PD-ABK-153
ISN 42366

ENVIRONMENTAL HEALTH PROJECT

ACTIVITY REPORT

No. 4

EVALUATION OF WATER
INTERVENTIONS IN BOLIVIA

Clydette Powell
Oscar Larrea
Veronica Vargas

December 1994

Prepared for the USAID Mission to Bolivia
Office of Health and Nutrition
U.S. Agency for International Development
under the Environmental Health Project Activity No. 030

Environmental Health Project
Contract No. HRN-5994-Q-00-3037-00, Project No. 936-5994
is sponsored by the Bureau for Global Programs, Field Support and Research
Office of Health and Nutrition
U.S. Agency for International Development
Washington, DC 20523

CONTENTS

ACKNOWLEDGMENTS v
ABOUT THE AUTHORS vii
ACRONYMS ix
EXECUTIVE SUMMARY xi

1. INTRODUCTION 1

2. EVALUATION METHODOLOGY 9

3. FINDINGS 19

4. COMPARISON OF COSTS AND BENEFITS 43

5. CONSTRAINTS TO THE EVALUATION 51

6. CONCLUSIONS ABOUT THE TECHNICAL ENGINEERING ASPECTS 55

7. CONCLUSIONS ABOUT THE HEALTH IMPACT 57

8. CONCLUSIONS ABOUT THE COST-UTILITY OF WATER AND SANITATION PROJECTS 59

9. LESSONS LEARNED 61

10. RECOMMENDATIONS 63

FIGURES

1. Map of Bolivia and Study Area xiv
2. Conceptual Framework (Assumptions) 7
3. Diarrhea Episodes/1,000 Population, 1991-1993 33

TABLES

1. Summary of Project Data 3
2. Annual Funding for Water and Sanitation Projects,
Government of Bolivia and Selected Agencies (in thousands of U.S. dollars) 6
3. Volume of Work of Various Projects' Water Systems 10
4. Water Project Financing 11
5. Technical Aspects—Level of Service with Potable Water 12
6. Latrine Construction 13
7. Participation by the Community in Potable Water Interventions 22
8. Evaluation of the Potable Water Systems Visitied 23
9. Comparison of Design Parameters: Rural Potable Water Systems 27
10. Communities Visited by Department 29
11. Characteristics of the Potable Water Systems in the Communities Visited 30
12. Characteristics of the Latrines in the Commuities Visited 32
13. Distribution of Water and Sanitation Interventions
by Community Size and Institution 44
14. Unit Capital Costs per Water System by Size of the Population 45
15. Cost-Utility Based on Expected Outcomes 47
16. Cost-Utility Based on Documented Outcomes 48
17. Expected and Documented Cost-Utility Ratio Summary Comparisons 50

ANNEXES

A. Scope of Work 67
B. List of Places Visited 71

C. List of Persons Contacted 75
D. Documents Reviewed and Documents Consulted 79
E. Chronology of Evaluation Visit 85
F. Site Visits 87

ACKNOWLEDGMENTS

The members of the evaluation team greatly appreciate the collaboration and support provided by USAID, CARE, Community and Child Health, UNICEF, and World Bank/UNDP/Proyecto Yacupaj. Staff members of the counterpart institutions were very helpful in providing information and explaining their roles in this project.

In particular, we would like to thank Ing Cesar Castellon of USAID for his role in organizing and facilitating many details of our itinerary in the five departments in Bolivia to which we traveled together. The trips we made would not have occurred without his in-country expertise, flexibility, courtesy, and good-nature. We also would like to acknowledge the able assistance of Anne Beasley, who actively participated in the focus group activities, providing a number of insights and demonstrating an inspiring interest in the welfare of the Bolivian women and children we met along the way.

And lastly, we are grateful to the many people in the communities of the Altiplano/Valle, Cochabamba, Chuquisaca, Santa Cruz, and Potosi who welcomed us and opened their doors to us that we might better understand their needs and achievements and who answered our many questions with patience, enthusiasm, and courtesy.

ABOUT THE AUTHORS

Clydette Powell, MD, MPH, is a Senior Physician Consultant for Harvard Community Health Plan and is also a faculty member of Harvard Medical School in Boston, Massachusetts. She is trained as a pediatrician and neurologist as well as an epidemiologist. Dr. Powell has performed both long-term and short-term consultancies for USAID, the World Health Organization, the World Bank, the Asian Development Bank, and various nongovernmental organizations. She has extensive experience in Asia, Africa, and Latin America. She served as team leader for this evaluation.

Oscar Larrea, an Ecuadorian engineer with specialty training in water supply and sanitation systems, has provided technical assistance worldwide, with special expertise in Latin America. As an independent consultant based in Quito, he has previously served on WASH technical teams.

Veronica Vargas, a Chilean health economist based in Washington, D.C., is an independent consultant who has provided technical assistance to the World Bank, Pan American Health Organization, and Harvard Institute for International Development. Her experience is in Latin America and Africa.

ACRONYMS

ARI	acute respiratory infection
AT	Asistencia Technica
Bs	Bolivianos (currency unit)
CARE	Cooperative for American Relief Everywhere
CCH	Child and Community Health
CDD	Control of Diarrheal Diseases
CEA	cost-effectiveness analysis
CORDECO	Corporacion de Desarrollo de Cochabamba
DCM	Deputy Chief of Mission
DHS	Demographic and Health Survey
DINASBA	Direccion Nacional de Saneamiento Basico
DP	USAID Office Development Programs
EHP	Environmental Health Project
EPI	Expanded Program for Immunization
FHI	Food for the Hungry
FIS	Fondo de Inversion Social
GOB	Government of Bolivia
MAU	Ministerio de Asuntos Urbanos
MINSA	Ministerio de Salud y Asistencia (Ministry of Public Health)
MOH	Ministry of Health
NGO	nongovernmental organization
O&M	operation and maintenance
ONG	organization no gobernamental
ORS	oral rehydration solution
ORU	oral rehydration units
PLANSABAR	Plan Nacional de Saneamiento BASICO Rural
PVO	private voluntary organization
SD	standard deviation
SDA	Special Development Activities
SNIS	Subsistema Nacional de Informacion en Salud
SSP	Secretaria de Salud Publica

SVEN	Sistema de Vigilancia Epidemiologica Nutricional
TA	technical assistance
UIME	Unidad de Investigacion Monitoreo y Evaluacion
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
URO	Unidad Rehydratacion Oral
US	Unidades Sanitarias, Regional Health Unit
US$	U.S. dollar
USAID	United States Agency for International Development
VIP	ventilated improved pit latrine
WB	World Bank
WS/S	water supply and sanitation

EXECUTIVE SUMMARY

USAID/Bolivia is one of the agencies that funds the provision of potable water and sanitary facilities through several projects within Bolivia. This evaluation examined the impact of water and sanitation interventions through contacts with four projects that are sponsored either by USAID or other agencies: CARE, Community and Child Health (CCH), pilot Project Yacupaj under United Nationas Development Program/World Bank, and UNICEF. In addition, the team reviewed documents of one other USAID project, the Special Development Activities (SDA). According to USAID, the objectives of the evaluation were "to determine the impact and effect of the water interventions in improving the health status of beneficiaries; to assess the extent to which the various project/activity interventions have been advancing USAID's Family Health Strategic Objective; and to identify possible areas of overlap or selection and/or implementation criteria which were not mutually reinforcing." USAID also requested a cost comparison of the projects as related to water and sanitation interventions. The full scope of work is provided in the annex of this report.

From August 22 to S ptember 9, 1994, the evaluation team of the Environmental Health Project visited five departments in Bolivia along with 23 communities representing the four projects mentioned above. Methodology consisted of review of epidemiologic, economic, and technical engineering data from the projects, along with site visits, focus group discussions, and meetings with key informants.

Findings

1. Projects generally use output indicators to monitor their progress in terms of number of systems constructed. Only one project routinely monitors impacts (CARE) by collecting nutritional and diarrheal disease data every three to six months. CCH did gather baseline diarrhea incidence data and is slated to conduct another follow-up survey later this year. No project measures infant mortality according to the Family Health Strategic Objective of improving child survival.

2. Quantitative data from CARE projects indicated a positive impact on child health as related to nutritional status and diarrheal disease incidence. The projects in the Altiplano were able to demonstrate a decrease in 2-week diarrheal incidence from 27% in 1993 to 7% in 1994 and in Chuquibamba from 27% to 21% over the same time period. Among children 12-23 months old in the Altiplano/Valle areas, the prevalence of moderate malnutrition decreased from 66% to 53%, while severe malnutrition declined from about 24% to about 14%. In Chuquisaca/Cochabamba, the data show that children 1-2 years old experienced the most improvement in nutritional status: from 78% prevalence to 55% among the moderately malnourished group and 32% to 19% in the severely malnourished group.

3. Since 1991, the Subsistema Nacional de Informacion en Salud (SNIS) system has included national data on diarrheal disease and nutritional status. If one uses 1992 as a baseline, there has been a consistent drop in the incidence of disease in 9 out of the 12 reporting areas. The most significant decrease was demonstrated in Pando (248 to 136 cases/1,000). For the country as a whole, there was a 16% decrease from 1992 to 1993. Demographic and Health Survey (DHS) data for children under 6 months of age show that the prevalence of diarrhea decreased from 25% in 1989 to 17% in 1994.

4. The linkages among water supply projects are provided through Direccion Nacional de Saneamiento Basico (DINASBA), which has

initiated activities aimed at ensuring coordination among the various technical and financial cooperation agencies and institutions through technical meetings with representatives from the government, NGOs, and PVOs.

5. The coordination of other donors involved in water supply activities comes, in part, through DINASBA. Through a UNDP initiative, an operational matrix was established that lists and defines the role and objectives of each project and program with a view toward providing clear guidelines for the participation of international agencies.

6. Project sustainability is mainly achieved through community participation in system administration. It is not clear if the Government of Bolivia (GOB) has attained increased institutional capacity to finance and provide support for these communities once the donors depart. The bulk of funding comes from the donors, with the communities investing on average 30% of the capital start-up costs.

7. The overriding community selection criteria common to all projects appear to be the community's willingness to participate in administration, operation, and maintenance, plus its ability to pay recurrent costs. The availability of good quality water is another selection criterion all projects use. All projects do not use the criteria of need for services due to lack of resources (i.e., poverty, lack of access to services) and health status (mortality rates, diarrheal disease burden, or malnutrition).

8. Projects use a similar process to choose the design of their systems. Considerations include population requirements, water sources, operation and maintenance, and the community's capacity to administer the system. The actual engineering components (materials and specifications), although not assessed in depth due to limited evaluation time, show some variation. CCH and CARE Programs have health components.

9. While the projects may not necessarily have strengthened GOB water and sanitation directly, they have had a powerful impact on community development and democratization. This is demonstrated by the sustained activities of the water committees, the involvement of women, and the additional improvements in the systems which many communities have made on their own. For example, one community organized and paid an extraordinary amount to hire a lawyer to claim its water rights. The projects have had a profound impact on women's time, generating multiple social and child health benefits.

10. It was not possible to determine true cost-effectiveness, due to the paucity of health impact data. Two cost-utility estimates were made, based on a mix of qualitative and quantitative data and expected health impacts derived from project inputs and outcome measures. The analysis yielded results that generally favor lower cost programs (due to economies of scale) which use simpler technologies and include health education, sanitation, community participation, and emphasis on the concept of the user as a client.

Recommendations

- USAID should continue its support of water supply, sanitation, and hygiene education activities linked to health programs, not only as a means to improve health, but also because of the benefits for community development, democratization, and women's empowerment. The emphasis of support should focus on strengthening coordination and the social science aspects (health education and community participatory) of the projects.

- USAID could provide general water supply and sanitation (WS/S) sector support through technical assistance to DINASBA. This would include assistance in reviewing and analyzing the *Third Draft of the Manual for Designing Basic*

Rural Sanitation Works, including norms applicable to all segments of the rural population. It should help this body to set standards, prioritize province and community selection, eliminate duplication in agency services to communities or identify where no coverage exists, and serve as a resource center for lessons learned from project administration and implementation.

- Along with the good community selection criteria currently utilized by all projects (which promote community-based programs), it is recommended that additional parameters, such as limited access to services, health needs, and low socioeconomic status, be included.

- Small-scale studies are recommended to compare the health and other benefits of different WS/S system designs, such as the differential effects that various water supply designs (household versus public access) have on water-washed diseases (scabies, impetigo, conjunctivitis). Other issues are differences in utilization (by all family members), maintenance, willingness to pay, and sustainability of different sanitation systems, e.g., pour-flush versus VIP designs.

- Within the health sector, it is recommended that the following be required before any project is approved for implementation by USAID: identification of specific health indicators, achievable goals (including definition of numerators and denominators), and a detailed methodology and timetable for data collection. In addition, USAID should encourage projects to establish community-based health information systems for data collection and project monitoring and evaluation. Participation by community members in all aspects of this process, in a manner that does not interfere with income generation, is highly advisable. This is not only a powerful health education tool; it also provides the community with a better understanding of and control over its health status.

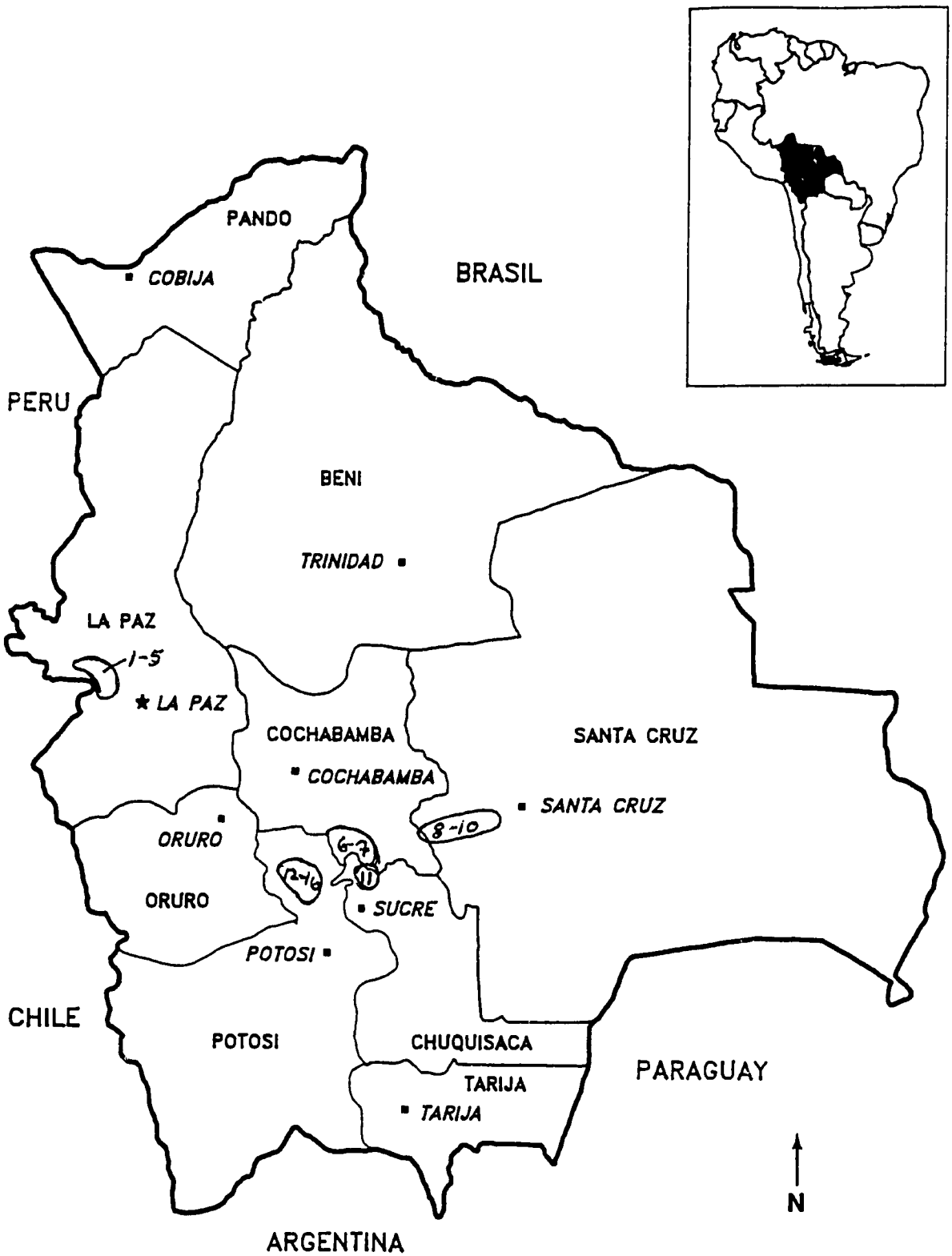


Figure 1
Map of Bolivia and Study Area

1. 1° DE MAYO
2. SURFINI
3. CURUPAMBA
4. MURUMANANI
5. CHINCHAYA
6. EL PUENTE/MARAPAMPA
7. MESA RANCHO
8. CUEVAS
9. BERMEJO
10. YERBA BUENA
11. BELLA VISTA
12. ÑEQUERI
13. CHE'WA
14. CORATA
15. CHALLOMA
16. LUCAS KAHUA

1 INTRODUCTION

1.1 Background

USAID/Bolivia is one of the agencies that funds the provision of potable water and sanitary facilities through several projects within Bolivia. This evaluation examined and visited four projects that are sponsored either by USAID or other agencies: CARE, Community and Child Health (CCH), pilot Project Yacupaj under United Nations Development Program (UNDP)/World Bank, and United Nations Children's Fund. In addition, the team reviewed documents of one other USAID project, the Special Development Activities (SDA). According to USAID, the objectives of the evaluation were "to determine the impact and effect of the water interventions in improving the health status of beneficiaries; to assess the extent to which the various project/activity interventions have been advancing USAID's Family Health Strategic Objective; and to identify possible areas of overlap or selection and/or implementation criteria which were not mutually reinforcing." In addition, USAID requested a cost comparison of the projects as related to water and sanitation interventions. Original plans to evaluate the Food for Work projects were modified because of time and travel constraints. (A detailed scope of work can be found in the annex.) The evaluation was conducted in-country from August 22 to September 9, 1994, by a team of three consultants. (See Figure 1 for a map of the areas studied.)

USAID's Family Health Strategic Objectives encompass many aspects of improved family health within Bolivia: improvement of institutional capabilities for delivery of preventive and curative health services; health policy and cost recovery plans; improved health knowledge, attitudes, and practices among Bolivians; improved immunization coverage; lower infant, child, and maternal mortality rates; higher contraceptive use; adequate nutrition among children; and better access to improved water. The latter strives to increase the availability of potable water to both urban and rural populations as described in the 1992 Ministry of Urban Affairs document entitled "Agua Para Todos." In 1992, it was estimated that 74% of the urban population had access to potable water, compared to 31% of the rural population.

The five water supply projects reviewed by the team are summarized in Table 1 according to communities served, beneficiaries, budget, systems installed, types of water services, and cost recovery contributions.

The CARE/Water and Health II serves as a follow-on to the Child Survival and Rural Sanitation Project in Bolivia. It is financed by USAID as Project No. 511-0618 for four years beginning in 1991 and ending in March 1995. The project works in seven provinces in the La Paz Department and in the Campero province of the Cochabamba Department. It is designed to improve infant and child nutrition and immunization status within these two departments. The project helps develop community capabilities in the areas of primary health care, water and sanitation, agriculture, and community organization. Water and sanitation efforts to improve potable water and sanitation services rely heavily on village cash and in-kind contributions. In addition, a subsidy (approximately 70% of costs) for villagers interested in building latrines provides incentives. The project addresses sustainability of its interventions through grassroots enthusiasm and participation. The water supply program currently serves 156 communities with a budget of US$5.1 million. The estimate of beneficiaries to be covered by services upon completion of the

project will be 40,000. The communities contribute 30% of the capital investments paying 1-3 bolivianos (Bs) per household per month for operation and maintenance (O&M). 116 gravity-fed and 6 pump-fed residential connected systems were installed between 1992-1994.

