

## PARTICIPATION EFFECT FROM WATER PROJECTS ON EPI

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**Abstract**—It has been hypothesized that in addition to the direct health and amenity benefits of an improved water supply, there are other, more subtle, benefits to communities who participate in community-based water supply projects. A detailed empirical comparison of villages with and without community-based water projects in Indonesia and Togo suggests that such indirect benefits are substantial. Between 25 and 30% more children are immunized in villages with community-based water projects than in comparison villages which either have benefitted from non-participatory water projects, or have had no water project.

From a comparison between the activities of villagers and workers in external agencies involved in water projects in the two countries, it is concluded that successful participatory water projects are best characterized as a partnership between the community and the external agency. Such projects require substantial inputs of time, resources, skill and persistence from both the community and the external agency. These inputs must be sustained by both parties in all phases—planning, construction and maintenance—if this partnership is to result in lasting improvements in water supply and other aspects of community life.

**Key words**—community participation, immunizations, water supply, program evaluation

### BACKGROUND

Improving water supply services to rural people in developing countries has been a major objective of international and national development efforts over the past 30 years. The World Bank has estimated [1] that governments and external donors are currently spending U.S. \$1500 million annually on this sector. Official figures show that while some progress has been made, 60% of people in rural areas of developing countries still do not have access to an adequate water supply [1]. In-depth assessments show that the situation is substantially worse than the coverage figures would suggest. Not only is it increasingly difficult to mobilize resources from external agencies and national governments for construction of new systems, but often it is found that villagers who 'have access' do not use the improved systems, and that these improved systems are not maintained. To give but two examples from a recent World Bank review: surveys in East and West Africa have shown that only one in three 'beneficiaries' of improved rural water systems actually use such systems; and in some countries the construction of new facilities is not even keeping pace with the rate of failure [1].

From reviews of experience in this sector by one of the authors and others, however, it has become apparent that there are some successful rural water supply projects and that, in these successful projects, the local people themselves have played a major role in the planning, financing, construction and maintenance of their systems [1].

Over the last 10 years there has been an important development in a related sector. The development community has recognized the possibilities for improving health through widespread adoption of new medical technologies such as oral rehydration ther-

apy (ORT) and expanded programs of immunization (EPI). As a result of analyses which have concluded that such technologies offer cost-effective approaches to improving child survival [2], many international agencies [3] and national governments have concluded that more resources should be devoted to such technologies and relatively less to improving water supplies.

It has become evident, however, that such arguments are deficient on several counts. Briefly: water supplies are not just health interventions, but economic and social interventions, too; water supplies affect not only infant mortality, but also infant morbidity and the sickness and survival of other age groups; and the long-term health impacts of improved water supplies may be substantially greater than the short-term impacts [4-6].

Because of the importance of these questions, considerable attention has been devoted by one of the authors and others to defining the health impacts of improved water supplies, and to methodologies for assessing these impacts [7-9]. In addition to the impacts on the usual range of water-related diseases [10], a subtle but important hypothesis has been raised. It has been suggested that the health of communities which are directly involved in improving their own water supplies is improved not only because of a reduction in water-related diseases, but also because the process of community organization enables such communities to undertake a variety of actions in other sectors which ultimately contribute to the social, economic and health well-being of the community. Specifically it has been hypothesized that participation in primary health care activities will be higher in communities in which participatory water supply projects have been undertaken; and it has been suggested that participation in immunization

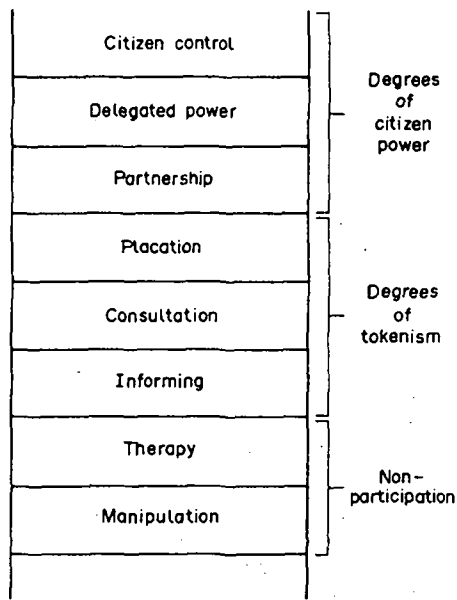


Fig. 1. Eight rungs on a ladder of citizen participation. Source: Ref. [12].

campaigns would be an appropriate measure for such 'secondary' effects [9].

Concurrently it has become apparent that, in the medium- to long-term, a major constraint on the 'new' medical technologies will be to sustain delivery of such technologies by agencies and to sustain demand for such services by villagers. Accordingly, it is of considerable interest both in correctly assessing the role of water supply programs, and in developing strategies for sustaining the use of improved medical technologies to test the following hypothesis:

Communities which participate in decision-making throughout all phases of a water supply project will display higher rates of participation in other primary health care activities (such as EPI) than communities which have either a non-participatory water supply project or no water supply project at all.

The principal objective of the research described in this project was to provide an empirical test of this hypothesis.

