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TASK ALLOCATION OF COMMUNITY HEALTH WORKERS

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## I. SUMMARY

### Problem Statement

More than 100,000 people die every year in Haiti, a country of over 6 million persons, of which 1 million are children under five.

The health problems of children in Haiti are similar to those of children of other areas of the developing world: diarrhea, malnutrition, immunizable diseases, respiratory illnesses. Close to 40% of all childhood deaths are diarrhea-related and most children who die are malnourished. In areas where tetanus immunization of women of childbearing age has not been done, neonatal tetanus may account for 25% of all infant deaths. Measles strikes nearly all children in Haiti but its toll with regard to mortality is unknown.

To confront these problems, the Ministry of Health of Haiti has adopted a strategy which incorporates 3 specific elements:

- phased implementation of selective priority health interventions
- regionalization
- mobilization of the private sector.

This strategy is being implemented through a service delivery model which, in the public sector, involves the creation of catchment areas of 10,000 persons who depend for their care on a dispensary manned by auxiliary nurses. Health agents, who are government-paid employees trained for 3 months, provide village based curative and preventive services.

Many private institutions, particularly those with no health agents working in their sectors, have also adopted a community-based service delivery model emphasizing outreach and selective interventions. They use the services of village-based collaborators who are primarily health promoters and educators rather than service providers. Services, in this context, are provided at the village by an itinerant community health team.

## Operational Problem

In neither the government nor the private models are health worker tasks allocated in a rational manner. The government health worker manual lists at least 17 separate tasks health workers are to perform. The tasks of community collaborators are even less well defined.

Because of the panoply of tasks expected to be performed by health agents, and the poorly defined role of the community collaborators, health workers and collaborators alike may be confused as to the relative importance of tasks assigned to them as are the decision-makers responsible for their supervision. Within a context of severe constraints in terms of personnel, financial and commodity resources, it may be possible to enhance system performance by focusing on tasks with the highest health benefit and/or on subpopulations (example higher risk children) in greater need of services.

These conditions can be translated into a formal statement of a key operational problem faced by health planners in Haiti: determine those "best" proportions of personal time and commodity resources devoted to each CHW task that will (1) maximize overall value of health benefit to the community while ensuring that (2) no resource levels are exceeded, but that (3) all minimum performance levels are met (or exceeded).

## Study objectives

To arrive at such a determination, two service delivery sites were selected for study. One is located in a peri-urban area (Cite Soleil) on the outskirts of Port-au-Prince, the capital of Haiti, the other was located in a rural area (Mirebalais).

The objective of the study was to determine the best way of allocating tasks to community health workers, tasks related to a limited list of priority health interventions i.e. oral rehydration therapy, immunization, growth monitoring, family planning. This list was chosen because it is the one adopted by health institutions implementing population-based community health programs in Haiti as the focus of CHW-related activities.

The operational problem could therefore be characterized by an objective (a measure of how good a task allocation is), a set of decision variables (the activities across which the scarce resources are to be allocated), a set of constraints (limitations placed on the decision variable to reflect the resource activity) and a set of performance or output constraints.

In this instance, the operational problem becomes one of determining a method of allocating task based on the relative benefit (use effectiveness) of a specific intervention, and based on the time the CHW would need to have to make mothers of children under five competent in the use of the intervention, the solution being constrained by the fact that minimum performance levels are to met for all three task areas.

#### Methodology

In a first phase, through a series of studies, use effectiveness was calculated for oral rehydration therapy, immunization and family planning. This involved the determination of two elements: 1) the effectiveness of the intervention; 2) the actual use of the intervention as measured by utilization data.

For ORT, use-effectiveness was calculated in the following manner: cohorts of births for 1983 and 1984 were followed longitudinally and survival status of each child was recorded on the basis of whether or not the mother was a user or non-user of ORT. Child mortality experience by mothers of each group (user and non-user) prior to the introduction of ORT (1983) was calculated through fertility and pregnancy outcome histories. Mortality experience for 1983 and 1984 cohorts were determined prospectively.

For measles, use-effectiveness was calculated as follows: the survival of a cohort of children vaccinated with measles vaccine at age 6-12 months was calculated and compared to that of a similar group of unvaccinated children.

For family planning, the 1984 birth cohort survival data was used to calculate the relative and attributable risks of infant mortality associated with a short birth interval.

Coverage (use) for ORT, measles and family planning were calculated as follows:

For ORT, a special survey of mothers of the 1983 and 1984 cohorts was conducted to determine whether they were users of ORT and to ascertain their degree of competency in ORT use. Socio-economic data were also collected.

Measles vaccine coverage and contraceptive prevalence data were obtained from service statistics.

Results showed that use of ORT was associated with a 36% reduction in 0-2 year mortality. Competent use was noted at 39%, giving a use-effectiveness score of 0.14.

Measles vaccination was associated with a 22% reduction in 0-2 year mortality. With a coverage of 80%, use effectiveness was calculated at 0.17.

Attributable risk associated with a short birth interval was calculated at 98 per 1000 women. Use effectiveness was estimated at 0.028, with use (contraceptive prevalence) at 11%.

In a second phase, the time needed by CHW to make mothers competent in the use of these 3 interventions was estimated.

Using a multiple criteria utility assessment table, alternative task allocation schemes were developed which took into account:

- risk status of the mother with regard to infant or child death.
- the use-effectiveness score
- the time needed to teach the intervention
- the focus of the teaching i.e. whether it should be on mothers of high risk children or on all mothers.

In a third phase, two schemes were tested, one whereby tasks were allocated on the basis of a time-use-effectiveness measure and a focus on all mothers; in the other scheme, tasks were allocated on the basis of a time use-effectiveness score. Health workers in this group were instructed to focus exclusively on at-risk children. As a control, a group of CHWs received no specific task allocation instruction and were told to proceed as they normally did.

#### Results

The results showed that workers who were to cover all mothers, irregardless of risk status, could not perform their tasks adequately.

By contrast, health workers who were expected to focus exclusively on mothers of at-risk children managed to fulfill their responsibilities.

On a subjective basis, the CHW themselves felt that the focus on high risk group was a more efficient and effective way of using their time.

In terms of the output variables recorded, the at-risk group targeting appeared to be the only operationally feasible strategy to follow within the context of the service settings of this study.

This study suggests that in certain settings, the adoption of a selective intervention strategy is the most applicable strategy to follow for an institution with limited resources in time, personal and commodities.

Furthermore, the selective approach should be employed in a context where services are targeted on a priority basis to high-risk groups.

## II. THE RESEARCH PROBLEM

### A. Health problems in Haiti.

Two countries share the island of Haiti in the Caribbean : Haiti and the Dominican Republic. The country of Haiti has a population of 6 million people growing at a rate of 1.75% per year. ( Institut Haitien de Statistiques et d' Informatique, 1982). Three-quarters of this population live in rural areas. The Port-au-Prince metropolitan area has a population of 1 million people.

More than 100,000 people die in Haiti every year. Of these, nearly half are children under five (Augustin, 1986). Specific information on the principal patterns and causes of death have been derived from a number of surveys as well as census data. These include the National Census of 1971, the Haiti National Nutrition Survey of 1977, the Haiti Fertility Survey (1978), the National census of 1982, the contraceptive prevalence survey of 1983 as well as the CDD/EPI survey of 1985. Local special studies provide additional information on disease patterns and causes of death. These data can be extrapolated for the entire country only with a great deal of caution.

#### 1. Infant and child mortality

An estimated 45,000 children under five died in Haiti in 1985. Of these, 27,000 were under one year of age. The greatest risk period for infant and childhood death are the first week of life, the first month, the last 6 months of the first year. These three combined periods account for more than half of all child deaths (Augustin, 1986).

The infant mortality rate was estimated at 124/1000 in 1982. Neonatal mortality has been estimated to account for 42% of all infant deaths (Lerebours, 1985). Hospital data provide lower figures. For example, at Bon Repos Hospital, neonatal deaths account for 21% of all infant deaths.

In the Central Highlands of Haiti, in villages surrounding the town of Mirebalais, the neonatal mortality rate was 39/1000 in 1980, 66/1000 in 1981, 65/1000 in 1982, 44/1000 in 1983 and between 20-30/1000 in 1984. It should be noted that a neonatal tetanus eradication program was introduced in the area in 1983. (Augustin, unpublished data).

The second high risk period during the first year of life occurs during the last 6 months of that first year. This period coincides with a time when breast feeding becomes insufficient : growth faltering frequently begins then.

## 2. Causes of death

Little reliable data exist on causes of death of Haitian children. Much of the available information comes from hospital data. Only a small minority of childhood deaths occur in hospitals.

In the rural area of Petit-Goave, the causes of infant death (less than one year of age) were as follows :

Table 1. Cause of infant deaths  
Petit-Goave, 1978

1. Gastro-ententis	35%
2. Tetanus	12%
3. Malnutrition	11%
4. Other infections	10%
5. Perinatal causes	9%
6. Pneumonia	3%
7. Prematurity	2%
8. Other	1%
9. Unknown	17%

For children 1 to 4 years old:

Table 2 Cause of childhood deaths  
Petit-Goave 1978

1. Gastro-ententis	34%
2. Malnutrition	33%
3. Pneumonia and other infections	13%
4. Accidents	1%
5. Unknown	19%

Source: Paisible P, Berggren GG. Demographie et Fecondite .Presses Fardin, Port-au-Prince 1982.

The nationwide 1985 health survey provided the following data:

Table 3 Cause of death, children under five  
Haiti 1985

1. Diarrhea	47%
2. Malnutrition	21%
3. Tetanus	21%
4. Measles	5%
5. Other	6%

Source: Lerebours, 1985.

### 3. Factors associated with childhood mortality.

#### a. The age of the mother

In rural areas, infant mortality is higher as the mother is older, particularly for mothers 35 years of age and over.

Table 4 Age of the mother and infant mortality : rural Haiti

Age of the mother (in years)	IMR
15-19	91
20-24	59
25-29	103
30-34	111
35-39	150
40-44	143
45-49	132
50-+	90

A similar phenomenon is encountered in urban areas:

Table 5 Age of the mother and infant mortality : urban areas

Age of the mother (in years)	IMR
15-19	83
20-24	111
25-29	148
30-34	159
35-39	123
40-44	157
45-49	130
50-+	123

Source: Haiti National Nutrition Survey, 1978.

#### b. Parity

High parity is associated with an increased infant mortality rate.

Table 6 Parity and IMR, rural Haiti

Age of mother (in years)	Children ever born (average)	IMR
15-19	1.1	91
20-24	1.7	59
25-29	2.9	103
30-34	4.5	111
35-39	6.0	150
40-44	7.7	143
45-49	9.1	132
50--+		90

Table 7 Parity and IMR, urban

Age of mother (in years)	Children ever born (average)	IMR
15-19	1.2	83
20-24	1.8	111
25-29	2.7	148
30-34	4.4	159
35-39	5.7	123
40-44	7.0	157
45-49	7.7	130
50--+	5.7	123

Source: Haiti National Nutrition Survey, 1978.

