

Cost Efficiency Analysis

Latrine-Building Programs in Ethiopia



Water, sanitation, and hygiene (WASH) programming covers a large proportion of environmental health activities conducted by the International Rescue Committee (IRC). In acute emergencies, beneficiaries need emergency WASH promotion programs that prevent disease and enhance personal safety and dignity. Places recovering from crisis receive support for stronger community and government oversight on water systems and hygiene and sanitation services.

Latrine design is highly depended on local context in all these activities. A wide range of factors—environmental factors, such as ground conditions and availability of materials; community factors, such as population density and access to existing systems; and cultural factors, such as the acceptability of handling human waste and privacy requirements—are necessary to consider when the choice of sanitation system is made. These factors play a role in technical design deci-

sions, including whether to use a dry or water-based system, whether to use an underground or raised pit/storage tank, and whether to use a squatting or sitting user design.

This analysis examines the cost efficiency of WASH activities in Ethiopia, mainly:

- Building household latrines that serve individual family units
- Building community latrines in blocks that serve groups of families/the general population
- Rehabilitating old, unusable latrines
- Maintaining existing latrines

This analysis seeks to examine whether there are latrine-building programs that deliver the same output at different costs. If so, what are the drivers of the cost differences? Are there features of programs that, although they increase cost, also impact the useful life of a latrine? What factors of program design could be modified to improve cost efficiency?

- **The number of people effectively served by latrines depends on the usable life of those latrines and how well they are maintained.** This suggests that maintenance and promotion costs should be considered as part of the 'infrastructure' of latrines when calculating the costs.
- **The cost efficiency of programs in this analysis has a wide range that is driven by differences in materials, labor, and maintenance costs.** The cost per person-year of latrine access achieved ranged between \$5 and \$113, with a median of \$44. Implementation staff costs were relatively consistent across programs, with a significant difference in the proportion spent on materials, labor, and maintenance costs across programs.
- **Scale is important.** Because of the 'fixed' nature of program management costs, large scale (in terms of quantity of latrines built within a program) latrine-building efforts made programs cost much less per person-year of access achieved.
- **Spreading program shared costs over a greater number of activities improves efficiency.** The more activities shared across a program's fixed costs, the more cost efficient activities become, especially when activities are complementary such as latrine building and maintenance.

Due to the large number of environmental, community, and cultural factors that influence latrine design, this analysis focuses on one country to make the latrine models more comparable. Ethiopia was chosen, since the IRC has implemented many environmental health projects in recent years. The selection was further limited to programs that operate within refugee camps, as opposed to those within host communities. While squat/pit latrines are consistently found in Ethiopia, variety still was found in the type of latrines built and the populations served, and lessons learned about the factors that influence cost efficiency.

The total cost of these activities for our sample ranges from \$180,000 to \$349,000 for building between 44 and 1,150 latrines per program. These costs include:

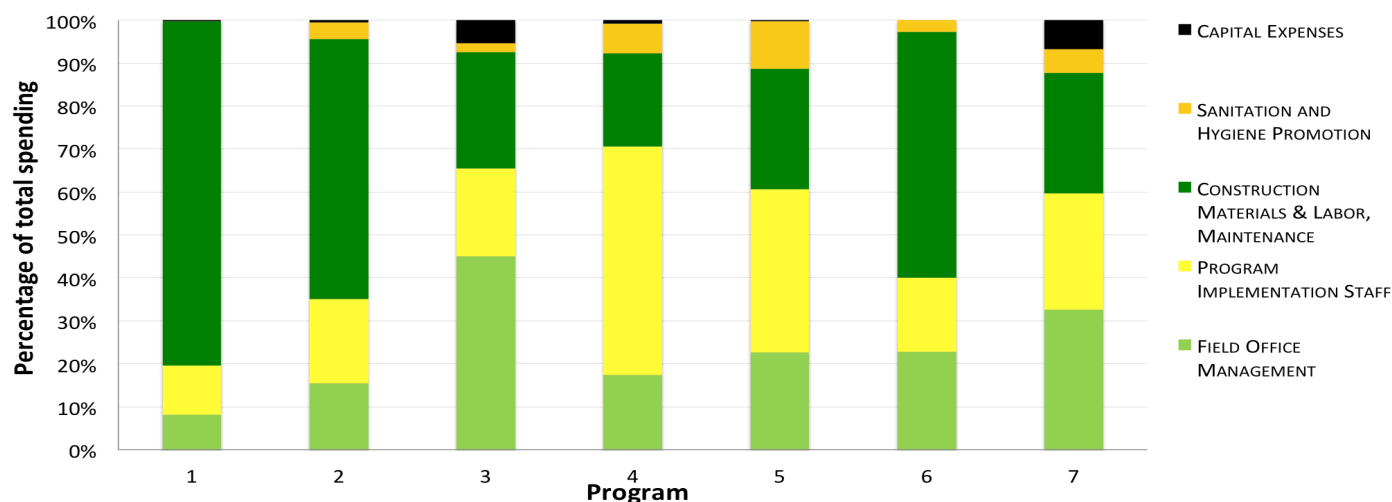
- Country management costs—Addis Ababa office personnel, travel costs, and office maintenance
- Field office maintenance—Support staff for field and camp offices, as well as office operating costs
- Program implementation staff—Personnel hired to carry out program-specific activities