A second objective of this investigation was to develop a conceptual framework for understanding, operationalizing and evaluating the social and behavioral phenomenon of community participation. This was deemed necessary because while much has been written about community participation in health programs, there is little consistency in how community participation is conceptualized and subsequently measured. As Feachem points out in a discussion of community participation in water supply projects, terms such as 'felt needs', 'bottom-up planning', 'motivation' and 'integrated development at the village level' are highly complex and diffuse, and their meaning in any particular context is often obscure [11]. The difficulty is that participation is essentially a descriptive term that is made up of numerous different activities and situations, and thereby leaves much room for confusion about its causes and effects, its amounts and distributions [13]. Participation is not an objective that exists in specific quantities

or that can be measured in particular units to be compared over time.

Nonetheless, this does not imply that the objective of developing a framework for conceptualizing community participation should be abandoned. On the contrary, because the health sector has neglected the need for empirical work on the subject, the wide variation of participatory interventions has been accompanied by an equally wide range of results. Moreover, for lack of a conceptual framework to help explain these differences, health planners and policy makers are obliged to make decisions on the basis of anecdotal information or conjecture on how community participation influences health behavior and outcomes.

#### CONCEPTUAL FRAMEWORK

The nature and extent of community participation encouraged by a water supply project vary. The extremes are, on the one hand, minimal participation in which specialists and funders from outside the community's land, labor or materials, and, on the other hand, a project in which community members are fully involved in decision-making throughout all phases of planning, constructing and operating a water supply system. Community participation is not simply a yes-no variable that is either present or absent. Rather, community participation occurs in varying degrees.

Arnstein [12] visualized the possible range of participation as the rungs in a ladder representing a progression of who has power over program decisions and resources (see Fig. 1). When the role of community groups or leaders is limited to compliance with, or the rubber-stamping of, decisions made by outside project personnel, then the level of participation is confined to the bottom two rungs of the ladder. Projects which elicit the opinion of members of a community by surveying them, inviting them to be heard at meetings, or informing them in advance of project plans but do not allow them to make decisions or to have any control over the allocation of resources fall onto the middle three rungs of token participation. Under these conditions the community may indeed hear and be heard, but it lacks the power to ensure that its views will be *heeded* by the project. Further up the ladder are levels of participation with increasing degrees of decision-making power. At these top three rungs, communities negotiate as equal partners by engaging in trade-offs, vetoing, or obtaining full control over decisions and resources.

There are some obvious limitations to this ladder, some of which Arnstein herself points out. First, neither the community or the external agency is homogeneous. Within each group individuals typically have divergent points of view, competing interests, and differing roles and status. Second, the ladder does not include an analysis of factors other than power which may inhibit or facilitate reaching greater levels of participation. Factors such as the amount of time available, the community's knowledge and experience base, or the outsiders' skills and instruction also influence the degree to which participation is achieved. Third, the eight rungs do not provide a

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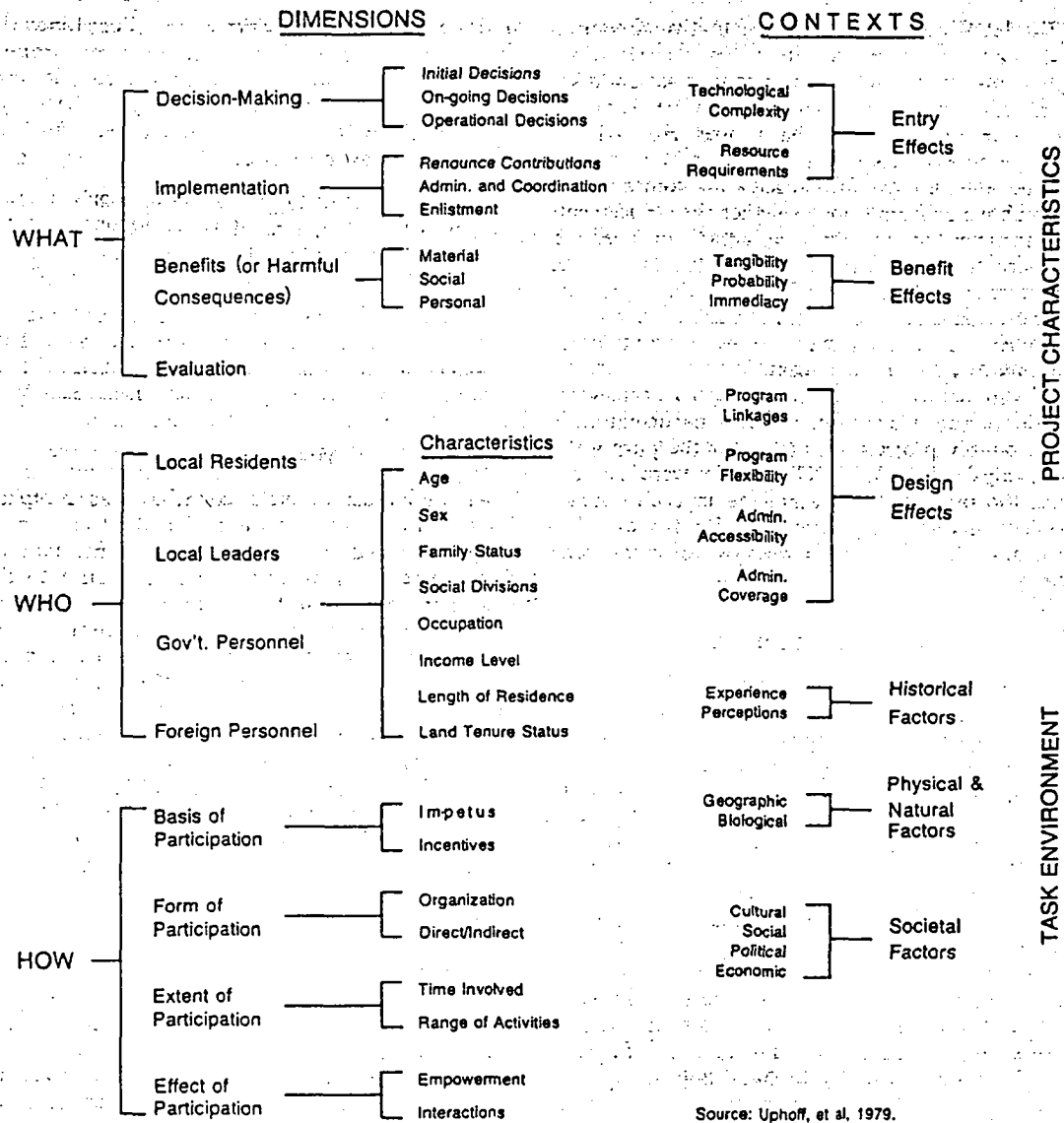