#### c. Place of residence

As can be seen, infant mortality is higher in urban areas in spite of the fact that health services appear to be more available there. One possible explanation is the widespread usage of bottle feeding. In Cite Soleil, a peri-urban slum area, bottle-fed infants are four times more likely to die than infants exclusively breast fed in the first month of life (Berggren et al, 1981).

#### d. Other factors

These include the nutritional status of the child, the birthweight of the child and his resistance to infection, socio-economic factors.

#### 4. Health problems of Haitian children

##### a. Diarrhea

From these surveys, it appears that diarrhea is the principal cause of death in the population and the number one health problem for the country.

Point prevalence for diarrhea (day of the survey) in children under five years is 21% in Port-au-Prince marginal neighborhoods and between 8% to 10% in rural areas of Haiti (Lerebours, 1985). Greater variability in reporting is encountered with the standard CDD WHO 2 week recall questions. Results range from 21% to 54%. (MSPP; Coreil, 1984; Cayemittes 1985; Boulos 1985; Prevost and Augustin, 1985; Lerebours et al, 1985).

Based on these various surveys, the incidence rate of diarrhea over a period of one year ranges from 5.8 per child in rural areas and 14.6 per child in urban marginal neighborhoods (Pierre-Louis, 1986). This means that Haitian children under five suffer as a whole 7 million episodes of diarrhea per year.

The proportional mortality rate for diarrhea has been estimated at 30% in a rural survey conducted in 1985 (Lerebours, 1985). The hospital case-fatality rate for diarrhea ranges from 9% to 66%. (Veillard, 1986).

Hospitals reporting high case-fatality rates tend to admit very severe cases of diarrhea with complications to their ward, either because parents come too late or because, as in the situation with the University Hospital, most cases are treated in a special OR rehydration unit detached from the main pediatric ward. In such a unit, the case-fatality rate is 1%.

##### b. Diarrhea-Malnutrition interaction

Diarrhea is more prevalent among malnourished children. At Ste Catherine's Hospital in Cite Soleil, 25% of admitted children have severe malnutrition. They contribute 58% of all deaths of children under five (Boulos et al., 1985).

At Bon repos Hospital in 1984, the nutritional status of admitted children was as follows :

Table 7 Nutritional status of children  
admitted with diarrhea  
Bon repos 1984

Normal	M1	M2	M3
44.38%	16.45%	17.49%	21.66%

Source: Bon Repos Hospital Annual Report, 1985.

## c. Malnutrition

According to the Haiti National nutrition survey of 1978, the prevalence of malnutrition among children under five was as follows :

Table 8. Prevalence of malnutrition among children under five, Haiti, 1978.

	Rural	P-a-P	Haiti
Acute Malnutrition (weight for height)	16.8%	10%	15.9%
Chronic Malnutrition (height for age)	28.6%	15.7%	26.7%
2nd and 3rd degree (weight for age)	29.5%	14.6%	27.3%

Nutrition surveys carried out in the South of Haiti 2 years apart have produced similar results.

Table 9. Nutritional status of children under five, Gomez classification

	N	M1	M2	M3
1978	25%	45%	26%	4%
1981	22%	45%	27%	6%

Source: DSPP, South Nutrition Surveys, 1978 and 1981.

Malnutrition is generally under-estimated as a cause of death in Haiti.

Data from Cite Soleil suggest that close to 60% of the deaths of children under five in that population are associated with severe malnutrition. In rural areas where neonatal tetanus mortality remains a major contributor to infant mortality, the relative importance of malnutrition may be proportionately less. The importance of malnutrition as a cause of death increases as the infant becomes older. In Petit Goave, malnutrition was responsible for the death of 33 % of children 1 to 4 years of age in 1977 (Paisible and Berggren, 1981).

#### d. Infections

Besides diarrhea, other infections play an important role in childhood deaths. These include :

- neonatal tetanus, accounting for 25 to 35 deaths per 1000 live births.
- pneumonias
- measles
- tuberculosis
- malaria
- other respiratory illnesses.

#### B. Interventions

ORT. Oral rehydration therapy was used in a limited fashion in Haiti in the late 70's. Two institutions, Albert Schweitzer Hospital and the Haitian-Arab Center, were pioneers in this respect. Formal introduction of ORT at the University Hospital in 1980 was followed in 1983 by the launching of a nationwide campaign to induce mothers to adopt it as the prime intervention in cases of diarrhea. As a result of this campaign, the use of oral rehydration therapy jumped from 24% to 78% in the capital and from 8% to 20% in rural areas. Concurrently a decrease in admissions at the University hospital oral rehydration unit was noted between 1983 and 1985 while use of ORT prior to increased. No reliable data on ORT impact in rural areas are available.

#### Growth monitoring

Between the mid-1960s to the mid-1970s, the principal strategy of the MOH to combat malnutrition has been the establishment of nutrition rehabilitation centers. This strategy was abandoned to be replaced by growth monitoring and nutrition education. Berggren et al. had shown that growth monitoring coupled with demonstration education and targeted food supplementation had a positive impact on the nutritional status of children under five. In many places where growth monitoring is now being practiced, no food is distributed. Little data exist in Haiti to evaluate the impact of growth monitoring on overall prevalence of malnutrition. What data exist (South survey; Cite Soleil; Belle Anse) suggest little or no overall impact when impact is measured using the distribution of children under five with normal nutritional status or mild, moderate or severe malnutrition (Boulos et al., 1985; Van Oyen, 1985).

## Immunization

While the effectiveness of tetanus immunization of pregnant women to prevent neonatal tetanus is well established in Haiti, the overall impact of such an intervention on infant and child mortality for the entire country is unknown. As for other vaccines, such as DTP and measles, coverage is so low (less than 10%) that no impact could be expected. The situation is improved for BCG vaccine as far as coverage is concerned but no information is available as to an overall impact of the national BCG campaign on the incidence and prevalence of tuberculosis.

## Vitamin A

Studies carried out in Indonesia suggest a link between avitaminosis A and child mortality. A survey of 4000 Indonesian children 1 to 5 years of age revealed an increased risk of death among children suffering from Vitamin A deficiency.

When Vitamin A was administered, death rates were cut by more than one third.

## Fertility control

The crude birth rate for Haiti is estimated at 36/1000 and the contraceptive prevalence rate at 3.8%. Even in areas where contraceptive prevalence is higher, no effort has been made to evaluate the impact of reduced fertility on child mortality.

## C. The Community-based primary health care system

The infrastructure that has been put in place to implement these interventions is one which begins with a health agent who is responsible for a given number of registered individuals (usually not exceeding 2000). Four health agents are supervised by an auxiliary nurse who is based in a dispensary. Since there are usually 2 such nurses per dispensary, the standard catchment area covered by these two auxiliaries and 8 agents contains approximately 10,000 people. The next level of care is that offered by the health center, manned in Haiti by what is known as a commune doctor. The commune doctor is a licensed physician in charge of health care for a relatively large area (some communes may have a population exceeding 100,000 people). Commune doctors are assisted by social service doctors. Physicians having completed medical school and serving in a rural area for one year as a pre-condition to their being granted a license to practice. The commune doctor is supervised by the district health administrator (usually a physician with an MPH degree - there are 14 districts in Haiti). The next level is the region (there are four health regions in Haiti). Region directors answer to the general director in Port-au-Prince.

This hierarchical structure makes no differentiation between private and public institutions. Thus district administrators have the right to supervise private health institutions. In practice, however, there are a number of differences not only between private and public institutions, but also between institutions in different regions.

The North, South, Transverse and West constitute the four regions. The North and South regions were the first to implement the new PHC infrastructure and as such conform best to the model outlined above. The West and Transverse regions were formally organized in the summer of 1983 at a time when the training program for health agents had been frozen. Thus most formally trained health agents are distributed in the North and South, and very few in the West and Transverse regions.

In April of 1982, AOPS launched its Community Health Action Program (CHAP). The purpose of the program was to assist selected private health institutions in the implementation of population-based community health programs. Initially, 15 institutions were to be selected to institute programs for 10,000 people each, for a combined registered population of 150,000 people. The program was recently expanded to enroll 500,000 people by September of 1986. Many of the selected institutions were located in the West and Transverse regions, in areas devoid of health agents. AOPS recommended to these institutions that they train a number of community health workers (usually 10 per institution) to do some of the tasks usually performed by health agents. Although the tasks were specified, neither the type of training nor the method of compensation was defined. Many private institutions elected to train workers who were considered as volunteers, thus not eligible for a regular salary. This choice was dictated by the fact that in many instances, the institution wanted to minimize recurrent program costs. In other instances, the institution felt that health maintenance should be the basic responsibility of the community, mothers being the health agents "par excellence" for themselves and their children.

#### D. ISSUES

The utilization of front line health personnel such as community health workers (CHWs) has been, and remains, a critical element in satisfying the basic health care needs of poor populations in developing countries. This circumstance assumes particular importance in light of the generally heightened health care crisis now present in most developing areas and the efforts to meet the Alma-Ata goal of "Health for All by the Year 2000".

##### 1. Rationale for task selection

Private Voluntary Health institutions which have adopted the community outreach method of providing primary health services work with a number of significant constraints which may be listed as follows :

... limited health staff. The small paid staff of one physician, auxiliary nurse and record keeper is usually quite busy seeing patients for curative care at the health center. Any additional burden on staff time would have to be limited. At the same time, most health institutions have one or two "slow days" during the week when the patient load is less.

b. In many areas where PVOs work, there are no government health agents. In other areas, the pattern of work of health agents has been erratic.

c. The manager of the health center, usually a priest, nun or community development person, frequently has other responsibilities besides those of running a health clinic. Most managers have little additional time to manage comprehensive health programs.

d. Patient receipts and other clinic revenues are usually insufficient to meet the cost of running health centers. No great deal of funds could be available for additional outreach services. Such an addition could be feasible only if the marginal costs involved were minimal or at least affordable.

Because of these factors, the idea of a selective approach to primary health care emphasizing a limited list of effective interventions appears more suitable to most PVOs.

Drawing from the government model, the following list of priority health interventions could be constructed: for infants and children, oral rehydration therapy, breast feeding, immunization and growth monitoring; for adults, family planning, pre-natal care, malaria control and tuberculosis control.

Malaria and tuberculosis control activities in Haiti are primarily vertical programs, both sponsored by the government, although in the case of tuberculosis control, the participating of a private group, Crusade against Tuberculosis (CAT) is crucial.

