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**The Health Benefits of Water  
Supply and Sanitation Projects:  
A Review of the World Bank  
Lending Portfolio**

*Background Paper for the IEG Evaluation of  
World Bank Support for Health, Nutrition, and  
Population*

Lisa Overbey



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# **The Health Benefits of Water Supply and Sanitation Projects: A Review of the World Bank Lending Portfolio**

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**Background paper for the IEG evaluation of World Bank support  
for health, nutrition, and population**

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## EXECUTIVE SUMMARY

Extensive evidence has emerged supporting the potential effectiveness of improvements in water supply and sanitation (WSS) infrastructure and behavior change activities on health outcomes, particularly on the incidence of diarrheal and other water-related diseases in developing countries. Diarrheal diseases remain among the five top preventable killers of children under five in developing countries and in many, among the top two. There is a strong correlation between unhygienic conditions of poor households and communities and the frequency and severity of diarrheal episodes.

This paper reviews the contribution of the World Bank's WSS lending portfolio to improving health outcomes, in general and among the poor, as background for the Independent Evaluation Group (IEG) evaluation of the Bank's support for health, nutrition, and population (HNP). Over the past decade (FY97-06), the World Bank committed more than \$7.2 billion to 117 new WSS projects in six developing regions, managed by the WSS Sector Board. This paper reviews the extent to which these projects: cite potential health benefits in design documents; include explicit objectives with respect to improving health outcomes; target environmental improvements that are likely to provide health benefits; target services and health or behavioral outcomes among the poor; and collect evidence on changes in health outcomes. For projects that have closed, it assesses the extent to which expected health benefits or objectives have been achieved.

The health benefits of the World Bank's WSS investments remain obscure. While half of the projects cited potential health benefits and 89 percent financed infrastructure that plausibly could have improved health, only one in ten had an explicit objective to improve health for which it was accountable. Projects approved more recently (FY02-06) are *less* likely to have been justified by health benefits, to have explicit health objectives, or to plan to collect health indicators. They are also less likely to target behavior change, which is critical in transforming infrastructure improvements into sustainable health improvements. Among the 26 completed projects, only four documented changes in the prevalence or incidence of disease. Fewer than half of closed projects included behavior change objectives or activities.

Among the few projects that measured health outcomes, attribution of these changes to improvements in WSS is weak. The extent to which infrastructure improvements have been carried out is generally well documented, and all four completed projects that measured changes in health status reported that it improved. However, poor sanitation and hygiene behaviors can wipe out any potential health benefits. Few of the projects measured these intermediate behavioral indicators that would give greater confidence in the interpretation of the outcomes. Further, they do not account for other factors that may be contributing to these same outcomes, like rainfall, better health facilities, or successful health campaigns.

The lack of information on the relation between World Bank investments in WSS infrastructure and health outcomes reduces the scope for improving the effectiveness of these investments and for understanding better the relation between health and WSS

interventions in improving health outcomes among the poor. While improved access to safe drinking water is an explicit Millennium Development Goal (MDG), the literature shows that better access does not necessarily lead to better health. The WSS sector needs to be equally concerned with the health MDGs of reducing malnutrition and under-five mortality. Indeed, it is difficult to imagine that the health MDGs could be achieved without effective WSS investments that reduce diarrhea and other water-borne and water-washed diseases.

## **ACRONYMS AND ABBREVIATIONS**

AFR:	Africa (Region)
CE:	Cost Effectiveness (Analysis)
CID:	Center for International Development
DFID:	Department for International Development
EAP:	East Asia and Pacific (Region)
ECA:	Europe and Central Asia (Region)
ERR:	Economic Rate of Return
HNP:	Health, Nutrition and Population
IEC:	Information, Education and Communication
IEG:	Independent Evaluation Group
LCR:	Latin America and Caribbean (Region)
LIC:	Lower-Income Country
LMC:	Lower-Middle Income Country
MDG:	Millennium Development Goal
M&E:	Monitoring and Evaluation
MNA:	Middle East and North Africa (Region)
MIC:	Middle-Income Country
NPV:	Net Present Value
ORT:	Oral Rehydration Therapy
PAD:	Project Appraisal Document
SAR:	South Asia (Region)
UMC:	Upper-Middle Income Country
VIP:	Ventilated Improved Pit
WA:	Sanitation
WB:	Solid Waste Management
WC:	Water Supply
WD:	Flood Protection
WHO:	World Health Organization
WS:	Sewerage
WSS:	Water Supply and Sanitation
WZ:	General Water, Sanitation and Flood Protection

# 1. INTRODUCTION

1.1 Poverty and poor health continue to be mutually reinforcing conditions. Poor health is a cause of low productivity and a strong correlation exists between poverty and lack of education, low access to health care services, and unsanitary conditions. Public action to improve the health and productivity of the poor, therefore, depends on the extent to which health and other sectors effectively address the multiple aspects of poverty that undermine health.

1.2 Diarrheal diseases remain among the five top preventable killers of children under five in developing countries and in many, among the top two.<sup>1</sup> The incidence of diarrhea is highest in Sub-Saharan Africa and Latin America, and among children below the age of five, with incidence rates peaking in infants age 6 to 11 months. There is, however, a strong correlation between unhygienic conditions of poor households and communities and the frequency and severity of diarrheal episodes. Improvements in water supply and sanitation infrastructure and behavior change activities have been shown to improve health outcomes, particularly the incidence of diarrheal and other water-related diseases in developing countries.<sup>2</sup>

1.3 Recognition of the potential contribution of water supply and sanitation (WSS) to health outcomes in the Bank's WSS sector dates back to 1993, when it introduced its first comprehensive strategy for water resources.<sup>3</sup> The strategy emphasized the potential health benefits of clean water supply and better hygiene, particularly their role in reducing the incidence of diarrheal diseases. It also advocated public health education, particularly on the safe handling of water, to change hygiene behaviors and improve health outcomes, particularly among the poor.

1.4 The 1993 strategy guided Bank involvement in an increasing number of international partnerships, most notably the Global Water Partnership and World Water Council, both formed in 1996, and the World Bank-United Nations Development Program (UNDP) Water and Sanitation Partnership. However, the comprehensive principles at the heart of the strategy, including those which may have particularly impacted health outcomes, were not initially widely adopted in Bank water-related projects.<sup>4</sup> Initiatives specifically related to sanitation, hygiene, and health became more common after 2000, following the World Water Forum and adoption of the Millennium Development Goals (MDGs), which included indicators for access to safe drinking water and sanitation<sup>5</sup> and reduction in the incidence of preventable diseases.

1.5 In 2004, the Bank's WSS program introduced a sector strategy with objectives and priorities similar to those of the overarching water strategy issued ten years earlier.<sup>6</sup> The

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<sup>1</sup> Bhargava and others. 2006.

<sup>2</sup> WHO, 2004.

<sup>3</sup> World Bank 1993.

<sup>4</sup> Pitman 2002.

<sup>5</sup> Specifically, the MDG is to "reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation" by 2015.

<sup>6</sup> World Bank 2004.

strategy acknowledged the critical relation between better sanitation and hygiene and improved health outcomes, noting that the health benefits from WSS investments depend on a “three-pronged strategy: (i) access to sufficient quantities of water; (ii) sanitary disposal of excreta; and (iii) sound hygiene practices.”<sup>7</sup> Improving health outcomes is recognized as one of five “cross-cutting operational, policy, and institutional priorities”, requiring both investment in WSS infrastructure as well as behavior change.<sup>8</sup> The strategy also advocated targeting interventions to the poor as an institutional priority. The creation of the Sanitation, Hygiene and Wastewater Advisory Service (SWAT) in 2004, and the hiring of a health specialist for the WSS program in 2005 are evidence of the heightened commitment to improving health outcomes in the 2004 strategy.

1.6 This paper reviews the contribution of the World Bank’s water supply and sanitation lending portfolio to improving health outcomes, in general and particularly among the poor, as background for the IEG evaluation of the Bank’s support for health, nutrition, and population (HNP). Over the past decade (FY97-06), the World Bank committed more than \$7.2 billion to 117 new WSS projects in six developing regions, managed by the WSS Sector Board. Specifically, the paper reviews the extent to which these projects: cite potential health benefits in design documents; include explicit objectives with respect to improving health outcomes; target environmental improvements that are likely to provide health benefits; target services and health or behavioral outcomes among the poor; and collect evidence on changes in health outcomes. For projects that have been completed, it assesses the extent to which expected health benefits or objectives have been achieved.

1.7 The paper is organized as follows. The next section provides an overview of the transmission of water-related diseases, particularly diarrhea, and how WSS infrastructure and behavior change activities have been shown to reduce these risks and improve health outcomes. The third section explains the scope and methodology of this review. The fourth section presents the findings for all approved projects and for closed projects, and the final section summarizes the findings and raises issues for management.

## **2. Water-Related Infections and the Potential Impact of WSS Improvements**

2.1 Water-related infections are transmitted through four main routes (Table 2-1). The fecal-oral transmission<sup>9</sup> of diarrheal and other water-related illness such as dysentery, cholera and typhoid fever, occur most often through the ingestion of pathogen-infected water (waterborne transmission) or person-to-person due to lack of water for hygiene or lack of hygiene practices (water-washed transmission).<sup>10</sup> Reducing waterborne

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<sup>7</sup> Ibid, p. 14.

<sup>8</sup> Ibid, p. 20.

<sup>9</sup> Fecal-oral transmission is a process by which pathogens found in the stools of one individual are transferred to the mouth of another.

<sup>10</sup> Bhargava and others. 2006. As shown in this table, most waterborne infections transmitted by the fecal-oral route can equally be transmitted by water-washed routes. Based on a number of studies that show no impact of water quality improvements on diarrheal disease, Cairncross and Valdmanis (2006, p. 777)

transmission requires improvements in water *quality*, while reducing water-washed transmission depends on increasing the *quantity* of water and environmental improvements to source waters. Water and sanitation improvements along with spraying and other treatment can also interrupt water-based transmission of schistosomiasis and guinea worm and transmission of diseases like dengue, malaria, and trypanosomiasis by insects that breed in or bite near water.<sup>11</sup>

**Table 2.1 - Classification of water-related infections**

Transmission route	Description	Examples	Actions to mitigate infection
Waterborne	The pathogen is in water that is ingested	Feco-oral diseases: Diarrheals, dysenteries, typhoid fever	Improvements in water quality, handling, storage and sanitation, treatment of source waters and change in hygiene behavior. Improvements in quantity of water supply, sanitation to reduce water source contamination, treatment of source waters, and change in hygiene behavior
Water-washed (or water scarce)	Person-to-person transmission because of a lack of water for hygiene	Skin and eye infections and feco-oral diseases: Scabies, trachoma plus diarrheals, dysenteries, typhoid fever, and various viral and bacterial pneumonias	
Water-related insect vector	Transmission by insects that breed in water or bite near water	Dengue, malaria, trypanosomiasis	
Water-based	Transmission via an aquatic intermediate host (for example a snail)	Schistosomiasis, guinea worm	

Source: Cairncross and Feachem, 1993. Adapted from White, Bradley and White, 1972.

**2.2 Among water-related infections, diarrheal diseases are of the greatest public health significance**, accounting for an estimated 1.6-2.1 million deaths annually in the decade 1990-2000 and one of the top five preventable causes of under-five child mortality in developing countries.<sup>12</sup> While under-five child mortality due to diarrhea has declined over time, the incidence of diarrhea has been relatively stable.<sup>13</sup> Correct use of oral rehydration therapy (ORT), immunizations against diseases such as cholera that cause diarrhea, the promotion of exclusive breast feeding, and micronutrient supplements have proven effective in reducing the severity and incidence of diarrheal episodes among infants and young children.<sup>14</sup>

conclude that “most endemic diarrheal disease is transmitted by water-washed routes and is not waterborne” (in contrast to epidemic waterborne disease).

<sup>11</sup> Schistosomiasis, for example, can be prevented by eliminating the waterborne snails that act on its host. Measures include warnings against swimming and adding chemicals.