- Capital expenses—Assets, such as computers or motorbikes, purchased for program implementation
- Materials and labor for latrine construction and maintenance
- Sanitation and hygiene promotion activities—Campaigns, community meetings and home visits

As donors place restrictions on the value or structure of country management costs funded by their grant, grant budgets do not represent the actual management costs for the program. For instance, the grant that funded Program 6 did not allow any financing for country management, while Program 5 allocated nearly a quarter of its total budget for country management. This highlights a potential source of bias in using grant budgets as the source of cost data. Yet, because this analysis focuses on one country, the country management structure in a given year was actually the same for all programs. Since country management structure is considered constant in this context, we remove country management expenses when comparing cost efficiency across programs.

Program	Population Served	Number of Camps in Program	Latrine Activities in Program			Sanitation Promotion Included?	Total Cost
			Household Latrines Built	Community Latrines Built	Old Latrines Rehabilitated		
1	Eritrean	1	550	16	-	No	\$307,008
2	Sudanese	3	1,125	25	-	Yes	\$319,854
3	Sudanese	2	-	44	-	Yes	\$203,171
4	Sudanese	2	300	-	-	Yes	\$348,686
5	South Sudanese	2	20	-	71	Yes	\$179,559
6	Somali	1	408	-	-	Yes	\$275,818
7	Sudanese	2	70	-	-	Yes	\$199,960

Figure 1. Program Spending by Category



Measuring Latrine Access

For the cost analysis, a typical output of interest is the number of latrines produced. Another metric commonly referenced in the humanitarian WASH literature is the number of latrines that meet SPHERE standards. As discussed above, counting the number of latrines obscures important information about how long they were used and how many people could use them. This analysis therefore looks at the output of person-years of latrine access—a measure that reflects not only how many latrines were built, but for how long they were usable. The metric for person-years of latrine access achieved is:

$$\text{Person-Years of Latrine Access} = \text{Number of Persons Using Latrine} \times \text{Expected Lifetime of Well-Maintained Latrine}$$

This makes it possible to compare the cost efficiency of different latrine designs in different contexts that lasted for different amounts of time. The assumptions for number of users and latrine longevity are discussed in the Appendix.

There is a large difference across programs in the proportion of costs dedicated to materials, labor, and maintenance, while implementation staff costs remain relatively similar. Materials, labor, and maintenance costs range from 20 percent to 80 percent of total cost, and program staff costs ranges from 10 percent to 50 percent of the total (see Figure 1). The differences may be a factor of the scale of program implementation. Seeing these costs in absolute values rather than proportions provides greater insight (see Figure 2): the costs of implementation staff remain mostly consistent across programs, with the exception of Program 4. At the same time, construction materials, labor, and maintenance costs change dramatically based on the quantity of latrines built. This suggests that approximately the same number of management personnel can administer anywhere between roughly \$50,000 and \$200,000 worth of construction. In other words, implementation management staff costs act as a fixed cost for latrine construction programs, a

fact that means it is possible to drive down the per-latrine cost by building more latrines per program.

The number of people effectively served by latrines depends on the usable life of those latrines, which is determined by how well they are maintained. This suggests that maintenance costs should be considered part of the ‘infrastructure’ of latrines when costs are tabulated. The more users a latrine has, the faster the facility deteriorates. Further, the quality and usability of a latrine drops off dramatically if not well maintained. Without desludging, pit latrines become virtually unusable after a few years. Thus, the funding and planning for the maintenance of latrines is essential if a latrine is to continue to serve a population after initial construction. Maintenance costs are also included as a relevant cost of creating latrine access (see Appendix for further discussion of how maintenance costs are handled in this analysis).