The second concept is an emphasis on a defined population for the delivery of services. Population registration in this instance is not done primarily for evaluation purposes, but as a key service tool: it allows identification of sub-populations in need of special care and it allows the follow-up of non-participants and other no-shows.

The feasibility and usefulness of such an approach combining a limited set of interventions and a registered target population had been demonstrated by the experience at Albert Schweitzer Hospital (Berggren et al 1982) and in a government rural health pilot project (DSPP, 1982).

## 2. Definition of tasks

Health workers cooperating with PVOs function within the context of an outreach service delivery program in which a community health team from the center delivers most of the services. This occurs at rally posts. These posts are places of assembly at or near a village where village mothers and children meet the community health team at periodic intervals. The following services are provided by the team at the rally post :

- group health education
- growth monitoring and nutrition education
- immunization
- pre-natal care
- family planning
- curative care

In such a context, the health worker becomes primarily an educator and a motivator. Through training sessions with mothers, he seeks to establish their competency in the use of specific interventions, particularly ORT, feeding practices and family planning. As a motivator he seeks to convince these mothers of making use of these interventions; furthermore, through his file of registered families, he identifies no-shows and other non-participants for whom he reserves special motivation, sessions, frequently in the home.

The list of tasks in such a setting would therefore include:

1. Census-taking and registration of the target population. On completion of registration, the CHW reviews the records of each family and draws up from these records a list of priority individuals in each group to be served.
2. Preparation for rally posts. This include announcing the arrival of the health team at least a week in advance and ensuring that the post is ready (securing the site; ensuring that benches and tables are available etc).
3. Work at the rally post. Health workers help in crowd control, registration, health education, weighing of children.
4. Identify rally post no shows and update the records of rally post attendees.
5. Domiciliary visits for motivational purposes or for follow-up care.
6. Small group educational sessions in villages where topics such

The tasks of the government "agent de sante" are well defined and listed in the publication entitled "Manuel de l'agent de sante". These tasks include (table 1) :

Table 1. Tasks of Agent de sante

1. Organization of catchment area (census, geographic distribution of families)
2. Domiciliary visits
3. Curative care
4. Referral of cases
5. Follow-up of referred cases
6. Contacts with community groups
7. Health education
8. Environmental sanitation
9. Contraceptive distribution
10. Assistance in vaccination
11. Growth monitoring and follow-up
12. Follow-up of the cases
13. Malaria control
14. Participation in diarrheal disease control programs.
15. Up-dating of registers for pregnant women, family planning users, children under five
16. Preparation of monthly reports
17. Meetings with health volunteers and other types of health workers (Traditional birth attendants, traditional healers etc).

The principal focus for the activities of health agents is the rally post, a place of assembly where the agent meets groups of 20-30 mothers living near by, proceeds with health education sessions, growth monitoring and contraceptive distribution. An auxiliary nurse from the closest government dispensary is expected to attend these sessions occasionally for supervision and vaccination purposes.

#### E. The operational problem.

Because of the panoply of tasks expected to be performed by the health agents and the poorly defined role of the community collaborator, health workers and collaborators alike may be confused as to the relative importance of tasks assigned to them as are the decision makers responsible for their supervision. Within a context of severe constraints in terms of personnel, financial, and commodity resources, it may be possible to enhance system performance by focusing on tasks with the highest health benefit and/or on subpopulations (example higher risk children) in greater need of services.

These conditions can be translated into a formal statement of a key operational problem faced by health planners in Haiti: determine those "best" proportions of personnel time and commodity and economic resources devoted to each CHW task that will (1) maximize overall value of health benefit to the community while ensuring that (2) no resource levels are exceeded, but that (3) all minimum performance levels are met (or exceeded).

The operational problem just described may be recognized by some as a form of the general resource allocation problem. The problem is, after all, a management problem characterized by an objective (a measure of how good a particular allocation is), a set of decision variables (the activities across which the scarce resources are to be allocated), a set of resource or input constraints (limitations placed on the decision variables to reflect the resource scarcity), and a set of performance or output constraints.

Within the context of Haiti, the MOH has adopted a number of health priorities which can be translated into the following levels of performance:

- Ensure that 100% of mothers correctly use oral rehydration therapy.
- Ensure that 80% of children are completely vaccinated by age 1 year.
- Ensure that 80% of the pregnant woman are vaccinated with tetanus toxoid.
- Ensure a contraceptive prevalence rate of 25%.
- Ensure that 80% of children are enrolled in a growth monitoring program.

Other performance levels have not been specifically related to the tasks given to CHWs i.e. it is not always quite clear how the completion of one set of tasks is related to the objectives fixed by the MOH.

Less clear is whether the CHW can in fact perform all of these tasks in a fashion which will result in a positive health impact. Since health agents in the government model are to cover all families, it could be anticipated that each family would receive the same intensity of coverage.

### III. STUDY OBJECTIVES

The principal objective of the study was to determine those best proportions of community health time devoted to each of four tasks areas i.e. oral rehydration therapy, immunization, growth monitoring and family planning that will a) maximize overall value of health benefit to the community while ensuring that b) no resource levels are exceeded but that c) all minimum performance levels are met (or exceeded).

As a proxy for "health benefit", the impact of the four interventions on 0-2 year mortality was to be measured. Performance levels are those fixed by the Ministry of Health (see above).

One might theorize that focusing CHWs efforts on activities associated with interventions with high use effectiveness would in fact maximize the impact of these efforts on community health. It is difficult to determine the relative use-effectiveness of specific interventions in a Haitian setting based on data available prior to this study. Aside from immunization of women of child-bearing age with tetanus toxoid, an activity known to eliminate neonatal deaths due to tetanus, the impact of other interventions such as ORT, immunization and family planning has not been evaluated in Haiti.

Once use-effectiveness is determined, the next step would be to integrate this value with that of the time needed by the CHW to implement this intervention in the field. Should two interventions be equally effective, a more rapid impact would be obtained if one intervention took less of the CHWs time to introduce than the other.

The time utilization studies coupled with use-effectiveness studies might provide a model for the optimal allocation of CHW time among various tasks. One way to maximize the time-use-effectiveness of community health worker-related interventions would be to concentrate health worker activities on high-risk households.

The study, therefore, provided the opportunity to determine:

- a. the impact of oral rehydration therapy on 0-2 year mortality at the community level.
- b. the impact of measles vaccination on 0-2 year mortality.
- c. the relationship between birth interval and infant mortality.

The overall objective of the study required exploration of the following issues:

- 1) What task or activity need the community health worker carry out to help meet specific program targets for priority interventions?

2) Are there particular subgroups which should receive priority with regard to the targeting of health worker efforts?

3) Should an equal amount of effort or time be allocated to all identified tasks?

#### IV. STUDY HYPOTHESES

The principal hypothesis governing this study was that there is an ideal way of allocating tasks to community health workers to maximize the impact that they would have on infant and child mortality. The tasks revolves around the four priority interventions : oral rehydration therapy, immunization, growth monitoring and family planning.

These limitations arise from the existing guidelines under which community health workers operate within the health outreach programs sponsored by AOPS, the Haitian Association of Voluntary Health institutions. These guidelines include those stemming from the requirements of the health institution itself and the performance targets fixed by the Ministry of Health.

Two sub-hypotheses were that :

1) It was possible to estimate the time-use-effectiveness for the tasks associated with each of the four interventions.

For the first sub-hypothesis, it would therefore become necessary to analyze what it was that a health worker was supposed to do with respect to each of the four interventions. For example, if the ultimate target for an ORT program was to have all mothers make correct use of ORT every time their child had diarrhea, it would be important to determine what set of tasks would be necessary for the health worker to reach this goal.

Furthermore, it would be also necessary to measure the time needed to perform these specified tasks. Once a use-effectiveness score is predicated, based on data empirically derived during this study, or obtained from the literature, it would become possible to calculate a time use-effectiveness for the specific intervention.

One major assumption was that some households were more in need of services than others, that in effect an attributable risk of infant and child mortality could be allocated to a small minority of the population in such a way that should services be preferentially targeted to it, a disproportionate impact on child survival would occur.

2) Another sub-hypothesis therefore was that a health worker might have the same or a greater overall impact on the health of his community by focusing his activities on a small set of households, perhaps 20% of his target population, rather than by "diluting" his efforts on his entire catchment area.

This approach presents a number of formidable problems linked principally to the measurement of the use-effectiveness of specific interventions and to the measurement of the time needed to perform specific tasks.

## 2.V. METHODOLOGY

### 1. Settings

The study took place in one rural and one urban sites, Mirebalais and Cîte Soleil.

Mirebalais, the principal site for the study is a town of 8,000 people 40 miles from Port-au-Prince the capital of Haiti. Mirebalais is at an important cross-roads in the Central Highlands of Haiti, one road leading to Belladere on the border with the Dominican Republic, one road leading to Pont Sonde and the Artibonite Valley, the principal source of food for the capital, one road leading to Hinche and Cap-Haitien to the North and one road leading to Port-au-Prince.

The town is an important market place where produce from the Central Highlands is sold. The town itself has all the amenities of urban civilization including piped water, electricity and telephone. It is the capital of one of the 58 administrative subdivisions of the country, an arrondissement, and sends a congressman to the National Assembly.

Resources include several public and private schools, including one public secondary school, and a small hospital functioning primarily at this time as an outpatient unit (a health center). The center, which belongs to the community, is manned by two teams : one team from the Ministry of Health takes care of all fixed-facility services and rarely goes on outreach. Another team, sponsored by a private voluntary organization, EYE CARE HAITI, encompasses an eye treatment group made up of one ophthalmologist and 6 ophthalmic assistants as well as a community health team made up of 3 physicians, a network of 28 community health workers scattered around in villages within a 350 square kilometre area surrounding Mirebalais.

Community health services are population-based and oriented towards the provision of priority health interventions, mainly oral rehydration therapy, growth monitoring, immunization, pre-natal care and family planning. Services are provided on an outreach basis at rally posts, places of assembly at or near a village where mothers meet members of the Mirebalais community health team at intervals of approximately 6 weeks.

Community organization in the villages around Mirebalais centers around the "Conseil Communautaire". This entity is made up of members drawn up from the village. These organizations have tended to be government sponsored. They are dominated by a small group of government designated leaders. Their focus is generally on public works such as road maintenance, school or community center construction as well as political i.e. mobilizing support for government policies. structures, purposes and functions.

The urban site, Cite Soleil, is a peri-urban slum with perhaps similar health problems as in rural areas, but with vastly different implications with regard to health service delivery. Cite Soleil is the site of a population-based community health program and has accumulated data on the impact of various interventions, particularly oral rehydration therapy and measles.

## 2. Design and data base

The study was carried out in three phases:

-Phase I . Analysis of the operational problem.