Fig. 2. Basic framework for describing and analyzing rural development participation.

framework for examining how a project develops a relationship with the community, and therefore, cannot be used to assess how project workers engage community members in the tasks of planning, constructing, operating and maintaining a water supply system.

The process of eliciting and sustaining community participation in a project is understood by Uphoff *et al.* [13] as having several dimensions and contexts (see Fig. 2). They systematically dissect participation into the *dimensions* of the *WHAT* (the kind of participation taking place), the *WHO* (the sets of actors involved in the participatory process), and the *HOW* (the specific characteristics of that process). The *context* of participation focuses on the relationship between the technological and programming characteristics of the project itself, such as the digging of a well or the laying of pipes, and the patterns of actual participation that emerge. The context also includes the characteristics of the physical setting, history of the region, and the social systems

operating in the environment in which the project is executed. These have subtle but powerful effects on participation patterns.

Each of the three dimensions are then refined further into variables that represent the critical actors and components of participation in a project. The *WHAT* variables that warrant concern are participation in: decision-making; project implementation; benefits from the project; and project evaluation. These four categories of activities represent the major ways in which community participation can assist projects.

The *WHO* variables are of great importance because when 'the community' is expected to participate, it should be clear as to who in this large and heterogeneous group are involved. The general types of participants are: local leaders; local residents; government personnel; and foreign personnel. The first two sets of participants are those who have local roots. The last two sets of people are, to varying degrees, outsiders.

The HOW variables add the qualitative dimension to the analysis of participation. They generate insights into such issues as why participation takes place, continues or declines, and why participation has the particular pattern that it does. How participation is occurring is determined by such variables as: whether the initiative for participation comes mostly from above or from below; whether the inducements for participation are more voluntary or coercive; the structure and channels of participation over time through formal or informal organizations; and the duration and scope of participation (which may vary from a one-shot event to an intermittent or continuous range of activities).

This model was used as the conceptual framework for the present study of community participation in water supply projects. However, for the purpose of this analysis, the CONTEXT variables were excluded since the projects to be examined in each country would be in the same geographic region and would all be dealing with the same technology of rural water supply.

#### THE RESEARCH DESIGN

The study used a cross-sectional, quasi-experimental design [9] to compare participation in primary health care activities in three groups of villages in each of two countries: villages which were part of a participatory water supply project, villages which were part of a non-participatory water supply project, and villages which were not part of any water supply project.

The objective was to find out whether participation by the community in decision-making during all phases of a water supply project would affect the utilization of other primary health care services by the community. To measure this effect it was necessary to choose a primary health care intervention that: is not influenced by the direct impact of a water supply project (use of oral rehydration therapy, for example, would not be appropriate); and for which reliable data exist in the individual villages.

Participation in an expanded program of immunization (EPI) was chosen as the indicator. For efficiency reasons it was desirable to choose a measure such that substantial numbers of individuals do participate and substantial numbers do not participate. Full immunization coverage was, thus, not used as a measure because the coverage levels in the study communities were low. Rather, the study used as an indicator the percentage of children who had completed the DPT (diphtheria, pertussis, tetanus) immunization series. This series of three injections was satisfactory both because completion of the series requires sustained participation over time, and therefore, substantial social and behavioral change, and because the distribution among those completing and those not completing the series was satisfactory in the study communities.

To include villages in the study so that the three groups would be as similar as possible with respect to certain social, economic and geographical conditions, it was desirable to have the participatory and non-participatory water supply projects operating in the same region during a similar period. It was also

important that EPI activities be introduced into the area by workers not affiliated with the water projects after the water systems were completed and that primary data on immunization coverage at the village level were available. If these conditions were fulfilled, the following hypotheses could be tested:

Villages where participatory water supply projects have taken place display higher completion rates of the DPT vaccination series than similar villages where non-participatory water supply projects have taken place.