The CCH project (No. 511-0594) is USAID's first bilateral assistance project with the Ministry of Health since 1980. The project agreement was signed in July 1988 with an initial authorization of US$16.5 million from USAID funds and the PL-480 program, and US$5.5 million of Government of Bolivia funds over a five-year period. These funds have supported Control of Diarrheal Diseases (CDD), the Expanded Program for Immunization (EPI), and integrated child survival efforts within Ministry of Health (MOH) health districts. Other funds were later added for Chagas' disease. The CCH project includes almost US$5 million for improving rural water supply and sanitation in three departments (La Paz, Cochabamba, and Santa Cruz). The water and sanitation subcomponent has undergone changes since inception of the project and focuses on community empowerment and training in direct collaboration with community water and sanitation management committees. Initially to be implemented by the MOH's Division of Environmental Sanitation, the WS/S functions of the project were later divided between the Ministry of Housing and Urban Affairs and the Regional Development Corporations in the departments. In terms of water supply programs, CCH serves 96 communities of 37,383 beneficiaries. Similar to the CARE projects, 30% of the capital investments are contributed by the communities, with slightly higher O&M charges, between 1-10 bolivianos (Bs) per household per month. 89 gravity-fed and 2 pump-fed residential connected systems were installed between 1991 and 1994. These systems deliver approximately 30 liters per person per day.

The Special Development Activities (SDA) Project No. 511-0623 was authorized for US$500,000 in June 1991. Its purpose is to assist people in remote areas of Bolivia to undertake self-help projects that will immediately impact their social and economic welfare. Subprojects address basic self-help efforts of poor people in health, education, and production. Communities provide 25% of the costs to complement the 75% USAID funding provided under SDA. Currently 21 communities of approximately 1,378 beneficiaries are served with water supply programs with a budget of approximately US$90,000. Data on cost recovery for O&M were not available. During a three year period (1990-1993), 18 water systems were installed, including both gravity-fed public standposts and hand pumps. These deliver lower amounts of water per person per day than the CCH and CARE projects (15-20 liters).

UNICEF has been engaged in activities in water supply in Bolivia on a limited scale. Beginning in 1988, it focused on some provinces in Cochabamba Department and the northern provinces of Potosi Department, an isolated and impoverished area with estimated family incomes of US$7 per month. Between 1988 and 1990, 125 gravity-fed systems were constructed, costing between US$5,000 and US$10,000 each. This provided 450 standpipes to 32,000 beneficiaries. Communities contributed about 20% of the investment costs in the form of labor and construction materials and all operation and maintenance costs. National nongovernmental organizations (NGOs) executed these projects. The target beneficiary population to be served with water supply services is 59,215. Currently 215 communities are served with a budget of US$1.1 million with O&M recovery charges at .50 bolivianos per household per month. During 1992, 97 hand pump public standposts were installed which deliver on average 18 liters/person/day.

Projecto Yacupaj began in 1992 under the support of UNDP and a Dutch development agency, with the World Bank as the implementing agency. As a pilot project in three

provinces in Potosi Department, its staff of 14 focuses on WS/S. To date it has facilitated the installation of 243 water systems. It works by contracting with national organizations and local authorities and institutions. It also emphasizes capacity building among health promoters and community leaders in the areas of health, operations and maintenance of water systems, and organization management. As for financial support, the project contributes amounts similar to CARE and CCH: 70% of the costs of materials and supplies. The communities provide all the labor. The targeted beneficiary population is 39,700. Currently their water supply program provides services to 232 communities at a cost of US$3.9 million with O&M charges at .50 Bs/household/month, comparable to the UNICEF programs. During 1993-1994, 146 hand pump public standposts were installed. These provide approximately 20 liters/person/day.

Table 1

Summary of Project Data

Project	Number of Commu-nities	Bene-ficiaries	Budget in US$	Commu-nity Contri-bution	Monthly Tariffs in Bs/Mo	Finished Systems				Service Type	Liters/ Person/ Day
						Time-frame	Type	Number	Total		
CARE	156	40,000*	5.1m	30%	1-3	92-94	GF PF	116 6	122	3,4	30
CCH	96	37,383**ª	4.7m	30%	1-10	91-94	GF PF	89 2	91	3,4	30
SDA (0623)	21	1,378ª	.09	25%(+)	no data	90-93	GF HP	18	18	1,2	15-20
UNICEF	215	59,215***	1.1m	18-20%	.50	92	HP	97	97	2	18
WB/UNDP	232	39,700***	3.9m	30%	.50	93-94	PSP	146	146	1,2	20

GF = gravity-fed

PF = pump-fed

(1) HP=hand pump

(2) PSP=public standposts

(3) gravity-fed + residential hookup

(4) systems with >1 residential hookup, either gravity- or pump-fed

* estimated beneficiaries

** hard data

*** target population

ª beneficiaries served

Note: CARE, UNICEF, and WB/UNDP do not report the exact number of beneficiaries currently being served, but rather of populations targeted for coverage upon completion of the projects. CCH and SDA report population currently being covered.

1.2 Sources of Funding

1.2.1 Government of Bolivia

Through several World Bank loans, GOB provides the majority of funding for water and sanitation projects. These projects comprised about 9% of the public investment in 1994, which is equivalent to about US$51 million (see Table 2).

As part of the GOB's "Water for All" initiative in 1992, the government launched the National Water and Sanitation Plan, 1992-2000. This plan foresaw a total investment of US$223 million in rural areas for 1992-2000. The annual investment was projected at US$23 million. To support this new sector plan, the GOB requested World Bank assistance in 1993 to fund the rural water and sanitation project PROSABAR, which would increase coverage in rural areas. To improve the management of future investments, PROSABAR will review the results and experience of other projects, such as UNDP/World Bank Potosi pilot project, USAID-funded projects, and UNICEF.

1.2.2 USAID

During the last five years, USAID has contributed about US$14 million to 12 water and sanitation projects. The most important of these have been Water and Health II, executed by CARE, and CCH, executed by a government-supported agency. Other water projects were part of an agriculture development project and are not included in this evaluation. CARE installed 122 water systems. Additionally, the agency has supported health education and family garden production to complement the installation of water and sanitation systems. CCH installed 96 water systems along with health education programs.

1.2.3 Other International Sources

Since 1991, UNICEF has provided about US$1.3 million for 243 water systems to small and remote populations. UNDP/World Bank has installed 232 WS/S systems, including various types of hand pumps, for US$4 million. The project has promoted concepts of low-cost technology and community participation. The international agencies, in contrast to the GOB operations, have allocated a significant percentage of funds to health education activities, which complement water and sanitation interventions.

1.2.4 Community Contributions

Currently, most of the programs funded by the agencies and the GOB contribute 70% of total capital expenditures. The communities are financing the remaining 30%. Communities also contribute labor and materials, such as sand and stones, for construction.

GOB plans to make changes in the current financing method to improve efficiency. The new method will develop standard costs that could be compared with the costs of actual projects as a means of evaluating efficiency and improving management of the services. The new rule will be to pay 70% of a fixed amount of the capital expenses. That amount will be based on average historical costs differentiated by community size. The municipalities and the users will be paid any amount exceeding that figure. This method allows for greater control and planning of financing and liberates financial resources to increase coverage.

1.3 Conceptual Framework

Several components must be in place for a WS/S system to have a positive health impact. The

technical aspects include appropriate technology for the setting and an adequate supply of water acceptable for consumption. This must be accompanied by a sanitation system that covers at least 75% of the population and is properly functioning, clean, and used by all members of the community. In addition, a community must have the means to sustain a WS/S system. Fees, trained operators, an effective and representative water committee, the participation of women in decision-making, and some form of institutional support are essential components. Lastly, an educational component must be in place. Community members must be instructed in personal, domestic, and environmental hygiene. All these elements—technical, organizational, and educational—when balanced and complementary, enhance the probability of a WS/S system having a positive health impact. These principles are illustrated in Figure 2. As there were no hard data on which to evaluate health impacts (with the exception of CARE), expected health impacts were determined based on which of these components the programs had successfully implemented.

Table 2

Annual Funding for Water and Sanitation Projects,
Government of Bolivia and Selected Agencies (in thousands of US dollars)

Funding Source			FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	Subtotal	TOTAL
Government of Bolivia			12,952	20,028	32,513	48,152	16,366	34,050	56,749	51,255	272,065	272,065
USAID	CARE	Self-financing PHC	50	4	10	0	0	0	0		64	
		Care Water (1)	0	0	0	0	207	2,034	1,776	1,102	5,119	
	CCH	CCH (2)	0	0	0	636	763	1,953	1,162	221	4,735	
	CORDEP	Chapare (3)	0	0	0	1,212	0	0	0	0	1,212	
	OTHER		416	20	260	871	0	0	0	0	1,567	13,415
UNICEF					50	50	50	50	142	760	1,102	1,102
UNDP/WORLD BANK							n/a	710	2,320	879	3,909	3,909

Source: For GOB, Minister of Finance and Prosobar. For USAID, UNICEF, and UNDP/World Bank, official documents

(1) CARE project includes four components: WS/S, PHC, family gardens, and community organization.

(2) CCH project includes four components: diarrhea/cholera control, EPI, district dev., Chagas' control.

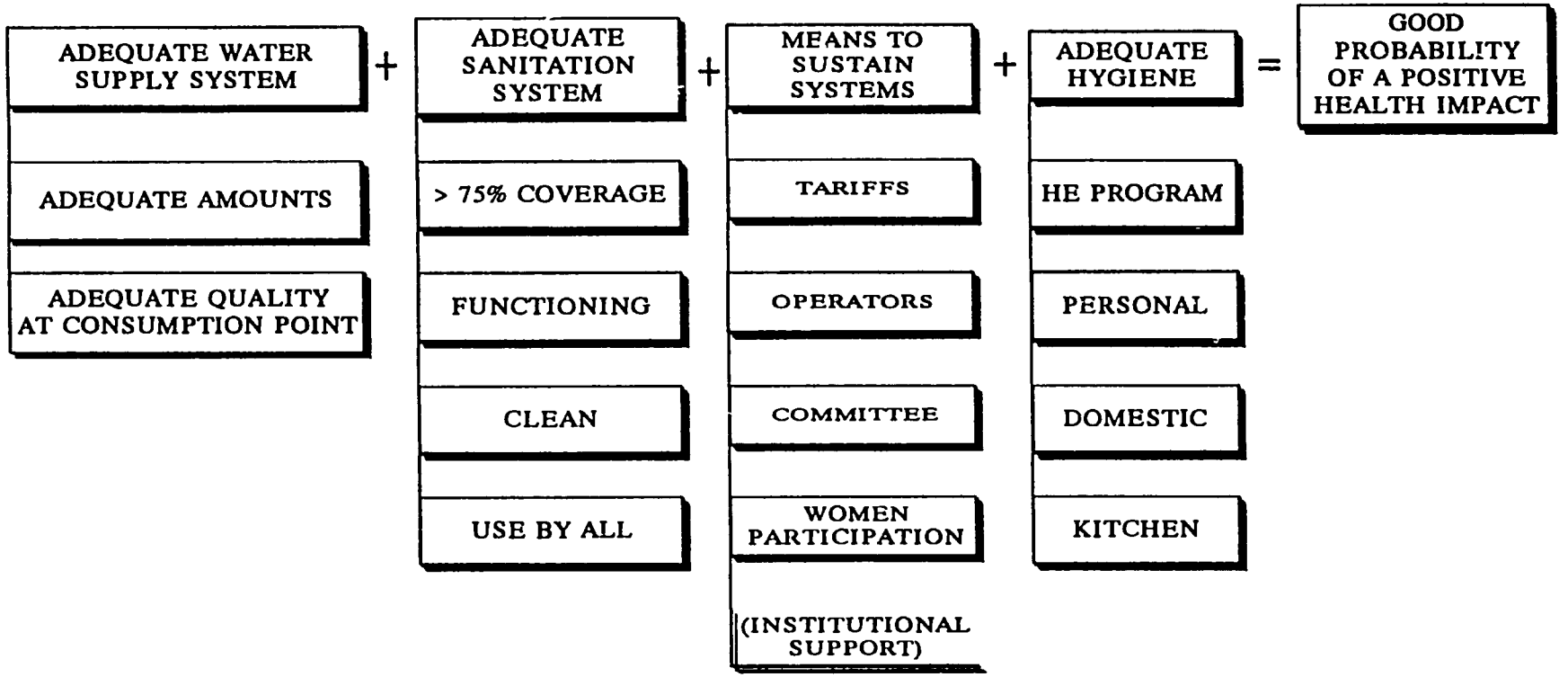
(3) CORDEP project includes water & sanitation component.

* Includes 5 projects, one of which is SDA (0623)

FIGURE 2

Conceptual Framework

[ASSUMPTIONS]



2 EVALUATION METHODOLOGY

2.1 Sanitary Engineering Data Search

The first step in this evaluation consisted of conducting a qualitative analysis of information available in Washington, D.C., and Bolivia on water and sanitation projects financed by USAID and other donors. Time constraints limited the analysis to project details for the following:

- Projects being implemented by CARE
- Projects being implemented by CCH
- Projects being implemented by UNICEF
- Projects being implemented by UNDP/World Bank
- USAID Special Activities Project (0623)

The findings of those searches are summarized in Tables 3-6.

2.1.1 Project Financial Data

Financial information was extracted from official documents of the various institutions under analysis. Project directors, engineers, and project agronomists were interviewed during site visits of some select projects, and this complemented the budgetary information.

2.1.2 Cost-Effectiveness Methodology

Because resources for the delivery of health services are limited and must be prioritized, USAID has been paying increasing attention to measuring the impact of its programs. To determine which tradeoffs are "worth" the cost, health planners use cost-effectiveness analysis (CEA), in which the economic cost of a health intervention is divided by an estimate of health impact.

The methodology developed in this paper applied the general principle of CEA methodology but with an important variant for calculating effectiveness: a multiple-criteria approach combining indicators into a single index called a utility. Water supply, sanitation, hygiene, and sustainability variables are rated on a scale of 1 to 5.

The objective of this CEA was to study a project's ability to reduce disease burden, to enhance community organization, and to increase household income as compared to the cost in dollars spent by the program. This evaluation gathered information on the projects based on the study of 14 communities. The communities are ranked according to their cost-utility ratio.

The total capital cost of the interventions is divided by an estimate of the utility of the health, participatory, and income outcomes. The cost-utility ratios can be compared across communities to measure the impact of the water and sanitation intervention on the communities' welfare. The intervention with the smallest ratio is considered to have the greatest cost utility. The expected utilities may or may not correspond directly with the documented health benefits or socioeconomic benefits (derived from soft qualitative judgments with the exception of CARE), but they create the appropriate conditions.

TABLE 3

Volume of Work of Various Projects Water Systems

PROJECT	LOCATION	NUMBER OF FINISHED SYSTEMS		INSTALLATION PERIOD
CARE-PD-20	Altiplano Chuquibamba Yungas	Gravity-fed Pump-fed	116 6	1992 to 1994
CCH	Altiplano Valle Sur Chapare Valle Puna Carrasco Valle Valles Cruceños Chiquitanía Sur	Gravity-fed Pump-fed	89 2	1991 to 1994
UNICEF	Northern Potosí	Hand pumps	97	1992
WB UNDP	Yacupaj Chayanta	Public standposts	146	1993 1994 (2nd. Q)
SDA (0623)	La Paz Cochabamba Santa Cruz Potosí Oruro Beni Pando Tarija	Gravity-fed and hand pumps Total of 18 small systems		1990 to 1993

TABLE 4

WATER PROJECT FINANCING

Project	Project Contribution	Community Contribution
CARE-PD-20	70%	30%
CCH	70%	30%
UNICEF-PROANDES	82 - 80%	18 - 20%
UNDP/WB	70%	30%
SDA (0623)	75%	25% (+)

TABLE 5

TECHNICAL ASPECTS— LEVEL OF SERVICE

WITH POTABLE WATER

PROJECT	TYPE OF SERVICE	SUPPLY liters/person/day	FEE Bs/month	IS THERE A WATER COMMITTEE?	
				YES	NO
CARE-PD-20	3, 4	30	1 - 3	X	
CCH/CARE-PD-20	3, 4	30	1 - 10	X	
UNICEF-PROANDES	2	18 15 - 20	0.50	X	
UNDP/WB YACUPAJ	1, 2	20	0.50	X	
SDA (0623)	1, 2	15 - 20	no data	X	

Type of Service:

1. Hand pump
2. Public standposts
3. Small gravity-fed systems and residential hookups
4. Systems with more than one residential hookup, either gravity-fed or pump-fed

TABLE 6

LATRINE CONSTRUCTION

PROJECT	LOCATION	NUMBER OF LATRINES BY TYPE			
		VIP	AA	PAA	DPA
CARE	Altiplano Chuquibamba Yungas	—	7, 515	—	—
CCH	Altiplano Valle Sur Chapare Valle Puna Carrasco Valle Valles Cruceños Chiquitanía Sur	226	6,340	4	202
UNDP/WB YACUPAJ CHAYANTA	Northern Potosí	540	214	22	—

TYPE: VIP - Dry latrine with improved ventilation

AA - Flush latrine with hydraulic seal

PAA - Public latrine, type AA

DPA - Alternating dry latrine, type VIP

NOTE: The UNICEF project does not install latrines.

2.1.3 Cost Methodology

The costs included in this exercise correspond to capital costs. The capital costs comprise the personnel involved in the design and construction of the infrastructure as well as the personnel involved in the education component, construction materials, depreciation, and support costs incurred by the projects in the communities studied.

The information provided by the institutions is given in different categories. CARE's costs include personnel (qualified, nonqualified) involved in design and construction, project administration, construction materials, equipment and tools, transportation, and depreciation. In comparison, UNDP/World Bank, CCH, and UNICEF cover all these costs except personnel involved in the project design and depreciation costs. Not included are overhead costs incurred by USAID-Bolivia and UNDP/World Bank-Bolivia, nor those incurred by UNICEF-Bolivia to support and monitor the project.

Because projects use different technologies, the costs of gravity-fed piped water systems with in-home connections (CCH and CARE) were contrasted to those without home connections (SDA programs, UNICEF, and World Bank).

2.1.4 Health Data

Prior to the team's arrival, documents were requested from CARE, CCH, UNICEF, the Demographic and Health Survey (DHS) team, and government health institutions. These documents contained either baseline or follow-up health data reflecting project impact on health by water and sanitation interventions. The team requested data that directly measured health indicators or that demonstrated the progress made by health activities within project areas that would be visited during the evaluation. Such data could be surveillance data from periodic surveys or final evaluations. The team asked for cholera data in the project areas or provinces. The team requested district- and area-based data on diarrhea morbidity and mortality from the Subsistema Nacional de Informacion en Salud (SNIS). The team spoke with staff from DHS about its preliminary report from a recent survey, conducted as follow-up to the 1989 DHS work. The team also asked for documents that detailed the educational component of the WS/S project. In addition, the team gathered maps and government documents on health and socioeconomic indicators.

2.1.5 Focus Groups

Focus groups were conducted at each site visited (except Murumanani and Ch'ew). Groups usually consisted of women in the community who were brought together by the local health promoter and sessions lasted 30-60 minutes. Availability of the women depended on the time of day the group gathered and whether or not there had been prior notification of the team's planned arrival time. Group size varied from 5 to 25. Project staff translated from Spanish to Aymara or Quechua. Occasionally the team offered refreshments, which kept the group informal and allowed for more open discussions. Constraints to the focus groups are detailed under a later section of this report.

Four main questions were posed to the focus groups: (1) In general, what has been the impact on your lives by the establishment of a water system in your community? (2) With what aspects are you satisfied and which ones are in need of improvements or changes? (3) To what degree do you, as women, participate in the decisions made about the water system? How do you handle issues where there may not be complete agreement? (4) What has been the impact on your health and that of your family?

Depending on the answers, other questions were asked to develop the women's comments further. For example, the women were asked to

identify the most serious health problems in their community. The team occasionally explored community perception of the causes of diarrhea, the ways in which it could be prevented or treated, and the perceived incidence of diarrhea and malnutrition in the community. The team also asked about bathing, washing, meal preparation, and any other activities that are associated with the use of water. This probing was an attempt to assess the degree to which education has affected the local water and sanitation programs since their inception.