This incorporated the following:

a. an exploration of the linkages between the specified community health worker-related tasks and the effect that the carrying out of these tasks would have on 0-2 year survival. This effect is not a direct one i.e. the specific action of a community health worker does not have a direct impact on child mortality. The role of community health workers is to obtain that mothers make competent use of specific interventions. The mediation factor is effective (competent) use by mothers of the intervention. On that basis , an exploration of the relationship between maternal competence and use of services was carried out.

b. a determination of the impact of the specific interventions on 0-2 year mortality. Impact is a measure of the theoretical effectiveness of the intervention combined with its effective use. To do this , a number of secondary studies were carried out.

To measure the impact (use-effectiveness) of ORT, a 1984 Mirebalais birth cohort as well as a cohort of infants reaching age one in 1984 were studied to determine whether use of ORT was associated with increased child survival. This took aspects of a before and after survey design as the childhood mortality experience of the mothers of these children before and after the introduction of ORT (1983) was determined on the basis of whether or not they were users of ORT. Retrospective mortality data was obtained through fertility and pregnancy outcome histories while prospective data on infant and child mortality were obtained for all children born in 1984 and those who became one year of age in 1984.

As for measles vaccination, the following was done: in 1982, a study was conducted in Cite Soleil to determine the ideal age for vaccinating children against measles. A group of 612 children were vaccinated at that time. The age range of these children was between 6 months and 12 months. The survival status of these vaccinated children was then compared to that of children of the same age who had not been vaccinated. Socio-economic data were collected in both studies to explore the effect of possible confounding variables.

The effectiveness of family planning was calculated indirectly through the determination of the potential effect of birth spacing on infant mortality. This was done by comparing the risk of death of infants born after a short birth interval to that of infants born after a longer birth interval (greater than 23 months). The attributable risk of infant mortality associated with a short birth interval was calculated.

In neither Mirebalais nor Cite Soleil could a valid study design be adopted to measure the impact of growth monitoring on 0-2 year mortality. The study was therefore restricted to the three interventions, namely ORT, immunization and family planning.

These studies provided data on theoretical effectiveness of these specific interventions, assuming 100% of mothers used them in a competent manner. The next step was to measure actual use, as determined through service statistics. In a parallel fashion, factors related to use were also determined. Of particular interest was the relationship between maternal competence and use. This was felt to be important because the principal task of community health workers with regard to these interventions was to make mothers competent in the use of the intervention. If improved competency was associated with increased use, then use-effectiveness could conceivably be made more competent in the intervention.

Use-effectiveness scores were then determined by combining use data and effectiveness data.

#### -Phase II . Solution development

In a second phase of our study, specific task allocation schemes were developed, using a multiple criteria utility assessment table. The utilization of such a tool allowed us to calculate the relative time-use-effectiveness of allocating community health worker time to specific interventions. To do so required the calculation of the specific time needed by a community health worker to make a mother competent in a specific intervention.

#### -Phase III. Solution testing.

In a third phase, the hypothesis that an ideal task allocation scheme based on time-use-effectiveness could function more effectively if it was oriented towards high-risk groups was then tested using a quasi-experimental design.

In the next few pages, we will review the results of the preliminary studies on the relationship between maternal competence and utilization, on the use-effectiveness of oral rehydration therapy, measles immunization and of lengthening the birth interval.

SPECIAL STUDIES

## VI. MATERNAL COMPETENCY AND USE OF SERVICES

Factors influencing the utilization of health services in developing countries have been explored in several studies (Kiney, 1966; Gwatkin et al, 1980; WHO, 1984; Marks, 1979; Bamisaiye, 1984). Many of the studies have focused primarily on issues such as distance, cost or general availability of services. Other studies have explored maternal factors such as education (Caldwell, 1979), women's roles (Ware, 1985) or locus of control (Lundy, 1982). In general, non-users of services appear to be recruited primarily from the ranks of the poorer, less educated members of the community and presumably are of poorer health and nutritional status. The health planner, with no immediate prospect for change in the role of women in society or their level of education may seek other determinants of use over which he might have a greater degree of control.

Of relevance in this context is the question of maternal competency. As Ware has noted, "if female education is effective? germs or sanitary food-handling practices, then one might to implement programs to teach these matters specifically without having to provide eight years of schooling for all potential mothers" (Ware, 1984). In other words, the education gradient with regard to utilization of health health services might be eliminated or reduced if all mothers were made equally competent in the use of specific interventions.

We will review the relationship between competency and use of services in the two study settings, Mirebalais and Cite Soleil, with a focus on ORT and immunization.

### A. ORT

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In our two study settings, Mirebalais and Cite Soleil, a concerted effort was made to teach mothers about oral rehydration therapy.

In Mirebalais, mothers from specific health sectors were invited to attend periodic rally posts at or near their villages. In general 6 to 8 rally posts were held for each village (or health sector) per year. During the first three months of rally post activity, the only health education topic was oral rehydration therapy. While awaiting other services at these rally posts, assembled mothers witnessed a practical demonstration of how the oral rehydration solution was to be prepared and in addition they were taught when, how to use, and how much to use.

In Cite Soleil, mothers of children with diarrhea were referred to a day-bed rehydration center, where, under the direct supervision of a nurse, they learned to prepare ORT and they spent the day at the center rehydrating their child.

The program in Mirebalais had started during the last two months of 1983 while in Cite Soleil, the rehydration center had been in operation since 1980.

In the spring of 1985, mothers of children born in 1983 and in 1984 were interviewed in Mirebalais in Cite Soleil.

The competence of these mothers in ORT as defined by a number of correct responses to a set of questions exploring indications, preparation and administration of ORT, was measured in these two settings. The results showed a higher level of competence in Cite Soleil where 78% of mothers could answer all questions correctly as opposed to 51% of the mothers in Mirebalais.

The detailed findings for Mirebalais are as follows :

Age. Out of a total of 1147 mothers, the age was known for (80%). Of these, the age distribution was as follows :

Table 11. Age distribution, Mirebalais mothers, 1985.

Age group	%
15-19	3.9%
20-29	54.5%
30-39	34.2%
Over 40	7.2%

Literacy .73.3% of the mothers were illiterate.

#### Patterns of knowledge of ORT

Of the group, 85% of mothers had a general understanding of what oral rehydration therapy meant, and 86.5% could recognize an ORS packet. 92.8% of those who stated that they knew what ORT was could give an adequate explanation of it.

#### Competence

When competence in oral rehydration therapy was graded 0 (least competent) to 4 (most competent). 16.6% of the mothers could be classified as "least competent", 16.3% had a "1" rating, 11% had a rating of "2", 13.5% had a rating of "3", and 42.5% were classified as "most competent" (table 12).

Table 12. Competency rating in ORT, Mirebalais mothers, 1985.

rating score	%
0	16.6
1	16.3
2	11.0
3	13.5
4	42.5

#### Use of ORT and competence.

There was a significant progression in the use of ORT with regard to competence. While 62.5% of mothers not competent reported using ORT, this rose to 91.9% for fully competent mothers.

#### B. IMMUNIZATION

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The MOH of Haiti has defined the immunization target for the country as having 80% of infants vaccinated with BCG, DTP and measles vaccine by the time they reach one year of age.

The role of the community health worker in a defined population system is to know who the children under one are and to encourage the mothers of the children to attend rally posts to have their children immunized.

Vaccination, from the point of view of the mother, is a passive service; the mother herself is not the instrument of the service as is the case for ORT. She must of course have an understanding of the purpose of immunization but the extend of knowledge required in this regard is not as clear as it is for oral rehydration therapy.

The Direction of Health Education of the Ministry stresses the following points of knowledge for mothers :

- 1) Schedule of immunization
- 2) Side-effects to be anticipated
- 3) Specific illnesses being prevented

The specific task of the CHW with regard to immunization therefore, is to teach mothers the value and schedule of vaccination, the side-effects to be anticipated and the specific illnesses being prevented. In addition, the CHW must ensure that all mothers do in fact get their children immunized. In the case of vaccination, vaccine availability is more a function of the visiting community health team than of the community health worker.

As was the case for ORT, acquisition by mothers of knowledge concerning immunization could be obtained by the mother via different routes including the media, health personnel. No data are currently available on where in fact mothers get their information on immunization. In our two study settings, Mirebalais and Cite Soleil, mothers are taught about immunization in approximately the same way: group education sessions held by a nurse or a health worker followed by individual instruction as the nurse vaccinates the child.

Whether letting mothers know in advance about immunization sessions and teaching them in groups about immunization at a rally post is enough for the CHW to do was investigated in Mirebalais by looking at patterns of knowledge about immunization for a sample of 320 mothers of children under five and actual immunization coverage for the children.

The characteristics of the mothers were as follows:

Age. The average age has 29 years with the following distribution (table 13):

Table 13. Age distribution, Mirebalais mothers, 1985.

Age group	N	%
Less than 20	13	4.1
20-24	83	26.35
25-29	76	24.12
30-34	56	17.77
35-39	53	16.82
40 +	34	10.79
Total	315	

Children. These mothers had given birth to an average of 4.84 children of which 3.77 were still alive. Each mother had lost an average of one child.

The average age of the youngest child was 17.55 months. The average number of children under five per mother was 1.605.

Education. 75% of the mothers were illiterate.

#### Knowledge about vaccination

When asked to explain why it was important to have a child vaccinated 89% gave an adequate answer. Furthermore, 92% of these mothers knew how many vaccination sessions a child had to attend in order to be fully vaccinated.

## Immunization coverage

Despite this high level of knowledge about immunization coverage for polio vaccine (3 doses or more) was 50%; 50% for DTP; and 36% for measles vaccine.

This discrepancy between knowledge and practice may be explained by a number of factors including the following :

- occasional vaccine shortages. Between 1983 and 1985, the period when these children could have been vaccinated, vaccines were occasionally unavailable in the whole country. This factor does not adequately explain the discrepancy because most of these periods were brief.

- a policy, for the case of measles vaccine, not to vaccinate children over 24 months of age. While this factor may have played a role for children 24 months to 59 months of age, it does not explain the fact that measles coverage is low sectors where the vaccine has been consistently available.

Other explanation might include the opportunity cost of bringing a child to a vaccination session where mothers may have to wait several hours for their turn, side-effects from the vaccine, particularly fever, and cultural taboos which tend to restrict younger infants to the home.

When these issues are viewed from the perspective of the task assigned CHWs with regard to vaccination, only the latter, taboos, would appear to be particularly relevant.

The opportunity cost for the mother of bringing a child to a vaccination session might be reduced with greater efficiency on the part of the vaccinating team. A better understanding, or acceptance of side-effects, might be achieved if the vaccinator spent more time discussing these issues with mothers, and gave each mother an anti-pyretic for the baby.