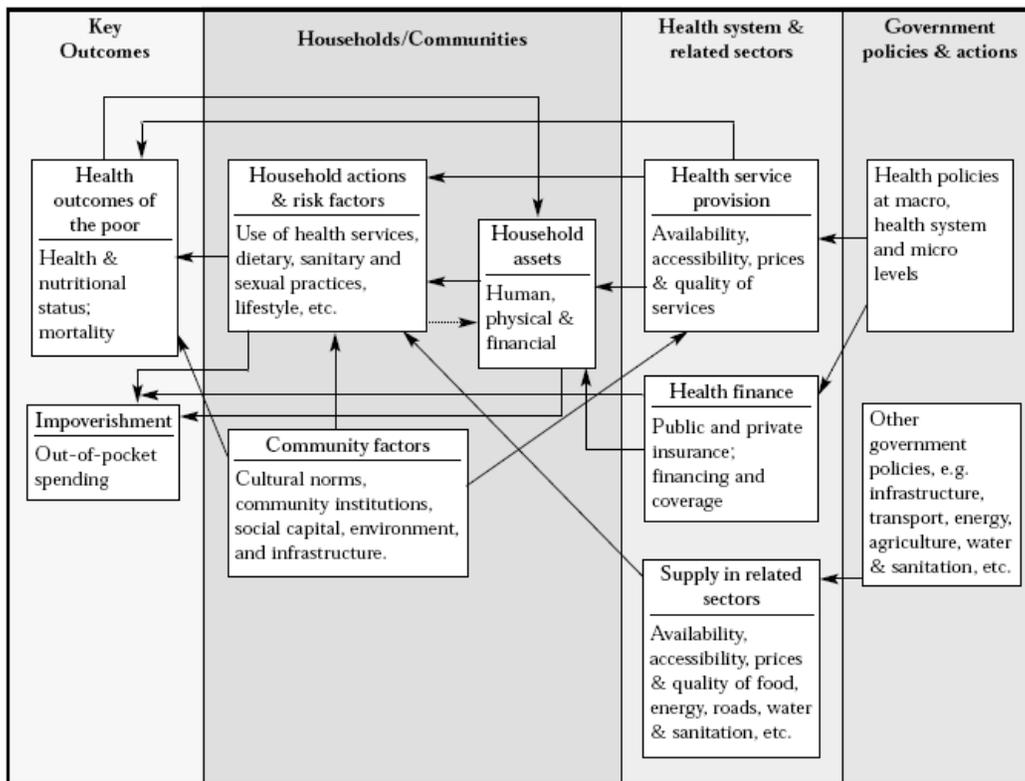
<sup>12</sup> Keutsch and others 2006.

<sup>13</sup> Ibid, p. 374. The authors attribute the decline in child mortality from diarrheal disease to better case management and nutrition.

<sup>14</sup> Huttly and others 1997, Zwane and Kremer 2007

2.3 **The potential of improved water supply, sanitation and hygiene interventions in reducing diarrheal morbidity and mortality is great.**<sup>15</sup> According to the World Health Organization (WHO), poor sanitation, lack of access to clean water, and inadequate hygiene account for approximately 90 percent of childhood diarrhea.<sup>16</sup> The channels through which better water supply, sanitation, and hygiene can affect health outcomes, including reduced diarrhea is presented in Figure 1.1. A wide range of water and sanitation technologies, from piped systems to less sophisticated and less expensive water

**Figure 1.1 Water, sanitation, and hygiene as determinants of health outcomes**



Source: Claeson and others 2001.

<sup>15</sup> While this potential is indeed great, improving health outcomes rarely serves as the primary objectives driving WSS project design and implementation. Expansion of services, increasing utility efficiency, reducing economic costs and the time it takes to fetch water often drive the design of WSS interventions.

<sup>16</sup> WHO, 2004.

supply and sanitation systems (Table 2-2), may reduce the incidence of diarrheal disease and confer other health benefits.<sup>17</sup> Changes in personal and domestic hygiene – through hygiene and sanitation promotion (Table 2-3) – can have equally large impacts.<sup>18</sup> Key health-improving behaviors include hand washing, sanitary disposal of feces, and protecting drinking water from fecal contamination. Recent estimates suggest that improvements in water, sanitation, and hygiene, could reduce the total burden of disease in Africa and Southeast Asia by 4-5 percent.<sup>19</sup>

**Table 2.2 - WHO assessment of “improved” and “not improved” technologies for WSS interventions**

<b>Technologies considered "improved" :</b>	
<b><u>Water supply</u></b>	<b><u>Sanitation</u></b>
Household connection	Connection to a public sewer
Public standpipe	Connection to a septic system
Borehole	Pour flush latrine
Protected dug well	Simple pit latrine
Protected spring	Ventilated improved pit latrine
Rainwater collection	
<b>Technologies considered "not improved"</b>	
<b><u>Water supply</u></b>	<b><u>Sanitation</u></b>
Unprotected well	Service or bucket latrines (where excreta are manually removed)
Unprotected spring	
Vendor-provided water	Public latrines
Bottled water	Open latrine
Tanker truck provision of water	

Source: WHO/UNICEF, 2000.

**Table 2.3 - Definition of hygiene and sanitation promotion**

Hygiene promotion	Processes to promote changes in behavior to reduce the spread of sanitation-related diseases, e.g. washing hands at critical times and safe management of children’s feces, personal and domestic hygiene.
Sanitation promotion	Processes to stimulate household demand for the sanitation hardware necessary to maintain a healthy environment: latrines, toilets, sewer connections, etc. “Demand” here means more than just “desire”; it reflects that desire through a “willingness to pay” towards the cost of the infrastructure.

Source: World Bank <http://go.worldbank.org/Y9ADNX6OM0>, 2007.

<sup>17</sup> Aziz and others 1990, Daniels and others 1990, Esrey and Habicht 1985, Esrey and others 1991, Fewtrell and others 2005, Kremer and Zwane, 2007, VanDerslice and Briscoe 1995. Even modest improvements to service have been shown to improve health outcomes (see Annex 1). Cairncross and Valdmanis (2006) report that the main determinants of the effectiveness of less sophisticated systems are the extent to which improvements are used by all households and adequately maintained. Feachem and others concluded that low-cost sanitation technologies may confer health benefits, but that use and maintenance were key factors.

<sup>18</sup> Curtis and Cairncross 2003, Daniels and others 1990, Esrey and others 1991, Huttly and others 1997, Strina and others 2003.

<sup>19</sup> Cairncross and Valmanis 2006, p. 789.

**2.4 While WSS interventions *can* have an impact on diarrheal and other water-related diseases, the number of high quality studies demonstrating impact is small and there is high variability in the findings.**<sup>20</sup> Curtis and Cairncross (2003), for example, found only 7 studies with interventional designs through the end of 2002 relating hand-washing to the risk of infectious intestinal or diarrheal diseases, only two of which had any randomization, the rest comparing two communities or a pair of communities.<sup>21</sup> Many WSS studies are cross-sectional, showing correlations between health outcomes and household ownership of or access to improved water supply and sanitation, which is also often correlated with better hygiene behavior. In these studies, those “impacted” by WSS infrastructure are essentially self-selected and it is impossible to tell whether health impacts stem from infrastructure or their better hygiene behavior. Studies with case/control designs often compare households in two villages or pairs of villages; because of the externalities of sanitation and water, one would expect results within a village to be highly correlated.

**2.5 Meta-evaluations of the findings of studies of the impact of WSS interventions show great variability in results.** For example, the 1991 review by Esrey and others, using only the 19 relatively rigorous studies available for which diarrhea morbidity impact could be calculated (though few of them were randomized), found an overall median reduction in diarrheal disease of 26 percent, but with a range of no effect to an 84 percent reduction (Table 2-4). A more recent synthesis of findings on the impact of improved hygiene found a median reduction of 33 percent in diarrheal morbidity across 10 relatively rigorous studies, but the impact ranged from 11 to 89 percent.<sup>22</sup> A number of explanations have been offered for the heterogeneity in measured health impacts, among them: variations in the technology and the extent to which interventions were implemented; pre-intervention levels of pathogens, sanitation, water quality and quantity, and hygiene behavior;<sup>23</sup> and the socioeconomic status and culture of the beneficiaries.<sup>24</sup> Beyond the variability in reported results, the sustainability of these impacts has also rarely been assessed.<sup>25</sup>

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<sup>20</sup> Fewtrell and others 2005; Esrey and others 1991, Huttly and others 1997, Curtis and Cairncross 2003

<sup>21</sup> They also note that there was very little information in these studies about “the content of the intervention, the type of message and the number of contacts with targets to gauge how much impact should have been expected.” (p. 279)

<sup>22</sup> Huttly and others 1997.

<sup>23</sup> For example, VanDerslice and Briscoe (1995) found in a cross-sectional study that improved water quality is associated with lower diarrhea in communities with good sanitary conditions, but would have no effect in communities with poor sanitary conditions.

<sup>24</sup> Fewtrell and others 2005,

<sup>25</sup> Fewtrell and others 2005. However, Cairncross and Valdmanis (2006) point to several studies in which new hygiene behaviors, particularly handwashing with soap, have been sustained for years after the intervention.

**Table 2.4** - Reduction in diarrhea morbidity from water supply and sanitation interventions, two meta-evaluations

<b>Intervention</b>	<b>Number of studies<sup>a</sup></b>	<b>Median reduction (%)</b>	<b>Range of reduction (%)</b>
<i>Water supply, sanitation, hygiene<sup>b</sup></i>	19	26	0-68
Water supply and sanitation combined	2	30	*
Sanitation alone	5	36	*
Water quality and quantity	2	17	* <sup>c</sup>
Water quality alone	4	15	* <sup>d</sup>
Water quantity alone	5	20	*
Hygiene behavior alone			
Esrey and others 1991	6	33	14-48 <sup>c</sup>
Huttly and others 1997	10	33	11-89

Source: Esrey and others 1991, except where noted.

Notes: \* Not reported.

a. “Rigorous” studies only.

b. Includes a wide variety of different types of water and/or sanitation and/or hygiene interventions reviewed by Esrey and others 1991 for which the impact on diarrhea morbidity could be calculated.

c. Looking across all 22 studies reviewed (of which only 2 were rigorous), “In the studies that reported a health benefit, the water supply was piped into or near the home, whereas in those that reported no benefit, the improved water supplies were protected wells, tubewells, and standpipes.” (Esrey and others 1991, p. 613) Zwane and Kremer (2007) report that evidence of the health benefits of improvements in rural communal water supplies is scant.

d. Three of the four studies found little or no association between drinking water quality and childhood diarrhea (Esrey and others 1991, p. 613).

e. Ibid, p. 613-614.

**2.6 The extent to which water supply, sanitation, and hygiene interventions are complements or substitutes in producing health benefits is unclear.** Fewtrell and others (2005) and Esrey and others (1991) suggest that, based on comparisons of outcomes in their meta-evaluations, the impact of combined interventions is similar to the effect of single interventions—that is, the interventions are not additive, but substitutes. However, it is rarely possible to disentangle the effects of components of an integrated intervention, and there are very few studies in which more than one type of intervention is tested in the same country, against a control group.<sup>26</sup> Furthermore, the health impact of these interactions, like that of individual interventions, is likely to be context-specific. This is borne out by a recent simulation of five different “interdependent transmission pathways” of diarrheal disease.<sup>27</sup> The level of preventable disease was estimated by comparing two scenarios, one in which all households are exposed to contaminated drinking water and another in which they all receive enhanced water quality. The simulation revealed that if sanitation is poor, “water quality improvements may have minimal impact, regardless of [the] amount of water contamination. If each transmission pathway alone is sufficient to maintain diarrheal disease, single-pathway interventions will have minimal benefit”. On the other hand, if only a single pathway is critical to

<sup>26</sup> Huttly and others 1997. A recent exception is Luby and others (2006), who found in a randomized study in squatter settlements of Karachi, Pakistan that different types of water treatment and handwashing promotion, individually and in combination, were associated with a reduction in diarrhea of 51% to 64%. The combined interventions did not necessarily have greater impact than the single-interventions. The authors speculate that this may be due to the fact that “65-75% of diarrhea ...in this sewage contaminated environment is caused by pathogens that require a large dose to cause disease. A substantial reduction in the number of organisms ingested, either through hand washing or water treatment, may markedly reduce diarrhea.”