2.1.6 Site Visits

Twenty-three communities were visited, with the following primary objectives:

- To verify the current status of potable water and sanitation systems
- To verify the degree to which the water supplied and the latrines constructed were used
- To analyze service coverage
- To analyze the operations of the Water Committees
- To assess participation of women in systems administration

Field trips were made to these rural communities located in five departments: La Paz, Chuquisaca, Cochabamba, Santa Cruz, and Potosí. The communities visited were those in which projects sponsored by CCH, CARE, UNICEF, and UNDP/World Bank had been implemented. SDA projects were not visited because of travel logistics.

At each community, usually following the focus groups, we visited the homes of some of the women in the group to assess the environmental cleanliness. Specifically, we inspected the kitchen (and any other areas where food was prepared and eaten), the latrines, the place where the water was retrieved, and the place where dishes and clothes were washed. We looked for general level of cleanliness; the presence of animals within eating or cooking areas; and the ready availability of soaps, wash pails, and buckets. We also assessed the cleanliness of the outdoor environment and where and how garbage was discarded. During these visits, a quick visual assessment of the cleanliness of babies, children, and other family members was made along with an adjustment for the availability of water and the local climate conditions. When the locale and climate favored the growing season, we looked at home gardens. To facilitate the proper and impartial recording of observations at each site, a checklist of 20 items was developed and used on-site. (The checklist form and the accompanying details for each site visit are included in the annex.)

2.1.7 Community Documents

At each site, where available, the team asked to see the community health records maintained by the health promoter. We reviewed the recorded incidence of disease and the most common reasons for seeking the assistance of the health promoter. When available, the team asked to see some of the health records of the children to look for growth trends and written comments on diarrhea. If there were common meeting areas, the team looked for wall posters with health education messages, especially those that related to water and sanitation and hygiene practices. The presence of such posters indicated that health education classes could be occurring at that site. The team asked to see any drug cache that might have oral rehydration solution (ORS) packets and anti-helminthics and attempted to learn how often these were requested or prescribed.

2.2 Development of the Indices

2.2.1 Health index

The overall health impact was determined by using available diarrhea and nutritional data, by collecting focus group comments, by conducting site visits, and by reviewing any documents available at the community level or from the supporting agency.

When these data were compiled, they formed the basis of a health index. For diarrheal incidence and nutritional status, five overall rankings were given a numerical value from 1 to 5, with 1 being "much worse" and 5 being "much improved." Hard data were used whenever available. When no hard data existed, comments from the focus groups formed the basis for judging whether or not health parameters had improved.

As for environmental and personal hygiene (site visit) assessment, the rankings were similar: "excellent," "very good," "acceptable," "fair," and "poor." A 5 was given to an excellent environmental assessment and 1 to a poorly maintained and dirty environment. The same rankings were used for community knowledge or attitudes about health and for the degree of community participation in health affairs as related to water and sanitation.

The overall health indices were integrated into the cost-utility ratios table, along with a poverty level (for 1992) as described in the document "Mapa de Pobreza en las Provincias." Subtitled as a guide for social action, this document is a compilation of findings by the Unit for Analysis of Social Policy, the National Institute for Statistics, the Unit for Population Policy, and the Unit for Analysis of Economic Policy. It was published in 1994 under the aegis of the Ministry of Human Development of the GOB. The data included in the document encompass socioeconomic status, occupation, educational level, presence of basic needs, and living conditions.

The cost-utility table contains weights that were assigned through a sensitivity analysis as well as a correspondence with what the team deemed to be in agreement with the observations and available data about a community. The weights considered the immediacy or delay of an impact and the objectivity of the data obtained about the community. In other words, changes in diarrhea incidence were more likely to be specific and more immediate indicators of the impact of water and sanitation intervention than nutritional status measurements. Reports about the community's knowledge and practices were given less weight because the team could not make firsthand observations to verify stated practices.

2.2.2 Sustainability Index

The level of sustainability includes two variables: timeliness of payment of fees for the water system and the degree of participation by women in the water committee. Timely payment reflects the seriousness of community investment. Participation by women on the water committee suggests forward thinking and a willingness by the community to include those people most likely to have a vested interest in the decision-making processes. As primary users of water supply, women are also the primary beneficiaries of any improvements, and their involvement in operation and maintenance is important. Both variables are given the same weight.

2.2.3 Income Index

Family gardens were chosen as an indicator of income benefits due to the availability of water to the community. CARE and UNICEF programs have family-garden and school-garden components. The garden component of the project is very cost-effective. Start-up costs for garden production add US$50 per garden to CARE costs. Family-garden output is about US$545 per year. The gardens are 100 m^2 and

produce about 11 varieties of vegetables through the year. The gardens in the Cochabamba area are perennial, with a harvest every four months. The nutritional benefits from the project are significant. The garden produces about 800 calories per capita, or about one-third of the daily requirement.

3 FINDINGS

3.1 Linkages Between Various Agencies and Institutions

During the decade from 1981 to 1990, the basic sanitation sector in Bolivia was characterized by the existence of more than 45 agencies dedicated wholly or in part to providing basic sanitation services throughout the country. Four ministries were involved with water and sanitation activities: the Ministry of Urban Affairs, which was responsible for urban population groups; the Ministry of Public Health and Social Welfare which, through the Directorate of Environmental Sanitation (DSA), was responsible for monitoring water quality at the national level as well as providing service to rural towns with populations of fewer than 2,000 inhabitants; the Ministry of Planning and Coordination which, through its nine Development Corporations, carried out a number of different projects in both urban and rural areas; and the Ministry of Campesino Affairs which, through its National Community Development Service, implemented both irrigation and water and sanitation works in rural areas. During the period analyzed (1981-1990), service coverage in the country was deficient: only 53% of the population had potable water systems, and only 25% had sewerage systems; disposal of solid waste was markedly poor in all areas of the country, and monitoring of water, land, and air pollution was practically nonexistent.

The international support provided to the sector during this period in the form of technical and financial cooperation failed to follow a well-defined plan in almost all of the various cooperating agencies. This was because cooperation was provided on the basis of individual projects as they were identified and approved and as financing became available. This external support was not successful in developing a national-level capability within the sector sufficient to solve sector problems. Thus, in both urban and rural areas, completed projects lacked appropriate project administration organizations.

In contrast to the situation in urban areas, institutions charged with providing services in rural areas included committees, administrative boards, service cooperatives, NGOs, and individual projects. Among other attributes, such institutions were empowered to set consumption and service rates.

In order to overcome the deficiencies that characterized the 1981-1990 period, the current government administration felt it necessary to implement a far-reaching reorganization of the sector, with a corresponding redefinition of responsibilities. Toward this end, the government issued a Supreme Decree to reorganize the sector and create conditions to facilitate implementation of the "Water for All" (Agua para Todos) program. This was to be carried out through the year 2000 by a process of institutional reorganization, improved efficiency in institutional management, and the active participation of both internal and external financing organizations.

The new provisions of the Supreme Decree stipulate that the basic sanitation sector will consist of the following:

a) Ministry of Urban Affairs

b) Regional Development Corporations

c) municipal governments

d) administrative entities

e) financial entities

f) advisory agencies

- Thus, the Ministry of Urban Affairs became the governing entity for that sector of the country responsible for potable water supply, sewerage, excreta disposal, solid waste disposal, and monitoring of environmental pollution. Its basic functions are as follows:

- To define national policies for the sector
- To coordinate sector planning
- To approve national plans and programs
- To approve and dictate technical standards
- To approve service fee policies
- To obtain financing
- To promote technological and scientific development

In order to ensure proper compliance with the above functions, the central government ordered the creation of the Directorate of Basic Sanitation (DINASBA); opted to maintain the nine Regional Development Corporations; incorporated the *alcaldías* (offices of mayor) on the basis of their role as autonomous local government entities, and placed greater emphasis on local administrative entities; granting them autonomy as regards administrative and financial management and making them responsible for the provision of basic sanitation services throughout the country. At the same time, it was ruled that all investments in the sector were to be recovered through user fees. It was also ruled that, in rural areas where the population was highly scattered, the government was to assume responsibility for investments, while communities would participate in system administration, operation, and maintenance.

The National Regional Development Fund was established within the government financial agency to channel loan funds to departmental seats and intermediary cities, while the Social Investment Fund became the government financial arm for funding investments in rural and marginal low-income areas.

The following action strategies were defined for the Water for All program:

- political will of the government
- intersectoral coordination
- community participation
- international cooperation

Thus, DINASBA became the technical/operational entity responsible for activities conducted within the sector. DINASBA has already initiated technical meetings with representatives from the government, NGOs, and PVOS, activities aimed at ensuring coordination among the various technical and financial cooperation agencies and institutions. It is expected that, in the future, interested communities will also participate. Currently, an operational matrix lists and defines the role and objectives of each project and program, with a view toward providing clear guidelines to govern the participation of international agencies within the framework of a UNDP initiative. Therefore, while in the past there was no coordination among the various projects and organizations, great strides have been made through DINASBA.

3.2 Sustainability

Ultimately the best means to assess sustainability of water and sanitation activities would be a retrospective approach—evaluation of projects completed at least two years earlier. As this study evaluated on-going projects, the potential for sustainability was assessed through the degree of community participation, the sustainability index described previously. and project financing.

Most of the project start-up financing comes from outside the community, as demonstrated in

Table 4 (Water Project Financing on page 11). Therefore, it is unlikely that the country will be able to finance new systems without outside donor assistance.

To complete the amount specified in the agreement with the implementing agency, the communities contribute to the cost of construction by supplying locally available materials, unskilled labor, or cash. In general, a 30% community contribution is stipulated for the construction of conventional systems, as in the case of the CARE-PD-20, CCH, and UNDP/World Bank projects. The UNICEF-PROANDES and Special Activities projects involve very rudimentary systems that do not require the use of specialized technologies. In such cases, the community contribution is almost always in the form of labor and locally available materials.

The remaining costs are covered by the project itself, in this case by external grant funds. In the CARE-PD-20, CCH, and Special Activities (0623) projects, financing is provided by USAID; in the UNICEF-PROANDES project, financing is provided by UNICEF; and in the YACUPAJ project, financing is provided by the World Bank.

In general, all the communities are involved to a varying degree in the financing of recurrent costs and maintenance, as reflected by the number that have functioning water committees, trained operators, tariff systems, and women participants. (See Table 7).

Water committees for conventional systems consist of a president, occasionally a vice-president, several members-at-large, a secretary-treasurer, and one or two operators. Forms are kept for dealing with the registry of users, collection of fees, and payments, in addition to a cash book and a book for recording observations and inventories. The committee meets periodically and keeps a book of minutes. The review of these documents, together with conversations with committee members and systems operators, makes it possible to determine whether or not the committee is functioning properly. In the case of Potosí, the system built by UNICEF and UNDP/World Bank operates solely on the basis of public water taps, with no house taps and few users; service is provided to extremely poor communities that cannot afford to pay more than 50 cents of a boliviano per month per family. These communities do not require a full-fledged water committee, with all of its administrative responsibilities; but they do have a president who performs additional functions, such as those of treasurer. They also have a system operator.

All operators have been trained in the proper discharge of their responsibilities. Some have attended level 1 and 2 training courses. Several systems have two trained operators who perform their duties in alternate months. This makes it possible for the operators to pursue other activities to earn additional income, as the remuneration they receive from the committee is insufficient.

As explained above, the total amount of fees collected goes to cover system administrative, operating, and maintenance expenses and payments made to personnel, including operators. Timeliness of tariff payments, another measure of sustainability, was good to high in all areas as well. (Table 8). Whether these fees cover larger recurrent costs for the systems was not clear. In no case is the income generated sufficient to recover investment costs.

Participation by women is definitely important, both in the large projects involving conventional systems as well as in the very small and rudimentary systems built in Potosí. As part of the sustainability index, women's participation ranged from good to excellent (Table 8). Women serve as members-at-large on the water committees, and in one case a woman serves as committee president; women are trained to operate the system and to assist in bricklaying and plumbing activities.

TABLE 7

PARTICIPATION BY THE COMMUNITY IN POTABLE WATER INTERVENTIONS

Department and Community	Water Committee	Level of Training Operators	Fee Bs/Month	Operator Remuner-ation Bs/m	Partic. By Women
LA PAZ					
1• de Mayo	Functioning	2	1.0	NO	NO
Surfini	Functioning	2	1.0	NO	WC 1)
Murumanani	Functioning	2	1.0	10	WC
Chinchaya	Functioning	2	2.0	10	PWC 2)
Curupamba	Functioning	2	2.0	10	NO
CHUQUISACA					
Bella Vista	Functioning	2	2.5	15	WC
COCHABAMBA					
El Puente	Functioning	2	3.0	15	WC
Marapampa	Functioning	2	2.0	15	WC
La Palca	Functioning	2	10.0	15	NO
Mesa Rancho	Functioning	2	S/T	25	WC
La Viña	Functioning	2	2.5	20	WC
SANTA CRUZ					
Los Negros	Functioning	2	Under constr.	—	
Agua Clara	Functioning	2	6.0	25	NO
Yerba Buena	Functioning	2	7.0	25	NO
Achiras	Functioning	2	10.0	50	NO
Cuevas	Functioning	2	7.0	100	WC
Bermejo	Functioning	2	6.0	50	WC
POTOSI					
Che'w	In existence	1	0.5	—	PB 3)
Ñequeri	In existence	1	0.5	—	PB
Lucas Kahua	In existence	1	0.5	—	WC
Balseras	In existence	1	0.5	—	NO
Corata	In existence	1	0.5	—	OP 4)
Challoma	In existence	1	0.5	—	NO

1) WC = on Water Committee

2) PWC = president of Water Committee

3) PB = trained in plumbing and bricklaying for 12 systems

4) OP = system operator

TABLE 8

EVALUATION OF THE POTABLE WATER SYSTEMS VISITED

Departament and Community	General Operation	Residential Hookup (status)	Appropriate Use	Improvements	Partic. by Women	Payment of Fees	Standpipe Functioning	Overall Ranking
LA PAZ								
1° de Mayo	5	2	4	3	3	5	-	4
Surfini	4	2	4	3	3	3	-	4
Murumanani	3	2	4	3	4	3	-	4
Chinchaya	5	2	4	4	5	5	-	5
Curupamba	4	2	4	3	3	3	-	4
CHUQUISACA								
Bella Vista	4	2	4	4	4	4	-	4
COCHABAMBA								
El Puente	5	2	5	3	4	4	-	4
Marapampa	5	2	5	3	4	4	-	4
La Palca	4	2	4	4	3	3	-	4
Mesa Rancho	5	2	4	3	4	4	-	4
La Viña	5	2	4	4	4	4	-	4
SANTA CRUZ								
Los Negros	Under constr.							
Agua Clara	5	5	4	5	3	4	-	4
Yerba Buena	5	5	4	5	3	4	-	4
Achiras	4	4	4	5	3	5	-	4
Cuevas	4	4	4	5	4	4	-	4
Bermejo	5	4	5	5	4	5	-	5
POTOSI								
Che'w	5	-	4	1	3	4	4	4
Ñequeri	5	-	4	1	3	4	4	4
Lucas Kahua	5	-	4	1	3	4	4	4
Balseras	5	-	4	1	2	4	4 (1)	3
Corata	4	-	4	1	5	4	4	4
Challoma	4	-	4	1	3	4	4	3

Rankings: 5 = excellent; 4 = very good; 3 = good; 2 = fair; 1 = poor; (1) pumps

3.3 Selection of Communities

The selection of communities varies in accordance with the level of service each requires to sustain development. Another determining factor is the economic capacity of the community and its willingness to absorb the administrative, operating, and maintenance costs involved in providing the service so as to ensure the sustainability of the project and guarantee that the water will be used for its original purposes.

In practice, the criteria vary in detail, but all adhere to the same general philosophy. For example, PLANSABAR (Plan Nacional de Saneamiento BASICO Rural) bases its popular participation strategy on three elements:

- selection of the level of service
- participation in investment costs
- participation in administrative, operation, and maintenance costs

These three components will determine the selection of a community and its priority for system construction.

CARE

CARE uses the following primary criteria for selecting communities:

- The communities must be without health and potable water services.
- There must be geographically concentrated population groups having a minimum of 20 communities, and subgroups having at least five communities, all located less than three hours' distance from the community situated at the center of the area in question.
- Priority will be given to communities pertaining to provinces located within the areas designated for alternative development defined by the government.
- Counterpart groups must be interested and able to fulfill any commitments that they make.
- The water system must be feasible.
- The communities must express an interest in their own development and have a minimum of 20 nuclear families, with a distance of no more than 100 meters between houses.
- The child population must include at least 12 children under age 2.

Compliance with these criteria, especially the sixth bullet, is strengthened by an agreement that establishes contributions (in kind as well as in cash) for construction of the system. The agreement also ensures system sustainability through the payment of user service fees. The community must match, in local materials and labor, 30% of the total value of the materials to be used in the potable water system. In the case of latrines, each family must contribute US$15 for the construction of type AA latrines, while CARE contributes US$22.

The cost of residential water hookups is treated similarly to the method used for latrines, in accordance with the total cost of the materials. In addition to CARE, both the unit and the Regional Development Corporation intervene in the final selection of communities.

CCH

Selection of communities for a project is the responsibility of the local committee, which is made up of representatives of the health district, the Regional Development Corporation, the Regional CCH, and the NGO that hooked up the services. The NGO has a voice but no vote. The community must fulfill a number of requirements in order to be selected, including its acceptance of the project and active community participation in the EPI. In addition, a number of different technical requirements must be met; the geographical area must be selected by province; three to four communities must be located near

each other to spread project activities to the area of influence; the communities must be accessible, regardless of distance; and a given community must be within the geographical area of the corresponding health district. With regard to socioeconomic characteristics, the community must have no fewer than 35 and no more than 500 occupied dwellings, and it must have a school and a health post as well. In addition, it must be feasible to install a gravity-fed water supply system in the community, with a distance factor of a maximum of 12.5 meters between the water source and the population, multiplied by the projected number of beneficiaries.

The approval process CCH uses is complicated and time consuming, but this may be due to the fact that the project incorporates a health component in addition to the water and sanitation component. However, processing is quite flexible, as it takes into consideration the possibility that the communities that have not been selected in an initial stage may receive the benefits of a lower level of service, in accordance with the particular characteristics of each community.

UNICEF

Selection is based equally on submission of a request from the community; the feasibility of obtaining easily accessible water; and the willingness of the community to participate in the construction, administration, operation, and maintenance of the system to ensure its sustainability. No latrines are constructed.

UNDP/World Bank

The community must request support from the project, which then analyzes five technical operations for water supply projects and three for sanitation projects. Population size varies between 50 and 250 inhabitants. The distance between the water source and the community must not exceed 150 meters.

The specific steps in community selection utilized by UNDP/World Bank are as follows:

- The community, after identifying the need for water, sanitation, or both, requests technical and economic assistance.
- The project (UNDP/World Bank) "Yacupaj" will conduct a study of the water availability in and economic capacity of the community.
- The community participates in determining the type of system to be implemented.
- Upon completion of the construction, a community board undertakes the responsibility for operation and maintenance.

Similarities and Differences in Selection Criteria

In summary, the following selection criteria are common to all of the projects:

- Availability of water
- Degree of population concentration in the community
- Ability to pay adequate fees for system operation, maintenance, and administration
- Organization of a water committee, water board or other community entity to assume responsibility for administering the system, collecting monthly fees, etc.
- In systems with individual house taps, users must agree to pay the water board for the cost of the installation
- Adequate source water quality, as measured by WHO norms

The following differences were observed in the communities even though the same criteria were applied:

- size of the community
- type of system or level of service
- health status of the community
- existence of other public services
- geographic region

The various implementing agencies use other criteria, but as they are too numerous to be analyzed, another study would be necessary to fully explore their ramifications.