## Discussion

In the case of ORT, the data suggest a relationship between competence and use. Mothers who have used ORT show greater competence than mothers who have not. Whether it is the increased use which leads to increased competence or vice-versa deserves further analysis.

Competence in immunization is more difficult to define as few authorities agree on what it is mothers need to know regarding the intervention. The mothers in this study were tested on two points: indications and number of doses. The vast majority of mothers gave an adequate answer yet coverage was only 50% for 3-dose vaccines at the time of interview (this includes some children under one who would not have time to receive the 3 doses). This confirms findings in other societies where it is not always clear that if mothers knew more, compliance would improve (Brown et al, 1980; Christodolow et al, 1981).

## VII. THE EFFECTIVENESS OF PRIORITY HEALTH INTERVENTIONS : ORT.

In Haiti, where more than 40% of deaths of children under five are associated with diarrhea, it could be surmised that elimination of diarrheal deaths might have a significant impact on infant and child mortality. In a best scenario hypothesis, the introduction of an effective intervention such as oral rehydration therapy, by virtually eliminating all deaths due to diarrhea, would cut the under five mortality by 40%. That this would be unlikely to happen is due in great part to the fact that children saved from a diarrheal might very well die from another illness. This is particularly true in Haiti where less than 40% of children under five are normal nutritionally. Malnourished children are known to be at increased risk of dying of a variety of illnesses.

In the best of circumstances, therefore, the theoretical effectiveness of oral rehydration therapy would be limited by the proportionate mortality rate due to diarrhea. In practice, it would be also limited by the number of mothers making effective use of it.

As we have discussed in preceding pages, we have suggested that the principal role of community health workers with regard to ORT is to make mothers competent in the use of oral rehydration therapy, to motivate them to use it and to ensure that oral rehydration salts are available and accessible right at the village.

An estimation of the effectiveness of oral rehydration therapy use in a hospital setting in the reduction of the case fatality rate of diarrhea is straightforward although in the absence of long term follow up, only short term results are available. The results have shown conclusively that ORT can, in fact, reduce the case-fatality rate due to diarrhea.

An estimation of the impact of ORT use on infant and child mortality in community-based programs is more difficult to accomplish. Use implies the presence of a living child who suffers from diarrhea, thus raising the possibility of bias : mothers found to have used ORT are more likely to have had a surviving child than mothers who have not made use of ORT. This is the principal task requested of the CHW.

In Mirebalais, oral rehydration therapy was introduced through a series of village-based demonstration seminars targeted to mothers in November and December of 1983. It was anticipated that the impact of the program would be felt primarily on babies born in 1984, thus having an effect on the IMR for the 1984 birth cohort and on babies who would become a year old or more in 1984, i.e. babies born in 1983.

The objective of the study was to determine whether use of ORT was associated with a fall in the 1984 IMR and the 1-2 year mortality rate.

Women expected to give birth in 1984 were identified through a community survey of 5000 households conducted in late summer 1983. From this community survey, pregnant women with a probable date of delivery in 1984 were identified and their names used to create a pregnancy register. This register was periodically updated through domiciliary visits conducted by village health agents. Through these visits, women who became pregnant subsequent to the initial survey but who were expected to give birth in 1984 were also identified.

The survey also identified a cohort of children born in 1983 who would reach their first birthday in 1984.

Between March and April 1985, the mothers of these two groups of children were interviewed in their villages. The survey instrument was a three part questionnaire, the first part being an abbreviated fertility history covering the 4 most recent pregnancy outcomes, the second part being a socio-demographic survey, the third part covering the mothers knowledge and utilization of oral rehydration therapy.

Mothers were divided into two groups : those who were users of ORT and those that were not.

For each group, the overall survival for birth cohorts born in the years 1981, 1982, 1983 and 1984 was measured using crude mortality and survival data as noted in the fertility history.

## Results

### 1. General characteristics of the study population.

#### age

Less than 4% of the mothers were 19 years old or younger; 54.5% were 20 to 29 years old; 34.2% were between 30 and 39 years of age, and 7.2% were 40 years old or older (table 14).

Table 14. Age of mothers, Mirebalais, 1985.

age group	N	%
less than 19	40	3.9
20-29	562	54.5
30-39	353	34.2
40 and over	74	7.2

#### Parity

Parity status was available for 1040 women (90.67%). Of those, 169 (16.3%) had experienced only one birth; 453 (43.6%) had experienced 2-4 births, while 418 (40.1%) had experienced more than 4 births (table 15).

Table 15. Maternal parity, Mirebalais, 1985.

parity	N	%
1	169	16.3%
2-4	453	43.6%
more than 4	418	40.1%

#### Literacy

Literacy status was unavailable for 121 women. For the remainder, 248 (24.2%) were found to be literate against 778 (75.8%) who were illiterate (table 16)

Table 16. Maternal literacy, Mirebalais, 1985.

	N	%
Literate	248	24.2
Illiterate	778	75.8

#### Occupational status

24.7% of the women reported that their work produced income as opposed to 72.1% who said their work did not (table 17).

Table 17. Women working for money, Mirebalais, 1985.

	%
yes	27.4
no	72.6

68.6% of the women reported living in a two-room house while 6.4% stated they lived in a one-room house. A house with more than two rooms was available for 25% of the mothers .

#### Type of roof

50.8% of the women reported living in a house with a tin roof; for 36.7% of the women, the roof of their house was made of straw while, for 12.3%, the type of roof was unknown .

#### Latrines

42% of the women stated they had a latrine as opposed to 58% who did not.

#### Radio

33% of the women had a radio in their house as opposed to 67% who did not.

#### Source of water

For 58.9% of the women, the water came from a spring. For 21.4%, it came from a river. 10.2% obtained their water from a pipe. For 8.4% the water came from another source. Only 1% reported obtaining the water from well. (Table 18).

Table 18. Source of drinking water, Mirebalais, 1985.

Source	%
spring	58.9
river	21.4
public fountain	10.2
well	1.0
other	8.4

#### Incidence of diarrhea for the index child

52.9% of the mothers stated their child had diarrhea "within the last two weeks" as opposed to 47.1% who said their child did not.

76.5% of the women were users of ORT (ever-used) while 23.5% were non-users. 46.4% of users are fully competent of all mothers, 39.1% can be considered competent users.

Among the mothers whose children had had diarrhea "during the last two weeks", 38.1% had used ORT. Other treatment modalities used were water 25%, prescription drug 7.7%, traditional medicine 25.8%, other remedies 3%. (table 19).

Table 19. Treatment of the most recent episode of diarrhea

ORT	38.1
water	25.0
drug	7.7
traditional medicine	25.8
other remedies	3.0

### 5. Factors governing the use of ORT.

- Literacy. Literate women were more likely ( $p=0.0065$ ) to use ORT than illiterate women. 83.1% of literate women used ORT vs 74.7% of illiterate women.

- Work for income. Working mothers were less likely to use ORT compared to non-working mothers (68.2 vs 78.7)  $p<.0001$ .

#### Type of house

Women living in larger houses were more likely to use ORT ( $p<.0001$ ).

#### Latrine

Women who had latrines at their disposal were more likely to use ORT than women who did not (82.2 vs 73%)  $p<.0001$ .

#### Radio

Women who had a radio were also more likely to use ORT than women who did not (80.8 vs 74.6)  $p<.0001$ .

#### Incidence of diarrhea

Women who reported their child had diarrhea "with the last two weeks were more likely to be users of ORT than women who did not (80.7 vs 73.7)  $p=.0098$ .

## Competence

There was a significant progression in the use of ORT with regard to competency. While 62.5% of mothers not competent reported using ORT, this rose to 91.9% for fully competent mothers.

### 3. Patterns of ORT use for mothers of children born in 1984.

A total of 683 mothers were interviewed. In this subgroup 77% were users of ORT vs 23% who were non-users. While 15.4% had a competence graded "0", this rose to 41.2% for the most competent.

For this group, incidence of diarrhea within the last two weeks was 59.4%. Of these children with diarrhea, 140% were treated with ORT. The remainder was treated with a variety of remedies including water (24.7%), drugs (7.3%), traditional medicine (23.1%).

Of those mothers who do not use ORT, the most common reason for not doing so is that they did not know how to use it.

Table 19 Reasons for not using ORT

Does not know how	47.9%
Not available	12%
Multiple reasons	6.2%
Other	33.5%

Such factors as literacy, type of water, availability of latrine were not found to be statistically significant in this subgroup.

### 5. Use of ORT and mortality (1984 birth cohort).

The overall infant mortality rate for the 1984 birth cohort was 72/1000. The level of the infant mortality rate was not significantly affected by ORT competence. As for literacy, the IMR for children of literate women was 51/1000 and 80/1000 for children of illiterate women. The difference was not statistically significant.

The IMR was 92/1000 for non-users of ORT and 59/1000 for users; the difference did not attain statistical significance ( $p=0.1737$ ).

Although the trends in IMR difference persisted when controlling for various factors and when comparing users to non-users, the differences did not attain significance. For literate users, the IMR was 43/1000; it was 71/1000 for literate non-users ( $p=.8843$ ). For illiterates, the IMR was 66/1000 for users, 98/1000 for non-users ( $p=.3559$ ).

When comparing mothers of surviving children to mothers of dead children, no difference could be found in terms of ORT knowledge or competence .

## 6. Patterns of ORT use for children born in 1983.

For this subgroup, users significantly differ from non-users in several characteristics.

### - Literacy

88.3% of literate mothers are users vs 74.7% of illiterate mothers ( $p=0.0038$ ).

### - Type of roof

The type of roof also makes a difference. Women living in houses with a straw roof are less likely to be users ( $p=0.0018$ ).

### Latrine

86.9% of women who have latrines use ORT vs 72.1% who do not have latrines ( $p=.0002$ ).

### Incidence of diarrhea "last 2 weeks"

84.1% of women whose children had diarrhea are users vs 74.7% of women whose children did not have diarrhea within the last two weeks ( $p=.0208$ ).

### ORT competence

Increased competence is associated with increased use. 94.7% of fully competent mothers use ORT vs 66.1% of "least" competent mothers ( $p<.0001$ ).

## 7. Mortality and use of ORT for 1983 birth cohort

The overall mortality rate for children of users of ORT born in 1983 was 98/1000. It was for children of non-users. The difference was not statistically significant ( $p=.1892$ ).

## 8. Trends in mortality before and after the introduction of ORT

The survival status of children born alive in 1980, 1981, 1982, 1983 and 1984 was analyzed. Since ORT was introduced in late 1983, one would anticipate no difference in mortality between children of users and children of non-users for the years 1980, 1981 and 1982. If ORT had an impact, it would be shown by a decreased mortality rate for the 1983 and 1984 birth cohorts.

