	10 (2.4)	70 (14.6)
Solids & Pap	1 (14.3)	3 (4.8)	219 (53.4)	223 (46.5)
Solids	1 (14.3)	0 (4.8)	181 (44.1)	182 (46.5)
Total	7	63	400	470

Of the 293 women who reported giving their child only pap or both pap and solids, 77.5 reported adding to the pap, most saying they added sugar to the pap and several others reporting adding milk, fat or oil, eggs, fish or rice. The table below shows a more detailed breakdown of this variable.

Table C-7

Comparison of Foods Given During Diarrhea and Adding to Pap

Mother Added to Pap	Foods Given to Child During Diarrhea: Pap Only	Pap and Solids	Total
Yes	33 (48.5)	191 (86.4)	224 (77.5)
No	35 (51.5)	30 (13.6)	65 (22.5)
Total	68	221	289

Overall, a large majority (92.3 percent) of the mothers reported correct feeding behavior during diarrhea. These mothers included those who gave solids to children old enough to eat solids, and those who added supplements to pap given to children only on liquid diets. Although early messages stressed giving solids to children old enough to eat them, later messages suggested trying to get a sick child to eat anything that seemed palatable. For this reason, of the ten women who reported giving only paps to children already on solids, if they reported adding to the pap, their responses were considered correct. Approximately eight percent of the mothers reported incorrect behavior.

The next feeding question was about how much the child was fed after the diarrhea was over. In order to try to avoid leading the women to give the proper response based on their knowledge rather than actual behavior, the question was phrased in terms of how much the child ate rather than how much the mother gave the child. The majority of the women reported incorrect behavior, 17.5 saying that the child ate less than before the diarrhea and 47.1 percent saying that the child ate the same amount. Thirty-five percent of the women reported that their child ate more than before the diarrhea, the practice the campaign has been advocating. In four cases, the question could not be answered because the child still had diarrhea at the time of the interview.

The third feeding question asked about whether the mother had given the child special foods after the diarrhea or the same foods as before. Only 4.8 percent of the mothers reported giving the child any of the power foods that had been recommended by the campaign. Seventeen mothers reported giving pap as a special food, and several others gave bananas or oranges. In these cases, if the mother also mentioned giving any of the power foods, her answer was considered correct. Almost 90 percent of the mothers percent reported no special feeding.

Health-worker Contact

The responses to the question about healthworker visits ranged from no visits in the last three months to three women reporting having been twice a week (or 39 times). The frequency distribution can be seen in Table C-8. In many cases a woman did not respond with the number of times she had been to the clinic, but reported taking a child to the clinic once a month or every two weeks (every time the clinic was in her village). In these cases, the number of times she had been to the clinic was determined by multiplying her answer by the number of weeks or months elapsed since the start of Ramadan. It is possible that the women wanted to please the interviewers and thus reported visiting the clinic whenever it was available, thus this variable may be biased toward higher healthworker contact than is actually the case. Frequency of healthworker contact was checked against actual availability of health services to the village and, although for some women the numbers seemed too high, generally the responses were in the realm of possibility, particularly

Table C-8

Number of Times Mothers Reported Visiting the Health Center

Number of Times Visited Center	Number of Mothers	Percent
0	136	21.0
1	109	16.8
2	161	24.8
3	111	17.1
4	87	13.4
5	7	1.1
6	7	1.1
8	9	1.4
9	4	.6
12-39	18	3.0
Total	649	

considering the frequency of illness during this season.

