

**Health Impact of the Dhanusha Community Drinking Water and Sanitation Project:  
A Model for Self-Sustaining Community-Based Development  
Phase I**

A Proposal Submitted to the Puget Sound Partners for Global Health

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## **Background**

*The Problem:* Approximately 2.9 billion people worldwide lack an adequate water supply and 4.2 billion people live without sanitation (1). Lack of a protected water supply and unsanitary housing conditions are the primary reasons for the prevalence of fecal-related and water-borne diseases which dominate morbidity and mortality in developing countries (2). Over 12% of deaths in children under the age of 14 in Nepal are attributed to cholera or diarrhea, second only to pneumonia for specific cause of death (3). Like most rural areas of Nepal, the Dhanusha district in the southern region is severely under-served in terms of water supply and sanitation needs. Water supply wells are few, constructed poorly, and subject to bacterial and chemical contamination. Based on counts of visits to regional health clinics in the Dhanusha district, the three most common illnesses reported during the 2001/02 reporting period were skin diseases, intestinal worms, and diarrhea related diseases (4). These conditions, along with the many other water-borne and infectious diseases that plague the nation, are among those that would be most affected by access to clean water and sanitation. Although there is strong evidence of the health benefits from improved water and sanitation in developing countries, there are few specific examples of interventions, and their impact, that can be used as models for local communities.

*Response:* The Living Earth Institute (LEI) is a non-profit organization located in Seattle, WA with the mission to provide environmental education and awareness for the protection, restoration and sustainable use of natural resources. One of its primary programs involves “sustainable development”, working with local communities to assess and implement sustainable approaches to growth and development. In 2000, the Dhanusha Community Development Project was initiated with the goal of serving over 600 households by providing a latrine for each household and shared deep-water supply wells in the villages of Mujeliya and Rajual, Janakpur Municipality, Nepal. In order to create the infrastructure to manage, operate and maintain drinking water and sanitation systems, LEI contracted with the Women Development Service Center, a Nepali non-government organization (NGO) based in Janakpur, to organize the project and develop community involvement and ownership. Following formation of a local Project Management Committee, Stage I of the project was completed in December 2003. In addition to installation of 15 drinking water wells and 50 latrines, health and sanitation education, literacy programs and skills development training for women were carried out. All of the project programs have been implemented by local experts, social workers, engineers and labor force. The project is scheduled to continue through the end of 2005, at which time every household will have a latrine, and additional wells will be added so that approximately 5-7 households will share a properly constructed and protected well. The combination of the sanitation system, clean water, and community-led education is destined to change the health of this community.

*Need for Evaluation:* Although the Dhanusha project has the potential to be a model program that can be duplicated in other Nepali districts as well as other countries, lack of resources has prevented evaluation of the impact of this work. Assessment of differences in birthrate, mortality, incidence/prevalence of disease and general health of the community before and after implementation of the project, as well as participants’ perceptions of involvement and commitment to the program, is necessary to document the effect and ascertain areas for improvement for future projects. Development of dissemination materials to be utilized by other interested communities is also needed.

## **Specific Aims**

With the aid of Puget Sound Partners for Global Health, this project proposes to provide a health assessment of the Dhanusha Community Development Project by coordination and development of household surveys to evaluate health status of the district pre- and post-project completion. Specifically, we propose to use these funds to plan and develop procedures for implementation of the project and to conduct the project pre-test. During Phase I of this project, we will complete the following tasks:

- 1) Develop field procedures to evaluate morbidity and mortality related to water and sanitation along with community perceptions of the Dhanusha project;
- 2) Implement a baseline survey to provide household enumeration and health status for each household member prior to completion of the Dhanusha project;
- 3) Estimate general health and rates of morbidity and mortality, focusing on water-borne illnesses, for the Dhanusha community.
- 4) Compare general health and rates of mortality/morbidity by subgroup of community members including demographics, number living together, and completion status of latrine/water well for the household.
- 5) Compare knowledge and behavior of basic sanitation learned during the community education programs by demographics, time since training, and completion status of latrine/water well for the household.
- 6) Provide an evaluation of the project from participants' perspectives and to identify areas for improvement in the future.
- 7) Develop materials for dissemination of the Dhanusha project as a model for self-sustaining community development of water supply and sanitation systems.
- 8) Develop plans for obtaining funds for implementation of the post-test in 2006.