Villages where non-participatory water supply projects have taken place display completion rates of the DPT vaccination series that are similar to those of villages where no water supply projects have taken place.

#### THE STUDY SITES

An initial list of eight countries was compiled because they had community-based water supply projects funded by the Agency for International Development (AID) which were of interest to the Water and Sanitation for Health Project that sponsored the research through an AID contract. After detailed review of project documents and discussion with officials knowledgeable about the projects, two countries, Togo and Indonesia, were selected.

In Togo the participatory water supply project chosen for analysis was the Togo Rural Water Project. This project which began in 1980 was funded by the United States Agency for International Development (USAID) and the European Economic Community (EEC), and executed by the Ministry of Health and Social Affairs. The purpose of the project was to improve the health and living conditions of a total of 120,000 people residing in 150 villages in the Savannah Region and in 250 villages in the Plateau Region by drilling 535 tube wells, equipping approx. 400 with foot pumps, and providing a complementary 'socio-health' input.

The 'socio-health' component was primarily a community development effort which involved villagers in a series of organizational, technical, and human relations activities. Togolese social affairs agents initiated most of these activities after receiving extensive training in health education and community organizing skills. Community participation was defined in a project document as a continuous learning process which makes possible community action for the resolution of local health problems [14].

By mid-project in 1983, 80% of the planned boreholes had been completed. Moreover, 350 village development committees had been organized and their officers trained. Of these committees 80% had established funds to maintain and repair the water pumps. Only the project villages in the Plateau Region were used for the present investigation because a comparable non-participatory water supply project did not exist in the Savannah Region.

The non-participatory project initiated in the Plateau Region of Togo was the Fourth EDF (European Development Fund) Water Supply Project. In this project external teams drilled tube wells and installed pumps in 100 villages needing better water supplies. According to EDF officials and regional water authorities, no effort was made to elicit com-

munity participation or to organize a community-based mechanism for maintaining the pumps.

In Togo childhood immunizations are provided free of charge. Services are available either through health clinics designated as fixed centers and equipped with refrigerators or through mobile vaccination teams traveling to each village located more than 5 km from a fixed center. Field workers for the USAID and EDF projects were not involved in promoting EPI services.

A stratified random sample representing all five prefectures in the Region was chosen, giving 10 participatory ('P') villages and 10 non-participatory ('N') villages. The selection of 10 control ('C') villages that were not part of any water supply project was more problematic, however, because a verified list of villages did not exist. Ten villages were selected randomly from a specially created list of villages that were not part of either the USAID or Fourth EDF Projects. Visits to these villages revealed that some had benefitted from one of the many non-governmental water supply projects operating in the region. Due to time and resource constraints the present study was forced to find seven replacement villages using a non-random procedure. Thus, the group of 10 control villages in Togo is not a true random sample.

In Indonesia, all villages in the participatory water supply category were part of the CARE Rural Water Supply Project in West Java Province. CARE has been involved in water supply improvement in Indonesia since 1979 in three administrative areas: Bali, Java and Nussa Tenggara Barat-Lombok. CARE, whose development philosophy stresses community development and participation, works intensively with a community during the implementation of a water supply project, with the typical length of contact in a village being one to two years from start to finish. CARE employs Indonesian field workers to carry out much of the construction, community organizing and education activities. These workers often live in the village during the construction of the water supply system, participating in village life and involving local political, religious and informal leaders in planning and implementing the project.

As of 1985, CARE had installed 90 gravity water supply systems, 880 hand pumps and a few rainwater catchment systems. Gravity water systems were the principal type installed in West Java Province. A 1984 evaluation report indicated that 62% of the systems were fully functional, 27% were partially functional, and 11% were minimally or non-functional. Only CARE project villages in West Java were included in the study as 'P' villages because comparable non-participatory water supply projects did not exist in the other provinces.

The non-participatory water supply project ('N') villages were drawn from those that had been part of the INPRES (Indonesian Presidential) Program, of the Indonesian government. INPRES funds primary health care activities, including water and sanitation projects that are largely non-participatory. Water supply projects begin at the *puskesmas* (community health center) where a sanitarian is on staff to work with local government officials. Typically, a community leader approaches the sanitarian for assistance in improving the community's water supply. Funds may

be solicited from the government health department and the sanitarian distributes these to the village leaders. The sanitarian supervises the water supply project and recruits local labor for construction. Villagers receive a small fee for their work. No effort is made to organize a community-based mechanism for maintaining the gravity water system.

In Indonesia, childhood immunizations are provided free of charge at the *puskesmas*. Each *puskesmas* has a vaccination worker who is responsible for outreach and for keeping records on immunized children from each village in the service delivery area. Field workers for the CARE and INPRES projects were not involved in promoting EPI services.

A random sample of 10 'P' villages were chosen from CARE villages in West Java Province. Each CARE village was then matched with an 'N' village from the INPRES program and a 'C' village that had not been served by any water supply project. The criteria used for matching were: similarity in population size; similarity in socioeconomic status; distance from a *puskesmas*; and location in the same district. Each village was visited to verify its similarity to others in the comparison and control groups.