Because of the problems seen with women's ability to count and mark time in other variables, there was some skepticism about the validity of the full range of responses to this question. Frequency of contact with the healthworker was compared to responses to earlier Stanford questions about where the mother had learned about W-S-S and whether a healthworker had taught her to make a medicine for diarrhea at home. The results showed no consistent or interpretable pattern. For example, in the responses to, "Have you ever been taught by a health worker to make a medicine at home for diarrhea?" asked in March 1983, 78 percent of the women who reported no healthworker contact between June and September 1983 said yes, 82 percent of the women who had been to the health center once said yes, but only 50 percent of those who had been 9 times and 59 percent of those who had been 12 or more times reported having been taught by a healthworker. This type of inconsistency appeared in the other comparisons. See Table C-9. Statistical tests (collapsing high contact into a category of 5 times or more) showed a significant relationship between times the healthworker was seen and reporting having learned to make a diarrhea medicine from a healthworker ($p<.0002$), but the relationship was very weak (gamma=.02) as might be expected from the inconsistent pattern of the relationship. Because of these problems, the variable measuring healthworker contact that was used in the final analyses had two values: no contact with a healthworker since the beginning of Ramadan and one or more visits to the health worker.

Social Support for Use of W-S-S

Information Dissemination

In the September 1983 interview, the mothers were asked if they talked to other women about how to keep their children healthy. When the responses to this question were compared to responses to Stanford questions about

Table C-9

Validation Tests of Number of Times Mother Has Been to the Health Center with Whether a Health Worker Has Taught Her to Make W-S-S

	Number of Times Mother Has Been to Health Center					
Percent Reporting Having Learned About W-S-S from a Health Worker	0	1	2	3	4	5 or More
in						
March, 1982	33.0	48.1	43.4	48.4	31.2	48.6
January, 1983	72.5	91.0	91.3	83.5	67.5	74.4
March, 1983	77.8	82.4	93.8	92.0	78.6	74.4

talking to others, the results showed no clear pattern. As can be seen in Table C-10, there was no significant relationship between talking with others about child health (September 1983) and talking with others about what had been learned about diarrhea (July 1982), there is a significant and positive relationship with discussing what one has learned about diarrhea on the radio in September 1982, but there is a significant and negative relationship in December 1982.

Table C-10

Results of Validation Tests of Information Dissemination

Relationship between "Do you talk with others about how to keep your children healthy?" (September 1983) and	Significance	Gamma
"Do you talk with other people about what you have learned about the care of children with diarrhea?" (July 1982)	p<.59	---
"Have you talked about these announcements [campaign messages] with other people?"		
(September 1982)	p<.001	.55
(December 1982)	p<.001	-.77

These results indicate that the information dissemination measure of social support was not valid. Therefore, it was not used in the analyses.

Access to Material Goods

Access to Water, Sugar, and Salt

An immediate constraint to using W-S-S was whether the mother had access to sugar, salt, a Julpearl bottle, and a bottle cap. Mothers were asked if they had or could get sugar or salt and were asked to show their bottle and bottle cap before the campaign (March 1982), and in January and March/April 1983. A summative scale of access to ingredients was constructed, but reliability tests showed the components of the scale to be unreliable (Cronbach's alpha=.52). Examination of access to the different ingredients over time showed that having the ingredients in January 1983 had little relation to having them two months later. In particular, having a Julpearl bottle or bottle cap seemed to be random. Women did not seem to have put away a bottle or cap for special use to make W-S-S. Because of these problems, a measure of access to W-S-S ingredients could not be made.

Mother's Nutrition as a Measure of Family Wealth

Another measure of family wealth was suggested by Bertrand, et al. (1978). They found that nutrition, measured by number of portions of animal protein consumed in a week, can be used as an indicator of standard of living and income. For this, a variable based on the mother's weekly consumption of meat and fish was also attempted. The women in the sample had been asked how many times a week they ate meat and fish in March/April 1982 (Time 1) and in August/September 1982 (Time 2).