3.4 Design Standards

The common universal criteria used in designing rural water systems can be summarized as follows:

1. current population
2. population to be served
3. future population
4. amount of water for consumption
5. design period
6. water quality
7. water sources
8. disinfection
9. sanitation
10. construction specifications
11. operation and maintenance specifications
12. community education
13. community participation

All water interventions consider the same criteria in deciding what type of system to use, taking into consideration the level of service assigned to each community. CARE and CCH projects link their water interventions with other health and nutrition interventions through the joint implementation of these programs, while the other projects may or may not offer any health services.

Table 9 describes the systems utilized by the projects reviewed. All of the projects are using gravity-fed systems, but household service varies. Both CCH and CARE provide residential hook-ups, which increase access to greater quantities of water. This would favorably impact water-washed diseases (scabies, conjunctivitis) and likely improve the ability of the users to increase personal and domestic hygiene. The likelihood of contamination of water through improper storage and handling would also be diminished.

The trade-off for these benefits would be the cost of household hookups. The differences between the projects may be merely the up-front capital investments for the donors, as the community contributions are the same across the board (average 30%). These issues are discussed later in the paper in the economic analysis.

Characteristics of Water Systems and Communities

What follows is a description of the various projects in terms of the water supply and sanitation inputs. Table 3 on page 10. demonstrates the location of the projects, types and numbers of systems, and implementation time frame. Generally speaking, the projects do not disaggregate their data, such as beneficiary population by geographical region or type of system. Since all of the projects are ongoing, the ability of this evaluation to determine long-term sustainability was limited. From 1990 to 1993, the Special Activities Project carried out 18 small projects with broad community participation. These systems are very rudimentary and are distributed over eight departments of the country.

Table 5 on page 12 summarizes the levels of services offered by the projects. As mentioned above, the higher the level of service (e.g., residential hook-ups) the greater the consumer

TABLE 9

COMPARISON OF DESIGN PARAMETERS
RURAL POTABLE WATER SYSTEMS

Institution	Ranges Current Population Being Served	Minimum Supply L/p/d	Design Life Years	Water Quality Criteria	Level of Service	Type of System	Comment
CARE	< 5000	30-150	20	WHO (1984)	house connection	gravity-fed, pump-fed	Supply varies by zone and size of population
CCH	174-2,500	10-100	20	WHO (1984)	house connection	gravity-fed pump-fed	Varies with population size
UNICEF	no data	15-20	no data	Bacteriol.	public standpost	gravity-fed	Optimum 30 l/p/d
UNDP/WB	50-250	15-20	no data	no data	public standpost hand pump	gravity-fed	Optimum 30 l/p/d Optimum 30 l/p/d

costs and water quantities. The fee is charged monthly in the amounts shown. At an exchange rate of 4.65 bolivianos per U.S. dollar, amounts collected for payment of fees are modest, and not all systems are able to cover actual operating and maintenance costs. However, most users are amenable to increases in the fee in accordance with increases in administrative, operating, and maintenance costs. Water quotas in liters per person per day are assigned during the design stage as a function of the availability of water in each community. In the case of the projects listed, they are adequate for the type of system built.

Table 6 on page 13 describes the excreta disposal systems utilized by the projects. UNICEF does not provide latrines in its programs, which raises the question of the impact on health of a water supply that lacks a means to reduce or contain primary fecal-borne contamination. None of the projects report community-level coverage for excreta disposal, which is a critical determinant of health impacts (> 75% associated to improved health impacts). Both CCH and CARE provide higher levels of service with pour-flush latrines. CCH offers an option for the population to select the type of latrine hardware based on willingness to pay. UNDP also offers design selection not only for latrines, but for public water supply systems as well.

Twenty-three communities were visited for a better evaluation of the projects' water supply and sanitation inputs and outcomes. They are listed in Table 10. The communities seen were not randomly selected and thus were not necessarily representative. Rather, they were accessible and therefore selected due to the time limitations of the field visits. Unfortunately, the distances between rural communities in Bolivia are great, and a considerable amount of time is required to travel from one town to the next. In addition, there is normally a considerable degree of population dispersion within a given community.

With the exception of Los Negros, all of the systems visited have been completed. In addition, all are administered by a water board, and users pay a monthly fee to ensure the sustainability of the system. In other words, upon the conclusion of the project, a water committee or board is already in existence to assume responsibility for system administration; collection of fees; recovery of the cost of house taps (if any); and system operation, maintenance, and expansion. The water committee or board is elected democratically by popular vote during a general assembly, and membership is on a rotating basis.

The specifics of the water supply services are demonstrated in Table 11. Most of the systems are gravity-fed and have their source of supply in a surface spring. Generally speaking, coverage is good, with the exception of Chinchaya, Mesa Rancho, and Yerba Buena. Chinchaya is characterized by a high degree of population dispersion within the community, thus making it more difficult to provide widespread coverage. The low coverage in Mesa Rancho is reportedly due to the social relationships among its residents. Yerba Buena is currently in the process of expanding its water system through the addition of a new source of supply.

Depending on the degree of dwelling dispersion in the community, a level of coverage in excess of 80% can be considered adequate for obtaining satisfactory results in terms of the improvement of health conditions and standard of living among the beneficiary population.

In the department of Potosí, supply is based on public standposts, which are insufficient to provide coverage to the entire population.

Water quality is monitored at the beginning of the project and during the survey phase, based on WHO-recommended standards. The agency charged with monitoring the quality of water for human consumption in Bolivia is the Health Secretariat of the Ministry of Urban Affairs. There is currently no regular program for monitoring water quality in rural areas.

TABLE 10

COMMUNITIES VISITED BY DEPARTMENT

PROJECT	DEPARTMENT	COMMUNITY	YEAR BEGUN	TYPE OF SYSTEM
CARE	La Paz Prov.	1° De Mayo	1994	Gravity
		Surfini	1994	Gravity
		Murumanani	1993	Gravity
		Chinchaya	1992	Gravity
		Curupamba	1993	Gravity
	Chuquisaca	Bella Vista	1994	Gravity
	Cochabamba	El Puente	1994	Gravity
		Marapampa	1994	Gravity
		La Palca	1994	Gravity
		Mesa Rancho	1994	Gravity
		La Viña	1994	Gravity
CCH	Santa Cruz	Los Negros	Under constr.	Pump-fed
		Agua Clara	1992	Gravity
		Yerba Buena	1992	Gravity
		Achuiras	1992	Gravity
		Cuevas	1992	Gravity
		Bermejo	1992	Gravity
UNICEF	Potosi	Che'w	1994	Standpost
		Ñequeri	1994	Standpost
UNDP/WB		Lucas Kahua	1994	Standpost
		Balseras		Hand pump
		Corata		Standpost
		Challoma		Standpost

TABLE 11
CHARACTERISTICS OF THE POTABLE WATER SYSTEMS IN THE COMMUNITIES VISITED

Department and Community	Water Source	No. of Connections	% Coverage	Beneficiary Population (current)	Water Quality
LA PAZ					
1° de Mayo	Spring	40	81.1	185	G
Surfini	Spring	36	84.5	190	G
Murumanani	Spring	138	97 2	710	G
Chinchaya	Spring	48	74.1	290	G
Curupamba	Spring	41	100.0	205	G
CHUQUISACA					
Bella Vista	Spring	100	81.0	210	G
COCHABAMBA					
El Puente	Spring	14	93.2	220	G
Marapampa	Spring	29	93.0	145	G
La Palca	Spring	35	82.5	285	G
Mesa Rancho	Spring	29	59.2	245	G
La Viña	Spring	61	100.0	305	G
SANTA CRUZ			Dept and Community		
Los Negros	Pump	Under constr.			G
Agua Clara	Spring	51	—	—	G
Yerba Buena	Spring	76	74.5	510	G
Achiras	Spring	56	82.5	285	G
Cuevas	Spring	33	83.3	210	G
Bermejo	Spring	73	92.6	405	G
POTOSI					
Che'w	Spring	19 cist.	—	400	G
Ñequeri	Filt. Gal.	6 cist.	—	150	G
Lucas Kàhua	Spring	8 cist.	—	200	G
Balseras	Well	3 HP	—	75	G
Corata	Spring	2 cist.	—	50	G
Challoma	Spring	2 cist.	—	150	G

Water quality: G = good; NP = not potable

Therefore, the degree of quality listed on the table is not a reflection of current standards, but is presumptive. It was not feasible within this evaluation to do random sampling at consumption points, but such sampling is recommended if a future study is indicated.

A summary of the degree of community participation in the water supply programs is presented in Table 7 on page 22. The water committees in Potosi have a more minor role than in the other projects, as the services involve less administration; thus they are classified as "in existence." No data are available on operator remuneration within these areas.

In order to obtain an approximate idea of how the systems were performing their primary functions, a table was prepared to compare seven different parameters. (See Table 8 on page 23.) A scoring system of 1-5 was applied, based on observations and interviews with community members, with 5 being the highest score and 1 the lowest. An overall ranking of the systems was developed from these scores.

General operation. Observations were made in order to ascertain the status of the system, proper functioning of valves, presence or absence of leaks, breaks in the line, operation of storage tanks, pressure release valves, status of sanitary covers, pumps, motors (if any), etc. All areas were ranked as excellent to good, indicating good maintenance.

House taps. The hookup between the network and the house was examined in detail to identify potential leaks, as well as to ascertain the current condition of the connection itself, determine whether there was any dripping caused by poor maintenance or misuse, see whether the footing was broken or worn, and verify the existence of a covered infiltration well. With the exception of Santa Cruz, there were problems in most of the areas, primarily with the infiltration well.

Appropriate use. If the water was being used solely for domestic purposes and not for irrigation or other uses, a score of 5 was given, and an average score was obtained from the total number of observations performed. Most of the communities devote their water resources to household use.

Improvements. The purpose of this parameter is to measure, to the extent possible, the degree to which water interventions in rural areas have contributed to improving the living conditions of the population as a function of improvements in lifestyle, e.g., whether showers, wash basins, laundry tubs, etc., have been installed. In the case of Potosí, no improvements are possible, as only public standposts are used. The communities in Santa Cruz under CCH demonstrated the greatest improvements, followed by many of the CARE projects. This may reflect a willingness to pay and standard of living benefits when residential hook-ups are utilized.

Participation by women. As analyzed above, participation by women is very important in the community. In order to assign a value to this parameter, observations were made of women's attitudes toward the system and its upkeep, as well as care in operation. The latter is especially important to ensure that the system does not cause puddles of water, which could become breeding sites for mosquitos.

Payment of fees. When the total amount of fees collected exceeded 80%, a score of 5 was given; for between 70 and 79%, a score of 4 was given; for between 60 and 69%, a score of 3 was given; for between 50 and 59%, a score of 2 was given; and for less than 50 percent, a score of 1 was given. When delays or delinquency in payment of fees exceeds three months, service is disconnected (in conventional systems). A fee averaging the equivalent of US$150 is then applied for service reconnection.

Public standposts. The operation of the public standpost systems built by UNICEF and UNDP/World Bank was observed, and the same scoring system used with the conventional systems was applied.

TABLE 12

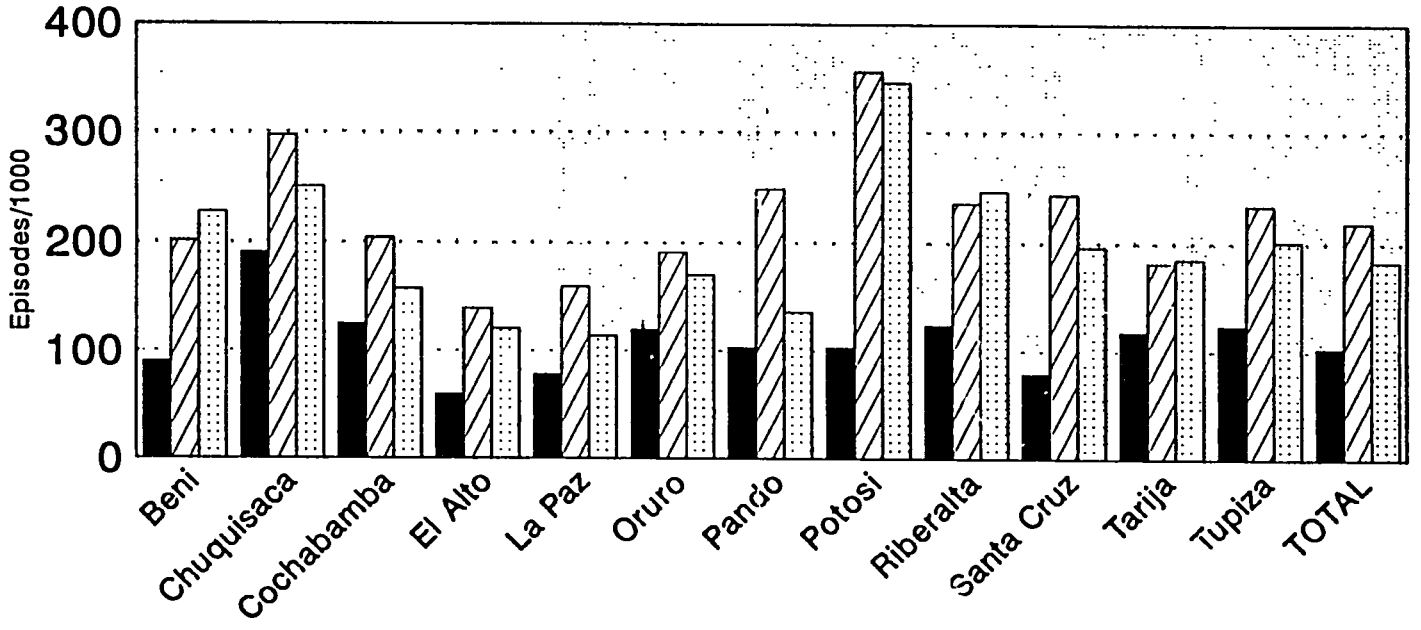
CHARACTERISTICS OF THE LATRINES IN THE COMMUNITIES VISITED

Department and Community	No. of Latrines Installed	Latrines Inspected	% Correct Use	% Clean	% With Paper and Water	Overall Ranking of Water
LA PAZ						
1• de Mayo	40	15	75	75	80	G
Surfini	34	12	70	75	70	G
Murumanani	148	22	60	72	72	F
Chinchaya	48	20	73	70	70	G
Curupamba	46	10	70	72	65	G
CHUQUISACA						
Bella Vista	35	20	55	58	60	F
COCHABAMBA						
El Puente	14	5	70	78	70	G
Marapampa	29	6	60	60	60	F
La Palca	35	5	55	50	50	F
Mesa Rancho	30	14	60	65	55	F
La Viña	61	6	65	65	60	F
SANTA CRUZ						
Agua Clara	51	5	72	75	70	G
Yerba Buena	76	13	72	74	70	G
Achiras	56	6	70	75	60	G
Cuevas	73	11	50	58	50	F
Bermejo	48	14	70	78	71	G
POTOSI						
Lucas Kahua	21 VIP	12	20	20	0	P
Balseras	0				—	
Corata	2 VIP	–	—	—		—
Challoma	0	2	100	100	0	G
		—	—	—		—

G = good; F = fair; P = poor

FIGURE 3

Diarrhea Episodes/1,000 Population (1991-1993)



	Beni	Chuquisaca	Cochabamba	El Alto	La Paz	Oruro	Pando	Potosi	Riberalta	Santa Cruz	Tarija	Tupiza	TOTAL
1991 ■	90	191	125	60	78	120	103	103	124	79	118	124	103
1992 ▨	201	297	204	139	159	191	248	355	235	243	181	233	218
1993 ▩	227	250	157	121	114	170	136	345	246	196	185	201	183

Regional Reporting Units

Source: SNIS

Overall ranking. The systems in all areas were ranked from excellent to very good with the exception of two communities, Balseras and Challoma, in Potosi (UNDP/World Bank). Without household hook-ups, there were few improvements. Lower participation of women also contributed to the poorer ranking of these communities. The impact on the general cost utility could not be determined due to missing health and other data and assessments.

As part of the community-level assessment, 198 latrines were inspected to determine utilization, maintenance, and cleanliness, as demonstrated in Table 12 (Characteristics of the Latrines in the Communities Visited). The CCI pour-flush installations were generally better maintained than those within the CARE projects, while only one area with the VIP-styled latrine received a poor overall score. The team was not able to assess the handling of children's feces, a critical sanitation issue. As mentioned earlier, community-level coverage was not available.

3.5 Health Impact Related to Diarrheal Disease

Government Sources

The SNIS surveillance system (Subsistema Nacional de Informacion en Salud) tracks diarrheal disease incidence on a national basis. Reporting is limited to those cases seen in health facilities and thus does not represent the total diarrheal disease burden. Figure 3 demonstrates the trends from 1991, when the reporting system was initiated, to 1993. There was a characteristic rise in diarrheal incidence after the first year because of better reporting, as users became more familiar with the system. If we are to use 1992 as a better measure of baseline, there has been a consistent drop in incidence in 9 out of the 12 reporting areas. The most significant decrease was demonstrated in Pando (248 to 136 cases/1,000). For the country as a whole, there was a 16% decrease from 1992 to 1993.

When the team requested a breakdown of SNIS data by province and districts (those places visited by this evaluation team), the 1993 data for diarrhea ranged from at least 18% (Oropeza) to 47% (Chayanta) among children 2-5 years of age. These data do not include children under one, as do the data of the previous years. They cannot be compared to previous years for a trends assessment because the SNIS computers cannot extract such stratified data for earlier years.

The reader is referred to the section in this document that deals with constraints and limitations of data. That section details the considerations that must be made in attempting to interpret government data and other project survey sources.

CARE

CARE has developed and implemented WS/S projects in Altiplano as well as in Cochabamba and Chuquisaca, an area commonly referred to as "Chuquibamba." From 1993 to 1994, the incidence of diarrhea in the two weeks preceeding the data collection decreased from 27% to 7% in Altiplano. In Chuquibamba, the numbers dropped from 27% to 21%. Therefore, the WS/S projects have, along with other health activities, had a significant impact on decreasing diarrheal incidence in Altiplano and a smaller but notable impact in Chuquibamba.

As for cholera incidence, data are less conclusive and indirectly linked to the WS/S projects. There were at least 111 cases of cholera in the Chuquibamba area between November 1992 and March 1994, with none reported in Altiplano. Surveys show that public awareness of cholera was much greater in Chuquibamba than in Altiplano because there had been more migration from cholerous areas into Chuquibamba. Greater fear of cholera in Chuquibamba led to more frequent hand-washing. The installation of WS/S

systems without health education may have had some impact on cholera incidence; however, projects that combined education with the installation were likely to have enhanced efforts to prevent cholera.

Home treatment of diarrhea and the use of oral rehydration solutions (ORS) are proxies for the effectiveness of health education activities that may accompany the installation of a WS/S system. This activity may decrease the number of reportable cases of diarrhea to facilities that report to the government. Data from 1993 and 1994 about mothers' knowledge of the use of ORS as a first-line therapy for dehydration secondary to diarrhea show that knowledge of the usefulness of ORS in the Altiplano increased from 14% to 35% from 1993 to 1994 and 37% to 41% in Chuquibamba. However, the percentage of mothers who said they would use more oral liquids for diarrhea dropped from 57% to 38% in the Altiplano. In Chuquibamba, the percentage jumped from 37% to 74%, showing that mothers were more aware of the use and indications for ORS. The April 1994 survey determined that in Altiplano, 30% of the community was taught about personal health and hygiene, in contrast to 85% in Chuquibamba. Both areas showed an increase from the December 1993 survey where the numbers were 24% and 51%, respectively.

CCH

Baseline studies for CCH were done in 1990 for six districts and in communities identified for water system assistance. A community-based health education assessment survey was also done in the four project districts. Because a follow-up survey is not planned until October 1994 (one month after the completion of this evaluation), lack of data makes it impossible to comment on changes in diarrheal incidence. The alternative was to rely on community perception through focus group discussions.

The communities visited stated that the incidence had either been the same or worse since the inception of the WS/S projects. For example, one representative community stated that although acute respiratory infection is its greatest health concern, it frequently has cases of diarrhea, including a recent case which resulted in a toddler's death. The perception is that children still die despite the presence of WS/S systems. Incomplete health education may be the weak link.