In summary, data were collected from 30 villages in Togo and 30 villages in Indonesia. In each country the 30 villages were of three types: (1) 10 participatory water supply project 'P' villages; (2) 10 non-participatory water supply project 'N' villages; and (3) 10 'C' villages that were not part of any water supply project. In each country the 30 villages were selected because they were all located in the same region and districts of the country, and were believed to be comparable demographically and in distance from a clinic or health center where free immunization services are available. All water supply project villages had been exposed to EPI services through field workers not involved with the water projects after their improved water supply systems had been completed. The control villages had also been exposed to the vaccination program but had not been served by a water supply project.

#### DATA COLLECTION

Field data were collected from three sources: community leaders, field workers involved with the participatory water supply projects, and immunization records. A study collaborator in each country was responsible for pretesting the instruments and protocols in the local language and for overseeing the recruitment and training of interviewers. The collaborators also coordinated the selection of villages to be included in the investigation and gathered background information on all study communities and projects.

Community leaders in both participatory and non-participatory water project villages were interviewed in their villages to gain a community perspective on who participated in what kinds of activities, and how, during the life of the water supply project. Interviews were conducted with the village chief, and one male and one female village leader. A questionnaire was designed to assess the who, what and how variables identified through the study's conceptual framework of community participation, both in the water

supply project and during the years surrounding its implementation.

The general level of community competence was assessed in terms of collective problem-solving. Information was collected on community groups in existence and community projects undertaken before and after the water supply project. A series of questions was asked to determine the level and nature of community input during specific phases of the water project. Leaders were asked to state who was involved during the various project phases, to describe the activities of the project itself and the length of time required to complete the water system. Issues related to sustainability were also investigated in terms of describing how the water system is maintained and how the community handles the acquisition of parts needed for repair. Leaders in the participatory water supply projects were also asked how the village development committees were functioning, how villagers contributed to the maintenance of the water system, and what the level of community interest was in subsequent development activities that followed the installation of the water system.

The community leader questionnaires were administered as a semi-structured interview using a casual conversation format since many of the respondents were not literate. The interviews were conducted on a one-to-one basis and required 30–45 min to be completed.

Field workers, who had been assigned to the participatory water supply project villages that were selected for study, were also interviewed using essentially the same items and format as the community leader questionnaire. The non-participatory projects did not assign field workers to specific villages. Thus, these interviews were only conducted for the participatory water supply project villages. Field worker responses provided an outsider's perspective on the who, what and how variables of community participation to serve as a basis for comparison with the community leaders' inside perspective. To understand better the amount of follow-up given to the village, field workers were asked to make additional comments regarding the nature and frequency of their contact with the village after the completion of the water system.

In both Togo and Indonesia immunization data were collected on the DPT vaccination series. In Indonesia records are kept on the DPT status of children aged 3–14 months, while in Togo records are kept on the DPT status of children aged 12–36 months. (This difference in age groups is not significant for the present study since data analysis was carried out separately for each country.)

In Indonesia the study collaborator reviewed immunization records maintained in each *puskesmas* for the study villages within its jurisdiction. Several years of records were examined to decide which year of data appeared the most valid. This was done by assessing the neatness and completeness of the records as well as by when the *puskesmas* personnel received training in record-keeping.

In Togo similar immunization records did not exist for each village in the study. Consequently, data were collected in each study village by interviewing all caretakers of children aged 12–36 months and

extracting information from their vaccination cards. If the child's vaccination card was not available, the interviewer was trained to ask the mother if the child had received the first, second and third DPT shots, and the dates when they were received. However, such reports were presumed less reliable than vaccination card information. If mothers did not have birth certificates, then interviewers checked other program records they might have from the Ministry of Health, private voluntary agencies, or auxiliary midwives. Moreover, interviewers were trained not to record data for children who did not appear physically to fall within the age range of 12–36 months, even when presented with a documented birth date. This was due to the reported practice of altering the birth date on documents for school admissions purposes.

In Togo the immunization data collected in one USAID village and in one EDF village were excluded from the study due to unsatisfactory performance by one particular interviewer. Thus, the immunization findings for the study groups in Togo are based on nine participatory project villages and nine non-participatory project villages.

## RESULTS

The results from the investigation fall into two categories: findings concerning participation in immunization programs and findings concerning participation in water supply projects.

### *Question 1: Does a community-based water supply program stimulate participation in immunization programs?*

The data collected in Indonesia and Togo verified that the three groups of villages were, with one exception, similar in terms of the selection criteria, and thus, constituted a valid sample. In Indonesia the average population size of 'P' villages was 3104, of 'N' villages was 3034, and of 'C' villages was 3444. The average number of children aged 3–14 months in 'P' villages was 74, in 'N' villages was 83, and in 'C' villages was 83. The average distance from a *puskesmas* or health center was 6 km for each group of villages.

In Togo the 'P' and 'N' villages were similar. The average population size of 'P' villages was 856 and of 'N' villages was 1025. The average distance to a health clinic was 8 km from 'P' villages and 10 km from 'N' villages. The average number of children aged 12–36 months was 39 in both 'P' and 'N' villages.