As with the number of animals questions, there were many missing cases; in the first wave of nutrition questions, 147 women were not given the interview and in the second wave, 76 of the women were not questioned. In addition, there were many cases in which the woman reported not knowing how many times she ate meat or fish, particularly at Time 2. Once again, an effort was made to predict values for women who didn't know. It was thought this would be possible because, even though past experience showed problems with questions requiring numbers or mathematical skills, the full range of answers (from 0 to 21 times a week) for fish and meat were related between the two times. The correlation of number of times women ate fish at Time 1 and Time 2 was .41, $p<.001$, and for meat was .2, $p<.001$. The same prediction method using regression analysis within each geographical area was tried and found not to work. For several divisions, there were too many missing cases to be able to predict the nonmissing cases with any accuracy. Generally, the regression analyses showed that number of times fish was eaten in Time 2 did not explain a significant proportion of the variance in number of times fish was eaten at Time 1. The same results were found for meat eating. This was not unexpected because the two interviews were given at different times of the year. Food is generally less available in July and August, when the crops have just been started. Because of the large number of missing cases, no variable could be made to measure wealth in this way.

Estimation of Missing Values in Compound Wealth Scale

Before making the animal wealth scale, an attempt was made to estimate the number of animals a woman had if she had responded "don't know" to one of the questions. As there were already a large number of missing cases for this variable, it was important to try not to lose any more. Seventy-eight women reported "don't know" to one or more of the questions about animals. If a woman had given numerical responses for all but one or two kinds of animals, the values for the type or types of animals she didn't know were predicted. If she replied "don't know" three or more times, predictions were not made as there were too few values to use in making the estimates.

An inspection of these cases showed that all the "don't know" responses were from the McCarthy Island Division. Therefore, predictions were made based only on nonmissing cases in this division. Missing numbers of animals were estimated using a regression equation. For example, for a mother who said she didn't know how many sheep her family owned but did know how many other animals they had, a regression analysis was done on the values for mothers who had no missing answers using sheep as the dependent variable and the other six kinds of animals, poultry, cows, goats, horses, donkeys, and oxen as the independent variables. The number of sheep owned by the woman who didn't know the number was then derived by summing the regression coefficients from the relevant regression equation. For women who didn't know numbers of poultry and sheep, the regression analysis included only five independent variables, excluding poultry when estimating sheep and vice versa. Forty-nine values were estimated in this way, reducing the total number of missing cases from 188 to 139.

Access to Time

Season During Which the Child in Question Was Ill

Women in The Gambia are at their busiest during the rainy season, when they not only have their usual compound chores but also heavy work in the rice fields. During the dry season, they have lighter work and more free time to visit and, perhaps, to devote to their children. In the September 1983 interview, women were asked if the diarrhea bout they were describing had occurred during the rainy season or the dry season. Because the answers to this question showed little variation, (most women reporting illness in the rainy season), this was not used as a measure of time availability.

Amount of Time Spent in the Fields

In the same interview (September 1983) the mothers were asked what time they left the compound to go to the fields or their shop and what time they came home on the days they didn't have to come home early to make lunch for the compound. See the questionnaire in Appendix * for the exact wording of the questions. Preliminary pretesting had shown that women couldn't answer a question about how many hours a day they spent in the fields. Pretests using the modified question indicated that the women could specify a general time they left home or returned if they were provided with familiar time cues by the fieldworkers, e.g. Muslim prayers, radio programs, or mealtimes. In response to this, during the training session, the fieldworkers were told to provide such cues to the women and then translate this into an approximate hour of the day. Despite the promise shown in the pretests, this question was not successful in distinguishing amounts of time spent in the fields. One fieldworker reported that the women in her sample worked in the fields only in the morning, which is highly unlikely during the rainy season. This problem might have been rectified at the midpoint of the interviewing except that the fieldworker was ill during the first half of the interviewing and had completed too few of her interviews for this problem to be noticed. A second fieldworker permitted many of her respondents to reply "I don't know," without probing further. This was unexpected as the fieldworker had been one of the pretesters and had developed one of the means for fixing times. However, she also had been ill during the interviewing and complained to us that the women were very busy and not willing to spend a lot of time answering questions, thus it is possible that she rushed over the more difficult parts of the interview. Because of these problems, time in the fields was not used as a measure of time availability.