Figure 2. Spending: Implementation Staff Vs. Materials, Labor, and Maintenance

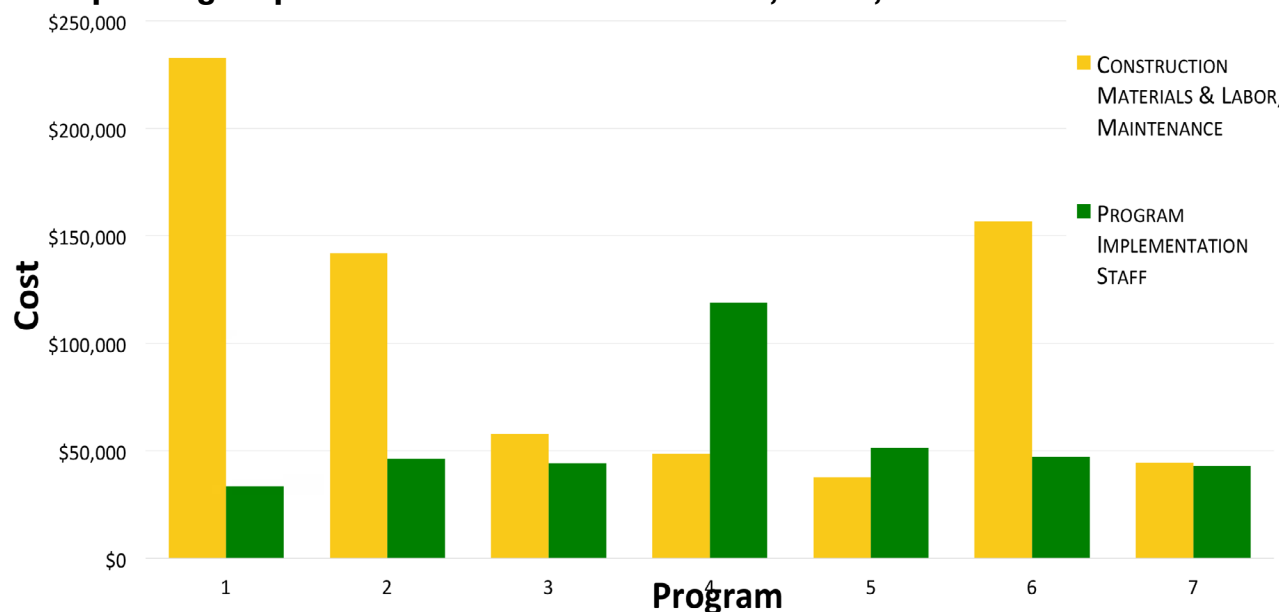
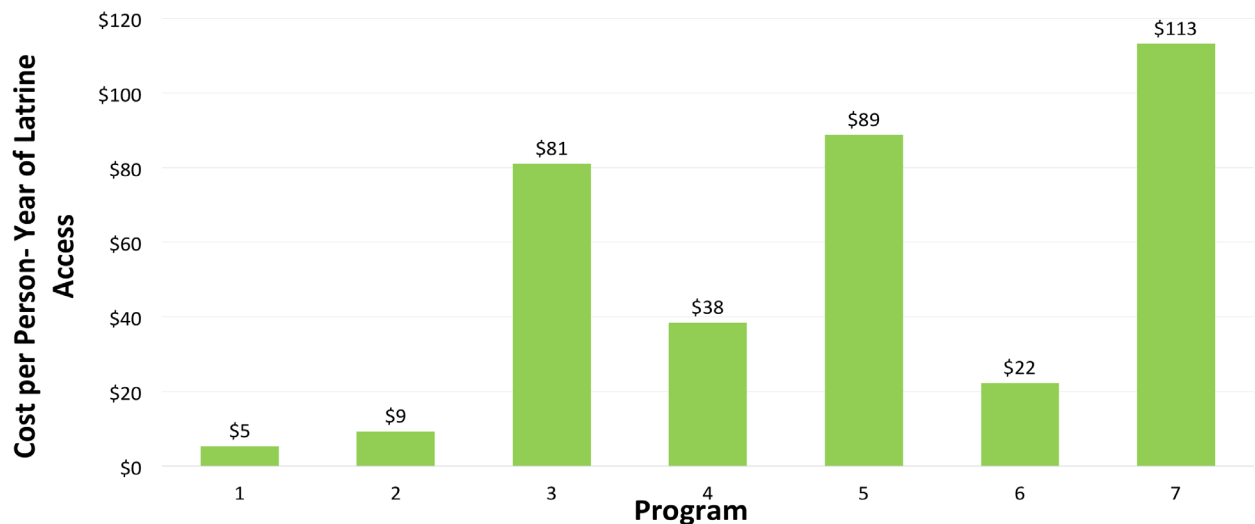