The 'C' villages in Togo, however, turned out to be somewhat dissimilar on two counts. They were found to be significantly smaller, with an average population size of 585, and closer to a health clinic, with an average distance of 5 km. The latter is particularly significant because analysis of the relationship between distance to a health clinic and DPT completion rates, regardless of project type, showed that DPT completion rates were nearly twice as high for villages less than 10 km from a health clinic. In addition, only 68% of the mothers interviewed in the control villages had vaccination cards, as compared to 96% of the mothers in 'P' villages. Thus, the

immunization data for 'C' villages were predominantly based on mothers' self-reports, an information source potentially biased by problems of recall and distinguishing the DPT series from other vaccinations. Given these differences with 'P' and 'N' villages, it was concluded that the 53% DPT completion rate calculated for the 'C' villages in Togo was not sufficiently reliable for further analyses.

In both Indonesia and Togo, villages in the participatory water supply project groups were found to have consistently higher DPT series completion rates than villages in the non-participatory project groups (see Table 1). In Indonesia, 60% of the children aged 3-14 months in the 'P' villages had completed the DPT series, in contrast to only 49% of the children in 'N' project villages. As in all Indonesian villages, regardless of distance, a child had to be brought to a puskesmas in order to be vaccinated. In Togo, 55% of the children aged 12-36 months in the 'P' villages had completed the DTP series, whereas only 40% of the children in the 'N' project villages had completed the DPT series.

It should be noted that in Togo, children from four 'P' villages and five 'N' villages had been vaccinated predominantly by mobile teams because they were located more than 5 km from a fixed center. This was confirmed by finding a pattern of identical vaccination dates for at least 75% of immunized children. However, an examination of the vaccination dates showed that the four 'IP' villages had been visited by mobile teams no more than three times, and the same number of mobile team visits was found for the five 'N' villages. Given these similarities in exposure to mobile team vaccination services, it was concluded that an accessibility bias did not exist in the Togo data. Children in the remaining villages had been vaccinated at a fixed center with no apparent pattern in dates.

As is evident from Figs 3 and 4, in all cases (with the exception of the first DPT in Togo) the differences are strongly statistically significant. Communities involved with a participatory water supply project do indeed display higher completion rates of the DPT series than villages involved with a non-participatory water supply project.

The second part of the hypothesis is that communities involved with non-participatory water supply projects display DPT series completion rates similar to those of communities not involved with any water supply project. As is evident from Fig. 3, the data from Indonesia are consistent with this hypothesis. Of the children aged 3-14 months in 'N' villages, 49% were found to have completed the DPT series. This was essentially the same rate found for children aged 3-14 months in the 'C' villages (Given the dissimilarity of the 'C' villages in Togo, the comparison with 'N' villages to test the second hypothesis was not carried out).

Before concluding that the participatory water supply projects were responsible for the higher immunization rates, it is necessary to consider an alternative explanation. If the prior history of community organization influenced the likelihood of a particular village being a 'P' or 'N' village, then the most reasonable explanation would be: "villages with a history of community involvement are more likely to be involved in participatory water supply projects and more likely to have higher immunization rates; any relationship between the participatory water project and the higher immunization rates is thus spurious."

In both Indonesia and Togo this possibility can be dismissed reasonably. First, the decision to be a 'P', 'N' or 'C' village was not made by the village, but was the result of a national-level decision regarding areas of operation of different programs. And,

Table 1. DPT series completion rates\* by villages in Togo and Indonesia and by type of water project

	Participatory water project			Non-participatory water project			No water project		
	N	Distance to health post (km)	DPT3 (%)	N	Distance to health post (km)	DPT3 (%)	N	Distance to health post (km)	DPT3 (%)
<b>Togo villages</b>	1272	30	71.4	659	4	77.8	—	—	—
	666	7	27.3	498	15	27.3	—	—	—
	467	10	15.4	2150	10	46.9	—	—	—
	942	1	55.9	1220	12	42.6	—	—	—
	1524	1	59.6	738	25	16.7	—	—	—
	952	0	67.3	244	0	81.5	—	—	—
	200	0	57.1	385	20	8.3	—	—	—
	565	12	38.8	2214	3	32.4	—	—	—
	1123	0	100.0	1124	0	25.0	—	—	—
<b>All villages</b>	<b>7711</b>		<b>55.0</b>	<b>9232</b>		<b>40.0</b>			
<b>Indonesian villages</b>	6273	1	48.7	6408	5	45.4	6410	5	38.7
	2067	15	42.4	1713	17	36.7	3165	9	30.1
	1761	4	94.2	1124	3	91.7	1186	2	92.6
	3783	1	17.0	3846	7	63.2	3463	6	70.7
	3143	1	71.0	2284	5	62.3	2457	7	75.0
	2856	1	76.8	3118	6	70.2	4315	7	57.9
	3370	6	68.7	2619	4	64.2	3722	8	47.6
	2488	7	40.0	2316	4	17.0	2989	5	40.0
	2401	12	25.0	4426	4	28.4	2479	5	27.6
	2453	10	31.6	2489	6	7.8	4249	3	9.4
<b>All villages</b>	<b>31,045</b>		<b>60.0</b>	<b>30,434</b>		<b>49.0</b>	<b>34,435</b>		<b>49.0</b>

\*In Togo, rates were calculated for children, age-12-36 months. In Indonesia, rates were calculated for children, age 3-14 months.