Outside Experience

Individual-level Variables

At the individual level, there were questions on whether the mother had been to Banjul (the capital city), whether she had seen a movie recently, whether she had seen pictures in a book, and her educational level. When the responses to these questions were examined, it was found that there was almost no variation. Most of the women had not seen a movie (82.5 percent) and very few had any education at one of the government schools (4.5 percent). Having been to Banjul was almost completely determined by distance from the city; over 95 percent of the women living in the three divisions closer to Banjul had been to the city. The majority of the women who had never been to Banjul lived in the McCarthy Island Division. The lack of variation between women on the individual-level measures of exposure to new ideas led to the decision to look at this at the compound level. These findings were not surprising. It had been expected that there might be little variation in women's experiences in a culture based on communal families and living.

Development of Scale Measuring Outside Experience

A summative scale was made with the five compound-level variables: a member of the compound has been to the West, the compound has a septic tank, the compound has a latrine, people in the compound use a plow, someone in the compound has 7 or more years of secular schooling. The full frequency distributions for each of these variables is available in Tables C-11 and C-12.

When the scale was tested for inter-item reliability, it was found to be unreliable, Cronbach's alpha being .25. The scale was then tested to see if it followed the Guttman scale model. The Guttman scale test showed a coefficient of scalability of .28, indicating that the scale was not unidimensional nor cumulative. The procedure identified the questions about septic tanks and plows as being poorly correlated with the other three items in the scale. Having a septic tank seems to be primarily related to being in the geographical area closest to the capital city, where space is at more of a premium. Use of a hoe instead of a plow may reflect type of agriculture practiced rather than agricultural innovativeness.

Table C-11

Frequency Distributions for Variables in the Experience with Outside Ideas Scale (Percent)

Variable	Yes	No	DK or Missing
Member of the Compound Has been to Europe or the U.S.	71.8	27.1	2.1
People in the Compound Use a Plow	77.1	17.3	5.6
Compound Has a Septic Tank	17.7	66.0	16.2
Compound Has Latrine	70.9	17.4	11.7

Table C-12

Distribution of Years of Education in the Compound

Maximum Number of Years of Education in Compound	Percent of Mothers
0	36.3
1	5.8
2	4.7
3	7.7
4	5.5
5	8.4
6	7.5
7	5.3
8	4.7
9	3.1
10	9.3
11	.3
12	.7
13	.3
14	.3

APPENDIX D

Additional Tables and Figures from Chapter 4: Knowledge and Behavior

Table D-1

Relationship of W-S-S Knowledge and Use with Control Variables

Control Variables	W-S-S Knowledge	W-S-S Use
Health-worker Contact (missing=3)	X2=31.4 p<.0001 gamma=.57	X2=10.3 p<.001 gamma=.32
Outside Experience (missing=91)	X2=13.3 p<.004 gamma=.30	X2=20.8 p<.0001 gamma=.29
Village Development (missing=0)	X2=17.8 p<.001 gamma=-.02	X2=52.1 p<.0001 gamma=.13
Red Flag Contact (missing = 0)	X2=52.2 p<.0001 gamma=.8	X2=25.9 p<.0001 gamma=.41
Num. Children <6 Years (missing=7)	X2=6.3 p<.01 gamma=.28	X2=3.3 p<.07 gamma=.16
Help Available (missing=33)	X2=.15 p<.7	X2=.01 p<.83
Personal Income (missing=6)	X2=3.6 p<.06 gamma=.24	X2=8.3 p<.0004 gamma=-.45
Compound Literacy (missing=183)	X2=13.6 p<.0002 gamma=.56	X2=1.0 p<.31
Mother's Status (missing=33)	X2=3.7 p<.06 gamma=-.23	X2=1.2 p<.27
Salience of Diarrhea (missing=74)	X2=3.0 p<.47	X2=0 p<1.0
Compound Wealth (missing=139)	r=.005 p<.45	r=-.01 p<.38