Figure 3. Cost Efficiency of Latrine-Building Programs in Ethiopia



The seven programs in this analysis created nearly 300,000 person-years of latrine access and ranged in cost efficiency between \$5 and \$113 per person-year of latrine access achieved. The vast majority of the latrines built across these projects were household, rather than community, latrines, which suggests that the results are more representative of the cost efficiency of household latrine building. Combining the cost data and the estimates of person-years of latrine access created by each program, it is possible to calculate the cost efficiency of these programs in terms of cost per person given access to latrines for one year. The wide range in cost efficiency, especially within one context, leads to the conclusion that it is possible to improve the cost efficiency of latrine building through program design decisions.

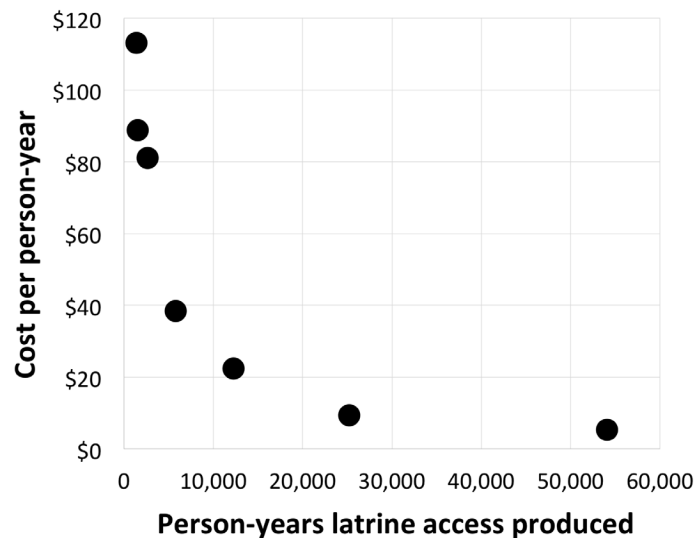
Scale, in terms of quantity of latrines built within a program, is a huge explanatory factor in the cost efficiency of latrine-building programs. Programs that produced more years of latrine access achieved significantly greater cost efficiency than those that built fewer latrines (see Figure 4). This is, in part, because implementation staff costs stayed relatively constant across programs, as discussed previously. Programs that build more latrines had a lower per-latrine cost, and were therefore more cost efficient.

The more activities shared across a program’s fixed costs, the more cost efficient activities become. The other major factor driving these results is the percent of time and effort attributed to latrine building. Some grants almost exclusively funded latrine-building activities, while others funded numerous additional environmental health or non-

health activities. The more activities funded under a grant, the lower the dollar value of shared costs attributed to latrines.

The additional cost of providing sanitation and hygiene promotion activities in conjunction with latrine building is relatively low, while the benefit may be quite high. Budget items were generally very similar across programs, with the exception of sanitation and hygiene promotion activities. Some grants funded no activities, while others had extensive activities. However, even the most extensive hygiene promotion activities cost no more than 10 percent of the program total. The evidence that these activities increase use or longevity of latrines naturally leads to the recommendation to implement promotion activities in conjunction to latrine building and maintenance.

Figure 4: Cost Efficiency Increase by Scale



Annex

Cost Analysis of Latrine-Building Programs: What Gets Included?

Household latrines are the most common latrines built in Ethiopia. Household latrines are a community preference, since they afford more privacy and safety for women and girls. However, availability of space and time constraints for construction can limit the feasibility of building household latrines.

Community block latrines are common in refugee camp settings in Ethiopia. The block design of a communal latrine involves several drop holes lined up side-by-side that share a common refuse pit. Community block latrines are generally more time-, space-, and material-efficient in terms of number of stances created. The design is often used as a short-term solution to provide latrine access in emergency settings, as well as a permanent structure used in schools, reception centers, or densely populated residential areas.

The programs in this analysis included both direct construction of household or community latrines, as well as the rehabilitation of existing structures. Regardless of whether a latrine was rehabilitated or built from scratch, the analyses assumed the same expected life year of duration, since whether a latrine is built new or rehabilitated to be made new again does not impact how long it will last in the future. Each activity results in the same output: A latrine that is now usable for beneficiaries. Cost data is not currently disaggregated to allow for analyzing the cost of rehabilitation separate from the cost of building a latrine from scratch.