The team also reviewed the past midterm evaluation for CCH. The report commented on health education efforts accompanying the installation of the WS/S systems. In the Bolivian CDD program, even though ORS packets are available to 56% of the population, ORS is used in only a small percentage of child diarrheal illnesses. Homemade solutions are used in about half the cases. The midterm evaluation also stated that the appearance of cholera hastened some of the CDD activities, which included distribution of ORS through community oral rehydration units (ORU).

UNICEF

Because no hard data were available as baseline or follow-up on diarrheal incidence, it is not possible to comment on changes in diarrheal incidence. Reliance on community perception through focus group discussions was the alternative. The two communities visited in Potosi, which recently had water supply but no sanitation system, stated that the incidence of diarrhea has fluctuated since the inception of the WS/S projects. They noted that much discharge into the river from nearby Uncia is a potential source of contamination for their community. The community of Nequere had experienced three deaths from diarrhea in children under 1 year of age in the last year.

UNDP/World Bank

Baseline data for 1992 on diarrheal incidence were available for the communities visited, but there have been no follow-up data for the last two years. Therefore, it is not possible to comment on changes in diarrheal incidence. Other than the 1992 community-based data, data provided by the UNDP/World Bank offices were mostly by departments and provinces only. Infant mortality rates were recorded but dates were not given, and no disease-specific death rates were indicated.

Reliance on community perception through focus group discussions was the alternative. The two communities that the evaluation team visited in Chayanta province (Potosi) stated that the incidence of diarrhea had lessened from previous years. For example, in 1992 one community had experienced 11 cases of diarrhea over three months in children under 5. With 25 children under 5 at that time, this represented a very high incidence rate for a short period of time. Now they report having an occasional case of diarrhea.

DHS data

In the 1989 DHS national survey, 28% of all children under 5 had had diarrhea in the two weeks immediately preceding the survey. The differences in prevalence between the three regions of Altiplano, Valle, and Llanos were small: 27% for Altiplano and 29.2% for both Valle and Llanos. Correcting for seasonality, this corresponds to 5.8 episodes of diarrhea per child per year. For children under 6 months of age, the prevalence was 25%; in contrast, for children age 6-23 months, the prevalence of diarrhea was as high as 40%. Maternal education levels counted for the greatest difference in the country. Water and sanitation variables accounted for a moderate amount of differences. Feeding practices explained only a small percentage of cases.

In the 1994 survey, it appeared that little had changed: 29.9% of children under 3 years of age had had an episode of diarrhea in the two weeks immediately preceding the survey. It is important to note that 17% of children under 6 months of age had had diarrhea in contrast to 40% in children 1 to 2 years of age. The three regions showed similar figures: Altiplano at 30%, Valle at 28.2%, and Llanos at 31.4%. These are small differences from the previous survey five years earlier. It is notable that the departments of Potosi, Oruro, and Cochabamba were slightly lower than national average; Cochabamba was lowest at 25.3%. Breakdown of prevalences at the departmental level for 1989 is not available in official DHS documents for comparison purposes.

Two important points should be made here: 1989 data refer to children under 5 years of age; 1994 data refer to children under 3 years of age. Nevertheless, data for children under 6 months of age show that the prevalence of diarrhea has decreased from 25% to 17%, suggesting that some progress has been made, although no explanation was given. In addition, some departments are lower than national average. A closer study of prevalence of health interventions would elucidate reasons for improvement.

3.6 Health Impact Related to Nutritional Status

The only trends in data on nutritional status relevant to an area visited in this evaluation are from the CARE surveys. Government data and DHS data are not disaggregated enough to link causally a local project with this kind of health measurement. For the ease of interpretation, moderately malnourished is defined as one standard deviation (SD) from the median weight for age and is referred to as the "yellow zone" on community health records and the SNIS data. Severely malnourished is defined as two or more SDs from the median weight for age and is labeled as the "red zone" (dangerous) in those same records.

Government

SNIS data for 1993 show that the percentage of adequately nourished children ranged from 65% in a Potosi province (Chayanta) to 88% in Chuquibamba, a Florida province. This means that there are as many as 35% of children under 5 years old in some parts of the country who are either moderately or severely malnourished. Because no data exist for these categories in the SNIS statistics for health for 1991-92, the trends cannot be assessed.

CARE

In the PN-20 project, health data surveys were done in April and October 1992, October 1993, and April 1994. In terms of nutritional improvements in the project areas in the Altiplano/Valle area, the prevalence of moderate malnutrition among children 12-23 months old decreased from 66% to 53%; for those severely malnourished, the prevalence decreased from about 24% to about 14%. These changes were not seen until two years later.

In the Chuquisaca/Cochabamba, the children 1-2 years old showed the most improvement in nutritional status: from 78% prevalence to 55% among the moderately malnourished group and 32% to 19% in the severely malnourished group. The other ages did not show major changes.

Although not visited during this evaluation, the Yungas/Larecaja tropical communities showed no improvement or some worsening in nutritional status.

CCH

Baseline data were not available for the communities this evaluation team visited. Because a follow-up survey is not planned until October 1994, there are no hard data available to review changes in nutritional status. Instead, the team relied on community perception through focus group discussions. Yerba Buena reported no cases of malnutrition. A review of some of the health cards showed that there were a number of "yellow zone" children—those who fell more than one SD below the median for weight for their age. Bermejo reported it might have one or two children in the yellow or red zone (2 SD), but no health cards were available for inspection. Other factors may influence nutritional status as well. For example, breastfeeding, which promotes better nutrition in infants, is decreasing in Bolivia.

UNICEF

No data were available as baseline or follow-up on infant nutritional status for the communities visited. Therefore, it is not possible to comment on changes in nutritional status from a review of hard data. Reliance on community perception through focus group discussions was the alternative. One community in Potosi (Nequeri) stated that out of about 90 children, 25 or so were malnourished. Until two years ago, Caritas had a regular program of growth monitoring and nutrition as well as food distribution. Unfortunately, that work had to be discontinued. Since those efforts were not sustainable, the community members said that their diet was limited and poor in protein (no eggs, meat, fish, or peanuts). They added that there had been seven deaths from malnutrition in the last year. They clearly stated that their health now was worse than two years ago when food supplements from Caritas contributed to better diets.

UNDP/World Bank

Baseline data for 1992 on nutritional status were not available for the communities visited, and there have been no follow-up data for the last two years. Therefore, it is not possible to comment on changes in nutritional status. Community perception through focus group discussions tends to be anecdotal. Although none of the many children seen by the evaluation team looked

wasted, it was not possible to know if stunting existed without knowing the corresponding ages of the children.

Other data provided by the UNDP/World Bank offices were mostly by departments and provinces. Infant mortality rates were recorded, but dates were not given and no disease-specific death rates were indicated.

DHS national data

According to the DHS data of 1989, undernutrition in Bolivian children is common. Thirty-eight percent of children age 3-36 months are short for their age, while 13% are underweight. Undernutrition prevalence is as follows: Altiplano 13.4%, Valle 16.1%, and Llanos 9.5%. Socioeconomic and demographic factors account for these conditions; 45% of rural children are stunted, compared to 32% of urban children.

The data for 1994, in contrast to 1989, show that 28% of children under 3 years are considered underweight, an improvement from data five years earlier. Thirty-seven percent of rural children (compared to 45% in 1989) and 21% in urban areas (compared to 32%) are considered growth retarded. Levels are similar in the Altiplano and Valle areas, whereas the percentages in the Llanos (18%) are half the national average.

3.7 Benefits of Focus Group Discussions

Focus group discussions were conducted in the following areas: Altiplano-Valle, Chuquisaca, Cochabamba, Santa Cruz, and Potosi. Comments from the women interviewed refer to the changes brought about in their lives as a result of the WS/S projects. Their quotes are categorized into the following five areas: comparison of the past with the present; time availability for other activities; impact on children, men, and home life; impact on disease prevention and treatment; and democratization processes.

These comments, which are representative of the 23 communities visited, reflect positive and direct impact by the WS/S projects. They were selected because of the frequency with which they were expressed by several members of the focus groups.

Comparison of past with the present:

"We wanted a water system so much that we each contributed 400 Bolivianos (about US$90) to hire a lawyer to help us get the rights to land that had a water source and which we believed was ours. We fought for two years before it was settled."

"In the past we have suffered much." (This sentiment was often expressed by the women.)

"We were so afraid to get water at night because of the snakes and insects; we would not dare risk our lives or those of our children to fetch water to make dinner, to wash our hands, or to bathe before we went to bed. We went to bed hungry, tired, and dirty."

"Now I don't arrive home exhausted from the fields only to go and fetch water for dinner; I can straight away begin preparing meals for my husband before he arrives home; he is much happier with me for that."

"I finally can have a family garden and don't have to buy those items at the market, which is very far away."

"In the past during sowing season or harvest time, we would be so busy and tired that we would wash our bodies only once a month. Now that we have water here in the community we can wash ourselves and our children far more often."

Time available for other activities:

"What difference has it made in our lives? We now have time even to dance!!"

"The time I save I now can use to paint cloth and to weave; those things are for my family or to sell in the market."

"With water so available, I now have a garden; I can prepare better meals for my family."

"I now have time to spend with other women in the community; as a young mother, I can find out how to do things better for my children and husband."

"I have time to attend meetings on health or the water committee discussions."

"I now have time and energy to keep my house clean."

"I have time to care for the animals."

Impact on children, men, and home life:

"We used to have to beg the children to fetch water for us."

"We used to have to search for little gifts ("regalitos") to persuade the children to get water for us. Now they can easily get it from the faucet."

"I can send my children to school with clean clothes and clean faces."

"My children are not late to school because they don't have to get up so early to go down and fetch water first for me. They also go to school more often."

"I used to have to pay someone to fetch river water for me. Now I can get it myself right here in my own yard—and I save the money for other things."

"Really, all the men do is eat, but we are able to prepare meals that satisfy them because we now have water and gardens. Our homes are happier as a result."

"By 10 in the morning, my washing is done and so I have time to be with my husband; he loves that!" (said by a women in her 50s, with a blush)

"We now wash our dishes after every meal; we used to use dirty dishes for the next meal. I think that was not a healthy thing to do."

"Would we give up the water we have now in order to have electricity instead? Absolutely not!" (Comment made after much complaining about the lack of electricity in their village.)

Impact on disease prevention and treatment:

In Altiplano, by report and by review of records, there have been no cases of cholera. It is also shown that some communities have experienced a marked drop in the number of cases of diarrhea. This is reflected in the following conversation:

"Are there any cases of diarrhea in children under 5 in this community (Curupampa) in the last two weeks?

"No, there haven't been; even my 7-month old has never had diarrhea."

"If he had diarrhea, what would you give him?"

"Well, I could prepare a homemade solution of one liter of water plus eight teaspoons of salt and one teaspoon of sugar."

At this point another woman quickly interrupted her and provided the correct formula for ORS.

The young mother sheepishly replied, "I guess I have forgotten how to make homemade ORS, because for me and my family, diarrhea is just no longer a problem."

The picture was not so for another community (Chinchalla) that complained, "There is no difference between the past and the present as far as diarrhea is concerned. Whether we wash our hands and our babies or not, we still have the same number of cases of diarrhea." A USAID worker later commented that this was not borne out by the statistics; there had been fewer cases of diarrhea since the inception of the water project. This gap in community perception and actuality may reflect the need for periodic communication

about how a community is improving through its own efforts.

In some instances, we asked the group what they thought were the causes of diarrhea. Most replied that dirty conditions were the cause, although others volunteered that the cold weather and inadequate clothing caused diarrhea.

Democratization processes:

"Having to work for a water system brought us together and got us organized."

"We used to be two communities who fought one another, but when we realized we had a common need—clean water—we united for the common good."

When asked who had the power to make decisions in the community about the water, communities varied. Some expressed an equal voice between men and women in decision-making matters; others noted that the men had the power because they could shout louder. Some women expressed fear of the men and held back on providing their opinions at community meetings. Others said when there was a vote, they respected the majority vote; if they had an impasse, where equal members of the community held opposing views, they would discuss it until some consensus was reached (Altiplano).

"If 10 of us say 'yes' and 10 of us say 'no,' then we talk and talk and talk until we come to an agreement or understanding."

In some communities, there are women on the "mesa directiva." In other instances, there are separate groups for men and for women, with a health promoter who serves as the link for communication between the two groups.

All those interviewed were satisfied with the present water system. One community expressed strong interest in having help getting irrigation channels for gardens. The same community said that water pressure was a problem for more distant homes.

3.8 Environmental Health Impact as Reflected by Site Visits

Using the 20-point checklist described in the methodology section, the team visually inspected each of the communities visited. The details for each community are included in the annex, with some descriptive material presented in this section.

Altiplano

With only one exception, all the latrines visited were clearly in use, immaculately maintained, not malodorous, and had evidence of a nearby bucket for pour-flush use. Each one had a wastepaper basket. Most were freshly painted. Soap for handwashing was occasionally seen at the nearby faucet. Some systems did not have a proper run-off for waste water.

Kitchens, on the other hand, were by and large dirty, poorly ventilated, and in some instances small animals were kept inside. Visual and olfactory evidence of animal defecation was apparent. Elderly members of the community were more likely to have such kitchens. In some places, cow dung is used as a fuel and may be kept in the kitchen.

Environmental cleanliness varied, but no places were obviously littered with animal excreta or food waste. Communities usually bury trash out in the fields. We saw no evidence of burning waste.

Chucuibamba

Six communities were visited in this area: Bella Vista, La Puente/Marapampa, Mesa Rancho, Yerba Buena, Cuevas, and Bermejo. The first three are CARE project sites, and the last three are CCH.

Four houses were visited in Bella Vista. In all instances, because of the tropical climate, the

kitchens were open-air, unlike those of Altiplano, which were enclosed. The disadvantage to open-air kitchens is that animals freely roam in the areas used for food preparation and eating. Latrines were generally not well maintained or clean, unlike the ones in Altiplano. In spite of having functioning water systems, the families did not seem to be using them for the pour-flush latrines. Environmental cleanliness was not particularly good. Children's faces were relatively clean, and most clothes looked clean. Most houses had family gardens.

In La Puente/Marapampa, an active and knowledgeable group of women comprised the focus group. Unfortunately, the focus group team did not visit any of their homes due to lateness of day and lack of light. Part of the team did visit the water systems, however.

In Cuevas, the level of cleanliness in the three houses visited was poor. Latrines were not kept clean. Cooking areas were dirty. Animals shared living and eating space with family members. There was little land for these homes, which abutted a contaminated river used by children for bathing and playing. There were no family gardens because of the limited space. Litter and junk were scattered inside the homes and in the yards.

In Bermejo, four houses were seen. This was the first community visited that had showers alongside the latrines. Conditions were adequate. Kitchens were usually outside and behind the houses. Animals had easy access to the cooking and eating areas. In addition, meat was often seen left hanging to dry, attracting flies and adding to the sources of diarrhea. Environmental cleanliness was fair. Children looked clean, and they were found helping to wash dishes.

Potosi - Bustillo and Chayanta provinces

In Potosi (Provincia Chayanta) where the UNDP/World Bank-supported Proyecto Yacupaj worked, the team visited some of the poorest and most isolated rural communities. As in other places, the kitchens were indoors, dark, and hard to evaluate. There were no animals in the kitchens, occasionally soap was available, and extra food was stored in the kitchen or in a separate location. The few ventilated improved pit latrines visited in Lucas Kahua did not have water nearby, nor wastepaper baskets inside. It was obvious that the latrines had not been used recently, but neither had water been available. There was no evidence of garbage scattered around the community; people said they bury it. Personal hygiene among the women and children was adequate. The community in Karata had had water only since May 1994, and people did not look as clean; in fact, these were some of the poorest and dirtiest children. Time constraints did not allow the focus group team to visit homes in this community, but the water systems component of the evaluation team visited them.

In the province of Bustillo (Potosi Department), the team visited two UNICEF project activities in the communities of Che'w and Nequere. The water systems team inspected the first community while the focus group team visited the second. Nequere was the one example in all the site visits of a community without a completed water system. It had three handmade shallow wells and one water spigot/font that had just been completed one week before the team's visit. Of the four homes visited, all kitchens were either inside the main house or attached to the house. Ventilation and lighting were poor. Animals were corralled separately and kept near the house but not inside the kitchen. Water was scooped from the shallow wells; women said that animals also came to drink from the wells and probably contaminated them. The environment around the houses varied from tidy to messy. The children looked cleaner than would be expected given the water limitations.

4 COMPARISON OF COSTS AND BENEFITS

4.1 Unit Costs across Selected Communities

When comparing different programs, it is important to consider that they are executed in different settings and with different objectives. Also, some projects have some costs covered by the central organization. For example, the costs of geological prospecting are charged to the central office for UNDP/World Bank's Project Yacupaj. On the other hand, CCH and CARE cover their own costs for such exploratory activities. More importantly, a comparison of unit costs per system, or per capita, across institutions reflects the different technical options and community sizes.

4.1.1 Technical Options

There are important differences across institutions that provide water and sanitation services in Bolivia in the unit cost of investment, mainly because of the different technologies offered to the communities. The gravity-fed piped water systems, with or without individual connections, are more expensive than hand pumps. The characteristics of the terrain and the availability of water sources strongly influence the selection of the technology and result in the capital costs. Bolivia has ample surface and groundwater resources, but these remain largely underdeveloped. Altiplano is the region with the smallest water supply, with an average rainfall of just 390 mm. CARE and CCH provide gravity-fed piped water systems with individual connections; these are more expensive than the simple pipes provided by UNICEF, Special Development Programs, and the UNDP/World Bank project.

The application of different technologies by various agencies explains different unit costs (see Tables 2 [page 6], 13, and 14). CARE, which has installed gravity-fed piped water systems with individual connections, spends on the average US$22,000 per system. CCH's average unit cost per system is about US$32,000. UNICEF has installed gravity-fed piped water systems with no individual connections, reducing the average unit cost per system to US$14,850.

The UNDP/World Bank pilot Project Yacupaj, located in Potosi Department, covers more than 200 communities. In place since 1992, its main characteristic is that it provides gravity-fed water systems without individual connections to small sized communities at about US$2,500, a notably lower cost. The project offers a choice of six different types of systems: Soya pump (Bs 230), Balde pump (Bs 320), Yaku pump (Bs 820), Protection spring (Bs 1110), India pump (Bs 2742), and distribution system (Bs 2945). Such costs may vary widely.

4.1.2 Community Size

Another difference among institutions is the size of the communities targeted (see Tables 13 and 14). Only 2% of households in the dispersed rural areas of Altiplano have water supply facilities. Community size and geographical location are important because low service levels are particularly acute in the rural areas, where 49% of the population lives. Less than 20% of the rural population is served by installed drinking water systems, and most of those served live in larger rural settlements. The dispersed rural population

Table 13

Distribution of Water & Sanitation Interventions by Community Size and Institution

Community Size	CARE		CCH		SDA 063		UNICEF		UNDP/World Bank	
0-100	13	8%	0	0%	2	10%	27	13%	198	85%
101-500	126	81%	60	63%	19	90%	181	84%	34	15%
501-1000	14	9%	26	27%	0	0%	7	3%	0	0%
1001 +	3	2%	10	10%	0	0%	0	0%	0	0%
TOTAL	156		96		21		215		232	

Sources: Agency official documents

Table 14

Unit Capital Costs per Water System by Size of the Population

	Piped System with Individual Connections						Piped System without Connections								
	CARE			CCH			SDA (0632)			UNICEF			UNDP/World Bank		
Commu-nity Size	Cost/ system	Cost/ capita	N	Cost/ system	Cost/ capita	N	Cost/ system	Cost/ capita	N	Cost/ system	Cost/ capita	N	Cost/ system	Cost/ capita	N
0-100	11540	144	3	n/a	n/a	n/a	8390	96	1	2970	59	300	2501	25	7
101-500	18567	76	56	24100	80	58	6454	35	7	14850	50	100	n/a	n/a	n/a
501-1000	35346	50	10	42073	53	24	0	0	0	n/a		n/a	n/a	n/a	n/a
1001 +	91500	46	1	58274	12	8	0	0	0	n/a		n/a	n/a	n/a	n/a

n/a = not applicable N = number of communities (100% for CCH; 50% for CARE) on which data is presented.