Table D-2

Discriminant Analysis Statistics
W-S-S Knowledge and Use

Variable	Standardized Discriminant Function Coefficient
Division 1	-.27
Division 2	-.76
Division 3	-.20
Health-worker Contact	.13
Village Development	.18
Outside Experience	.13
Num. Children < 6 Years	.007
Red Flag Contact	-.01
W-S-S Knowledge	.81
For Discriminant Analysis Including Social Support	
Division 1	-.22
Division 2	-.84
Division 3	-.31
Health-worker Contact	.09
Social Support	.13
Outside Experience	.10
Village Development	.08
W-S-S Knowledge	.81

Figure D-1

Interaction Effect of Personal Income with Knowledge on Use of W-S-S (Using W-S-S Residual Scores)

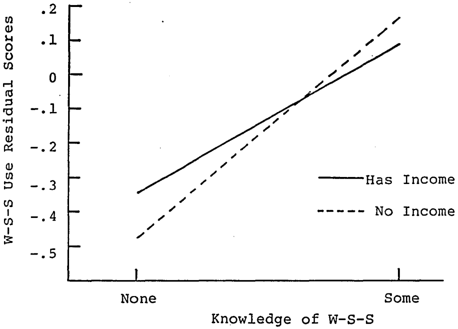


Figure D-2

Interaction Effect of Village Development with Knowledge on Use of W-S-S (Using W-S-S Residual Scores)

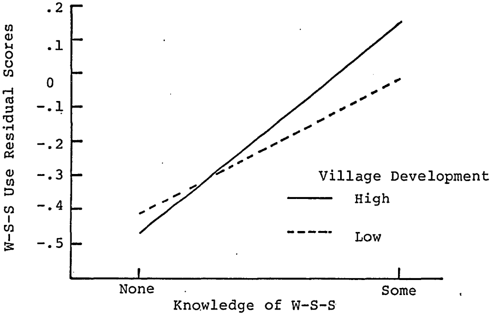


Table D-3

Relationship of Feeding Knowledge and Practice with Control Variables

Control Variables	Knowledge	Practice
Health-worker Contact (missing=2)	X2=8.8 p<.01 gamma=-.1	X2=1.2 p<.28
Outside Experience (missing=55)	X2=13.4 p<.04 gamma=.12	X2=2.02 p<.57
Village Development (missing=0)	X2=122.2 p<.0001 gamma=12	X2=27.6 p<.0001 gamma=.28
Num. Children <6 Years (missing=5)	X2=.68 p<.28	X2=1.5 p<.22
Help Available (missing=31)	X2=.22 p<.71	X2=.68 p<.09
Personal Income (missing=5)	X2=38.9 p<.0001 gamma=-.48	X2=11.3 p<.0008 gamma=-.34
Compound Literacy (missing=121)	X2=5.2 p<.07	X2=2.0 p<.16
Mother's Status (missing=30)	X2=5.4 p<.07	X2=.12 p<.73
Salience of Diarrhea (missing=29)	X2=2.5 p<.28	X2=1.6 p<.20
Compound Wealth (missing=98)	r=-.07 p<.08	r=-.14 p<.005

Table D-4

Discriminant Analysis Statistics
Feeding Knowledge and Practice

Variable	Standardized Discriminant Function Coefficient
Division 1	.37
Division 2	1.0
Village Development	-.28
Co-wives	.28
Outside Experience	.28
Compound Wealth	.20
Personal Income	-.24
Feeding Knowledge	-.19
For Discriminant Analysis Including Social Support	
Division 1	.29
Division 2	.51
Social Support	-.65
Village Development	-.28
Mother's Status	.20
Feeding Knowledge	-.02