<sup>27</sup> Eisenberg, Scott and Porco 2007.

maintaining diarrheal disease, a single intervention may be sufficient to interrupt transmission, and interventions that address non-critical pathways can be expected to have little effect.<sup>28</sup>

**2.7 Even when there are health benefits to WSS interventions, they do not necessarily reach the poor.** The impact of WSS improvements on the health of the poorest beneficiaries is rarely studied; the literature on the impact of WSS improvements focuses on average health benefits. However, a handful of studies that have examined the distribution of health benefits suggest that they may not reach the poor. For example, using propensity score matching techniques, Jalan and Ravallion (2003) found that expanding piped water had no impact on the prevalence and duration of diarrhea in the lowest two income quintiles. There were health gains among the lowest quintiles only if a woman in the household had more than a primary education. Daniels and others (1990) found a 24 percent average reduction in diarrhea associated with ownership of a ventilated improved pit (VIP) latrine in a case-control study in Lesotho, but the largest declines were among households with better hygiene and water use behavior and higher socioeconomic status. Esrey and Habicht (1988) found in Malaysia that improvement in water quality was associated with lower infant mortality only among the literate.

2.8 In summary, water supply, sanitation, and hygiene interventions have the potential to convey health benefits, but these benefits cannot be assumed. The effectiveness depends on contextual factors, local conditions and pathogens, and technology. Furthermore, even when health benefits are produced, it cannot be assumed that they are reaching the poor.

### 3. METHODOLOGY

3.1 This review systematically assesses the objectives or outcomes of Bank-supported WSS projects with respect to their anticipated health benefits. This includes specific objectives to improve health outcomes (among the entire beneficiary population or specifically among the poor), infrastructure improvements likely to have health benefits, collection of health indicators and, for projects that have closed, the demonstrated health benefits. The WSS projects reviewed include all active and closed projects approved over a ten-year period between fiscal years 1997-2006 (FY97-06). For the purposes of this review, this comprises all projects with financial commitments to sector codes WA (sanitation), WC (water supply), WS (sewerage), and WZ (general water, sanitation, and flood protection), and managed by the WSS Sector Board. Projects that are solely aimed

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<sup>28</sup> Briscoe (1984) highlighted this complexity in determining attribution and prioritization of interventions through an hypothetical example. Epidemiologists attempted to determine the relative importance three different transmission routes of a diarrhea causing bacteria. When the effects on disease incidence of eliminating one of three transmission routes is known, Briscoe concludes, "If disease incidence falls sharply after introduction of the intervention, the affected route *is* the primary transmission route. However, if the disease incidence does *not* fall sharply, no conclusions can be drawn about the relative importance of different transmission routes." In contrast, Cairncross and Valdmanis (2006), note the inconclusive evidence that changes in handwashing and sanitation behavior are unlikely to occur in the absence of adequate water supply or latrine and assume, based solely on compelling logic, that the effects of water supply, sanitation, and hygiene are independent and additive in calculating the effect of WSS interventions on the global disease burden.

at flood protection (WD) and solid waste management (WB) are not included in the review. Supplemental credits and projects approved under emergency procedures were also excluded.

3.2 In total, 117 projects were reviewed; sixty-two projects approved from FY97-01 and 55 projects approved between FY02-06. Eighty-eight projects remain active while 29 had already closed (Table 3-1). A list of the projects reviewed is in Annex 2.

**Table 3.1 - WSS Projects Included in the Portfolio Review**

Approval Date	Active	Closed	Total
1997-2001	33	29	62
2002-2006	55	0	55
<b>Total</b>	88	29	117

3.3 The review assesses the design of WSS projects on specific questions or themes in order to determine the extent to which health outcomes played a role in the rationale for design and implementation of all projects approved over the past ten years. The Staff Appraisal Report or Project Appraisal Document (PAD) was reviewed for each project, to answer the following questions:

- Does the project cite potential health benefits as a justification for or benefit of the project?
- Does it include explicit objectives with respect to improvements in health outcomes?
- Does it specifically target environmental improvements (e.g., water quality, reduction of pathogens) that are likely to provide public health benefits?
- Does it specifically target services or health outcomes *among the poor*?
- Does it propose to collect health indicators in general and among the poor?
- Does it specifically target behavior change among the poor?

3.4 The Implementation Completion Report (ICR) and, when available, IEG Project Performance Assessment Reports (PPAR), were used to assess achievements in health outcomes among the set of closed projects.<sup>29</sup> Closed projects were reviewed to assess the following questions:

- Did the project achieve its explicit health objectives?
- Did it implement environmental infrastructure expected to provide public health benefits?
- Did it collect data on health outcomes?
- Did it demonstrate improvements in health outcomes?

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<sup>29</sup>PPARs assess the development effectiveness (relevance, efficacy, and efficiency) and the lessons learned from completed World Bank projects, based on field visits. About one in four completed Bank projects is subject to a PPAR. Five of the closed WSS projects included in the portfolio review have a PPAR: Albania Water Supply Urgent Rehabilitation Project (P066491); Nigeria Small Towns Water Supply and Sanitation Program Pilot Project (P064008); Romania Bucharest Water Supply Project (P008778); Yemen Sana'a Water Supply and Sanitation Project (P005907) and Yemen Taiz Water Supply Pilot Project (P043367).

3.5 In addition, the review documented the extent to which the projects targeted health outcomes in the population (on average) and/or health outcomes among the poor.

## 4. FINDINGS

4.1 **Newly approved World Bank commitments in the WSS portfolio from FY97-06 totaled US\$ 7.2 billion** (Table 4-1). The highest commitments were in East Asia and Pacific (EAP) and Africa (AFR), the lowest in Eastern Europe and Central Asia (ECA). The greatest number of projects (23 percent) was approved in EAP, followed closely by AFR and ECA (21 percent each). Fifteen percent of projects were approved in the Latin America and Caribbean (LCR) region, 11 percent in the Middle East and North Africa (MNA) region, and 9 percent in the South Asia (SAR) region.

**Table 4.1 - Commitments and number of WSS projects by region, FY97-06**

Region	FY97-01		FY02-06		FY97-06			
	Commitments	Projects	Commitments	Projects	Commitments		Projects	
	\$ millions	No.	\$ millions	No.	\$ millions	%	No.	%
East Asia	1,388.71	15	1,213.41	15	2,602.12	36	27	23
Africa	541.40	13	762.60	11	1,304.00	18	24	21
MNA	325.20	7	774.56	6	1,099.76	15	13	11
LCR	405.30	9	406.60	8	811.90	11	17	15
South Asia	196.50	4	527.20	7	723.70	10	11	9
ECA	438.55	14	231.54	11	670.09	9	25	21
<b>Total</b>	<b>3,295.66</b>	<b>62</b>	<b>3,915.91</b>	<b>55</b>	<b>7,211.57</b>	<b>100</b>	<b>117</b>	<b>100</b>

4.2 The Bank's investment in WSS was directed primarily at lower-income (LIC) and lower-middle income (LMC) countries (87 percent). Only thirteen percent of Bank commitments in the WSS portfolio went to upper-middle income countries (UMC, Table 4-2).<sup>30</sup> Overall, the number of Bank WSS projects approved in LIC and LMC remained fairly stable over time, while the number in UMC declined.

**Table 4.2 - Commitments by country economic classification for WSS projects approved FY97- 06**

Region	FY97-01		FY02-06		FY97-06	
	Commitments (\$ millions)	Projects	Commitments (\$ millions)	Projects	Commitments (\$ millions)	Projects
Low-income	1,208.81	25	1,631.31	24	2,840.12	49
Lower-middle income	1,782.95	28	1,958.23	25	3,741.18	53
Upper-middle income	303.90	9	326.37	6	630.27	15
<b>Total</b>	<b>3,295.66</b>	<b>62</b>	<b>3,915.91</b>	<b>55</b>	<b>7,211.57</b>	<b>117</b>

<sup>30</sup> The economies are classified by the World Bank according to 2005 GNI per capita, calculated using the World Bank Atlas Method. The groups are low income (LIC), \$875 or less; lower middle income (LMC), \$876 - \$3,465; upper middle income (UMC), \$3,466 - \$10,725; and high income (HIC), \$10,726 or more.

## A. APPROVED PROJECTS

### Anticipated health benefits

4.3 **Half of the WSS projects approved between FY97-06 were justified in appraisal documents to some extent by the promise of health benefits**, although the share has been in decline: fifty-five percent of projects approved between FY97-01 cited health benefits, compared to 44 percent for FY02-06.

4.4 There were four main types of health benefit cited. The responses are not mutually exclusive and many projects cited more than one justification. About a third of all projects anticipated a reduction in the incidence of water-borne, infectious, parasitic or diarrheal diseases (31 percent) and about one in four cited a more general improvement in public health (22 percent) (Table 4-3). There were no significant variations by region or between LIC and middle-income countries (MIC) on the likelihood that projects would be justified by health benefits (not shown).

**Table 4.3 - WSS Projects justified by health benefits, FY97-06**

Is the project justified by health benefits?	FY97-01		FY02-06		Total	
	No. of projects	%	No. of projects	%	No. of projects	%
Yes	33	<u>55</u>	24	<u>44</u>	57	<u>50</u>
Of which the following benefits were cited:						
• Reduction in the incidence of water-borne, infectious, parasitic, or diarrheal diseases	23	<u>37</u>	13	<u>24</u>	36	<u>31</u>
• General health benefits or improvements in public health cited but with no specific mention of outcomes	13	<u>21</u>	13	<u>24</u>	26	<u>22</u>
• Decreased morbidity and/or mortality	4	<u>6</u>	1	<u>2</u>	5	<u>4</u>
• Improvements in well-being and/or living standards	3	<u>5</u>	6	<u>11</u>	9	<u>8</u>
No	29	<u>45</u>	31	<u>66</u>	60	<u>50</u>
(Total projects)	(62)		(55)		(117)	

### Health objectives

4.5 **While half of the projects justified themselves in terms of health benefits in the PAD, only one in 10 included explicit objectives to improve health outcomes and this has declined over time** (Table 4-4). Objectives to improve health and sanitary conditions and objectives to improve well-being or enhance welfare among project beneficiaries occurred with the most frequency. Overall, projects approved between FY97-01 were more likely to have explicit health objectives (15 percent) than were projects approved between FY02-06 (5 percent).

4.6 Projects in the MNA region were the most likely to have an explicit health objective (23 percent, not shown). The likelihood that a project would include an explicit health objective did not differ much between LIC and MIC (12 percent and 9 percent, respectively).