Source: Data for CARE and CCH from official sources. Data for UNICEF and UNDP/World Bank from Caceres (1994)

For CCH we have discounted latrines as 23% of the total costs.

is almost totally lacking in adequate water supplies and sanitation facilities. Additionally, small communities (settlements of fewer than 250 inhabitants) in Altiplano are among the poorest in Bolivia. Per capita income is estimated at US$80 per year, compared to the national average for Bolivia of US$650.

Eighty percent of the communities that CARE works with have populations of 100-500, while CCH targets communities of 100-1,000. UNDP/World Bank mostly targets communities with populations under 100, while UNICEF focuses its efforts on communities with fewer than 500 people. The institutions give no reasons to justify choice of community by size. Only the UNDP/World Bank project reported it chose to work with the poorest of communities.

When costs are compared, gravity-fed piped water systems demonstrate substantial economies of scale for a surprisingly low level of population size and density. Costs per capita vary inversely with the size of the population served. Most economies of scale occur when work is done in communities of 100 or more people.

4.1.3 Users Financing

Currently most of the programs funded by the agencies and the GOB pay 70% of the total capital expenditures, and the remaining 30% is financed by users. Users contributions comprise labor for the construction work, local construction materials such as sand and stones, and information about water points.

The GOB is planning to make changes in the current financing method in order to improve efficiency. The new method will involve developing standard costs which could be compared with actual project costs to evaluate efficiency and improve management of services. Under the new method, GOB will pay about 70% of a fixed amount of the capital expenses. The amount will be determined according to average historical costs differentiated by community size. Municipalities and users will pay any additional amount. This method will allow increased financial planning and control and will free financial resources that can be used to increase coverage.

4.2 Analysis of Cost Utilities

The cost-utility analysis shows that an ideal project would have an optimum mix of cost, water system features, hygiene (health education and environmental cleanliness), sanitation system features, and sustainability (collection of adequate fees as well as women's participation, empowerment, and democracy building).

Analysis of the cost-utility ratios (Tables 15-17) shows that the community with the best rating is Murumanani. This community has a high documented utility value (4.72) and costs in the lower bound. This example highlights the importance of combining low-cost technologies with health education, women's participation, and emphasis on the concept of the user as a client.

One important strategy the UNDP/World Bank project used is the standing exhibit of technology choices available to the users. This exhibit displays the four types of pumps available with the corresponding prices and the various latrine models. Asking communities to make their own choices reinforces the cost-sharing policy of the UNDP/World Bank.

Additionally, Chinchalla and Curupampa from the CARE project are good case communities where the cost-value ratios are optimal and costs are mid-range. The documented utility estimates are high at 3.52, combined with costs in a middle range. The strong points are the linkages of top-rate health education with technologies in the middle range of investment costs.

Those UNICEF communities also highlight the importance of linking low-cost technologies to

Table 15

Cost-Utility Based on Expected Outcomes

				Unit Costs		Water Supply		Sanitation	Hygiene		Sustainability		Cost-Utility	
	Institution	Community	Pop	Water System	Per Capital	General Operation	Quantity	Clean Latrines	Know-ledge	Env. Cleanliness	Fees	Women Partic.	Utility*	Cost Utility** Ratio
1	UNDP/WB	Corata	80	1,172	15	4	3	5	3	3	4	5	4	4 ***
2	UNICEF	Nequeri	150	10,000	67	5	3	1	2	2	4	3	3	23
3	CARE	1 de Mayo	185	19,110	103	5	5	5	5	5	5	3	5	22
4	UNDP/WB	Lucas Kahua	200	7,814	39	5	3	2	3	2	4	3	3	12 ***
5	CARE	Surfini	204	19110	94	4	5	5	5	4	3	3	4	23
6	CARE	Curupamba	205	11,887	58	4	5	5	3	2	3	3	4	16 ***
7	CCH	Cuevas	210	14,794	70	4	5	3	2	1	4	4	3	21
8	CARE	Bella Vista	210	22,038	105	4	5	3	3	2	4	4	4	29
9	CARE	Mesa Rancho	245	30,249	123	5	5	3	4	3	4	4	4	31
10	CARE	Chinchaya	290	14,913	51	5	5	3	1	2	5	5	4	14 ***
11	CARE	El Puente/Marapampa	365	20,354	56	5	5	5	5	5	4	4	5	12 ***
12	UNICEF	Che'wa	400	20,000	50	5	3	1	1	2	4	3	3	18
13	CCH	Bermejo	405	32,452	80	5	5	5	3	4	5	4	4	18
14	CCH	Yerba Buena	510	34,980	69	5	5	3	3	3	4	3	4	18
15	CARE	Murumanani	710	37,811	53	3	5	3	1	2	3	4	3	18

5 = Excellent, 4 - Good, 3 = Fair, 2 = Poor, 1 = Worse, 0 = no data

* Utility = Unweighted average of water supply, sanitation, hygiene, and sustainability scores

** Cost Utility = Per capita cost/Utility

*** Very Good

Table 16

Cost-Utility Based on Documented Outcomes

				Technical Characteristics				Unit Costs		Health Outcome		Income	Cost-utility	
	Institution	Community	Poverty Level	Date Initiated	Daily Liters	Type of System	Population	Water System	Per Capita	Diarrhea	Nutrition	Garden Production	a) Utility	Cost Utility b) Ratio
1	UNDP/WB	Corata	5	93	20	S	80	1,172	15	4	3	1	2.820	5 **
2	UNICEF	Nequeri	3	94	18	S&P	150	10,000	67	1	1	1	1.000	67
3	CARE	1 de Mayo	4	94	30	S	185	19,110	103	5 *	4 *	1	3.520	29
4	UNDP/WB	Lucas Kahua	5	92	20	S	200	7,814	39	4	3	1	2.820	14 **
5	CARE	Surfini			30	S	204	19,110	94	5 *	4 *	1	3.520	27
6	CARE	Curupamba	4	93	30	S	205	11,887	58	5 *	4 *	1	3.520	16 **
7	CCH	Cuevas	3	92	30	S	210	14,794	70	1	2	1	1.280	55
8	CARE	Bella Vista	4	94	30	S	210	22,038	105	4 *	5 *	1	3.380	31
9	CARE	Mesa Rancho	4	94	30	S	245	30,249	123	4 *	5 *	4	4.280	29
10	CARE	Chinchaya	4	92	30	S	290	14,913	51	5 *	4 *	1	3.520	15 **
11	CARE	El Puente/Mar	4	94	30	S	365	20,354	56	4 *	5 *	1	3.380	16 **
12	UNICEF	Che'wa	3	94	18	S&P	400	20,000	50	1	1	1	1.000	50
13	CCH	Bermejo				S	405	32,452	80	2	3	1	1.980	40
14	CCH	Yerba Buena	3	92	30	S	510	34,980	69	2	3	1	1.980	35
15	CARE	Murumanani	4	93	30	S	710	37,811	53	5 *	4 *	5	4.720	11 **

Poverty Level : 5 = Extreme poverty 4 = poverty 3 = mild poverty
S = Gravity-fed piped water system P = "piletas" B = Bombs
5 = Excellent, 4 = Good 3 = Fair 2 = Poor 1 = Worse
* Hard Data
** Very Good
a) Utility = [[diarrhea * 0.6 + Nutrition * .04]*.07]+[garden * .03]
b) Cost Utility = Per capita cost/Utility

local political organizations, women's participation, and health education efforts. One important characteristic of the UNICEF project is its association with the peasant federation. This association allows the project to share resources, thereby decreasing administrative costs. UNICEF selects communities according to their association with the federation.

One must view the cost-utility ratios using "documented outcomes" with caution, as only the CARE projects had discrete health data on which to base the utility indexes. Those projects without hard data may well have had equally strong health impacts. (The costs figure strongly in the analysis as well.) While Corata has a fairly low utility score (2.82), the low costs gave it the best cost utility score. To provide another view of the cost utility analysis, an expected utility score based on expected health impact derived from project inputs and outcomes was calculated, as described in the conceptual framework. The utility score did not have the large ranges or specificity, as it was based on an average as opposed to added weighted scores. Also, the estimates regarding sanitation were based only on one score (cleanliness of latrines), without the benefit of including community-level coverage. The rankings are similar, with costs again overriding the analysis as demonstrated in Table 17. Neither analysis is foolproof, because data are deficient in each case. Looking at both analyses gives an approximate picture.

Table 17

Expected and Documented Cost-Utility Ratio Summary Comparisons

Institution	Community	Documented Cost-Utility Ratio	Expected Cost-Utility Ratio
UNDP/WB	Corata	5	4
CARE	Murumanani	11	18
UNDP/WB	Lucas Kahua	14	12
CARE	Chinchaya	15	14
CARE	Curupampa	16	12
CARE	El Puente/Mar	16	16
CARE	Surfini	27	23
CARE	Mesa Rancho	29	22
CARE	1 de Mayo	29	31
CARE	Bella Vista	31	29
CCH	Yerba Buena	35	18
CCH	Bermejo	40	18
UNICEF	Che'wa	50	18
CCH	Cuevas	55	23
UNICEF	Nequeri	67	23

5 CONSTRAINTS TO THE EVALUATION

5.1 Health Data

5.1.1 General Comments

The greatest challenge faced in this evaluation was the lack of baseline and follow-up data for some of the projects visited. To measure an impact on health using specific indicators, one must have at least two points on the curve—a baseline and some follow-up. In addition, for a valid evaluation, these data must apply to the same population or the same denominator. Moreover, clear definition of the denominator is important: for example, are reported cases of diarrhea for all the children under 5 in a specific subarea of the community, or are these cases for the entire community?

Methodology for data collection and analysis are also critical. For example, in a nutritional survey, it is essential to know if children are actually weighed, or if the investigating team only reviewed the health cards for growth percentiles. The sampling method used (random, convenience, stratified random) also indicates whether the study represents the entire population impacted by a health intervention. These aspects were not always clear from the raw data the team were given.

Use of consistent questionnaires in surveys is essential for comparison of cross-sectional data. For example, if data are collected on diarrheal incidence, the question asked of the mothers must be phrased in the same way for each survey done over time. Some questions in the project's baseline survey were not the same as in the follow-up survey. For example, the question asked in the baseline survey, "Has your child had diarrhea in the last 24 hours or last week?" does not correspond to, "Any diarrhea in the last two weeks?" in the follow-up survey.

5.1.2 Specific Project Sources

CARE had baseline and some follow-up data. In some instances, the data for different regions were reported somewhat inconsistently. For example, the answer to the question about diarrhea is shown separately for Cochabamba and Chuquisaca in the baseline, whereas the follow-up survey data refer to "Chuquibamba," a combination of both departments. The CARE office summary data were far more helpful.

Greater limitations were encountered for obtaining data about the other projects. As for CCH, baseline data were available, but not follow-up data. Follow-up for CCH is planned for October 1994, after completion of this evaluation. No health data were available for the UNICEF projects that the evaluation team visited. The UNDP/World Bank Project Yacupaj had baseline data on its communities dating to 1992, but there were no follow-up data.

When data were not available, the health impact was assessed on the basis of focus groups and site inspections (environmental cleanliness). Without data on diarrhea and nutritional status, however, the reports from community focus groups tended to be anecdotal. Observations of nutritional status may pick up cases of wasting but not stunting unless the age of the child is known.

5.1.3 Government Sources (SNIS)

Several limitations were encountered in the SNIS data. The SNIS was able to provide district- and area-based data for 1993 and the first six months of 1994, but it was unable to extract the data for the same indicators for the same districts and areas for 1990-1992. SNIS's computer and data base could only provide data for the 12 regional health units ("unidades sanitarias") for earlier years, so a direct trends assessment could not be performed. In addition, the data are facility-based for reporting purposes, rather than community-based. Selection bias operates in these circumstances; the reported cases only reflect what conditions are cared for at a health center, but not what is happening more generally in the community. Not every member of the community who is sick comes to the health center for diagnosis or treatment.

To understand the limitations of SNIS, it is helpful to consider its structure. The Secretariat of Health has a centralized health system, with 12 Unidades Sanitarias (US), or regional health units, which also includes about 90-95 districts, each with its own hospital. Data at the area and district level are collected by the District Manager, and, theoretically, the District Manager provides program guidance based on the statistics. The data are compiled at the district, regional, and national levels at SNIS, although this compilation is said to need some rationalization and improvement. SNIS is in its fourth year of operation, having been a new initiative by the Secretariat (MOH) in response to a need for service statistics and epidemiologic information for planning purposes. NGOs are also said to report coverage statistics forward to the District level. A Monthly Informational Analysis Committee meets to review the quality of the data and develop program objectives, but the previous mid-term reviewers have raised questions as to the real achievements of any of these activities, either at the committee level or in the districts.

5.1.4 Other Specific Limitations with the SNIS Data Provided for This Evaluation

Denominator data were not provided with the results in a meaningful way, with the result that percentages of population affected could not be calculated. The absolute numbers that were provided are numerators only and have little meaning in themselves. Census data available to the evaluation team were not disaggregated enough for our calculations.

As for nutritional status data, there is no apparent correspondence between the measurements in each of the red, yellow, and green zones and the totals shown for children in the given age range. Some measurements are indicated as repeat visits, while others are new cases; therefore, there is no way to determine percentages of the population affected (those under 5 years of age) other than to compare the distribution of strata within the total measurements. Another section of data provided from SVEN (Sistema de Vigilancia Epidemiologica Nutricional) on the same computer printouts does not easily correspond to the measurements for the color strata. Again, no denominator data are indicated for the purposes of calculations.

Data from earlier years, which would be useful for comparison, do not exist in the same computer-disaggregated format. For example, in earlier years, the data are only available by departments; the more recent data are given by district. Department level data are too broad to show specific project impact within a province or district. A few projects, no matter how successful within a province, may have no overall impact on the data shown for an entire department. If those projects were 100% effective, but impacted only a small percentage of the population of a whole department, the success would be diluted, or even cancelled out, by failures elsewhere within the same department; data aggregated at the department level only would not show the

successes, only a weighted average at best. Full coverage of even a province by an organization's efforts and services is not likely. Therefore, district or area data are more useful for showing impact of specific projects. This is why community-based data are more useful.

5.1.5 Other Sources

Surveys which DHS teams conducted in Bolivia in 1989 and 1994 have some relevance to this evaluation. The 1994 data have just been released in preliminary form. Disaggregated data for nutrition and diarrhea variables do not exist below the department level, and therefore cannot be used for comparison. In addition, the sampling frame was based on departments and is not representative of the district level. DHS staff said that mathematical extrapolations could be made to provide district estimates, but this would take some time.

Cholera data are reported weekly. It is said that these are reliable data for confirmed cases. Varying degrees of in- and out-migration within areas and districts contribute to the incidence of cases and may not reflect the degree of sanitation in an affected area.

5.1.6 Focus Groups

Occasionally there were challenges to the focus groups. Some communities, for a variety of reasons, were not prepared to assemble a group of women. These reasons included:

- Lack of communication by the accompanying agency or communication errors about the date of the intended visit.
- Coincidence of time of day when team arrived with the time when most community members were still working in the fields.
- Small sized community, which did not allow a critical number of women for a focus group.
- Communities that had internal rivalries and were not willing to gather in one group.

When focus groups could be formed, certain group characteristics sometimes caused interruptions in the discussion:

- Groups were too large and could not be restricted to certain topics of discussion.
- Large groups that disintegrated into smaller satellite discussions left a smaller effective number of participants.
- Men wanted to listen in on a women-only discussion.
- Children came and went during the meeting.
- Some children needed the immediate attention of their mother.
- Road noise and passing trucks could be heard.

5.2 Financial Data

Availability of cost information limited the analysis. Cost data are not collected and analyzed systematically because of the additional costs to programs. CCH has more cost data but uses 35% more administrative resources than the other agencies.

One of the issues in evaluating and ranking the projects for cost utility is that the criteria used in this paper were developed after the projects had started. With the exception of the World Bank, most of the project managers are unaware of the implications of some of their decisions. Such an evaluation would be more useful once a project has been underway for one or two years.

5.3 Time Constraints

Consultants were originally requested for a five-week consultancy, but budget constraints limited it to three weeks. This left only two weeks to travel over several provinces and departments,

thereby influencing the selection of project sites to be visited. Such a restriction did not allow a random and representative sample of projects. It also meant in some instances that few of an agency's projects could be visited; this was particularly true for the site visits to the UNICEF projects, where only two communities could be visited.

6 CONCLUSIONS ABOUT THE TECHNICAL ENGINEERING ASPECTS

Bolivia's standards in designing, implementing, and operating rural potable water systems are based on various criteria that involve population, minimum water supply, and other parameters.

With regard to latrines, variability is based mostly on the type of service and the various designs that are used in accordance with the preference of the user. However, a global (nonsampling) qualitative analysis needs to be conducted in order to extract experiences that could provide the basis for better design selections. For instance, what is the correlation between use (especially by children), maintenance, willingness to pay, sustainability, and design (VIP versus pour-flush)?

The same can be concluded about procedures and criteria for selection of communities and prioritization of construction works. Although philosophically the criteria have the same basis, they have to be standardized, with a view toward simplifying procedures and making it possible to select communities that do not have the economic capability to finance their own systems.

The upper limits should be reviewed so that a greater number of rural communities can be covered. Such communities have solutions that are less complex and less expensive to implement, and they achieve a greater degree of community participation in the construction and sustainability of the system.

It has been demonstrated that water supply and latrine construction interventions do not, by themselves, produce a significant benefit and impact unless they are accompanied by regular sanitary education. In other words, instruction on cleanliness, hygiene, and appropriate use of water and latrines has been forgotten in communities with older systems. Such communities require refresher courses.

In all of the communities visited during this consulting assignment, the various potable water and latrine interventions have generated considerable interest about improving basic conditions in a number of areas. These include the following:

- **Housing.** Changes can be observed in the use of improved construction materials. High poverty areas experienced an increased interest in painting houses, based on the example set by the latrine outhouses or the structures used in the potable water systems.

- **Bathrooms.** Building on the initial system (consisting of a residential hookup), such things as showers, wash basins, laundry tubs, and in-line electric water heaters for showers have been installed.

- **Latrines.** Latrines have been improved through the installation of a toilet or a toilet with an elevated flush tank. Latrine floors have also been improved.

It was also observed that a significant number of water systems do not have, or do not use, the infiltration gratings at the base of the residential hookup, which reflects two factors: lack of project follow-up and weak sanitary education in this area.

In particular, the older communities visited in Cochabamba and Santa Cruz have experienced a significant level of socioeconomic development,

which has brought with it increased demand for potable water. However, water fees continue to be levied based on a single hookup and a single basic price. There are exceptions in communities producing *chicha*, but in other communities with differentiated consumption, a tariff plan has not yet been designed to take into account domestic, commercial, and other consumption.

Likewise, those users who in general have improved the services they provide as a result of potable water interventions should pay a differential fee in accordance with the number of hookups (water outlets) that they actually have. In this way, it will be possible to ensure the sustainability of the systems in future years.

7 CONCLUSIONS ABOUT THE HEALTH IMPACT

Quantifiable evaluation of health impact could only be accomplished for the CARE projects, for which both baseline and follow-up data were available. In those instances, water and sanitation interventions had a positive impact on health in several of the communities that the evaluation team visited. These efforts in water and sanitation interventions are helping USAID to achieve its Family Health Strategic Objectives in Bolivia. The availability of hard data for some communities provided an advantage in measuring the size of this impact. For example, all the CARE communities visited showed considerable improvements in diarrheal incidence and nutritional status. Community reports from the other projects provided soft data, which suggested possible positive impacts elsewhere.

Besides the health impact, the focus group discussions pointed out many positive changes in people's lives because of potable water and adequate sanitation:

- Enhanced quality of family life and domestic harmony
- Increased time for activities that had some economic impact
- Community empowerment and democracy-building
- Unification of community identity
- Indirect enhancement of educational opportunities for children
- Time for mental and physical recreation
- Reprioritization of community needs
- The discovery of benefits of working together for the common good

The focus group discussions revealed that, although the availability of water made no real change in basic diet in some communities, it did affect the frequency of bathing, the washing of clothes, and the washing of dishes after meals. Most communities reported that the incidence of scabies had decreased, due to more frequent washing. Harvest times may decrease the frequency of washing and bathing. This proves that daily practices need to be observed for longer than a few months.