Figure D-3

Interaction Effect of Mother's Status With Knowledge on Feeding Practice

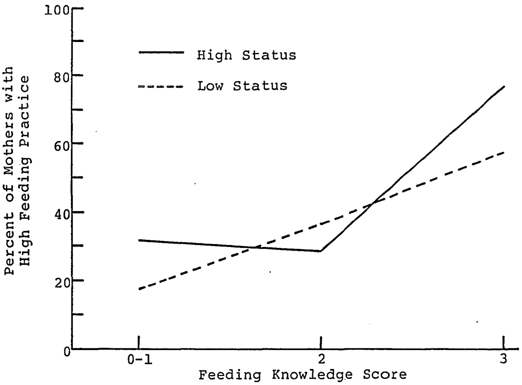
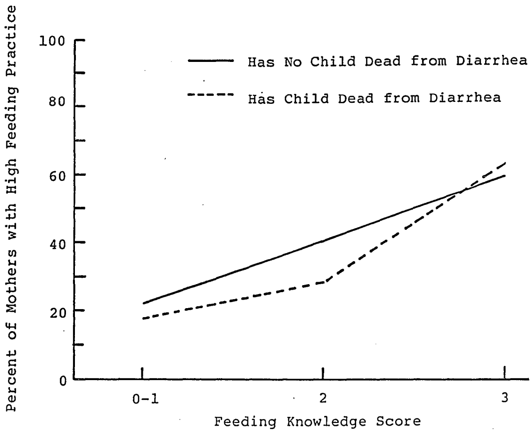


Figure D-4

Interaction Effect of Salience of Diarrhea with Knowledge on Feeding Practice



APPENDIX E

Additional Tables and Figures from Chapter 5: Mass Media Exposure and Knowledge

Table E-1
Relationship of Radio and Flyer Exposure
W-S-S Knowledgee with Control Variables

Control Variables	W-S-S Know.	Radio	Flyer
Health-worker Contact (missing=3)	X2=31.4 p<.0001 gamma=.57	X2=10.2 p<.001 gamma=.31	X2=.76 p<.38
Outside Experience (missing=91)	X2=13.3 p<.004 gamma=.30	X2=21.3 p<.001 gamma=.27	X2=2.6 p<.45
Village Development (missing=0)	X2=17.8 p<.001 gamma=-.02	X2=96.8 p<.0001 gamma=-.09	X2=32.2 p<.0001 gamma=.002
Red Flag Contact (missing = 0)	X2=52.2 p<.0001 gamma=.8	X2=1.9 p<.17	X2=.58 p<.45
Num. Children <6 Years (missing=7)	X2=6.3 p<.01 gamma=.28	X2=.01 p<.9	X2=.31 p<.58
Help Available (missing=33)	X2=.15 p<.7	X2=.54 p<.46	X2=.02 P<.89
Personal Income (missing=6)	X2=3.6 p<.06 gamma=.24	X2=88.2 P<.0001 gamma=.71	X2=35.3 p<.0001 gamma=.88
Compound Literacy (missing=183)	X2=13.6 p<.0002 gamma=.56	X2=32.9 p<.0001 gamma=.54	X2=1.9 p<.17
Mother's Status (missing=33)	X2=3.7 p<.06 gamma=-.23	X2=3.7 p<.05 gamma=-.17	X2=1.29 p<.26
Pictorial Ability (missing=49)	X2=5.9 p<.02 gamma=.21		X2=27.8 p<.0001 gamma=.26
Salience of Diarrhea (missing=74)	X2=3.0 p<.47	X2=0 p<1.0	X2=0 p<1.0
Compound Wealth (missing=139)	r=.005 p<.45	r=-.01 p<.3	r=.09 p<.02