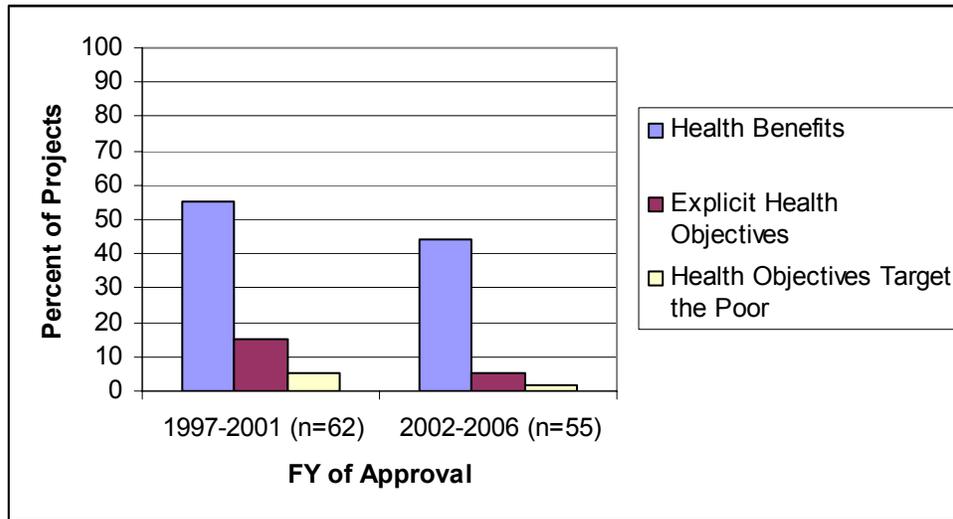
4.7 Of the twelve projects containing explicit health objectives, only four (3 percent of all projects) had explicit objectives to improve health outcomes *among the poor*. The poor were to be targeted through project implementation in rural, remote or poor regions. One case discussed the use of special selection criteria in order to ensure conditions were improved in rural areas containing the greatest proportion of the region's poor.<sup>31</sup>

**Table 4.4 - WSS Projects with an explicit objective to improve health outcomes, FY 97-06**

Are there explicit objectives to improve health outcomes?	FY97-01		FY02-06		Total	
	No. of projects	%	No. of projects	%	No. of projects	%
Yes	9	<u>15</u>	3	<u>5</u>	12	<u>10</u>
Of which, the objective is to improve health outcomes <i>among the poor</i>	3	<u>5</u>	1	<u>2</u>	4	<u>3</u>
Specific health outcome objectives:						
• Improve health and sanitary conditions	3	<u>5</u>	3	<u>5</u>	6	<u>5</u>
• Improve general well-being/enhance welfare	3	<u>5</u>	1	<u>2</u>	4	<u>3</u>
• Reduction in the incidence of water borne diseases	2	<u>3</u>	0	<u>0</u>	2	<u>2</u>
• To raise living standards	1	<u>2</u>	0	<u>0</u>	1	<u>1</u>
• Improve health productivity	1	<u>2</u>	0	<u>0</u>	1	<u>1</u>
No	53	<u>85</u>	52	<u>95</u>	105	<u>90</u>
(Total)	(62)		(55)		(117)	

<sup>31</sup>The four with specific objectives to improve health outcomes among the poor include: Argentina Buenos Aires Infrastructure Sustainable Development Project (P088032); China National Rural Water Supply Project (P003637); Moldova Pilot Water Supply and Sanitation Project (P074469) and Morocco Rural Water Supply and Sanitation Project (P040566).

**Figure 4.1 - Percent of WSS Projects justified by health benefits and containing explicit health objectives, FY97- 06**



### **Inclusion of health benefits in the economic analysis**

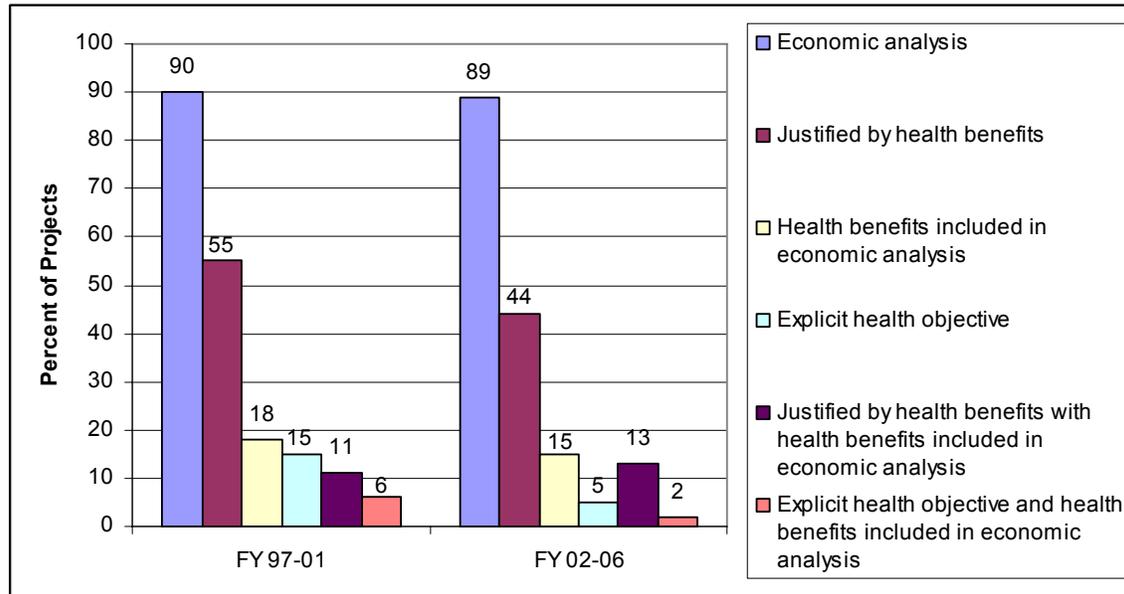
**4.8 The postulated health benefits of the WSS portfolio were generally not reflected in the projects' economic analysis.** While half of the projects in the WSS portfolio were justified in terms of health benefits, only 14 of these (12 percent) included health benefits in their economic analysis (Table 4.5, Figure 4-2).<sup>32</sup> Health benefits were more likely to be included in the economic analysis if the project contained an explicit objective to improve health outcomes: Forty-two percent of the projects containing an explicit objective to improve health outcomes included health benefits in their economic analysis (Figure 4-2). Overall, 19 projects (16 percent) in the WSS portfolio conducted an economic analysis at appraisal which factored in health benefits.

<sup>32</sup> This includes calculations economic rate of return (ERR) and net present value (NPV) as well as cost effectiveness (CE) analyses.

**Table 4.5 –Inclusion of health benefits in project economic analysis**

Were health benefits included in the project's economic analysis?	FY97-01		FY02-06		Total	
	No. of projects	(%)	No. of projects	(%)	No. of projects	(%)
<b>Projects with economic analysis (ERR, NPV, cost-effectiveness analysis), of which:</b>	<b>56</b>	<b><u>90</u></b>	<b>49</b>	<b><u>89</u></b>	<b>105</b>	<b><u>90</u></b>
<b>Health benefits are included in economic analysis</b>	<b>11</b>	<b><u>18</u></b>	<b>8</b>	<b><u>15</u></b>	<b>19</b>	<b><u>16</u></b>
<i>Assumption on health benefits are explicit</i>	7	<u>11</u>	6	<u>11</u>	13	<u>11</u>
Benefits defined as:						
• Reduced medical expenditure	6	<u>10</u>	6	<u>11</u>	12	<u>10</u>
• Reduction in time/earnings lost due to illness	2	<u>3</u>	5	<u>9</u>	7	<u>6</u>
• Savings from not having to boil or purchase water	2	<u>3</u>	1	<u>2</u>	3	<u>3</u>
• Reduction in the Burden of Diseases/lives lost	1	<u>2</u>	2	<u>4</u>	3	<u>3</u>
• Avoided potential loss of tourism	1	<u>2</u>	0	<u>0</u>	1	<u>1</u>
• Health care provided to people living nearby	1	<u>2</u>	0	<u>0</u>	1	<u>1</u>
<b>Health benefits are excluded in economic analysis</b>	<b>45</b>	<b><u>73</u></b>	<b>41</b>	<b><u>75</u></b>	<b>86</b>	<b><u>74</u></b>
Reasons for not including health benefits:						
• Reasons not discussed	29	<u>47</u>	29	<u>53</u>	58	<u>50</u>
• Difficult to quantify	10	<u>16</u>	13	<u>24</u>	23	<u>20</u>
• Difficult to measure due to lack of data	6	<u>10</u>	4	<u>7</u>	10	<u>9</u>
• Difficult to measure due to extensive and costly epidemiological studies	2	<u>3</u>	0	<u>0</u>	2	<u>2</u>
• Relationship between water improvements and health unclear	2	<u>3</u>	0	<u>0</u>	2	<u>2</u>
• Assumed that health benefits are captured in the willingness to pay	1	<u>2</u>	1	<u>2</u>	2	<u>2</u>
• Health benefits to be measured in ex-post ERR analysis	1	<u>2</u>	0	<u>0</u>	1	<u>1</u>
<b>Projects with no economic analysis.</b>	<b>6</b>	<b><u>10</u></b>	<b>6</b>	<b><u>11</u></b>	<b>12</b>	<b><u>10</u></b>
<b>Total Number of Projects</b>	<b>(62)</b>		<b>(55)</b>		<b>(117)</b>	

**Figure 4.2 – Projects justified by health benefits or with an explicit health objective that also factor health benefits into economic analysis, FY 97-06**



## Environmental Improvements presumed to improve health

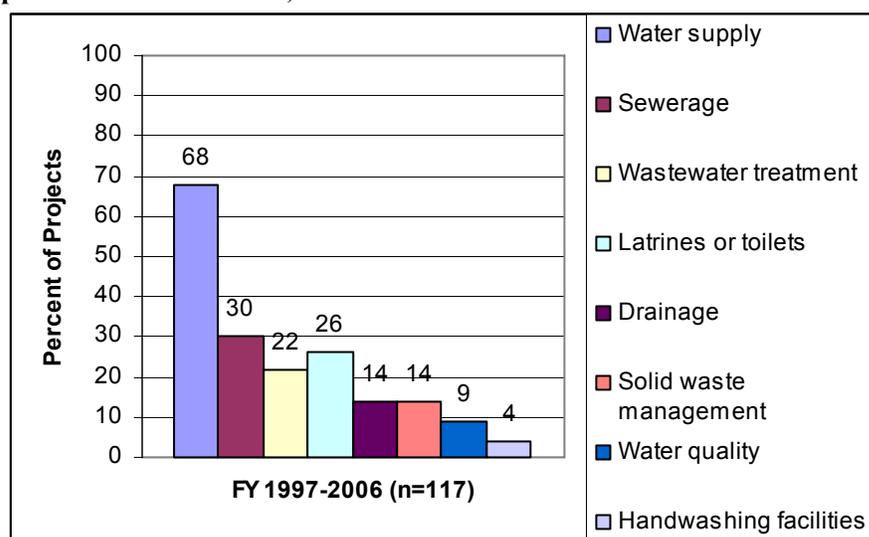
**4.9 While the share of WSS projects with explicit health objectives is small, an overwhelming majority of projects (89 percent) invested in environmental improvements with the potential to provide health benefits** (Table 4-6). A small decrease occurred between the first and second half of this ten-year period from 92 to 85 percent. These investments most often included construction and rehabilitation of water supply infrastructure (68 percent); sanitation improvements, such as construction and rehabilitation of sewerage systems (30 percent); improvements in waste water treatment plants (26 percent); and construction of latrines and toilets (22 percent, Figure 4-2). There are no significant changes in the types of environmental improvements over the two time periods.

**4.10 About one in four projects (28 percent) specifically targeted environmental improvements with potential health benefits to the poor** (Table 4-7). This share has remained stable over time. Nearly one in five (17 percent) intended to reach the poor by geographic targeting of improvements to rural areas or regions or districts with a disproportionate share of poor inhabitants, while only 4 percent targeted individuals or households within a community, based on measurements of economic status. Three percent of projects targeted on the basis of group characteristics, such as indigenous communities, ethnic, or occupational groups, or through selecting project areas based on group characteristics of beneficiaries, such as indigenous communities, ethnic or occupational groups or on the basis of a community being relatively underserved or unserved in the improvements provided by the project. The likelihood of targeting environmental improvements specifically to the poor was greatest in the LCR region (59 percent); however, it varied little between LIC and MIC countries (not shown).