## **Methods**

*Overall Approach:* This project involves the collaboration of three organizations: the Department of Epidemiology at the University of Washington for research expertise, the Living Earth Institute which is providing the intervention, and the Women Development Service Center of Janakpur, Nepal, for implementation of the fieldwork. Using resources and colleagues available to her within the UW Epidemiology Department, Dr. Fitzpatrick, a Research Assistant Professor, will provide expertise and guidelines for methodology to be utilized in the study including procurement/development of the assessment instruments, standardization of methods, and analyses of data. Meera Kansakar MA, a Nepali economist educated in both Nepal and the United States, will provide coordination and management for the field study as well as follow-up support. She will also provide the leadership necessary to the Women Development Service Center for conducting the door-to-door household health assessment. A team of six interviewers and two supervisors will complete each household survey in a 5-6 week period. A local physician is available to the project for consultation of medical issues as needed. Ms. Kansakar will also oversee data entry and management of study results. Local staff will be used for all aspects of field work and data management. Ms. Elardo, a professional engineer and founder of the Living Earth Institute, will provide expertise in documentation of procedures utilized for the Dhanusha Project. A Nepali student familiar with the project is available summer 2004 to help with

translations and development of training materials/database to facilitate the pretest. Analyses and preparation of reports and manuscripts will be a joint effort between Dr. Fitzpatrick, Ms. Kansakar, and Ms. Elardo.

*Survey Instruments:* The primary tool to be used for assessment of the health impact of the Dhanusha Project will be the HAZ-2, an instrument developed in cooperation with the World Health Organization for the evaluation of projects to improve water and sanitation (5). Well-standardized and easy to collect, HAZ-2 scores can serve as both an outcome measure of morbidity associated with poor water and sanitation as well as a screening tool for identification of consequences of early childhood diarrhea. We will supplement this instrument with questionnaires for household enumeration, births, deaths, application of training and education provided to reduce water-borne illnesses, and perceptions of the Dhanusha project.

*Analyses:* HAZ-2 scores will be calculated for evaluation of water/sanitation related morbidity. In addition, we will develop standardized rates for births, deaths and morbidity to compare with other surveys (e.g. the Nepali clinic visit counts). Multiple and logistic regression will be used to develop models for measuring the impact of specific aspects of the Dhanusha project and to adjust for confounders including age and other factors. Data cleaning and analysis of results will be done and baseline results of the project will be prepared for publication. Finally, we will develop materials describing the planning process and operations of the Dhanusha project for dissemination to other communities and organizations wishing to model these activities.

*Timing:* The timing of this Request for Proposal is ideal. As the community organization and installation of Stage I of latrines/wells are finished, the Dhanusha Project is in an early-enough stage to provide a pre-intervention assessment, while the community is sufficiently familiar with the project to provide feed-back on strategies utilized and education received. As the project is in process and some households have access to latrines and clean water, a comparison between those with and without basic sanitation is possible. Timeline for the project is as follows:

Month Task

1	Finalization of collaboration/contractual agreements between participating organizations, obtain IRB approval
2	Development/translation of instruments from English into Nepali, and from Nepali into Maithili (local language); field test survey instrument
3	Development of field survey protocol, identification of interviewers, preparation of supplies, interviewer training
4-5	Implementation of baseline survey
6	Data-entry of baseline survey
7-8	Data cleaning, coding, analyses, and report writing of baseline survey results
9-10	Development of materials describing the project as a model of sanitation development
11	Submission of baseline manuscript(s) for publication
12	Study close-out, development of plans for obtaining funding for post-test.