Assessing knowledge and attitudes about health practices is a challenge unless the practices can be verified. In general, the knowledge about home treatment of diarrhea showed an improvement in both geographical areas of Altiplano and Chuquibamba. This indicates that one health educational component of the program has been successful, although it reflects understanding of treatment but not necessarily prevention through hygiene behavior modifications. Actual use of ORS packets is not demonstrable with these data. It also assumes that ORS will be available in adequate quantities. Some communities use a homemade solution or traditional foods and liquids instead of ORS packets.

Environmental cleanliness, as evaluated by the site visits and use of the 20-point checklist, is an objective measure of the impact of WS/S projects. Communities that had organized themselves into water and health committees demonstrated higher standards for hygiene in common living areas. Projects that had integrated health education with the installation of a water supply performed better than those which had no educative component in their project.

Individual project health information systems appear to be the most valid, reliable, and accurate means of evaluating progress. Not only can individual projects develop their own indicators, but they are also in a better position to set goals and to know when they have achieved them. This is demonstrated by CARE's periodic surveys. Moreover, when a community has a first-hand understanding of its performance, it is in a better position to take corrective action or to become encouraged by its achievements. These are some of the reasons why the SNIS data have a limited means of monitoring progress.

Apart from the constraints and limitations mentioned earlier, additional factors must be considered in interpreting the health data results: geographical area and climate, and the time elapsed since implementation of the water and sanitation interventions. Geography and climate may work against better health outcomes and hygiene practices. For example, prevention of diarrhea may be harder in tropical areas with heavier rainy seasons. Given the seasonality of diarrhea, one must review a few years of data on diarrheal incidence to draw valid conclusions about trends. In addition, the time elapsed from WS/S implementation to the measurement of impact is critical. An impact, such as improvement of nutritional status, may not be seen immediately.

Potable water and adequate sanitation are not the only preventions for diarrhea. Diarrhea can be caused by poor food hygiene practices, such as exposing meat or fruit to flies, which are vectors for disease. Infants and toddlers crawling on dirt surfaces are more likely to pick up pathogens than children who are fully ambulatory. Animals who have free roam of cooking and eating areas and who defecate in those areas are sources of contamination. Young animals, especially puppies, have intestinal parasites that do not necessarily cause diarrhea in the host but may provoke diarrhea in the human. Swimming and bathing in contaminated rivers even when a clean source of water is available in the community are other practices that can lead to diarrhea when there is inadvertent consumption of water. There are also nonwater-borne infections and conditions that may be accompanied by diarrhea: measles, malaria, chronic malnutrition leading to chronic malabsorption syndromes, dietary deficiencies, and lactose intolerance. Changes in breastfeeding practices also need to be taken into consideration; a decrease in the prevalence of breastfeeding is often accompanied by unsterile bottle-feeding practices, leading to increases in diarrhea.

Nutritional data are more distant, indirect measures of WS/S programs. The determinants of malnutrition are food supply, maternal feeding practices, and recurrent or chronic diseases, of which diarrhea accounts for the majority of cases. As it relates to recurrent diarrhea, WS/S would have an impact. A WS/S program may increase the food basket as well as give mothers more time for improving feeding practices.

When evaluating nutritional impact, it is important to consider the lag time before an improvement is seen. The data for the CARE communities are a case in point. In addition, other factors must be taken into account: degree of poverty, cultural practices and beliefs about breastfeeding, introduction of solid foods, use of foods during illness, presence of other infections, and immunization status. Where food supply is limited, it is known that the use of starchy, low-energy density, low protein weaning diets is a factor in poorer nutritional status. It is also unknown what type of nutrition counseling occurs when weighing a child, especially one at greater risk for malnutrition. Without a detailed review of the survey methodology, one cannot determine, using the summarized data, what kind of sampling was done or whether the same cohort of infants was studied in each survey. As opposed to a simple chart review, the surveyors weighed the children, which speaks for some data validity, however.

8 CONCLUSIONS ABOUT THE COST-UTILITY OF WATER AND SANITATION PROJECTS

Tables 15-17, which parallel the conceptual framework, summarize the findings of this evaluation. Cost utilities shown in Table 15 were the result of on-site and direct observational data gathered by the team epidemiologist and water engineer. Table 16 used hard data from various information systems, combined with soft data from focus groups. Key elements from these two tables are combined in Table 17.

The probability of a positive health impact is a function of four main factors: an adequate water supply system, an adequate sanitation system, the means to sustain the systems, and adequate hygiene and education. A closer look at the components of each of these factors is necessary to comprehend the information provided by data analysis.

To have a positive impact on health, a water system must be properly functioning and deliver sufficient amounts that are acceptable for human consumption. A water system cannot stand alone. Most water projects are accompanied by a sanitation component. These sanitation projects aim to install latrines that are functioning, meet standards of cleanliness, and are available to at least 75% of a community.

A WS/S system must be coupled with a health education program that can be measured by people's knowledge of environmental health and personal hygiene and by evidence of environmental cleanliness, in domestic and public areas.

The fourth and last component is sustainability. The means to uphold an implemented system is most easily measured by a community's success in establishing an equitable fee structure, based on water consumption, and collecting those fees in a timely manner. This activity requires a water committee that represents its constituency, meets regularly, votes democratically, and trains its members to consistently serve the needs of the community.

Review of the expected outcomes shows cost utilities ranging from 4 to 31, the lower being more cost-effective. Using this framework of expected outcomes to calculate cost-utility ratios reveals four clusters of projects in descending order:

Cluster #1: Corata (World Bank), Lucas Kawa (World Bank), El Puente (CARE), Chinchalla (CARE)

Cluster #2: Curupampa (CARE), Chiw (UNICEF), Bermejo (CCH), Yerba Buena (CCH), and Murumanani (CARE)

Cluster #3: Nequeri (UNICEF), Primero de Mayo (CARE), Sulfini (CARE), Cuevas (CCH)

Cluster #4: Bella Vista (CARE), Mesa Rancho (CARE)

Some projects may have a high utility, but when the cost is factored in, the ratio is not in their favor. For example, the utility of the World Bank project in Lucas Kawa was one grade lower than that of the CARE project in Sulfini, but its cost per capita was less than half. Both communities are essentially the same size.

Economies of scale will favor the larger communities, because they can potentially have the same impact for less cost than a project in a smaller community. Moreover, if utilities are the same, the larger community may have a better cost-utility ratio because of the cost savings.

9 LESSONS LEARNED

While health is generally an assumed goal of many of the water supply programs, it is not explicit in the project design. Thus, progress towards achieving an improved health status is not uniformly measured. Projects generally use output indicators to monitor their progress in terms of number of systems constructed. Only one project routinely monitors health impacts (CARE) by collecting nutritional and diarrheal disease data every 3 to 6 months. CCH did gather baseline diarrhea incidence data and is slated to conduct another follow-up survey later this year. No project measures infant mortality according to the Family Health Strategic Objective of improving child survival. If health improvements are to be USAID's rationale for supporting water supply programs, projects should be given guidance during the design stages on how to measure these impacts.

Among projects that measure health impacts, the trends show improvements. For instance, quantitative data from CARE projects indicated a positive impact on child health as related to nutritional status and diarrheal disease incidence. The projects in the Altiplano were able to demonstrate a decrease in 2-week diarrheal incidence from 27% in 1993 to 7% in 1994 and in Chuquibamba from 27 to 21% over the same time period. The prevalence of moderate malnutrition among children 12-23 months old decreased from 66% to 53% and for those severely malnourished from about 24% to about 14% in the Altiplano/Valle areas. In Chuquisaca/Cochabamba, the data show that children 1-2 years old showed the most improvement in nutritional status: from 78% prevalence to 55% among the moderately malnourished group and 32% to 19% in the severely malnourished group.

Although not linked to water supply programs, national data through the SNIS system can be used to assess the trends in diarrheal disease and nutritional status after 1992. Using that year as a baseline, there has been a consistent drop in incidence in 9 out of the 12 reporting areas. The most significant decrease was demonstrated in Pando (248 to 136 cases/1,000). For the country as a whole, there was a 16% decrease from 1992 to 1993. DHS data for children under 6 months of age shows that the prevalence of diarrhea has decreased from 25% in 1989 to 17% in 1994.

The linkages between water supply projects can be provided most appropriately through the Bolivian organization of DINASBA. It has already initiated activities aimed at ensuring coordination among the various technical and financial cooperation agencies and institutions through technical meetings with representatives from the government, NGOs, and PVOs.

The coordination of other donors involved in water supply activities in part comes through DINASBA. USAID can play a role in strengthening this process. Through a UNDP initiative, an operational matrix was established that lists and defines the role and objectives of each project and program with a view toward providing clear guidelines to govern the participation of international agencies.

The prospects of sustaining the water supply projects appear good through community participation in the administration of the systems. It is not clear if the GOB has equally benefitted with any increased institutional capacity to finance and provide support for these

communities once the donors depart. The bulk of funding comes from the donors, with the communities investing on average 30% of the capital start-up costs. The emphasis of external support should now turn to increasing the GOB's institutional capacity to finance and support water supply programs through cost recovery schemes.

The overriding community selection criteria common to all projects appears to be willingness of the community to participate in the administration, operation, and maintenance, plus their ability to pay recurrent costs. The availability of water with adequate quality is another selection criteria used by all projects. Criteria not used by all is the need for services based on either lack of resources (i.e., poverty, lack of access to services) and health status (mortality rates, diarrhea disease burden, or malnutrition). These need to be included to reach those communities who may benefit the most in terms of health.

The process projects use to choose the design of their systems is similar. Considerations include population requirements, water sources, O&M, and the capacity of the community to administer the system. The actual engineering components (materials and specifications), although not assessed in depth due to time allowed for the evaluation, generally vary to some extent. These need to be standardized through DINASBA.

The rationale for supporting water supply programs as opposed to other health interventions should not be limited to direct measurable health impacts alone. Because of demand, the potential for sustained cost recovery makes water supply interventions not comparable to other programs. The projects have had a powerful impact on community development and democratization. This is demonstrated by the sustained activities of the water committees, involvement of women, and additional improvements in the systems many communities have made on their own. The projects have had a profound impact on women's time, generating multiple social and child health benefits. On these grounds alone, the case for investments in water supply can be made.

It was not possible to determine true cost-effectiveness due to the paucity of health impact data. Two cost-utility estimates were made based on i) a mix of qualitative and quantitative data and ii) expected health impacts derived from project inputs and outcome measures. The analysis yielded results that generally bias lower cost programs, frequently due to economies of scale. Therefore comparisons between projects can only be made with extreme caution.

10 RECOMMENDATIONS

The overall recommendations of the study team are as follows:

- USAID should continue its support of water supply, sanitation, and hygiene education activities linked to health programs, not only as a means to improve health, but also because of the benefits for community development, democratization, and women's empowerment.

- USAID could provide general WS/S sector support through technical assistance to DINASBA. This would include assistance in reviewing and analyzing the *Third Draft of the Manual for Designing Basic Rural Sanitation Works*, including norms applicable to all segments of the rural population It should help this body to set standards, prioritize province and community selection, eliminate duplication in agency services to communities or identify where no coverage exists, and serve as a resource center for lessons learned from project administration and implementation.

- Along with the good community selection criteria currently utilized by all projects (which promote community-based programs), it is recommended that additional parameters, such as limited access to services, health needs, and low socioeconomic status, be included.

- Small-scale studies are recommended to compare the health and other benefits of different WS/S system designs, such as the differential effects that various water supply designs (household versus public access) have on water-washed diseases (scabies, impetigo, conjunctivitis). Other issues are differences in utilization (by all family members), maintenance, willingness to pay, and sustainability of different sanitation systems, e.g., pour-flush versus VIP designs.

- Within the health sector, it is recommended that the following be required before any project is approved for implementation by USAID: identification of specific health indicators, achievable goals (including definition of numerators and denominators), and a detailed methodology and timetable for data collection. In addition, USAID should encourage projects to establish community-based health information systems for data collection and project monitoring and evaluation. Participation by community members in all aspects of this process, in a manner that does not interfere with income generation, is highly advisable. This is not only a powerful health education tool, it also provides the community with a better understanding of and control over its health status.

Recommendations for specific fields are given below.

Sanitary Engineering Recommendations

A series of seminar workshops should be conducted in coordination with DINASBA and with the participation of all institutions and organizations involved in the financing and implementation of potable water systems. The seminar workshops would review and analyze the *Third Draft of the Manual for Designing Basic Rural Sanitation Works*, including norms applicable to all segments of the rural population, beginning with those that are the most economically depressed. They would also require low-cost solutions and technologies that are extremely simple and easy to implement.

A similar recommendation is advisable for sanitation works and, specifically, for latrines. A preliminary field study should be conducted to

evaluate the benefits derived from the use of the various types of latrines that have been installed and the problems that have occurred in daily use. This recommendation is based on the fact that CCH uses a series of latrine types, CARE uses only one type, UNDP/World Bank is using different types for its projects, and UNICEF uses no latrines at all. This study is necessary to clarify needs and to standardize criteria.

Prior to the implementation of the seminar workshops recommended above, it would be advisable for a team of consultants with experience in rural water and sanitation to formulate national-level recommendations on engineering designs for all segments of the rural population. These recommendations would subsequently be a subject of study in the above-proposed seminar workshops. The official definition of "rural area," as used in Bolivia, should be considered.

Criteria used for selecting project communities and prioritizing construction work at the national level should be reviewed with DINASBA. The criteria should be designed so that they could be consistently applied to all rural areas of Bolivia, based on socioeconomic status, payment capability, technical options, water resources, and other relevant issues. These criteria should assist in prioritizing the implementation of construction from a technical standpoint.

It is recommended that a mechanism be identified that would ensure the implementation of sanitary education activities, supervision of construction, support for tariff review, and other matters related to the sustainability of the projects. This would protect the investment made and ensure the sustainability of the systems installed. A technical group with experience in health education, construction, and fees for rural areas could be organized under DINASBA or other appropriate institutions to evaluate the present systems and communities, to introduce corrective action, and to guarantee their sustainability. Evaluation could be made periodically, for example, every 6-12 months.

Health Sector Recommendations

Three components are critical to any successful WS/S project: sound and cost-effective technology, field-tested health education strategies, and reliable information (monitoring) systems.

Health indicators and goals. Before USAID approves any project for implementation, it should require that the implementing agency identify specific health indicators and achievable goals, including defining numerators and denominators and providing a detailed methodology and timetable for data collection.

Health information systems. USAID should require that projects establish a community-based health information system for data collection and project monitoring and evaluation. Baseline data should be collected at the time of project implementation. The community should be responsible for data collection. The project staff should facilitate the interpretation and application of the data so that communities know whether they have achieved their goal or whether corrective action is needed. Projects can only manage what can actually be measured.

Community selection criteria. USAID should require agencies responding to requests for proposals to justify community selection. Criteria for community selection in addition to those commonly used, should include community family health needs; community demonstration of prioritized needs; development of preliminary project implementation plan, budget, and a Gantt chart (timeline for project); and potential for sustainability. The Special Development Projects are an excellent example of meeting these criteria.

Epidemiology support. USAID should have available on a part-time basis an epidemiologist who has field experience in survey design and community-based health information systems,

can provide methodology support, and can make occasional field visits to various project sites. This person should provide some oversight to data collection and analysis.

Health education. If a water and sanitation system is to be implemented, USAID should verify that a clear health education plan will accompany it, even if an agency other than the one installing the water system implements it. The health education component should be based on culture-specific high-risk behaviors identified as a baseline. USAID should also verify that the health education components will be continued once the installation system is complete.

Minor Health Sector Recommendations

Review of CCH follow-up study. USAID should review the surveys that CCH has planned for fall 1994 to have a more accurate (and quantitative) assessment of the impact of WS/S interventions. This team's evaluation of the CCH WS/S interventions was limited in part by the timing of this evaluation (August/September) in relation to the planned follow-up surveys (October/November).

Supervision of health promoters. USAID should strongly encourage implementing agencies to conduct performance reviews of health promoters and their supervisors. Proper and frequent supervision of health promoters is essential, not only for correct diagnosis and treatment of community health problems, but also for quality of care and monitoring and encouragement of the promoter.

Investigation into communities that reject initiation of WS/S. USAID should request that an agency survey the community of Tahari in Altiplano to discover why it has decided not to have a water and sanitation system installed. It is located next to communities which have such systems.

Recommendations Related to Cost-Effectiveness

Community selection. Resources are scarce, so criteria need to be identified to support communities that have the greatest potential, represent poor segments of the population (levels 4 and 5 from GOB poverty map), and are more receptive to the intervention and therefore more likely to guarantee success and greater impact. Such criteria would be as follows:

- Demographic profile: communities that have a predominantly young population, who are more likely to benefit in the long term, as opposed to an aging or dying population.
- Willingness to pay or political participation: communities that are capable and committed to the future.
- Level of poverty: the poorest communities corresponding to levels 4 and 5 of the poverty map elaborated by the GOB.
- Epidemiologic profile: Communities that have the greatest water disease burden.

Technologies. The technologies used should be low cost, reflecting the capacity and willingness of users to pay. The use of low-cost technologies for communities with fewer than 100 people should be considered, because gravity-fed piped water systems with home connections are expensive in such communities. Simpler technologies, such as the one provided by Project Yacupaj, should be implemented. Implementing low-cost technologies will require overcoming the traditional attachment to sophisticated technology usually preferred by some engineers and operating managers.

Health education. The proper use of water supply and sanitation through health education yields more cost-effective and sustainable utilization of the infrastructure investments. The USAID-funded projects can provide a model and document the benefits of the health education component. The GOB projects have been

focused largely on the provision of infrastructure without adequate provision for hygiene education and community training in operation and maintenance of the water and sanitation installations. This is likely due to the fact that the health education components can be time consuming. Furthermore, the benefits are not as easily documented. However, USAID-funded organizations should promote these services to a greater extent, and fill this gap for the GOB.

GOB cost standardization. The cost standardization planned by GOB can be used initially as a management tool whereby actual project costs are compared with the standard costs in Bolivia. When appropriate, the standard costs can be phased in as the basis for planning and contracting with the NGOs and public and private contractors.

ANNEX A

SCOPE OF WORK

The evaluation team should specifically address the following themes:

- What evidence exists that the various water interventions contribute to USAID/Bolivia's Family Health Strategic Objective?
- How are the interventions measured to determine if the strategic objective is being met?
- What indicators of progress are employed in the various projects?
- To what extent have they advanced USAID's Family Health Strategic Objective?
- What improvements have there been in child and infant mortality rates and morbidity rates, and has the ncidence of diarrheal and other gastrointestinal diseases decreased? Are safe water and reduced incidence of diarrheal diseases contributing to improved nutritional status among target populations?
- What monitoring and evaluation systems are in place to measure indicator progress? Is the information collected appropriate for the indicators and the strategic objective? What do the indicators show?
- How do USAID-supported water interventions coordinate their strategic objectives and policies?
- What are the linkages between the various projects and the organizations involved in the project/activities (communities, implementing agencies, PVO, NGO, Government of Bolivia)?
- What is the level of sustainability involved in the water and sanitation activities? Are these community based, or do they depend on outside interventions? Is the water and sanitation field dependent on international (donor) financing?
- Which criteria are used for the selection of communities? How are they applied under each project activity? What happens in those communities once the construction of the water system is over? Once the projects are over?
- What common standards are used for the design of water interventions? Are there any linkages to other health and nutrition interventions?

In addition to the above cross-cutting themes, the following topics should be addressed:

- Determine the cost-effectiveness of each one of the water interventions under the various mission-funded projects/activities.

In doing this, the estimated cost of each water intervention activity should be analyzed and compared to decreased incidence of diarrheal and other gastrointestinal diseases, taking into account the origin of the materials, the complexity of the interventions, and the number of beneficiaries.