**Table 4.6 - WSS Projects containing environmental improvements likely to provide health benefits, FY97-06**

Environmental improvements likely to provide health benefits?	FY97-01		FY02-06		Total	
	No. of projects	%	No. of projects	%	No. of projects	%
Yes	57	<u>92</u>	47	<u>85</u>	104	<u>89</u>
Of which environmental improvements likely to provide health benefits are targeted towards <i>the poor</i>	17	<u>27</u>	16	<u>29</u>	32	<u>28</u>
Specific environmental improvements:						
• Construction/rehabilitation of water supply infrastructure	44	<u>71</u>	38	<u>69</u>	80	<u>68</u>
• Construction/rehabilitation of sewerage systems & increasing connections to them	20	<u>32</u>	17	<u>31</u>	35	<u>30</u>
• Construction of community or household latrines or toilets	17	<u>27</u>	11	<u>20</u>	26	<u>22</u>
• Construction/rehabilitation of wastewater treatment plants	15	<u>24</u>	16	<u>29</u>	31	<u>26</u>
• Improvements in the quality of water, making existing water supplies potable	11	<u>18</u>	6	<u>11</u>	16	<u>14</u>
• Construction of stormwater management/drainage	8	<u>13</u>	8	<u>15</u>	16	<u>14</u>
• Improvements in solid waste management/dumps	4	<u>6</u>	7	<u>13</u>	11	<u>9</u>
• Construction of handwashing facilities	3	<u>5</u>	2	<u>4</u>	5	<u>4</u>
No	5	<u>8</u>	8	<u>15</u>	13	<u>11</u>
(Total)	(62)		(55)		(117)	

**Figure 4.3 - Percent of WSS Projects containing environmental improvements likely to provide health benefits, FY97-06**



**Table 4.7 - Targeting among the poor of environmental improvements likely to provide health benefits**

Environmental improvements likely to provide health benefits?	FY97-01		FY02-06		Total	
	No. of projects	%	No. of projects	%	No. of projects	%
Yes	57	<u>92</u>	47	<u>85</u>	104	<u>89</u>
Of which environmental improvements likely to provide health benefits are targeted towards <i>the poor</i>						
	17	<u>27</u>	16	<u>29</u>	33	<u>28</u>
• <i>Geographic targeting</i>	11	<u>18</u>	9	<u>16</u>	20	<u>17</u>
• <i>Targeting of entire villages or neighborhoods based on the share of poor in the populations</i>	5	<u>8</u>	0	<u>0</u>	5	<u>4</u>
• <i>Targeting on the basis of group characteristics</i>	3	<u>5</u>	2	<u>4</u>	5	<u>4</u>
• <i>Targeting of individuals or households based on their economic status (within a community)</i>	2	<u>3</u>	8	<u>15</u>	10	<u>9</u>
• <i>Targeting of "unserved" or "underserved" communities</i>	<u>0</u>	<u>0</u>	<u>2</u>	<u>4</u>	<u>2</u>	<u>2</u>
No	5	<u>8</u>	8	<u>15</u>	13	<u>11</u>
(Total)	(62)		(55)		(117)	

### Behavior change components

4.11 **Thirty-six percent of the projects approved between FY 97-06 included some form of behavior change education or promotion** (Table 4-8). Hygiene education and promotion education activities proved the most common type of planned behavior change component during FY 97-06, found in one of every four projects. Fifteen percent of the projects planned sanitation education and promotion activities. Ten percent of projects mentioned the promotion of specific behaviors such as handwashing with soap and only two projects planned school-based hygiene and sanitation programs.

4.12 **Overall, the number of projects specifically targeting behavior change components towards the poor was small** (9 percent). Nearly twice the share of projects approved during the first half of the review period had behavior change components targeted to the poor, compared with the second half (from 11 percent, FY97-01, to 5 percent, FY02-06). MICs were three times as likely to target behavior change components towards the poor as LICs (12 percent versus 4 percent). Projects in the Latin America and East Asia regions were most likely to target behavior change components towards the poor.

**Table 4.8 – Percent of WSS projects that target behavior change**

Project targets behavior change?	FY97-01		FY02-06		Total	
	No. of Projects	%	No. of Projects	%	No. of Projects	%
Yes	23	<u>37</u>	19	<u>35</u>	42	<u>36</u>
Of which behavior change is targeted <i>among the poor</i>	7	<u>11</u>	3	<u>5</u>	10	<u>9</u>
Specific types of activities proposed to promote behavior change:						
• Hygiene education/promotion	19	<u>31</u>	10	<u>18</u>	29	<u>25</u>
• Sanitation education/promotion	12	<u>19</u>	5	<u>9</u>	17	<u>15</u>
• Mentions promotion of specific behaviors such as hand washing, use of soap, safe handling of water, use of latrines and toilets.	7	<u>11</u>	5	<u>9</u>	12	<u>10</u>
• School based hygiene and sanitation promotion	2	<u>3</u>	0	<u>0</u>	2	<u>2</u>
No	39	<u>63</u>	36	<u>65</u>	75	<u>64</u>
(Total)	(62)		(55)		(117)	

4.13 The Fourth Rural Water Supply Project in China stands out as one of the few projects included in the portfolio that combined rural WSS infrastructure improvements with sanitation and hygiene education services to change WSS behavior. As this ongoing project also proposes to collect data on health outcomes, the potential exists to monitor significant improvements in health outcomes.

### Health Indicators

4.14 **About one in five of the WSS projects proposed to collect health outcome indicators, although the share has declined over time** (Table 4-9). The two main categories of health outcome indicators pertaining to health were: prevalence or incidence of disease and indicators measuring changes in sanitation and hygiene behavior. Health outcome indicators focusing specifically on changes in the incidence of water borne or diarrheal diseases and child morbidity and mortality were to be collected by 17 percent of the projects. Only two projects over the 10-year period proposed to collect behavior change data.

**Table 4.9 - WSS Projects proposing to collect health indicators, FY97-06**

Does the project propose to collect health outcome indicators?	FY97-01		FY02-06		Total	
	No. of projects	%	No. of projects	%	No. of projects	%
Yes	14	23	8	15	22	19
Of which the health indicators will be collected <i>among the poor</i>	2	3	2	4	4	3
Specific health outcome indicators:						
• Incidence or prevalence of disease <sup>33</sup>	12	19	8	15	20	17
• Behavior change indicators <sup>34</sup>	2	3	0	0	2	2
• No	48	77	47	85	95	81
(Total)	(62)		(55)		(117)	

4.15 **Four projects proposed to collect health indicators specifically among the poor.**<sup>35</sup> In three of the four cases, the projects proposed to collect health indicators in rural areas. Two projects target the poor for collection of health indicators through their targeting of entire villages or neighborhoods based on their share of the poor. The Moldova Pilot Water Supply and Sanitation Project is the only project that has indicators for both water quality and health outcomes and also seeks to target to some extent the poor.

4.16 The greatest share of WSS projects that planned to collect health indicators were in the ECA region (48 percent), followed closely by South Asia (45 percent, not shown). Projects in MICs were slightly more likely to plan to collect health indicators than project in LICs (35 percent vs. 29 percent, respectively).

## **B. CLOSED PROJECTS**

4.17 Twenty-nine of the 117 projects have closed, all of them approved in the first five years of the period under review (FY97-01). However, ICRs for only 26 of the projects were available at the time of this assessment and serve as the basis for analysis of their achieved objectives.<sup>36</sup> Half of the closed projects were in LICs, 42 percent in LMCs and

<sup>33</sup>The following indicators were included in this category: reduction in the severity or incidence of diarrheal episodes; reduction in diarrheal morbidity among young kids; annual cases treated/annual deaths due to waterborne and vector-borne diseases; health problems related to incidence of waterborne diseases; decrease in sanitation-related diseases; incidence of diseases; prevalence of waterborne maladies; reduction in child morbidity and/or mortality; quantity of arsenic ingested; stunting rates

<sup>34</sup> Improvement in water related behavior (i.e., handwashing)

<sup>35</sup> Argentina Buenos Aires Infrastructure Sustainable Development Project (P088032); China National Rural Water Supply Project (P003637); Moldova Pilot Water Supply and Sanitation Project (P074469) and Morocco Rural Water Supply and Sanitation Project (P040566).

<sup>36</sup> Four projects approved between 1997 and 2001; Mauritius (P001921), Uzbekistan (P009121), and Vietnam (P051552 and P052037) are still active. Additionally, the official ICRs for three closed projects; Uzbekistan (P044942), Bangladesh (P050745) and Ecuador (P049924) were not available in time to be

8 percent in UMCs. The greatest share of closed projects were in ECA (35 percent), followed by AFR (23 percent), East Asia (19 percent); MNA (15 percent); South Asia (12 percent) and LCR (8 percent). The results for closed projects are summarized in Figure 4.4.

### **Implementation of investments likely to provide health benefits**

**4.18 Infrastructure components.** All but one of the completed projects planned to invest in environmental infrastructure likely to provide health benefits; twenty-one of them (81 percent) at least partly implemented their planned improvements. (Table 4-10). However, while 100 percent of the projects with wastewater treatment, water quality, or solid waste management investments implemented them, a third or fewer projects actually implemented planned latrines and toilets, storm management, and handwashing facilities.

**4.19 Behavior change components.** Only about a third of closed WSS projects (35 percent) planned investments to promote behavior change (Table 4-10). Of the nine projects, eight planned investments in hygiene education and one project planned investments in behavior change for HIV/AIDS prevention.<sup>37</sup> Seven of the eight projects implemented, to some extent, planned hygiene education and promotion activities.<sup>38</sup> In total, 78 percent of the closed projects successfully implemented their planned behavior change components. (Table 4-10).<sup>39</sup>

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included in the review. The Wastewater Disposal in Tourism Center Project in the Dominican Republic (P059510) is the only project from the LCR region included in the sample of closed projects.

<sup>37</sup> The HIV/AIDS component of the Zambia Mine Township Services Project (P064064) was to promote HIV/AIDS awareness and behavior change, mainly among municipal employees and their families.

<sup>38</sup> Planned hygiene education/promotion activities were not implemented in the Philippines Local Governments Unit Urban Water and Sanitation Project (P039022). The Sanitation component, which included the hygiene education activities, was not implemented.

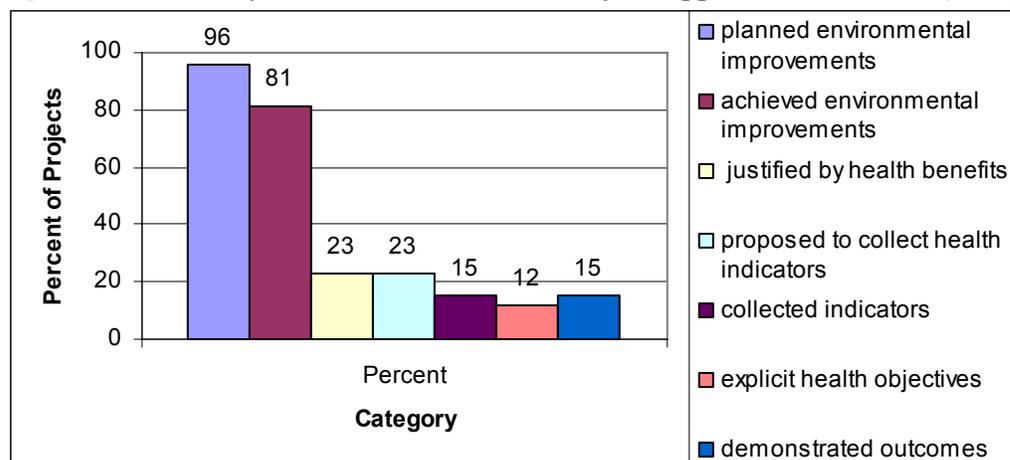
<sup>39</sup> The nine projects with planned investments in behavior change are: China Third National Rural Water Supply Project (P003637); Nepal Rural Water Supply and Sanitation Project (P010516); Turkmenistan Water Supply and Sanitation Project (P008867); Kazakhstan Pilot Water Supply Project (P0453030); Madagascar Rural Water Supply and Sanitation Project (P001563); Ghana Second Community Water and Sanitation Project (P050616) and Zambia Mine Township Services Project (P064064). The two projects that did not successfully implement behavior change components are: Morocco Rural Water Supply and Sanitation Project (P040566) and Philippines Local Government Urban Water and Sanitation Project (P039022).