For children of users of ORT, the unadjusted mortality rate for 1980 through 1984 was as follows (Table 21)

Table 21. Unadjusted Childhood mortality rate , 1980-1984  
offsprings of users of ORT  
(ORT introduced in 1983) Mirebalais 1980-1984

	N	Rate
1980	28/189	148/1000
1981	42/238	160/1000
1982	50/232	216/1000
1983	36/369	98/1000
1984	27/460	59/1000

The changing rates are significant at  $p < .0001$

For non-users, the corresponding values were as follows:  
(table 22)

Table 22. Unadjusted childhood mortality rate,  
offsprings of non-users of ORT,  
Mirebalais, 1980-1984

1980	9/55	129/1000
1981	11/62	177/1000
1982	13/68	191/1000
1983	15/100	150/1000
1984	13/142	92/1000

In this case, the changing rates do not attain statistical significance ( $p = .2684$ ).

The differences persist when controlling for confounding variables.

When combining the mortality data for 1980, 1981 and 1982, the combined rate is 182/1000 for users and 178/1000 for non-users. After 1983, the combined rate is 74/1000 for users and 115/1000 for non-users, a difference of 35.6%.

## Discussion

The data show a persistent difference in the rates of children of mothers who use oral rehydration therapy and mothers who do not. Use tends to be higher for literate women with more favorable socio-economic characteristics. The differences persist when these characteristics are taken into account but do not attain statistical significance.

The fact that more than 50% of all mothers are not competent in at least one aspect of oral rehydration therapy is great cause for concern. It appears that the most frequent source for error is the quantity of solution to be administered to the child with diarrhea.

Shifts in mortality between 1980 and 1984 may be accounted for the most part by the length of the follow-up period, ranging from 1 year for children born in 1984 to 5 years for children born in 1980. It is of interest that these changing trends were not of sufficient magnitude to attain statistical significance among non-users of oral rehydration therapy while they were for users. In 1983, a community health program began in the Mirebalais area. It incorporated many interventions including pre-natal care, family planning, immunization, growth monitoring and oral rehydration therapy. While our data suggest an association between oral rehydration therapy and reduced mortality levels, it does not conclusively document that one is the cause of the other. An alternative explanation is that "use of ORT" is a proxy for a number of traits of mothers who are more likely to take appropriate measures to save their children's lives, i.e. the positive deviants.

This study supports the notion that while ORT should continue to be promoted widely, it may be necessary to adopt better educational techniques to get the message across so as to make all mothers thoroughly competent in its use.

## VIII. THE IMPACT OF MEASLES VACCINATION

More than 100,000 children a year acquire measles in Haiti. Measles as the cause of death is vastly underreported in Haiti. In fact, many Haitian pediatricians do not feel that it constitutes a significant cause of death.

The study that is being reported was designed to determine whether immunization of children with measles vaccine is associated with a reduction of childhood mortality. The investigation was carried out in Cite Soleil.

### Methods

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During the month of October 1982, measles vaccination was introduced in Cite Soleil. All children from 6 months through five years of age were offered measles vaccine. The parents of infants 6 to 12 months of age were asked to participate in serologic studies after the nature and purposes of the study were explained in their native creole. Age (in months) was defined as the total number of completed months.

In December of 1984, 10,000 mothers living in Cite Soleil were interviewed regarding factors thought to be determinant of child survival, factors including socio-economic status, fertility, family planning, use of oral rehydration therapy. Of these 10,000 women, 1401 were mothers with children who would have been 6 through 12 months of age at the time of the original measles vaccination period (October 1982).

### Results

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Five hundred and ninety-five infants 6-12 months of age were vaccinated in October 1982. One hundred thirty-five (22.8 per cent) of 591 infants had measles hemagglutination inhibition antibody titers  $> 1.10$  at the time of vaccination. Four hundred fifty-six infants did not have antibodies at the time of vaccination. Follow-up blood specimens were obtained from 333 (73%) of these 456 infants of these 333 infants, 267 seroconverted after vaccination (80.2%).

Initial tabulation of the 1984 survey resulted in identification of 200 of the 592 children vaccinated in 1982.

Preliminary results reveal that only 2(1%) of the 200 children who had been vaccinated in October 1982 had died at age 12 months or greater. In comparison, of the 1200 similarly aged infants who were not vaccinated, 66 (5.5%) had died at age 12 months or greater ( $p < 0.01$ , chi Square). Similarly the rate of hospitalization for children who had not had measles was much lower than the rate of children who had measles.

## IX. BIRTH INTERVAL AND PREGNANCY OUTCOME

It is being increasingly well recognized that infant mortality rises with a shortened birth interval (Hobcraft et al., 1983). The presumption is that it is the shortened birth interval per year which is the cause of a subsequent adverse pregnancy outcome.

Alternative explanations include the fact that women who experience a shorter birth interval have special characteristics which inherently place them at higher risk of a subsequent infant death, factors such as literacy, education, or income.

Winnikoff (1983) has suggested that the increased mortality associated with a shortened birth interval may be related to the replacement phenomenon: women who have already lost an infant are more likely to develop a new pregnancy. Their previous infant death experience, evidence of higher risk, rather than the short interval, accounts for the increased mortality risk for the subsequent death.

We hereby report on the pregnancy outcome of mothers who became pregnant twice within a two calendar year period (1983 and 1984) in Mirebalais.

### METHODS

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#### Study participants

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All women identified as being pregnant at the time of the initial population survey, as well as all other women who subsequently became pregnant, were identified through a vital events monitoring program conducted by village health workers. For each pregnancy culminating in a delivery in 1984, outcome was determined and recorded in one of the following manners: abortion (miscarriage), stillbirth, neonatal death, death after the first month.

In addition, a questionnaire was applied to women who were due to deliver in 1984. Trained interviewers obtained data on previous pregnancy outcome for each woman.

### Results

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A total of 683 women having given birth in 1984 were identified. The age distribution of the group is given in table one.

a. Age. The majority of women were less than 30 years old. 3.8% of the women were less than 20 years old while 7.8% were 40 or over.

b. Ten-year successive birth cohorts: Of the 683 women, 98 had given birth in 1983 as well as in 1984 (14.34%). Of the 98 women, 47 (48%) had lost the baby who was born in 1983.

c. Pregnancy outcome. Pregnancy outcome was noted for the two groups : women who gave birth in 1984 and who had also given birth in 1983; women who gave birth in 1984 and who did not give birth in 1983.

Stillbirth rate. For the first group of women, 20 had also been pregnant in 1980. None of these 20 experienced a stillbirth for that year. Of the same group, 32 had also been pregnant in 1981, and 18 in 1982. The stillbirth rate for 1981 was 62/1000 while it was 111/1000 in 1982. The 98 women experienced 9 stillbirths in 1983 (rate 92/1000) and 2 stillbirths in 1984 (19/1000).

By comparison, the 585 women who gave birth in 1984 but had not given birth in 1983 experienced stillbirth rates of 18/1000 in 1980, 7/1000 in 1981, 15.6/1000 in 1982 and 18.8/1000 in 1984 (table 24).

Unadjusted mortality rate for successive birth cohorts.

Table 23 summarizes the mortality experienced of children born between 1980 and 1984 for the two groups of women.

When the mortality experience of children of mothers with a short birth interval is compared to that of mothers who did not give birth in 1983, the relative risk of death is 1.18 for the 1980 birth cohort, 1.49 for the 1981 birth cohort, 4.16 for the 1982 birth cohort and 3.57 for the 1984 birth cohort.

When the data was analyzed using only multiparity women, performing logistic regression to determine to what extent birth interval is a predictor of infant survival, the significant odds ratio ( $\alpha = 0.05$ ) for infant survival as a factor of long vs short birth interval has 4.1971.

The attributable risk for infant mortality (1984 birth cohort) was calculated for short vs long birth interval, using the above odds ratio. From the raw data, the unadjusted death rate for children born to multiparity mothers following a long birth interval was  $14/1460 = 30.4/1000$ . The unadjusted death rate for children born to multiparty mothers following a short birth interval was  $11/90 = 122.2/1000$ . The calculated attributable risk was 96.888 deaths per 1000 women.

Coefficients predicting infant survival, after controlling for the other variables, were as follows :

- 0.716 short birth interval
- + 0.716 long birth interval
- + 0.693 no previous deaths of children
- 0.153 one previous death of a child
- 0.540 more than one previous death of a child

The odds ratio for infant survival was as follows :

Variable	Odds ratio	95% confidence interval
Long vs Short birth interval	4.1971	10.69;1.64

#### Discussion

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This study documents that in a situation where women give birth twice over a period of two successive calendar year the replacement phenomenon may be in effect as half of those cases had lost the first child.

Women giving birth twice over a period of two successive calendar years are 4 times more likely to lose their child. Our study suggests that focusing on these women who may contribute less than 15% of all births will allow the prediction of as many as one third of all infant deaths. Preventing these births would reduce the infant mortality rate by 10%.

In our study, a short pregnancy interval is associated with an increased stillbirth rate only to the extent that the stillbirth may be the cause, as opposed to the end-result, of a short pregnancy interval. Women who lose their infant at birth or shortly thereafter do not have the contraceptive protection of breast feeding and are at much higher risk of quickly becoming pregnant again.

It is clear that in a setting such as that of rural Haiti, post-partum contraception is an intervention with a significant potential for reducing infant mortality.

TABLE 23

Age group	%
15-19	3.8
20-24	28.4
25-29	27.7
30-34	20.6
35-39	11.7
40 and over	7.8

Age distribution, women who gave birth in 1984.

TABLE 24

## Stillbirth rate

Year	1980	1981	1982	1983	1984
Total	(18/1000)	(7/1000)	(15.6/1000)	---	(18.8/1000)
Sample	4/218	1/142	4/256	---	11/585
Short birth interval	(0/1000) 0/20	(62/1000) 2/32	(111/1000) 2/18	(92/1000) 9/98	(20/1000) 2/98

## K. MULTIPLE CRITERIA UTILITY ASSESSMENT OF SELECTIVE CHILD SURVIVAL INTERVENTIONS.

The relative effectiveness of the three interventions, oral rehydration therapy, measles immunization, family planning, was compared in Mirebalais using an operations research tool, the multiple criteria utility assessment table, to estimate the relative effectiveness of these interventions in reducing mortality of children 0-2 years of age.

For each of the three interventions, a set of studies was conducted to determine the theoretical effectiveness of the intervention if all mothers in a given community were to use it. The results of these studies were reported in preceding pages. Actual use of the intervention as a result of training and motivation of mothers by community health workers was then measured. Use-effectiveness was then calculated by multiplying the percent reduction in deaths with the percent of mothers utilizing the intervention.

The process is illustrated in table 1, which represents an M.C.U.A. table, using hypothetical values for the effectiveness (% reduction in deaths) and use (% mothers using the intervention) of the three interventions: oral rehydration, measles immunization, family planning.