Table E-2

Discriminant Analysis Statistics
Radio Exposure and W-S-S Knowledge

Variable	Standardized Discriminant Function Coefficient
Division 1	-.72
Division 2	-.56
Division 3	-.26
Health-worker Contact	.52
Outside Experience	.14
Compound Literacy	.20
Village Development	.23
Red Flag Contact	.28
Radio Exposure	.52
For Discriminant Analysis Including Social Support	
Division 1	-.54
Division 2	-.05
Division 3	-.04
Health-worker Contact	.52
Outside Experience	.30
Social Support	.34
Compound Literacy	.24
Num. Children < 6 Years	.23
Help Available	-.15
Village Development	.12
Radio Exposure	.40

Figure E-1

Interaction Effect of Health-worker Contact with Radio Exposure on Knowledge About W-S-S (Using Knowledge Residual Scores)

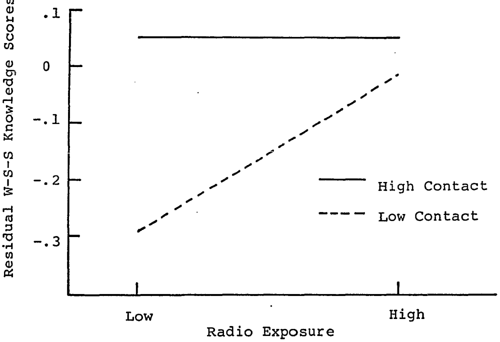


Figure E-2

Interaction Effect of Red Flag Worker Contact with Radio Exposure on Knowledge About W-S-S (Using Knowledge Residuals)

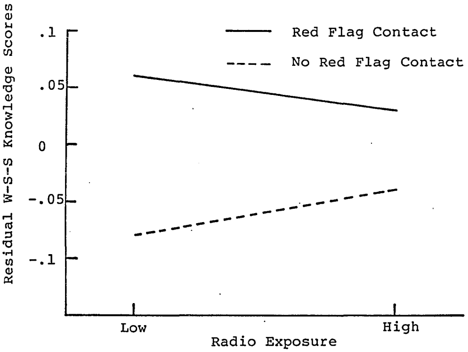


Figure E-3

Interaction Effect of Social Support with Radio Exposure on Knowledge About W-S-S (Using Knowledge Residuals)

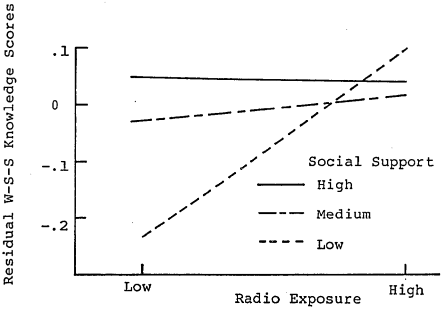


Figure E-4

Interaction Effect of Mother's Status with Radio Exposure on Knowledge About W-S-S

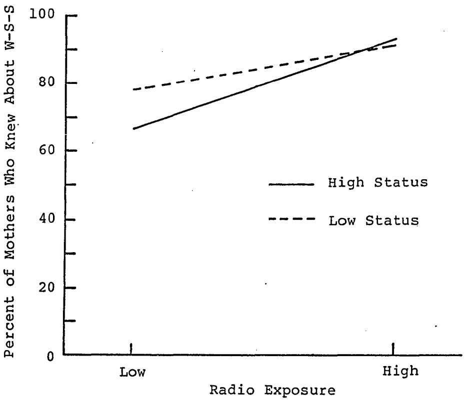


Table E-3

Discriminant Analysis Statistics
Flyer Ownership and W-S-S Knowledge

Variable	Standardized Discriminant Function Coefficient
Division 1	-.62
Division 2	-.15
Division 3	.19
Health-worker Contact	.63
Village Development	.44
Compound Literacy	.31
Red Flag Contact	.27
Outside Experience	.11
Flyer Ownership	.07
For Discriminant Analysis Including Social Support	
Division 1	-.42
Division 2	.52
Division 3	.43
Health-worker Contact	.66
Social Support	.31
Compound Literacy	.36
Village Development	.30
Pictorial Ability	.35
Flyer Ownership	.005