**Table 4.10 - Percent of closed projects that implemented planned investments in WSS infrastructure and behavior change with the potential to provide health benefits**

Investments with the potential to provide health benefits	No. of projects (planned)	No. of projects (actual)	Percent of projects that achieved planned investments.
<b>Infrastructure components:</b>	<b>25</b>	<b>21</b>	<b>84</b>
Water supply infrastructure	23	18	78
Sewerage systems and connections	9	8	89
Wastewater treatment	6	6	100
Latrines and toilets	8	3	38
Water quality	2	2	100
Solid waste management	1	1	100
Storm management and drainage	4	1	25
Handwashing facilities	1	0	0
<b>Behavior change components:</b>	<b>9</b>	<b>7</b>	<b>78</b>
Hygiene education/promotion	8	7	89
Sanitation education/promotion	3	3	100
Promotion of specific behaviors	3	3	100
HIV/AIDS prevention	1	1	100

**4.20 Targeting of the poor in the implementation of infrastructure and behavior change components.** Five of the closed WSS projects targeted water supply and sanitation improvements towards the poor through geographic targeting of rural areas or regions with a disproportionate share of poor people.<sup>40</sup> The Rural Water Supply and Sanitation Project in Morocco, and the Third National Rural Water Supply Project in China, achieved both infrastructure and behavior change components specifically targeted geographically towards the poor.

**Figure 4.4 - Summary results for closed WSS Projects approved in FY97-01 (n=26)**



<sup>40</sup> The five projects that specifically targeted the poor in their implementation of infrastructure components likely to provide health benefits are: China Third National Rural Water Supply Project (P003637); Ghana Second Community Water and Sanitation Project (P050616); Morocco Rural Water Supply and Sanitation Project (P040566); Mongolia Urban Services Improvement Project (P036052) and Bosnia-Herzegovina Mostar Water Supply and Sanitation Project (P057951).

## Achievement of health objectives and improvement in health outcomes

**4.21 Of the nine projects approved from FY97-01 with explicit objectives to improve health outcomes, only three had been completed and had ICRs.**<sup>41</sup> All three of these projects planned to collect health outcome data; only two actually collected the data, *in both cases showing substantial improvements in health outcomes* (Table 4-11, first panel). The third project with an explicit health objective, the China Third National Rural Water Supply Project, sought to maximize opportunities for reducing the incidence of water borne diseases through the inclusion of a sanitation and health education component, however, no indicators were planned to specifically measure changes in health outcomes. The ICR cited anecdotal evidence from supervisory missions suggesting a dramatic reduction in water borne diseases among targeted poor populations as a result of the project.<sup>42</sup>

**4.22 Among the 23 closed WSS projects that did not have explicit health outcome objectives, three (9 percent) nevertheless planned to collect health outcome data but only one project actually did so** (Table 4-11, second panel). The Kazakhstan Atryau Pilot Water Supply and Sanitation Project documented a decline in dysentery, typhoid, intestinal infections, and hepatitis A over the period 1999-2002.<sup>43</sup>

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<sup>41</sup> The China Third National Rural Water Supply Project; Morocco Rural Water Supply Project and Nepal Rural Water Supply and Sanitation Project.

<sup>42</sup>The project design combined physical investments in safe water supply systems with sanitation and health education activities. Specific water supply component activities included community participation in the selection of alternative service options from a full spectrum of improved (piped and non-piped) water supply systems suitable for individual rural households or communities. The sanitation and health education component activities included cooperation with school teachers and village doctors, Women's Federation members and public health systems to implement demonstration programs directed primarily towards housewives, school-aged children and household decision makers. Project indicators included monitoring expansion of service and improvements in hygiene and sanitation behavior.

<sup>43</sup> Data collected on health outcomes were reported in the ICR for each of the projects. The Morocco Rural WSS and the Kazakhstan Atryau Pilot WSS projects used data from outside sources. In the case of Morocco, national statistics reported data from 1995-2000 for the provinces in which the project was implemented; in the case of Kazakhstan, data were collected by the local Sanitary Epidemiological Center. The Nepal Rural WSS and Madagascar Rural WSS projects both collected data on health outcomes from impact surveys planned under the project.

**Table 4.11 - Results achieved by closed WSS projects with explicit objectives to improve health outcomes or that collected data on health outcomes FY97-01**

Project	Explicit objective to improve health outcomes	Justified by health benefits	Included a behavior change component	Intended to collect data on health outcomes	Components Implemented	Collected data on health outcomes and improvements	Demonstrated health improvements on average	Improvements demonstrated among the poor...
<b>Projects with explicit health objectives</b>								
<b>P003637</b> <b>China</b> <b>National Rural Water Supply Project</b> (1997-2007)	Yes. "To improve the well being of rural people through better drinking water and sanitation in poor and remote villages..." (SAR, p. 13)	No	Yes. Sanitation and health education component, specifically mentions handwashing. (PAD, p. 13)	An average 5 percentage point improvement compared to the baseline period in key water related health behavior of washing hands before food preparation or eating. (SAR, p. 14)	<i>Rural Water Supply (RWS):</i> 11,525 rain water collector and 1,223 piped water systems planned at appraisal. 1,610 rainwater collector and 1,394 piped water systems actually completed. 5.2 million beneficiaries. (Number of rainwater collectors reduced because beneficiaries opted for highest level of service. Number of beneficiaries still exceeded target.) <i>Sanitation and Health Education:</i> Latrine construction target- 14,180; Actual-15,439. 729 training courses in health education. \$ 916,000 worth of booklets, posters and other info distributed.	No. Supervision missions visiting 20-30 households and anecdotal evidence suggest that water-borne diseases decreased dramatically as result of project. (ICR, p. 6)	N/A.	N/A
<b>P040566</b> <b>Morocco</b> <b>Rural Water Supply and Sanitation Project</b> (1998-2003)	Yes. "Improve health and productivity of rural population, particularly children, who currently have poor access to safe water." (PAD, p.13)	Yes. Reduced diarrhea incidence and morbidity... especially among young children. (PAD, p.13)	Yes. Hygiene education program listed as an accompaniment to the physical investments of the project's institutional strengthening component. (PAD, 14)	Reduce by 50% the diarrheal diseases rate in young children (less than 5 yrs. old) within one year of project completion. (PAD, p. 13)	<i>Rural Water Supply:</i> 144 RWS systems and 134,000 beneficiaries planned at appraisal. 284 RWS systems actually constructed and 340,000 actual beneficiaries. 43% RWS also had house connection added. <i>Rural Sanitation:</i> 8,900 household and 4 block latrines planned at appraisal. 9,614 and 24 block latrines constructed.	Data collected on the incidence of diarrheal and other water-borne diseases.	24% reduction in reported cases of diarrheal diseases in young children between 1995-2000. Also, significant drop in cases of other water borne diseases and no cases of cholera in recent years. (ICR, p. 5)	Yes. Counties were targeted by the project on the basis of the share of poor in the population.

Project	Explicit objective to improve health outcomes	Justified by health benefits	Included a behavior change component	Intended to collect data on health outcomes	Components Implemented	Collected data on health outcomes and improvements	Demonstrated health improvements on average	Improvements demonstrated among the poor...
<b>P010516</b> <b>Nepal Rural Water Supply and Sanitation Project</b> (1997-2004)	Yes. "To raise living standards in rural areas by delivering sustainable health and hygiene benefits... through improvement of rural water supply and sanitation." (SAR, p. 11)	Yes. "Better health from more water, improved health knowledge and better hygiene practices." (PAD, p. ii)	Yes. Health and Sanitation Education (HSE) program. (PAD, 49)	Health impact through incidence of diseases." (SAR, p. 113)	<i>RHS and Sanitation Schemes:</i> 900 water supply schemes serving 394,050 beneficiaries planned at appraisal, 887 schemes actually constructed serving 526,850 beneficiaries. 46,328 household latrines constructed meeting 96% of target and 19,761 waste disposal pits. "Software" activities such as hygiene awareness programs implemented.	Data collected on the incidence of water and fecal borne diseases.	Decrease in the prevalence of water and fecal borne diseases from 83% to 13%, including diarrhea, as reflected in Impact studies. (ICR, p. 38)	No
<b>Projects without health objectives that planned to collect health data anyway</b>								
<b>P001075</b> <b>Guinea Third Water Supply and Sanitation</b> (1997-2006)	No	Yes. Reduce water-borne morbidity. (PAD, p. 28)	No	Proposes to monitor the prevalence of waterborne maladies as an indicator of increased individual and collective cleansing resulting from augmented volume of water usage. (SAR Annex 6-2, p.3);	<i>Urban Water Supply:</i> construction of 2 water storage tanks, 240 km of water pipelines, rehabilitation of 2 water storage tanks, 3 water intakes, boreholes, part of water treatment facilities; and part of a 700mm water main. <i>Urban Sanitation:</i> Major contract for wastewater treatment plant not completed by closing date. <i>Water Resources Management:</i> 2 of 5 regulations approved.	No	N/A	N/A
<b>P008500</b> <b>Kazakhstan Atryau Pilot Water Supply and Sanitation Project</b> (1999-2005)	No	Yes. Reduction of diseases through repair of leaks through sewage pipework. (PAD, p. 5)	No	"Reduction in the incidence of water borne diseases through improved water quality." (PAD Annex 1, p. 19)	37,000 beneficiaries of improved water supply and sewerage.	Data collected on incidence of water-borne diseases.	Reduction in the incidence of water borne diseases 1999-2002; Dysentery reduced from 83 to 8 cases; typhoid from 83 to 0; intestinal infection from 930 to 394; hepatitis A from 230 to 52. (ICR, p. 18)	No

Project	Explicit objective to improve health outcomes	Justified by health benefits	Included a behavior change component	Intended to collect data on health outcomes	Components Implemented	Collected data on health outcomes and improvements	Demonstrated health improvements on average	Improvements demonstrated among the poor...
P008867 Turkmenistan <i>Water Supply and Sanitation</i> (1997-2004)	No	Yes. Sanitation and health component meant to, "optimize health benefits." (PAD, p. 20) "Positive impact on public health." (PAD, p. 25)	Yes. Hygiene and sanitation education. (PAD, 21)	"Decrease in incidence of water borne diseases, particularly diarrheal diseases, subdivided by sex and age." (SAR, p. 104)	<i>Water Supply Improvements:</i> only first phase of urgent rehabilitation subcomponent completed: rehabilitation of 10 wells and 3 pumping stations in three out of seven etrap centers. <i>Sanitation and Health:</i> Capacity building and education activities satisfactorily completed. Turkmen authorities did not approve implementation of most physical investments.	No	N/A	N/A
<b>Projects with no health objective that did not plan to collect health data but collected it anyway</b>								
P001564 Madagascar <i>Rural Water Supply and Sanitation Pilot</i> (1998-2005)	No	Yes. "Reduction of morbidity and mortality due to water related diseases." (PAD, p. 3)	Yes. Development of tools to facilitate community mobilization, hygiene education and Information Education Communication (IEC) building on list of existing materials. (Annex 1, p. 4)	No	<i>Policy and Legal Framework WSS Sector:</i> Water Law approved in 2003; Ntl. Water Resource Agency and Water Regulatory Agency created and partially staffed. Ntl. WSS Program endorsed by Govt. in June 2005; Lease contract of water services in small towns implemented. <i>Community Based WSS Services:</i> Community needs assessment conducted; 200 community hygiene promotion sessions organized; 40 masons trained for sanitary latrine construction (although didn't result in major development of such facilities); 150 household latrines constructed directly by masons at request of rural families.	Data collected on water-borne diseases.	Water-borne diseases were reduced between 2002 and 2004: cholera by 100%; bilharzias by 43% and diarrhea by 8%. Reduction in disease is not attributable only to rural water supply and sanitation. ICR suggests more proximate indicators, such as hand washing and safe storage of drinking water, would have been better. (ICR, p. 5)	No

4.23 The Madagascar Rural Water Supply and Sanitation Pilot did not have an explicit health objective, nor did it propose in the PAD to collect health indicators, explaining that the reduction in the incidence of water borne diseases could not be realistically measured and that improving them fell out of the scope of the project. Nevertheless, extensive data were collected on the incidence of waterborne diseases in the project area for a two-year period during project implementation (Table 4-11, third panel). *Between 2002-04, four years into the project, the incidence of cholera decreased by 100 percent, bilharzias by 43 percent, and diarrhea by 8 percent.*

4.24 Altogether, four of the 26 closed projects (15 percent) actually collected health outcome data. WSS projects with explicit health objectives were more likely to collect data on planned indicators of health outcomes than were projects without these objectives or indicators, but the sample is very small.<sup>44</sup> **Four demonstrated improved health outcomes.** One project was targeted to poorer areas and thus, to the extent that it measured health outcomes, they were outcomes for the poor; *none measured health outcomes separately for poor and non-poor project beneficiaries.* **The extent to which these improvements in health outcomes, where they occurred, can be attributed to the project activities is unclear.** The ICR for the Madagascar Rural Water Supply and Sanitation Pilot Project notes, for example, that attribution would be more certain had the project also collected intermediate outcome measures, like changes in handwashing and safe water storage behaviors.