For oral rehydration therapy, the effectiveness measure (% reduction in deaths) is derived as follows: if every mother of children under two would use ORT appropriately, deaths would be reduced by what percentage?

The use figure (column 3) is derived from the following: if community health workers taught all mothers when and how to use oral rehydration solution, what proportion would use it correctly?

For measles immunization, an effectiveness measure is similarly derived: if every child were immunized against measles by age one year, deaths would be reduced by what proportion.

The use measure is derived as follows: if community health workers taught and motivated all mothers about immunization, what proportion of women would have children immunized?

Family planning effectiveness is estimated similarly on the basis of the potential reduction in infant and child deaths if all eligible women were to use an effective method. Actual use is estimated on the basis of the contraceptive prevalence rate.

### . Assessing relative use effectiveness

Table 2 summarizes the use-effectiveness scores obtained for each of the three interventions.

ORT. The theoretical effectiveness of oral rehydration therapy is estimated at 35.6%. This represents the percentage reduction in deaths if all mothers used ORT appropriately.

In our study setting, only 39.1% of mothers were competent users of ORT.

The use-effectiveness of ORT in this setting is therefore 0.14

Immunization. The theoretical effectiveness of measles immunization is estimated at 22%, and the actual use measured at 80%. The use-effectiveness score for measles immunization is 0.17.

Family planning. The theoretical effectiveness of family planning is estimated at 26% and the actual use measured at 11.5%. The use effectiveness score for family planning is 0.028.

## Discussion

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The use-effectiveness of specific interventions will vary in different settings, depending on the distribution of causes of death (proportionate mortality rate for specific illnesses), the probability of dying from other causes if death from a specific cause is prevented, the overall health and nutritional status of children, and the propensity of mothers to use the intervention.

Use is not a static phenomenon. It can be anticipated that more and more mothers can be progressively recruited in this area. Use-effectiveness may therefore augment as health education and motivation sessions become more effective.

### Time-use effectiveness

The time needed by a CHW to make 100 mothers competent in ORT is 600 minutes.

The same is true for immunization.

In contrast to ORT and immunization instruction, family planning instruction needs to be done partially on an individual basis. In Mireabalais, it would take 3000 minutes to make 100 mothers competent.

For each unit time needed to save 1 life with ORT or immunization training, we need 21 units of time of FP planning.

Table 1. Use-effectiveness of each of the three interventions  
(hypothetical values)

(1) Intervention	(2) Effectiveness (% reduction in deaths)	(3) Use as a result of training by CHW (%)	(4) = (2) x (3) Use-effectiveness (% reduction in deaths)
ORT	0.40 <sup>1</sup>	0.60 <sup>4</sup>	0.24
measles immunization	0.20 <sup>2</sup>	0.8 <sup>5</sup>	0.16
family planning	0.10 <sup>3</sup>	0.20 <sup>6</sup>	0.02

if every mother of children under five would use ORT appropriately,  
deaths would be reduced by 40%

if every child were immunized against measles by age 1,  
deaths would be reduced by 20%

if every eligible women were using family planning,  
deaths would be reduced by 10%

if CHW taught all mothers to use ORT, what proportion would use correctly?

if CHW taught all mothers about immunization, what proportion of women would  
have children immunized?

if CHW taught all women to use family planning, what proportion of women  
would accept and use family planning?

*Handwritten initials*

Table 1: Effectiveness of each of the three interventions

(1) intervention	(2) Effectiveness (% reduction in deaths)	(3) Use as a result of training by CHW (%)	(4) (2) x (3) Use-effectiveness (% reduction in deat
1. ORT	0.36 <sup>1</sup>	0.39 <sup>4</sup>	0.14
2. measles immunization	0.22 <sup>2</sup>	0.8 <sup>5</sup>	0.17
3. family planning	0.26 <sup>3</sup>	0.11 <sup>6</sup>	0.028

1. if every mother of children under five would use ORT appropriately, deaths would be reduced by 40%

2. if every child were immunized against measles by age 1, deaths would be reduced by 20%

3. if every eligible women were using family planning, deaths would be reduced by 10%

4. if CHW taught all mothers to use ORT, what proportion would use correctly?

5. if CHW taught all mothers about immunization, what proportion of women would have children immunized?

6. if CHW taught all women to use family planning, what proportion of women would accept and use family planning?

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## XI. TASK ALLOCATION SCHEMES

### Objective 1 :

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To test the hypothesis formulated in phase I of this study; that for every unit of time a community health worker spends to make a mother competent in the use of Serum Oral, s/he must spend 21 times this unit in the promotion of Family Planning in order to maximize the number of child lives saved \*\*.

### Objective 2 :

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To determine the relative effectiveness of promoting priority health care interventions by Community Health Workers to all women in selected communities or to focus promotion activities on women at high risk of losing a child.

### Secondary Objectives :

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To determine whether women at high risk of losing a child are more highly motivated to utilize available health services than women who are not at high risk.

### Study Design :

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Random selection of twelve localities to comprise study groups based upon ability of the mobile health team to provide regular visits. Each of groups A, B, and C will be represented by four localities. Groups will be defined as follows :

Group A. All registered women 15-45 years of age in the community will be invited by the Community Health Worker to enroll in the training program. The population of Group A is estimated to be 300 women. Fifteen groups of twenty women will meet for two, one-hour sessions during the nine week course of the program in order to be trained in the principles of oral rehydration therapy. Since each group of twenty women receive a total of 120 minutes of training, one may calculate that each woman receives 6 minutes of individual instruction. In addition, women will receive 21 times this amount of training, or 126 minutes for promotion of Family Planning. Family planning instruction will take place on an individual basis in the privacy of the woman's home. Principles, methods and personal attitudes concerning Family Planning will be discussed between the mother

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calculations from preliminary data. Final data slightly different.

and the Community Health Worker in two sessions of 63 minutes each. Due to constraints in available project time, and relatively, limitations of Community Health Worker time, the number of women receiving instruction in Family Planning will be limited to thirty-nine. It is expected that the Community Health Worker will promote discussion, group support systems and peer networks outside the group. Each Community Health Worker is expected to work 12 hrs. per week, following a three day reorientation session.

Given : 12 Community Health Worker Hours available per week.

9 weeks available for project completion = 108 total hours.

15 groups of twenty women meeting to learn Serum Oral.

120 minutes of instruction in Serum Oral = 30 hours Serum Oral

Leaving : 78 remaining hours for Family Planning

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Approximately 2 hrs sessions = 39 women for Family Planning.

Group B. Only women identified to be at-risk of losing a child will be invited by the Community Health Worker to enroll in the training program. The population of Group B is estimated to be 60 women given risk defined by the following criteria : 1) women over the age of 35 who have four or more children, one of whom must be under five years of age. 2) mothers of more than five children, one of which is under five years of age. 3) mothers of children under five determined to be moderately or severely malnourished (M2 or M3). Or 4) women who have lost a child within the past year. In accordance with the model developed for Group A, women will meet for two, one-hour sessions in the given nine week course of the program in order to be trained in the principles of ORT. Group B classes will be comprised of 10 groups of 6 women. Further 48 of the women in Group B will receive instruction in Family Planning. Again, Family Planning instruction will take place on an individual basis in the privacy of the woman's home. Principles, methods and personal attitudes concerning family planning will be discussed between the mother and the Community Health Worker in two sessions of 63 minutes each, or a work 12 hours per week on these activities and will be expected to promote discussion, group support systems and peer networks outside the group setting. These workers will also receive the three day reorientation session.

Given : 12 Community Health Worker Hours available per week.

9 weeks for available for project completion = 108 total hours.

2 one-hour sessions of Serum Oral Instruction.

6 groups of 10 women meeting to learn Serum Oral = 12 hours S.O.

Leaving : 96 remaining hours for Family Planning

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Approximately 2 hour sessions = 48 women for Family Planning.

Group C. This group represent the control group. Community Health Workers will not be trained in program objectives nor provided with time allocation schedules. It is assumed that they will continue to promote health services as in the past. These workers were however invited to participate in the three day reorientation session. it is estimated that each Community Health Worker in Group C is responsible for approximately 300 women.

The twelve Study Groups include :

Group A :	Domond	Mirebalais	D'Estinville	Boyer
Group B :	Mme Cyr	Bayasse	Niva	Laborne
Group C :	Fond Michel	Corporan	Desvarieux	Gilbert

#### Training and Orientation

Program orientation for Community Health Workers took place in two full-day and one half-day sessions from Wednesday, September 25 through Friday, September 27. Community Health Workers received \$2 per diem.

During the orientation, the Community Health Workers were advised of program goals and provided with a training manual prepared by Faith Greenfield Lewis. The manual, executed by Dr. Eustache of the Ministry of Education, covers the principles and correct usage of Serum Oral, Immunization, Nutrition and Family Planning. Most significantly, it emphasizes collaboration, participation and group dynamics, discussion. Community Health Workers were supplied with learning aids to promote the approach outlined in the manual. (See manuel, appendix b).

Further, all Community Health Workers were advised of program incentives, and given schedules appropriate to the study group to which they were assigned (see horare, appendix c).

Collaborators were given 10 days to formulate their seminar groups. In addition, each collaborator was assigned a scheduled time and a list of the 60 women to invite to participate in the survey questionnaire. Community Health Workers from Group A were further provided with a list of 20 "at-risk" women to whom they were to pay domiciliary visits for family planning.

## Results

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Of the 12 initially chosen villages slated for participation, two were eliminated, one from group A (Mirebalais) and one from group B (Niva). Mirebalais was eliminated because of the reductance of the Community Health Workers to participate. Niva was eliminated because it had not completed its census, thus lacking in vital background information. Niva was replaced by another village (Desvarieux) which was shifted from group C (the control group) to group B.

The final grouping was therefore :

Group A	Group B	Group C
Domond	La Borne	Gibert
D'Estinville	Mme Cyr	Comporant
Boyer	Desvarieux	Fond Michel
	Bayasse	

Below is a summary of what happened at each site.

### Group A

#### Domond

There were 22 seminars held with an average attendance of 15.6 women. There were 23 women visited for family planning. Total participation at seminars : 100 mothers.

#### D'Estinville

There were 8 seminars with an average of 17 women per seminar for a total participation of (3) mothers. There were 15 mothers visited for family planning?

#### Boyer

There were 22 seminars with a range of 15-20 women in attendance. The total participation was 193. There were 42 mothers who received visits for family planning.

Group B

Desvarieux

There were 6 groups of 10 women. Each group met twice. there was no absenteeism. The health worker organized an extra group of mothers.

A total of 72 mothers participated.

There were 51 family planning visits.

Mme Cyr

There were 6 groups of mothers which met twice for a total of 12 seminars.