*Significance of the Study:* Documentation of the health impact of the Dhanusha project provides several valuable outcomes for public health including: (a) effect of providing basic services, such as latrines and water wells, on the health of rural impoverished communities; (b) documentation and dissemination of a model that can be implemented in other regions in the world; (c)

awareness of community perceptions of such a project; (d) identification of new ideas/strategies for improving future projects; (e) epidemiologic data of disease incidence/prevalence using household surveys as a method of surveillance. In this phase of the project, with funding provided by the PSPGH, it will be possible to conduct the pre-test only for evaluating the impact of the sanitation project. But completion of this aspect of the project will facilitate Phase II funding as protocol and field testing/use of the instrument will be completed thus reducing cost for the second post-test. We plan to complete the entire pre-post test as planned. Upon completion, this project will demonstrate the impact that clean water and basic sanitation can have on the health of a community. We will develop materials for dissemination of these methods as a community-based model during this funding cycle, Phase I, of the project..

## **References**

1. Mars DD. Water, sanitation and hygiene for the health of developing nations. *Public Health* 2003; 117:452-6.
2. Checkley W, Gilman RH, Black RE, et al. Effect of water and sanitation on childhood health in a poor Peruvian peri-urban community. *Lancet* 2004; 363:112-18.
3. Nepal Population Census 2001, His Majesty's Government of Nepal, Central Bureau of Statistics, Kathmandu.
4. Annual Report, Department of Health Services, 2001/2002. His Majesty's Government of Nepal, Ministry of Health, Department of Health Services, Kathmandu.
5. Dillingham R, Guerrant RL. Childhood stunting: measuring and stemming the staggering cost of inadequate water and sanitation. *Lancet* 2004; 363:94-95.

## **Additional Information**

Fitzpatrick AL (PI), Health Impact of the Dhanusha Community Drinking Water and Sanitation Project: A Model for Self-Sustaining Community-Based Development

**One sentence description of project:** This project proposes to develop the protocol and provide the pre-test survey for evaluation of the health impact of a community-based effort to develop infrastructure and provide clean water and sanitation to a rural community of 600 households in Dhanusha, Nepal.

**Proposal Requirement:** This project involves the first-time collaboration of three organizations: the Department of Epidemiology at the University of Washington for research expertise, the Living Earth Institute which is providing the intervention, and the Women Development Service Center of Janakpur, Nepal, for implementation of the fieldwork. This project also brings a new investigator into the field of global health research. Dr. Fitzpatrick, a Research Assistant Professor and new investigator, has worked over 14 years in the fields of chronic disease and aging in the United States. After being introduced to international studies with the Multi-Disciplinary International Research Training Program in the School of Public Health, this will be her first effort as a Principal Investigator of an international study involving global health.

**Project Expectations:** Twelve months is an adequate period of time in which to develop methods and implement a community-based survey to the 600 households participating in the Dhanusha Community Sanitation Project. Although we had initially anticipated a three-year funding project to include the post-test after all households have received latrines and deep water wells, we will use the work done for the pre-test as the spring-board for obtaining funds to complete the post-test. During this year of funding, we also plan to develop materials explaining the community-based approach of the Dhanusha project for dissemination as a model to other communities. The budget of this twelve month funding period is higher than that initially proposed for the first year of the study due to compression of effort. In addition to developing start-up procedures and implementation of the survey, we must also include analyses and project dissemination materials within this time period. In addition, due to the increased workload for the cycle, we have made the following modifications to the original budget: a) increase of Dr. Fitzpatrick's salary from 4 to 5%; b) inclusion of a Nepali intern during summer 2004 to facilitate survey and database development; c) increase in salaries at field site, d) addition of 2 trips to travel budget to now include two persons' travel at project start-up and two near project completion, allowances per trip have also been increased to more realistic levels, e) addition of a small amount of consultation fees for Ms. Elardo who will be directly involved in many aspects of the study.

We believe that the project is very feasible given these parameters, and that all aims of the study will be completed within the time period of the study. We have confidence that we will be able to obtain funding for a follow-up survey of the community using these data as the motivating factor to a funding source. Our dedication to this project and its importance cannot be over-emphasized. We appreciate the opportunity that PSPGH has given us in their review and potential funding of this proposal.