- Establish if a national baseline data exists from which to measure overall impact and impact by gender.
- Determine to what degree the water interventions affected institutional development and strengthening and to what extent they improved the administration of water and sanitary facilities.
- Establish to what extent USAID-funded activities have been coordinated with other donors to increase effectiveness, attract further investments, and avoid duplication of efforts.

- Establish if disparate design standards and redundancies and duplication of efforts exist.

ANNEX B

LIST OF PLACES VISITED

CARE PROJECTS

- Altiplano-Valle
  - Omasuyos-Larecaja provinces
    - Primero de Mayo
    - Sulfini
    - Murumanani
    - Chinchalla
    - Curupampa
- Chuquisaca
  - Oropeza province
- Cochabamba
  - Campero province
    - Bella Vista
    - El Puente
    - Marapampa
    - Mesa Rancho

CCH

- Santa Cruz
  - Florida province
    - Yerba Buena
    - Cuevas
    - Achira
    - Bermejo

UNICEF

- Bustillo province
  - Che'w
  - Nequere

UNDP/WORLD BANK (Project Yacupaj)

- Chayanta province
  - Macha
  - Karata
  - Lucas Kahua
  - Challuma
  - Balcera

ANNEX C

LIST OF PERSONS CONTACTED

LIST OF PERSONS CONTACTED

USAID/Bolivia

Paul Ehmer	Director, Health and Human Resources
Eugene Szepesy	Director, Program Planning
Ing. Cesar Castellon	Chief, Division of Engineering
Anne Beasley	Monitoring and Evaluation Specialist
Joel Kuritsky	Technical Advisor, AIDS and Child Survival
Lic. David Lozano Herrera	Coordinator, Project Cochabamba
Charles Hash, PhD	Supervisor of Rural Development
Ing. Conrado Camacho	Coordinator for Engineering, CORDEP
Hector Dies de Medina	Project Manager, UDAPSO
Arg. Rafael Indaburo	
Robert Khan	Deputy Director, Program Development
Lic. Luis Fernando Moreno	Program Coordinator, PL 480, Title II
Lic Peter Natielo	Officer, Development and Proyectos
Salvatore Pinzino	

CARE

La Paz

Ing. Gerardo Romero	Project Manager, PN-20
Dr. Gonzalo Ramirez	Technical Advisor, Health
Ing. Victor Rico	Advisor, Yungas Project
Lourdes Gonzales	Nutritionist
Martha Davalos	Social Worker

Sucre

Dr. Juan Carlos Mendoza	Technical Advisor, Health
Amalia Porcel	Technical Advisor, Social
Carlos Miranda	Sub Gerente, PN-20
Ivan Albis	Technical Advisor, Water
Adalid Ramirez	Technical Advisor, Water
Tito Zarate	Agronomist

CCH

Lic. Antonio Gomez Vargas	Director, UIME
Filiberto Ojalvo Saavedra	Director, Water and Sanitation
Dr. Alvaro Munoz-Reyes	Executive Director
Dra. Carmen Casanovas	Director, District Development
Dr. Jose Luis Baixeras	Coordinator, Altiplano-Valle Sur
Ing. Fernando Caballero	Chief, Division of Engineering, Water and Sanitation
Lic. Pastor Maldonado	Educator, Water and Sanitation
Dr. Celso Vargas Padilla	Advisor, Health, Cochabamba (Distrito Valle Crucenos)

DINASBA

Ing. Enrique Torrico Vargas	Chief, Department of Basic Rural Sanitation
Ing. Rony Vega	Director, Basic Rural Sanitation, MAO
Ing. Jorge Calderon	

UNDP/WORLD BANK

Jennifer Sara	Coordinatora, Program for Water and Sanitation
Lic. Jose Decker	General Coordinator,"Prosabar"
Josefina Hagglund	Program Officer
Gerardo Berthin Siles	Program Officer

SNIS

Dr. Ramiro Zuleta Epidemiology, National Health Service, Department of Planning

Proyecto Yacupaj (Potosi) UNDP/World Bank

Virginia Chumasero

UNICEF (Provincia Bustillo)

Ing. Juan Bracamonte (Llagagua)

Ing. Jose Antonio Zuleta (Cochabamba)

National Institute for Statistics

Fernando Mollinedo Sampling specialist, National Demographic Health Survey

DANCHURCHAID - Bolivia

Humberto Caceres Magnus Consultant, Basic Sanitation and Civil Engineering

ANNEX D

DOCUMENTS REVIEWED AND DOCUMENTS CONSULTED

DOCUMENTS REVIEWED

Frederiksen, H., Berkoff, J., and Barber, W. "Principles and Practices for Dealing with Water Resources Issues," World Bank Technical Paper Number 233, 1993.

Churchill, A.; de Ferranti, D.; Roche, Robert; Tajer, Carolyn; Walters, Alan; and Yager, Anthony. "Rural Water Supply and Sanitation," World Bank Discussion Paper 18, 1987.

Cáceres, Humberto. "Definición de los Costos Unitarios de las Opciones Tecnicas en Saneamiento Básico a Incluír en el PROSABAR," April 1994. La Paz, Bolivia, The Republic of Bolivia, "Water Supply for the Dispersed Rural Population of the Bolivian Highlands," UNDP/World Bank, 1990. La Paz, Bolivia.

La Ninez y La Mujer en Bolvia; Analisis de situacion: 1994, UNICEF, Oficina de Bolivia.

Carel de Rooy, (Senior Project Officer, Water and Sanitation Section, Programme Division, UNICEF, New York). "Mission report: Programmed Visit to Bolivia: Water and Sanitation Sector (March 19-22, 1991)."

Narayan-Parker, Deepa. Objectivos e Indicadores para los Proyectos integrados de suministro de agua y saneamiento en colaboracion con la poblacion. Serie tecnica PROWWESS/PNUD, Incorporacion de la mujer a las tareas relativas al agua y al saneamiento, Lecciones Estrategias Instrumentos, New York, Abril 1989

Sommerfelt, Elisabeth; Boerma, J. Ties; Ochoa, Luis, Rutstein, Shea. *Maternal and Child Health in Bolivia: Report on the In-Depth DHS Survey in Bolivia, 1989*, DHS, Institute for Resource Development/Macro Systems, Inc., April 1991.

Karp, Andrew; Martin, Patricia; Guild, Sharon. *Final Evaluation of the CARE/Bolivia Child Survival and Rural Sanitation Project*. Wash Field Report No. 312, prepared for the USAID Mission to Bolivia under WASH activity No. 145. August 1990.

Whittington, Dale; Choe, Kyeong Ae. *Economic Benefits Available from the Provision of Improved Potable Water Supplies: A Review and Assessment of the Existing Evidence*. WASH Technical Report No. 77. Prepared for the Office of Health, Bureau for Research and Development, USAID under WASH Task No. 056, December 1992.

Bolivia: Health Situation and USAID Health Projects Descriptions, 1993, A USAID Health Profile, Center for International Health Information, ISTI.

Politica Nacional de Salud, Fundamentos y Logros, 1989-93, Ministerio de Prevision Social y Salud Publica.

Estadisticas en Salud, 1991-92, Ministerio de Prevision Social y Salud Publica, Direccion General de Salud, Oficina sectorial de Planificacion Proyectos y Recursos Humanos, Subsistema Nacional de Informacion en Salud.

Mapa de Pobreza: Una Guia para la Accion Social; Ministerio de Desarrollo Humano, Republica de Bolivia, UDAPSO, INE, UPP, UDAPE, 1993, D.L. 4-2-391-93.

Proyecto de Desarrollo Comunitario PN-20, regional Sucre, Breve Resumen del Proyecto, CARE-Bolivia, Sucre, Agosto de 1994.

DOCUMENTS CONSULTED

Ministry of Urban Affairs, National Basic Sanitation Directorate (DINASBA), Water for All Program. *National Potable Water and Sanitation Plan.* February 1992.

Karp, Andrés. ISA consultant. *Preliminary Internal Evaluation of the Water and Sanitation Sub-Component.* November 1991.

TVT Associates. James N. Beekt, G. Marr Burdman, B.J. Fisken. *Intermediate Evaluation of the Child and Community Health Project.* January 1992.

Yacupaj Project: UNDP/IBRD/CORDEPO/USP. Activities conducted in the Chayanta province of Potosí.

WASH Project, Technical Report No. 12. *Measuring and Evaluating Diarrhea and Malabsorption in Association with Village Water Supply and Sanitation.*

Beasley, Anne. *Final Evaluation of the Small Development Activities Project, No. 551-0623.* January 1994.

CARE-Bolivia. "Community Development Project PN-20." Sucre Region. August 1994.

Ministry of Urban Development. National Basic Sanitation Directorate (DINASBA). *Basic Sanitation Activities in Bolivia. Achievements for the 1993 Period.* September 1993.

Ministry of Urban Development. National Basic Sanitation Directorate (DINASBA). *Basic Sanitation Activities in Bolivia. Achievements for the 1992 Period.* September 1993.

Ministry of Urban Development. National Basic Sanitation Directorate (DINASBA). *Program for the 1994 Period.* December 1993.

CARE-Bolivia. *Manual for Designing Basic Rural Sanitation Works.* Third Draft. June 1994.

CCH. *Follow-up and Monitoring of Water Systems and Latrines.* Working Document.

CARE-Bolivia. *Monitoring of Quarterly Goals.* Working Document.

CORPAGUAS. *Potable Water - Aiquile - Annual Report.*

Government of Bolivia. Law No. 1551. "On Popular Participation." April 20, 1994.

Juárez, Mercedes and Baldivieso, Salvador. CARE-Bolivia. *Post-evaluation Report - PN-17.* October 1993.

Usín, Luis. *DINASBA, Tariff Policy for Potable Water and Sanitation Systems in Rural Populations and for Potable Water and Sewer Systems in Urban Populations.* November 1992.

CCH. *Presentation of Results. Baseline Survey, Ayo-Ayo District.*

EIA - India. *The Preparation of an Environmental Impact Assessment.* Working Paper.

CCH. *Evaluation of Water Systems and Latrines in Stages O and I.*

Agua Andina. "Objectives and Principles." May 1991.

Al Bartlett, M.A. Anderson, Paul Ahmer, J. Macías. *Midterm Assessment of the Child and Community Health Project.* October 1993.

USAID/Bolivia. *Special Development Activities Project.* 1991.

World Bank. *World Development Report, 1993.*

Richard Noth, UNDP/World Bank. *Study of the Policies and Institutional Framework of the Rural Basic Sanitation Subsector in Bolivia.* September 1991.

Edgar Zabala, UNDP/World Bank. *Evaluation of "YACU" Manual Water Pumps.* October 1991.

Claure Pereira & Asociados. UNDP/World Bank. *Study of Water Resources for the Supply of Potable Water to the Geographically Disperse Population of the Department of Potosí.*

J.N. Becht, F.A. Yánez, M. Zeballos. CARE International. *Report on the External Midterm Evaluation.* Community Development Project PN-20. February 1993.

PROSABAR. *Basic Rural Sanitation Project.* 1994.

CCH. Water and Sanitation Component. *Procedures in the Implementation of Water and Sanitation Systems in Rural Area Communities in the Health Districts of Cochabamba, La Paz, and Santa Cruz.*

CCH. *Guide to Selecting Communities for Gravity-Fed Piped Water Systems and Latrines.*

CCH. *Training Course for Community Water and Sanitation Operators.*

ANNEX E

CHRONOLOGY OF EVALUATION VISIT

14 August 1994	arrival in Bolivia of EHP WS/S specialist
15 - 19 August	preparation of field trip itinerary
21 August	arrival in Bolivia of EHP epidemiologist and EHP economist
22 August	team briefing by USAID/Bolivia mission
22 - 25 August	interviews and preliminary review of data
26 - 17 August	field trip to Altiplano-Valle
29 - 31 August	field trip to Chuquibamba (Sucre to Santa Cruz)
2 - 3 September	field trip to Oruro-Potosi
8 September	debriefing
9 September	submission of draft report
10 September	team departure from Bolivia

ANNEX F

SITE VISITS

FORMS DEVELOPED BY THE EVALUATION TEAM

SITE VISIT CHECKLIST

Project name and location CARE - Altiplano

Community name	Primero de Mayo			Sulfini	
# of houses visited	1	2	3	1	2
KITCHEN					
general cleanliness?	P	A	A	A	A
using clean dish water?	N	N	Y	N	N
soap nearby?	Y	N	Y	Y	Y
adequate ventilation?	N	Y	Y	N	N
animals in cooking area?	N	N	N	N	N
smells or odors?	N	N	N	N	N
food scraps lying around?	N	N	N	N	N
LATRINE					
general cleanliness?	E	E	E	E	E
soap nearby?	N	N	Y	Y	Y
toilet paper available?	Y	Y	Y	Y	Y
waste paper baskets?	Y	Y	Y	Y	Y
water buckets for flushing?	Y	Y	Y	Y	Y
evidence for use of latrine?	Y	Y	Y	Y	Y
nearby spigot?	Y	Y	Y	Y	Y
ENVIRONMENT					
animals corralled?	Y	Y	Y	Y	Y
garbage/junk in yard?	N	N	N	Y	N

stagnant water?	N	N	N	N	N
PERSONAL HYGIENE					
parents?	A	A	A	E	E
children?	A				
elderly?	A				
OVERALL RANKING:	E	E	E	E	E

Key: Y = yes, N = no, E = excellent, A = acceptable, P = poor

SITE VISIT CHECKLIST

Project Name	CARE - Altiplano Valle							
Community name	Murumanani				Chincaya			
# of House visited	1	2	3	4	1	2	3	4
KITCHEN								
general cleanliness?	P	A	A	E	P	P	A	P
using clean dish water?	N	N	N	N	N	N	Y	N
soap nearby?	N	Y	Y	Y	N	Y	Y	N
adequate ventilation?	N	N	N	Y	N	N	N	N
animals in cooking area?	Y	N	N	N	Y	Y	N	N
smells or odors?	N	N	N	N	Y	Y	N	N
food scraps lying around?	Y	N	N	N	Y	Y	N	N
LATRINE								
general cleanliness?	E	E	P	E	P	A	A	A
soap nearby?	Y	Y	Y	Y	N	Y	Y	Y
toilet paper available?	Y	Y	Y	Y	Y	Y	Y	Y
waste paper baskets?	Y	Y	Y	Y	N	Y	Y	Y
water buckets flushing?	Y	Y	Y	Y	Y	Y	Y	Y
evidence use latrine?	Y	Y	Y	Y	Y	Y	Y	Y
nearby spigot?	Y	Y	Y	Y	Y	Y	Y	Y
ENVIRONMENT								
animals corralled?	N	Y	Y	Y	N	N	Y	N
garbage/junk in yard?	Y	N	N	N	Y	N	N	Y
stagnant water?	Y	N	N	N	Y	N	N	N

PERSONAL HYGIENE

parents?	A	A	A	E	P	P	A	A
children?	A							A
elderly?	A				P			

OVERALL RANKING:	A	A	A	A	P	P	P	P

SITE VISIT CHECKLIST

Project Name and location CARE-Alti-Valle CARE-Cochabamba

Community name	Curupampa		Bella Vista		
# of House visited	1	1	2	3	4
KITCHEN					
general cleanliness?	P	A	P	A	E
using clean dish water?	N	Y	N	N	Y
soap nearby?	Y	Y	Y	N	Y
adequate ventilation?	N	Y	Y	Y	Y
animals in cooking area?	Y	Y	Y	Y	N
smells or odors?	N	N	N	N	N
food scraps lying around?	N	N	Y	N	N
LATRINE					
general cleanliness?	E	A	P	A	E
soap nearby?	Y	Y	N	N	Y
toilet paper available?	Y	Y	N	N	Y
waste paper baskets?	Y	Y	N	N	Y
water buckets for flushing?	Y	N	N	N	Y
evidence for use of latrine?	Y	Y	N	N	Y
nearby spigot?	Y	Y	Y	Y	Y
ENVIRONMENT					
animals corralled?	N	N	N	N	Y
garbage/junk in yard?	N	Y	Y	N	N

stagnant water?	N	Y	N	N	N
PERSONAL HYGIENE					
parents?	A	A	P	-	-
children?	-	P	-	-	-
elderly?					
OVERALL RANKING:	A	A	P	A	E

SITE VISIT CHECKLIST

Project Name and location CCH - Santa Cruz

Community name	Achira	Cuevas			Yerba Buena	
# of House visited	1	1	2	3	1	2
KITCHEN						
general cleanliness?	E	P	P	P	P	A
using clean dish water?	Y	N	Y	N	N	Y
soap nearby?	Y	N	Y	N	N	Y
adequate ventilation?	Y	Y	Y	Y	Y	Y
animals in cooking area?	N	Y	Y	Y	Y	N
smells or odors?	N	N	N	N	N	N
food scraps lying around?	N	Y	Y	N	Y	N
LATRINE						
general cleanliness?	E	P	P	P		
soap nearby?	Y	Y	N	N		
toilet paper available?	Y	Y	N	N		
waste paper baskets?	Y	N	N	N		
water buckets flushing?	Y	N	N	N		
evidence use latrine?	Y	Y	Y	Y		
nearby spigot?	Y	Y	Y	Y		
ENVIRONMENT						
animals corralled?	Y	N	N	Y	N	Y
garbage/junk in yard?	N	Y	Y	Y	Y	N
stagnant water?	N	Y	Y	N	Y	N

PERSONAL HYGIENE

parents?	E	A	A	A	A	E
children?	-	A	A	A	-	E
elderly?						
OVERALL RANKING:	E	P	P	P	A	E

SITE VISIT CHECKLIST

Project Name and location	CCH - Santa Cruz				CARE -C'bamba	
Community name		Bermejo				Mesa Rancho
# of House visited	1	2	3	4	1	
KITCHEN						
general cleanliness?	P	P	A	A	P	
using clean dish water?	Y	N	N	Y	N	
soap nearby?	Y	N	Y	Y	Y	
adequate ventilation?	Y	Y	Y	Y	N	
animals in cooking area?	N	Y	Y	N	N	
smells or odors?	N	N	N	N	N	
food scraps lying around?	Y	Y	N	N	Y	
LATRINE						
general cleanliness?	A	P	E	A		
soap nearby?	N	N	Y	Y		
toilet paper available?	N	N	N	N		
waste paper baskets?	N	N	N	N		
water buckets for flushing?	N	Y	N	Y		
evidence for use of latrine?	Y	Y	Y	Y		
nearby spigot?	Y	Y	Y	Y		
ENVIRONMENT						
animals corralled?	N	N	N	N	N	

garbage/junk in yard?	Y	Y	Y	Y	N
stagnant water?	N	Y	N	Y	N

PERSONAL HYGIENE

parents?	E	P	E	E	A
children?	E	-	A	A	-
elderly?					

OVERALL RANKING:	A	A	A	A	A

SITE VISIT CHECKLIST

Project Name and location	UNICEF				UNDP/World Bank			
Community name	Nequeri				Lucas Kahua Kara-ta			
# of House visited	1	2	3	4	1	2		
KITCHEN								
general cleanliness?	A	A	A	A	A	A		
using clean dish H2O?	Y	N	N	N	N	N		
soap nearby?	Y	N	N	N	N	N		
adequate ventilation?	Y	N	N	N	N	N		
animals-cooking area?	N	N	N	N	N	N		
smells or odors?	N	N	N	N	N	N		
food scraps around?	N	N	N	N	N	N		
LATRINE								
general cleanliness?	N/A (No Latrines)				A	P		
soap nearby?	N				N			
toilet paper available?	N				N			
waste paper baskets?	N				N			
H2O buckets - flushing?	N/A				N/A			
evidence use latrine?	Y				Y			
nearby spigot?	N				N			
ENVIRONMENT								
animals corralled?		Y	Y	Y	Y	Y	Y	N
garbage/junk in yard?		Y	N	N	N	N	N	N
stagnant water?		N	N	N	N	N	N	N

PERSONAL HYGIENE							
parents?	E	A	A	A	A	A	P
children?	E	A	-	-	A	A	P
elderly?							
OVERALL RANKING:	A	A	A	A	A	A	A