- 3 groups of 10
- 1 group of 9
- 1 group of 8
- 1 group of 6

A total of 53 mothers participated in these ORT seminars.

43 mothers received visits for family planning.

Labonne

There were 6 groups with an average of 8.7 mothers per group for a total participation of 57 mothers.

There were 49 mothers visited for family planning.

Bayasse

The CHW from Bayasse was dropped from the program (and subsequently fired) because of time unavailability for the job.

Group C

Gilbert

The CHW organized 4 seminars, blowing a conch before each seminar to assemble the mothers. There was no attempt to form a group. Average attendance was 19 mothers per seminar.

There were 7 family planning home visits.

The CHW there became sick and was in bed during most of the study period. He managed to perform 26 family planning visits.

Fond Michel

The health worker there held 5 seminars with an average of 16.2 mothers per seminar and a total participation of 81 mothers.

He did not report any family planning visits.

#### Discussion

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This exercise revealed that a limited list of mothers appears to be more manageable for a health worker to deal with at any one time. Whereas workers in group B followed the schedule reasonably closely, the same could not be said of workers in group A. None of the workers from group A ever managed to cover all mothers assigned to them, in spite of the fact that some held the required number of sessions.

It may be that mothers such as those in group B who feel that they have been specially selected are more apt to attend educational sessions.

In view of the operational simplicity of focusing on mothers with at risk children, focus which in our study does not appear to severely penalize the other mothers (they acquire their knowledge at the rally posts), it would appear advantageous to institute a screening system for the identification of at risk children. In settings where the brunt of the educational effort takes place at rally posts, additional educational sessions at the village targeted to mothers of at risk children have a potential for improving community knowledge with regard to key interventions.

### XIII. THE ROLE OF THE VILLAGE HEALTH WORKER: A PROPOSAL

I. The service delivery context : population-based selective primary health care.

The adoption of a population-based approach to primary health care has been associated most frequently with large-scale research projects conducted in population "laboratories". These projects were designated to provide information on patterns of illness and death, the interactions of contributory factors, demographic change, as well as the evaluation of the impact of specific health care interventions in developing countries (Wyon and Gordon, 1971; Kielman and Associates 1983; Chen et al., 1980).

In Haiti, small area registration systems have been set up primarily as a service delivery tool. "Population-based", in this instance, has meant the registration of all target families within a specific geographic area, and more importantly, a systematic effort to ensure coverage of all families including the poorest of the poor.

The pre-requisites for such an approach include the following :

1. Total population registration and longitudinal data collection by each institution.
2. Multi-purpose longitudinal surveillance of priority health problems. The accent is placed primarily on the identification of individuals in need of special care, rather than on the determination of incidence and prevalence rates.
3. Linkages of surveillance to service delivery through feed-back loops which allow identification of non-participants and delivery of special services to high risk groups.
4. On-going monitoring of coverage and evaluation of impact of selective interventions, particularly growth monitoring, immunization, family planning, and oral rehydration therapy.

The second element of this approach is its focus on selective interventions. In Haiti, priority health problems, and their related interventions, have been defined by the Ministry of Health of Haiti. The problems include :

- Diarrhea
- Malnutrition
- Tuberculosis
- Malaria
- High fertility
- Immunizable Diseases

Private health institutions in Haiti tend to have a limited approach to the control of tuberculosis and malaria. This is due

in part to the existence of a vertical program to deal with each of these problems: The Crusade Against Tuberculosis on the one hand (CAT) which trains TB agents and places them in cooperating institutions; and SNEM, the national service for malaria control which relies on a network of 6,000 villages volunteers who distribute chloroquine and do blood sampling.

For the remaining priorities, the Ministry of Health has stated which intervention should be preferentially utilized: for diarrhea, ORT; for malnutrition, growth monitoring; for high fertility, family planning; for immunizable diseases, the appropriate vaccines.

A selective approach to primary health care could therefore be justified on the basis of the overall national PHC strategy. In practice, it appears to be the only viable alternative for the public as well as the private sectors in Haiti.

Lerebours (1985) has reviewed the reasons which have led the Ministry to adopt a selective approach to health service delivery, the principal reason being the necessity not to exhaust the limited resources of the Ministry.

Augustin et al have conducted a similar review for the private sector (1985). Most private institutions in Haiti have the following characteristics:

1. Very few have a full time manager attached to a community health program. The person with overall responsibility has other charges which may include running a school, supervising an agricultural project, running a church etc.

2. The staff at these institutions is quite limited with no more than 1 physician, 1 or 2 auxiliary nurses and 1 record keeper typically. The physicians are usually quite young, one or two years out of medical school. The auxiliary nurses have had nine months of nursing school training; the record keeper frequently has not completed primary school.

3. The financial resources of these institutions are severely limited.

4. These institutions already conduct a full-fledged, successful, in their view, curative care program which they are unwilling to abandon.

Another justification for a selective approach has been broached in previous sections of this report. Even with the few interventions that must be implemented, in the health worker may become quickly overloaded.

The third element of a population-based approach to service delivery is the notion of coverage. The principal justification for population registration in this context is not research or evaluation but rather the improved service delivery which results from maintaining rosters of special target groups. Population

registration differs from a census which only gives the total population in a given area and gives an idea of population composition. Census data provide a good denominator and may be used to estimate coverage. Yet, within a service delivery context, it is not enough to know for example that 60% of the children are vaccinated: it is also important to know which 60% is covered, which 40% is not.

The idea of coverage cannot be separated from that of outreach. There is ample documentation that the effective coverage of fixed institutions is quite limited in developing countries.

In Haiti, the outreach model which has been developed is the rally post. The rally post is not necessarily a physical structure. It is a place of assembly at or near the village where mothers meet members of an itinerant community health team. The rally may be held under a tree, in a church, school or any other convenient location chosen by the villagers. Villages may be visited by the team every 4 to 6 weeks or on a quarterly basis, depending on need, availability of resources, and territory to be covered by the team. The team is primarily responsible for the provision of services including:

- a) health education
- b) growth monitoring
- c) immunization
- d) family planning
- e) pre-natal care
- f) curative care.

Given this context, what remains for the health worker to do?

## II Allocating CHW tasks.

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We will first list the tasks to be accomplished and we will then proceed with a discussion of how best these tasks can be allocated.

### Task 1. Population registration

Population registration, for a health worker, involves first of all the delimitation of his geographic territory. This is done in conjunction with the community health program director. Once boundaries are fixed, the health worker then proceeds to census and register all households on a door-to-door basis.

### Task 2. Creation of rosters of priority target groups.

Special rosters are prepared for all children under five in the village, all women in union. A special pregnancy roster may

be developed.

Task 3. Home visits to motivate households to attend rally posts.

These visits are usually carried out one week prior to the actual rally post gathering. The purpose is to let the population know when the next rally post is to be held. Particular attention is paid to no-shows at the previous rally post.

Task 4. Attendance at the rally post.

Health worker activities at the rally post may include crowd control, group health education, weighing children etc.

Task 5. Assessment of coverage and utilization.

After each rally post, the health worker does a preliminary assessment of attendance and coverage. He also identifies individuals in need of special follow-up care (or these individuals may be designated to him).

Task 6. Follow-up.

Follow-up visits may be done for sick individuals, children who are losing weight, no-shows etc.

These tasks by themselves, once the initial registration is over (which may take two to three months), will take up four to six days a month depending primarily on how scattered the community is. They will not vary very much from village to village, from institution to institution. What may vary is the nature and content of task 7, which we call family health education. Based on the experiences described in preceding pages, a task allocation scheme is suggested. This scheme contains many elements which may be considered sub-tasks:

Sub-task one : identification from family health records of households with special risk categories. These households include :

- 1) Those with children with severe malnutrition.
- 2) Those with women who gave birth in the preceding calendar year and who lost the child.
- 3) Those with women with more than five children.

These categories were chosen on the basis of data showing that in Mirebalais :

- Children with severe malnutrition account for 36% of the deaths.
- Women who give birth two years in a row account for 33% of infant deaths and that women who give birth and lose the child are at an extremely high risk of becoming pregnant after a short inter-birth interval.
- women older than 40 have a higher relative risk of losing a child .

The selected group should not probably exceed 60 women.

Sub-task 2. Select from this group women who should be preferentially targeted for family planning.

Sub-task 3. Create a calendar of special educational sessions for these women. The calendar should have two components: group sessions and domiciliary visits. Groups of 10 mothers appear very manageable and seem to be associated with the greatest attendance rate. The calendar should include, for each group, 2 one-hour sessions to discuss oral rehydration therapy, 2 one-hour sessions to discuss immunization, 10 one-hour sessions to discuss nutrition and growth monitoring. In addition, the calendar should include domiciliary visits to all or a fraction of the women to discuss family planning and distribute or re-supply contraceptives. The first two visits should be closely spaced (less than one month apart). Subsequent visits should be done on a quarterly basis (follow-up and re-supply).

Sub-task 4. Educational session for ORT.

Groups of 10 women should be assembled for one-hour sessions two weeks apart. The approach should be demonstration education. The health worker should ensure that each point of knowledge is well understood by each mother in the group. At the end of the second session, each mother should be verbally tested on the following points:

1. Recognition of diarrhea
2. The time to start therapy
3. How to prepare ORS
4. How to administer ORS (technique)
5. The quantity to administer
6. The frequency of administration
7. The time to prepare another solution
8. The time to bring the child to the nearest health center .

Mothers who have not mastered each and all of the points should be enrolled into another group.

#### Sub-task 5. Educational session for immunization.

Two one-hour sessions should be held two weeks apart for groups of 10 mothers. The immunization series should not start until the ORT series has been completed. A competency-based approach to immunization should be developed incorporating the following elements:

1. Purpose of immunization
2. Schedules of immunization
3. Side-effects of immunization

#### Sub-task 6. Nutrition education

Mothers should be organized in groups of 10, preferably by the age of the child. Topics to be covered include the following:

1. When to begin breast feeding
2. When to add other foods
3. How to prepare an appropriate weaning food
4. The frequency of feeding when the child is healthy
5. The frequency of feeding when the child is sick
6. Food selection
7. Food preparation
8. Interpretation of the growth monitoring card.

#### Sub-task 7. Family planning

Mothers are visited at home at the first visit, a short questionnaire is given to the mother exploring possible contraindications to contraception. If none exist, the mother is offered a packet of oral contraceptive pills and instructed in their use and side-effect. The mother is then told to come to the next rally post after her menstrual period (while she is on the pill) for an injection of depo-provera. Finally the CHW informs the mother that he will visit her soon after she has had her period.

This next visit is to ensure compliance and to remind the mother to visit the next rally post. Reassurance is given for any side effect which might have been felt.

The third visit is planned approximately three months after the second to remind the mother to attend the next rally post and enquire as to her experience with the contraceptive.