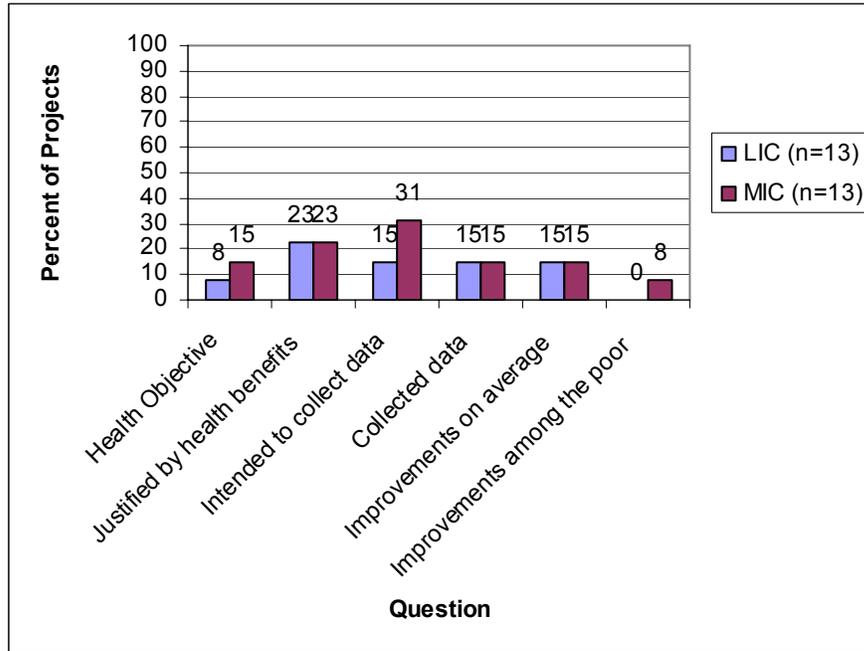
4.25 Completed WSS projects in MICs were twice as likely to have a health objective and to plan to collect data on health outcomes, compared with LICs (Figure 4-5). The other MIC-LIC differences in this figure are small and not likely to be significant given the small sample size (13 projects in each group). However, only half of the projects that planned to collect health outcome data in MICs actually did so. Interestingly, all of the closed projects in both MICs and LICs that collected data showed an improvement in average health outcomes. Putting aside the issue of attribution, this suggests either that WSS projects have a very high success rate in producing health benefits or begs the question of whether collected data are being reported only if they show an improvement.<sup>45</sup>

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<sup>44</sup> Among the 29 completed projects, only one had a dedicated monitoring and evaluation (M&E) component and two had subcomponents for M&E. Only one of those with an M&E component anticipated health benefits and planned to collect data on the incidence of water related diseases, however, the ICR did not report any data on these outcomes. Thus, a dedicated M&E component does not mean that data will more likely be collected on health outcomes.

<sup>45</sup> A study of 118 recently closed health, nutrition, and population projects found a similar result – very few projects reported a change in any type of outcome variable and, among those that did report a change, they were virtually all positive changes (Subramanian and others 2006).

**Figure 4.5 - Performance of closed WSS projects with respect to health data collection and improvements by economic classification FY97-01**

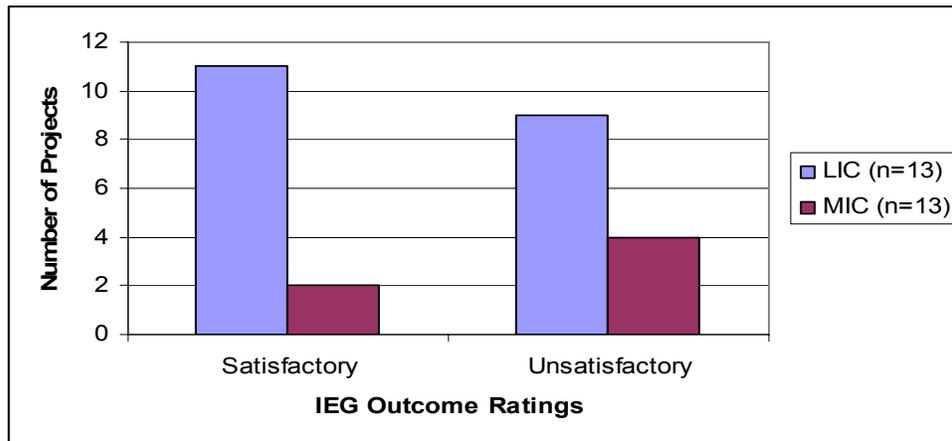


### IEG outcome ratings

4.26 IEG rates the outcome of all completed Bank projects, defined as the extent to which a project’s major relevant objectives were achieved, or are expected to be achieved, taking into account any shortcomings in efficacy, efficiency and relevance. Outcome is rated on a six-point scale: Highly Satisfactory; Satisfactory; Moderately Satisfactory; Moderately Unsatisfactory; Unsatisfactory and Highly Unsatisfactory. These ratings pertain to the entire project; specific objectives (including health objectives) are not rated individually.

4.27 **More than three quarters (77 percent) of the 26 closed WSS projects with ICRs received an outcome rating of moderately satisfactory or higher.** The three projects with health objectives and the six that measured health or water quality outcomes all received ratings of moderately satisfactory or higher, while a smaller share of projects without those characteristics rated as well (74 percent of those without health objectives, 70 percent of those that did not measure health outcomes, see Annex 3). Projects that measured health outcomes were more likely to receive a satisfactory outcome rating (100 percent) than those that did not (70 percent). Completed WSS projects in LICs were more likely to be rated moderately satisfactory or better (85 percent), compared with projects in MICs (69 percent, Figure 4-6), though with such a small sample of projects, these differences are not likely to be statistically significant.

**Figure 4.6 - IEG outcome ratings of closed WSS projects approved in FY97-01 by economic classification (LIC and MIC)**



*Note:* “Satisfactory” in this figure denotes an outcome rating of moderately satisfactory or higher; “Unsatisfactory” denotes an outcome rating of moderately unsatisfactory or lower.

## 5. CONCLUSIONS

**5.1 A review of the lending portfolio over the past decade reveals very little about the health benefits of the World Bank’s WSS investments.** Significant improvements in health outcomes are possible through improvements in water supply, sanitation, and hygiene, though they should not be assumed to benefit the poor. Half of the WSS projects approved in the past decade cited potential health benefits – that is, implicitly they had a health objective – and 89 percent financed infrastructure that plausibly could have improved health. Yet, among those completed, very few measured health outcomes and even fewer had formal objectives to improve health for which they were accountable. Fewer than half included behavior change objectives or activities, which are critical in transforming infrastructure improvements into sustainable health improvements. Only four (of 26) completed projects documented changes in the prevalence or incidence of disease.

**5.2 Among the projects that measured health outcomes, attribution of these changes to improvements in WSS is weak.** The extent to which infrastructure improvements have been carried out is generally well documented, and all six completed projects that measured changes in health outcomes or water quality reported that they improved. However, the literature shows that poor sanitation and hygiene behaviors can wipe out any potential health benefits. Few of the projects measured these intermediate behavioral indicators that would give greater confidence in the interpretation of the outcomes. Further, most ICRs do not point to other exogenous factors that may be contributing to these same outcomes, like rainfall, better health facilities, or successful health campaigns

**5.3 The trends in the design features of the WSS portfolio suggest that we will not learn substantially more about health impact from the projects approved more recently.** All of the completed projects that were reviewed were approved in the first

five years of the last decade (FY97-01). Projects approved more recently (FY02-06) are less likely to have been justified by health benefits, to have explicit health objectives, or to plan to collect health indicators. They are also less likely to target behavior change.

**5.4 In discussions, WSS staff suggested that the adoption of the Millennium Development Goal (MDG) on water in 2000 may have reduced the commitment of the sector to delivering health outcomes.** The MDG for ensuring environmental sustainability is to “halve the proportion of people without sustainable access to safe drinking water by 2015”. This goal – improving access – has been widely adopted as the “WSS sector’s MDG”, which could account for the decline in explicit health objectives and the collection of health outcome data. Yet, reduction of diarrheal disease is key to achieving other MDGs to reduce malnutrition and under-five mortality. Indeed, it is difficult to imagine that the health MDGs could be achieved without effective WSS investments to reduce diarrhea and other water-borne and water-washed diseases. The literature shows that while great improvements in health outcomes are theoretically possible from better physical access to safe drinking water, access alone will not necessarily assure them.

**5.5 The lack of information on the relation between World Bank investments in WSS infrastructure and health outcomes reduces the scope for improving the effectiveness of these investments and for understanding better the relation between health and WSS interventions in improving health outcomes among the poor.** While this desk review has been able to document the need for greater evidence on the efficacy of WSS investments in improving health, it has not been able to explain why so little has been documented. A first step would be to consult with staff and managers in the sector on the following questions:

- What accounts for the fact that so few projects with presumed health benefits formalize them as objectives, for which the projects are held accountable?
- What are the operational obstacles or constraints to improved collection of health outcome and behavioral data, even when they are planned?
- What resources and incentives would have to be put in place to ensure greater accountability for health outcomes, particularly among the poor?

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## ANNEX 1. LEVEL OF SERVICE AND DEMAND FOR WSS

Each of the water supply and sanitation improvements represent differing levels of service (Table 2-3). Higher levels of service that incorporate a greater degree of technology; however, do not always translate into higher costs to the beneficiary. For example, an intermediate level water supply improvement such as a yardtap may be cheaper for households previously dependant on vendor-provided water supplies. Additionally, the greater convenience and potentially greater health benefits which accompany more sophisticated water supply and sanitation improvements mean that the demand for a higher level of service and willingness to pay may be sustained even in the case of increased beneficiary costs and failure of the government to subsidize services in the medium term. This is not always the case, especially in very poor developing countries and particularly in rural areas where the implementation of piped water supply and sanitation systems are not feasible for a number of social, economic and environmental reasons.

**Table A1 - 1 - Typical levels of service providing access to safe water supply and sanitation in rural and urban areas.**

Level of service	Water supply	Sullage disposal	Sanitation
Deficient	Water source unsafe or inadequate or return travel time more than 30 minutes		Open defecation OR dirty communal latrine
Minimum	Communal point source with safe and adequate water and appropriate drainage, return travel time less than 30 minutes	Soakaway or other drainage at public waterpoint. Some sullage disposal at household level on plot or onto field, or in urban areas, gutter or open or covered sullage channel.	Simple pit latrine on household's plot
Intermediate	Point source on household plot with safe and adequate water supply (usually metered) and appropriate drainage	Soakaway on plot OR open or covered drain from plot to safe disposal; connecting channels within plot (made by householder)	Improved pit latrine or pour-flush toilet on householder's plot
High	Piped connection (usually metered) into house with safe and adequate water under continuous pressure	Open drain to safe disposal OR pipe to septic tank or sewerage	Flush toilet with septic tank OR sewerage (if water supply is sufficient)

Source: DFID, 1998.