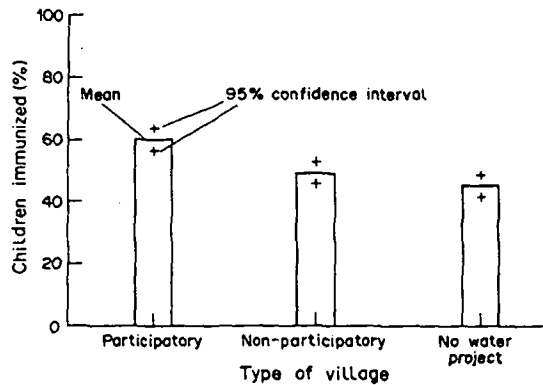


Fig. 3. Children age 3-14 months with complete DPT immunization by type of village.

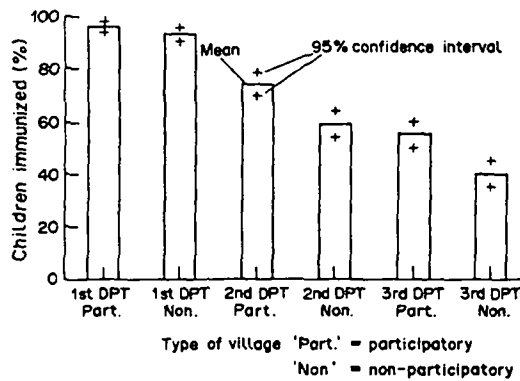


Fig. 4. Children age 12-36 months with DPT immunization by village type.

second, the philosophies practiced by the different agencies in the different regions were characteristics of the agencies, not of the regions in which they happened to work.

While these results are not definitive proof that participation in a water supply project will influence that subsequent participation in EPI services, the findings indicate a definite trend. Moreover, with similar findings based on water supply projects from two very different countries, the argument in favor of the study's hypotheses is strengthened.\*

*Question 2: What are the relative roles of villages and external agencies in successful participatory water supply projects?*

The second part of the data analysis focused on the 'who', 'what' and 'how' dimensions of community participation in these water supply projects.

The first task was to determine any differences in who was involved in the participatory project and who was involved in the non-participatory project. Comparisons were derived from the responses of field workers in the participatory project and community

\*A rapid assessment of a similar hypothesis in Malawi, showed that EPI participation rates in villages which had participated in a community-based water supply project which included a hygiene education component were twice the rates in villages which either had participated in a water supply project without a hygiene education project or had no water supply project [15].

leaders in both types of water supply projects to a matrix of questions designed to identify who determined the need for the project, who was involved in planning it, who built the water system, and who made decisions about maintaining the system.

Table 2 presents the number of responses from field workers and community leaders indicating which specific group of actors was involved in a particular phase of the water supply project. Given the inherent social and cultural differences between Togolese and Indonesian communities as well as the philosophical and administrative differences between bilateral government and private voluntary agencies, the patterns of participation are compared within each country.

In Togo the level of community involvement in the 'P' villages steadily increased with each project phase while outside worker involvement steadily decreased. By comparison, participation from outside workers in the 'N' villages also steadily decreased, but so did participation from community members. The most serious reduction in community involvement occurred during the construction phase, and outside worker involvement in the 'N' villages reached such a negligible level during the maintenance stage that when compared to 'P' villages, the difference was statistically significant.

These findings in Togo are not surprising. Both projects expected villagers to be responsible for the maintenance of the water system, but used different approaches. On the one hand, the EDF project approach was to involve only those villagers necessary to assist the drilling team, have the village chief designate an individual to be responsible for maintenance, provide pump repair instruction to this person onsite, and then move the team of project workers to another village after the water system had been installed. The roles of both the outside workers and the villagers were focused on the technical tasks of installation. Thus, as the water system neared completion, the involvement of the community not only decreased, but they were left without technical assistance to deal with the management problems of maintenance. On the other hand, the approach used by the USAID project was to assign a project worker to a village to solicit an initial commitment from village leaders to set-up a water pump maintenance

Table 2. Frequency of responses of field workers and community leaders identifying who participated in the water supply project phase

Project phase	Community leaders and groups		Outside workers	
	'P' villages	'N' villages	'P' villages	'N' villages
<b>TOGO PROJECTS</b>				
	N = 120		N = 90	
Determining need	15	23	27	20
Planning	25	21	17	18
Construction	30	11*	14	15
Maintenance	41	34	13	05*
<b>INDONESIA PROJECTS</b>				
	N = 150		N = 90	
Determining need	91	89	16	08*
Planning	75	89	18	09*
Construction	61	69	13	00*
Maintenance	69	63	12	02*

\*Differences significant at 5% level.



fund as well as a village development committee to be responsible for this fund and the water system. To broaden community participation the project worker provided hygiene education during committee meetings that were open to all villagers, and committee members from several project villages were trained by other project staff in basic outreach and water system management skills. A village man trained in pump repair and a village woman trained to monitor conditions of the water system became additional members of the committee. After the installation was completed, the project worker maintained contact by attending some committee meetings. The USAID project approach required a more evenly distributed reduction in outside worker involvement than the EDF project approach because community organizing and education to maintain the water system was as important to the role as was installing the water pump.