Figure E-5

Interaction Effect of Village Development with Flyer Ownership on Knowledge About W-S-S

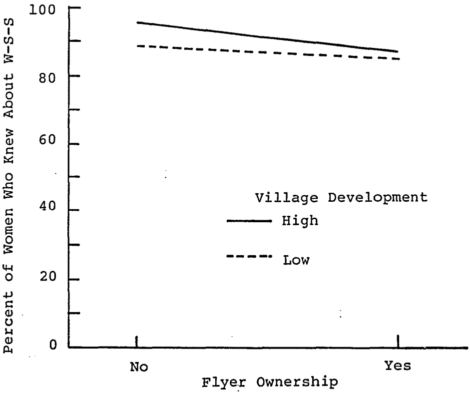


Figure E-6

Interaction Effect of Health-worker Contact and
Flyer Ownership on Knowledge About W-S-S

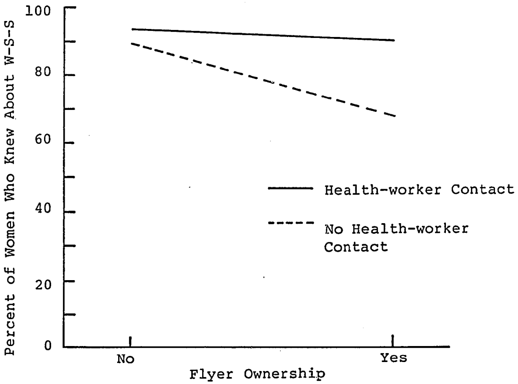


Table E-4

Relationships of Radio Exposure and Feeding Knowledge with Control Variables

Control Variables	Knowledge	Radio
Health-worker Contact (missing=2)	X2=8.8 p<.01 gamma=-.1	X2=23.4 p<.001 gamma=.56
Outside Experience (missing=55)	X2=13.4 p<.04 gamma=.12	X2=12.6 p<.006 gamma=.06
Village Development (missing=0)	X2=122.2 p<.0001 gamma=12	X2=132.8 p<.0001 gamma=.12
Num. Children <6 Years (missing=5)	X2=.68 p<.28	X2=1.97 p<.37
Help Available (missing=31)	X2=.22 p<.71	X2=.22 p<.64
Personal Income (missing=5)	X2=38.9 p<.0001 gamma=-.48	X2=26.1 p<.0001 gamma=.48
Compound Literacy (missing=121)	X2=5.2 p<.07	X2=22.4 p<.0001 gamma=.51
Mother's Status (missing=30)	X2=5.4 p<.07	X2=.01 p<.91
Salience of Diarrhea (missing=29)	X2=2.5 p<.28	X2=.005 p<.95
Compound Wealth (missing=98)	r=-.07 p<.08	r=.04 p<.17

Table E-5

Discriminant Analysis Statistics
Radio Exposure and Feeding Knowledge

Variable	Standardized Discriminant Function Coefficient*	
	Function 1	Function 2
Division 1	1.3	-.22
Division 2	1.0	.50
Personal Income	.11	-.29
Health-worker Contact	.05	.29
Outside Experience	-.10	.53
Village Development	-.24	.22
Radio Exposure	.06	.23
For Discriminant Analysis Including Social Support		
Division 1	1.9	-.40
Division 2	.90	.21
Compound Literacy	-.33	.002
Health-worker Contact	.22	.51
Outside Experience	-.23	.25
Village Development	-.30	-.21
Radio Exposure	.07	.25

*Discriminant analysis will produce one function less than the number of groups in the analysis (in this case the three levels of feeding knowledge). The first function was the most important, accounting for 92 percent of the possible variance. The second function, although explaining only 8 percent of the variance remaining, was significant at $p<.004$.

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