## Annex 2. List of projects reviewed

<u>Proj. ID</u>	<u>Project Name</u>	<u>Country</u>	<u>FY Approved</u>	<u>FY Closed</u>	<u>Loan Amt (\$ millions)</u>
P044942	PILOT WATER SUPPLY	UZBEKISTAN	1997	2001	5.00
P009482	FOURTH DHAKA WATER SUPPLY	BANGLADESH	1997	2002	80.30
P045303	PILOT WATER SUPPLY	KAZAKHSTAN	1997	2002	7.00
P008778	BUHAREST WATER SUPPLY	ROMANIA	1997	2002	25.00
P043367	TAIZ WATER SUPPLY PILOT	YEMEN	1997	2002	10.20
P010516	RURAL WATER SUPPLY & SANITATION	NEPAL	1997	2004	18.30
P008867	WATER SUPPLY & SANITATION	TURKMENISTAN	1997	2004	30.30
P004830	WATER SUPPLY	VIETNAM	1997	2005	98.61
P001075	THIRD WATER SUPPLY AND SANITATION	GUINEA	1997	2006	25.00
P005731	GREATER TUNIS SEWERAGE	TUNISIA	1997	2006	60.00
P003637	NATIONAL RURAL WATER 3	CHINA	1997	2007	70.00
P040566	RURAL WATER SUPPLY & SANITATION	MOROCCO	1998	2003	10.00
P045629	URBAN WATER SUPPLY	CAMBODIA	1998	2004	30.96
P036052	UB SERV. IMPROVEMENT	MONGOLIA	1998	2004	16.70
P001564	RURAL WATER SUPPLY AND SANITATION PILOT	MADAGASCAR	1998	2005	17.30
P008985	CESME WATER SUPPLY & SEWER	TURKEY	1998	2005	13.10
P035805	MUNICIPAL DEVELOPMENT	ARMENIA	1998	2006	30.00
P039015	NATL WATER 1	MOZAMBIQUE	1998	2006	36.00
P043420	WATER S.MOD.2	BRAZIL	1998	.	150.00
P036414	GUANGXI URBAN ENVMT	CHINA	1998	.	92.00
P043444	MUNICIPAL ENVIRONMENTAL INFRASTRUCTURE	CROATIA	1998	.	36.30
P001409	HIGHLAND WATER IB	LESOTHO	1998	.	45.00
P001921	ENV SEWERAGE & SANITATION	MAURITIUS	1998	.	12.40
P039983	4TH RURAL WATER SUPPLY & SANITATION	PARAGUAY	1998	.	40.00
P004576	WATER DISTRICTS DEVELOPMENT	PHILIPPINES	1998	.	56.80
P009121	RURAL WATER SUPPLY & SANITATION	UZBEKISTAN	1998	.	75.00
P005907	SANA'A WATER SUPPLY & SANITATION	YEMEN	1999	2003	25.00

P039022	LGU URBAN WATER APLI	PHILIPPINES	1999	2004	23.30
P008500	ATYRAU PILOT WATER	KAZAKHSTAN	1999	2005	16.50
P050745	ARSENIC MITIGATION WATER SUPPLY	BANGLADESH	1999	2006	32.40
P006046	WATER SECTOR REFORM	ARGENTINA	1999	.	30.00
P043933	SICHUAN URBAN ENVMT	CHINA	1999	.	152.00
P057352	RURAL WATER IV	CHINA	1999	.	46.00
P048521	AMMAN WATER & SANITATION	JORDAN	1999	.	55.00
P052240	NATIONAL WATER 2 B92	MOZAMBIQUE	1999	.	75.00
P051553	3 CITIES SANITATION	VIETNAM	1999	.	80.50
P066491	WS URG REHAB	ALBANIA	2000	2004	10.00
P064008	SMALL TOWNS WATER	NIGERIA	2000	2004	5.00
P057951	MOSTAR WATER SUPPLY & SANITATION	BOSNIA- HERZEGOVINA	2000	2005	12.00
P059510	WASTEWATER DISPOSAL IN TSM CENTERS	DOMINICAN REPUBLIC	2000	2005	5.00
P050616	COMMUNITY WATER II	GHANA	2000	2005	25.00
P064064	MINE TOWNSHIP SRVC SIL	ZAMBIA	2000	2006	37.70
P039199	PROSANEAR 2	BRAZIL	2000	.	30.30
P045910	HEBEI URBAN ENVIRONMENT	CHINA	2000	.	150.00
P049436	CHONGQING URBAN ENVIRONMENT	CHINA	2000	.	200.00
P044140	CARTAGENA WATER SUPPLY & SEWERAGE ENV.	COLOMBIA	2000	.	85.00
P008497	MUNICIPAL WASTEWATER	HUNGARY	2000	.	31.60
P069946	TEHRAN SEWERAGE I	IRAN	2000	.	145.00
P045182	RURAL WATER SUPPLY & SANITATION SIL	RWANDA	2000	.	20.00
P063383	APL OSE MOD & REHABILITATION	URUGUAY	2000	.	27.00
P049924	RURAL WATER SUPPLY & SANITATION	ECUADOR	2001	2007	32.00
P000306	OUAGA WATER SUPPLY	BURKINA FASO	2001	.	70.00
P047345	HUAI RIVER POLLUTION CONTROL	CHINA	2001	.	105.50
P051859	LIAO RIVER BASIN	CHINA	2001	.	100.00
P055454	KERALA RWSS	INDIA	2001	.	65.50
P061558	WATER SECTOR SIL	NIGER	2001	.	48.00
P008832	MUNICIPAL WATER & WW	RUSSIA	2001	.	122.50
P041528	LONG TERM WATER SECTOR SIL	SENEGAL	2001	.	125.00
P035786	LVIV WATER/WW	UKRAINE	2001	.	24.25

P070058	PUBLIC SERVICES MODERNIZATION TA	URUGUAY	2001	6.00
P052037	HCMC ENVIRONMENTAL SANITATION	VIETNAM	2001	166.34
P005906	RURAL WATER SUPPLY & SANITATION	YEMEN	2001	20.00
P065937	WATER SECTOR REF ASSISTANCE PROJECT	COLOMBIA	2002	40.00
P050653	KARNATAKA RWSS II	INDIA	2002	151.60
		KYRGYZ		
P036977	RURAL WATER SUPPLY & SANITATION	REPUBLIC	2002	15.00
P074042	BA'ALBECK WATER AND WASTEWATER	LEBANON	2002	43.53
P069491	LGU URBAN WATER APL2	PHILIPPINES	2002	30.00
P070244	WATER SECTOR REFORM TECH ASSIST	ST LUCIA	2002	2.60
P057883	DUSHANBE WS	TAJIKISTAN	2002	17.00
P047762	RURAL WATER SUPPLY	TANZANIA	2002	26.00
P049621	BUKHARA/SAMARKAND WS	UZBEKISTAN	2002	40.00
P073311	PROVINCIAL & PERI-URB WATER	CAMBODIA	2003	19.90
P070191	SHANGHAI URB ENVMT APL1	CHINA	2003	200.00
P074469	WATER SUPPLY & SANITATION	MOLDOVA	2003	12.00
P065256	NATIONAL RURAL WATER SUPPLY AND	PERU	2003	50.00
P058067	SECOND COMMUNITY WATER	SRI LANKA	2003	39.80
P059073	DAR WATER SUPPLY & SANITATION	TANZANIA	2003	61.50
P057602	URBAN WATER SUPPLY & SANITATION APL	YEMEN	2003	130.00
P041442	MUNICIPAL WATER AND WASTEWATER	ALBANIA	2003	15.00
P063398	MUNICIPAL WATER & WW	ARMENIA	2004	23.00
P086661	WATER SUPPLY PROGRAM PROJECT	BANGLADESH	2004	40.00
P075728	GUANGDONG/PRD UR ENVMT	CHINA	2004	128.00
P065416	COAST CITIES POLLUTN CONTROL (APL.1)	CROATIA	2004	47.54
P076735	WATER SUPPLY & SANITATION SIL	ETHIOPIA	2004	100.00
P082373	URBAN ENV SANITATION 2	GHANA	2004	62.00
P073369	MAHAR RWSS	INDIA	2004	181.00
P082510	KARNATAKA UWS IMPROVEMENT PROJECT	INDIA	2004	39.50
P071191	AHWAZ & SHIRAZ WATER AND SANITATION	IRAN	2004	279.00
P049618	NAIROBI WATER & SEWAGE INST RST SIL	KENYA	2004	15.00
P079116	ENVIRONMENT	MONTENEGRO	2004	7.00
P071285	RURAL WATER SUPPLY & SANITATION PROJECT	NEPAL	2004	25.30
P071075	URBAN WATER SEC REFORM 1 SIL	NIGERIA	2004	120.00

P088032	(CRL1) BUENOS AIRES INFRASTR SIDP (1APL)	ARGENTINA	2005	.	200.00
P087641	YEREVAN WATER/WW SERVS	ARMENIA	2005	.	20.00
P083353	URBAN INFRASTRUCTURE & SERVICE DELIVERY	BOSNIA-HERZEGOVINA	2005	.	20.00
P057933	TAI BASIN URBAN ENVIRONMENT	CHINA	2005	.	61.00
P075730	HUNAN URBAN DEV	CHINA	2005	.	172.00
P081346	LIUZHOU ENVIRONMENT MANAGEMENT	CHINA	2005	.	100.00
P086505	NINGBO WATER & ENVIRONMENT	CHINA	2005	.	130.00
P082973	APL1-WATER & SANITATION SECTOR SUPPORT	COLOMBIA	2005	.	70.00
P056256	URBAN WATER SIL	GHANA	2005	.	103.00
P084015	SMALL TOWNS WATER SPLY & SANIT	GHANA	2005	.	26.00
P076884	NORTHERN CITIES WATER & SANITATION	IRAN	2005	.	224.00
P056418	WATER SEC IMPROVEMENTS APL	LESOTHO	2005	.	14.10
P079661	MANILA SEWERAGE 3	PHILIPPINES	2005	.	64.00
P087203	POWER & WATER SIL	SIERRA LEONE	2005	.	35.00
P094416	WATER SUPPLY INFRASTR. IMPROVEMENT	ST LUCIA	2005	.	7.70
P073763	WATER SUPPLY DEV.	VIETNAM	2005	.	112.64
P081348	HENAN TOWNS WATER	CHINA	2006	.	150.00
P088030	(CRL) WATER SECTOR CONSOLIDATION PROJ	GUYANA	2006	.	11.30
P091695	MODERNIZATION WATER & SANIT SECTOR TA	MEXICO	2006	.	25.00
P086877	RURAL WATER SUPPLY AND SANITATION	MOROCCO	2006	.	60.00
P071391	NATIONAL URB WATER SEC REF SIM2	NIGERIA	2006	.	200.00
P083929	PUNJAB MUNICIPAL SERVICES IMPROVEMENT	PAKISTAN	2006	.	50.00
P079027	MUNICIPAL INFRASTRUCTURE	TAJIKISTAN	2006	.	15.00
P064836	URBAN WATER SUPPLY	TUNISIA	2006	.	38.03
P077287	RRD RWSS	VIETNAM	2006	.	45.87

### ANNEX 3. IEG OUTCOME RATINGS OF CLOSED WSS PROJECTS APPROVED IN FY97-01

Type of Project	Highly SAT	%	SAT	%	Mod SAT	%	Mod UNSAT	%	UNSAT	%	Highly UNSAT	%	N
All WSS projects	2	<u>8</u>	13	<u>50</u>	5	<u>19</u>	1	<u>4</u>	4	<u>15</u>	1	<u>4</u>	26
Projects with health objectives	0	<u>0</u>	1	<u>4</u>	2	<u>8</u>	0	<u>0</u>	0	<u>0</u>	0	<u>0</u>	3
Projects without health objectives	2	<u>8</u>	12	<u>46</u>	3	<u>12</u>	1	<u>4</u>	4	<u>15</u>	1	<u>4</u>	23
Projects that measured health outcomes	1	<u>4</u>	3	<u>12</u>	2	<u>8</u>	0	<u>0</u>	0	<u>0</u>	0	<u>0</u>	6
Projects that did not measure health outcomes	1	<u>4</u>	10	<u>38</u>	3	<u>12</u>	1	<u>4</u>	4	<u>15</u>	1	<u>4</u>	20