For the Indonesian 'P' villages community participation decreased between the need and planning stages while outside worker involvement remained about the same throughout the various project phases. By comparison, outside workers in the 'N' villages were reported to have negligible involvement during the first two phases and nearly none during construction and maintenance. Community participation levels for determining need in 'N' villages were comparable to those found in 'P' villages, but decreased abruptly between the planning and construction phases. Moreover, from an examination of the last two columns, it is evident that the involvement of outside workers in the 'P' villages was not only less variable during the different project phases but substantially greater than in the 'N' villages. An explanation for these results can be found, first, in the Indonesian system requiring all villages experiencing a need for an improved water supply to go through a centralized office which then assigned them to a project. Thus, 'P' and 'N' villagers were equally involved in determining a need. Second, the INPRES project approach was to supply the materials and a project worker, who often commuted between the project office and the village, to pay and supervise villagers as they installed the gravity water system. His role was that of a foreman with the power to hire and fire villagers to ensure their participation until the installation was completed. His involvement throughout was, therefore, minimal. The CARE project also provided materials and one outside worker, but the worker lived in his assigned village and the villagers were not paid for their participation. Before the materials were delivered, the CARE project worker was required to elicit the collaboration of the existing village development committee, which can be found in all Indonesian communities. Working through this committee, villagers were organized to construct the gravity water system and a sub-committee was formed to oversee its maintenance. After the installation was completed, the project worker moved away, but paid periodic visits to members of the sub-committee. The CARE project approach required more overall involvement from outside workers and more sustained community participation from planning to construction.

In sum, project workers in the 'P' villages of Togo and Indonesia did not tend to specialize or concentrate their input. In fact, they appear to have matched the pattern of participation elicited from community members, making less distinction between the inputs of outsiders and insiders. The participatory water supply projects elicited a parallel pattern of participation in which the kind of outside workers' involvement matched that of the communities. Moreover, the participation from outside workers was more evenly distributed over the specific phases of the project. The differentiation of roles and responsibilities between the community and the worker was minimal. In the 'N' villages of Indonesia, the involvement of outside workers during the construction and maintenance stages was negligible. In the 'N' villages in Togo the outside workers had almost no concern with maintenance. This lack of involvement from project personnel with respect to maintenance may be an important contributing factor to the eventual disrepair of a water system installation after the completion of the project.

Another difference found between the participatory and non-participatory project villages was the average length of time for completing the water system. The data indicate that participatory projects take significantly *more* time than non-participatory ones. The 'P' projects in Togo and Indonesia required an average of three and four months respectively as compared to one and two months for 'N' projects. Community participation thus requires greater inputs of time and personnel.

#### DISCUSSION

These findings reveal, first, that there is a positive relationship between participation in a water supply project, that emphasizes community involvement, and subsequent involvement in primary health care activities. Water supply projects without community participation do not stimulate participation in EPI services. Conversely, in Indonesia (where all villages had been involved in community participation through family planning activities) it was found that community participation without water supply projects is not enough. However, when community participation is combined with water supply projects, there does appear to be a 'stimulus effect'. Water project workers were not involved in promoting EPI services, yet villages served by participatory water supply projects demonstrated noticeably (and statistically significant) higher percentages of children who have completed the DPT series.

Given the ambitious immunization goals of international and national agencies, this secondary effect from the participatory water supply projects can be an important indirect contribution to child survival efforts. One of the four strategies identified by UNICEF to increase immunization coverage is "to reduce drop-out rates between the first and last immunizations by strengthening community participation". A participatory water supply project may be an important mechanism for improving community participation in immunization services.

Obviously, this does not mean that participatory water supply projects are in any sense the sole

strategy for increasing immunization completion rates, or that participatory water supply projects should be a prerequisite for all child survival activities. It does mean, however, that planners who look at long-term strategies for improving health status should consider participatory water supply projects as an important initial activity in communities where primary health care and child survival activities are being introduced.

Although, as with all quasi-experimental designs, the pre-project comparability of the communities is open to question, the consistency of the quantitative data and the weight of the qualitative supporting evidence suggests that, in fact, the community-based water supply programs did have an effect on stimulating participation in subsequent immunization programs.

#### CONCLUSIONS

It is now widely accepted that involvement of the community in the design, construction and maintenance is the *sine qua non* of sustainable and replicable rural water supply investments. It has further been claimed that the benefits of such involvement are not confined to improved performance of the projects *per se*, but that the communities themselves are transformed and that, as a result of such transformation, they are able to make better use of other opportunities. The present study is one of the few empirical tests of this assertion. The results strongly suggest that, as a consequence of participation in community-based water supply projects, communities have substantially higher rates of participation in immunization programs. By inference this would suggest that it is, indeed, true that there are secondary effects of community-based water supply projects which have significant effects on health and, presumably, other aspects of well-being.

The analysis also provides important insights into the nature of the people-agency partnership in successful community-based water supply projects. The investigation provides strong evidence that the romantic notion that communities will somehow 'manage on their own' is incorrect, and, conversely, evidence that shows that successful community-based programs require a substantial, sustained input from properly-trained external collaborators in the planning, execution and operation phases of a project. In sum, then, the investigation shows that:

- community participation in water supply projects requires time, resources, skill and dedication on behalf of both the community and an external 'collaborating' agency, and that
- the results of an effective partnership between the community and an external agency in improving the community's water supply is not only the direct health and amenity benefits from an improved water supply, but also an improvement in the community's capacity to use other opportunities in the health sector (such as immunizations) and other sectors.

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