Sanitation and hygiene promotion activities are distinct from construction and maintenance costs, but are included as relevant line items because they contribute to latrine use. Promotion activities are often necessary for community members to value latrines and understand use and maintenance. Thus, if we consider our cost models as a recipe that produces latrine use, promotion activities are a key ingredient of that recipe. For this analysis, construction, maintenance, and promotion of latrines were considered a ‘package’ program. Program staff were often involved in sanitation and hygiene promotion activities, as well as latrine construction and maintenance. Thus, separating promotion activities from construction costs would require a great deal of guesswork. Because latrine usage is only a piece of what is considered “hygiene promotion,” we include only half of the costs of these activities. Meanwhile, 100 percent of “sanitation promotion” activities are included. Grants that do fund these activities will tend to look slightly less cost efficient per unit of latrine access created. However, given that the promotion costs are low and are thought to promote latrine use, this should not be taken to mean that promotion activities should be removed from latrine programs.

Maintenance costs are included because latrine maintenance is essential for facilities lasting the years assumed in the output estimate. Ideally, the number of years that maintenance activities are funded would be known (thus ensuring the latrine is usable for this time period). Further, ideal budgets would separate maintenance for existing latrines as distinct from maintenance for newly built latrines. Yet, because maintenance line items do not specify new or old facilities, and since the duration of funded maintenance activities is not provided, it is challenging to have accurate maintenance expenses. Instead, this analysis considers the maintenance costs listed in a grant as an estimate of the cost of maintaining the latrines built by the project for the number of years specified.

Camp	Region	Household Latrines		Community Block Latrines	
		Longevity (Years)	People Served	Longevity (Years)	People Served
Adi Harush	Tigray	12	8	4	20
Hitsatas	Tigray	12	6	2	20
Adimazin	BGRS	4	5	3	20
Ashura	BGRS	2	5	1	30
Sherkole	BGRS	4	6	3	20
Fugnido	Gambella	3	6	1	50
Okugo	Southern State	2	6	2.5	30
Sheder	Somali	5	6	-	-



Cost Analysis at the IRC

The IRC is committed to maximizing the impact of each dollar spent to improve our clients' lives. As the IRC's CEO wrote in a 2015 article in *Foreign Affairs*, "Donors need to not just double the amount of aid directed to the places of greatest need but also undertake reforms that seek to double the productivity of aid spending." The Best Use of Resource initiative is focused on improving the reach and impact of the IRC by using internally available data to better understand the cost of delivering key IRC interventions. Generating evidence about cost efficiency and cost effectiveness will enable the IRC to cost and compare different approaches and their related impact, ultimately allowing decisions that achieve the best use of resources.

"Cost efficiency analysis" compares the costs of a program to the outputs it achieved (e.g. cost per latrine constructed, or cost per family provided with parental coaching), while "cost effectiveness analysis" compares the costs of a program to the outcomes it achieved (e.g. cost per diarrheal incident avoided, cost per reduction in intra-family violence). Conducting cost analysis of a program requires two types of information:

- 1) Data on what a program achieved, in terms of outputs or outcomes, and
- 2) Data on how much it cost to produce that output or outcome.

Asking Ourselves "What Did a Program Produce?"

Units across the IRC produce a wide range of outputs, from obvious items like nutrition treatment or shelter kits to more intangible things like protection monitoring or case management. Cost analysis requires us to focus in on one output (for cost efficiency) or outcome (for cost effectiveness), such as the number of items produced or the number of people provided with a service. Such outputs will not necessarily encompass all the work that a program has done. For example, a WASH program may build water pipelines, latrines, and solid waste disposal pits; each of which could be defined as a single output. The Best Use of Resources initiative focuses on analyzing the IRC's key outputs, such as access to sanitation in refugee camps, malnutrition treatment, and case management services. The focus is not to dismiss other dimensions of our program's work, but to concentrate on one output, allowing for comparison of cost efficiency across programs and contexts in ways not possible if budget data at the program level was the only factor considered. The Best Use of Resources initiative team works together with IRC's Program Quality Unit to identify the most important outputs and understand how to quantify these outputs to improve the accuracy and efficacy of the results of analyses and use these improved results in programming decisions.

Asking Ourselves "How Much Did It Cost?"

After defining the output of interest, staff builds out a list of inputs that are necessary for producing that particular output. If one thinks of a program as a recipe, the inputs are all of the 'ingredients' necessary to make that dish. Budgets contain a great deal of information about the ingredients used and in what quantities, but a single grant budget will frequently cover several types of outputs, or program activities across multiple sectors. Therefore, not all line items in a program budget will be relevant to a particular output; to get an accurate sense of the costs of producing a particular output, staff categorize costs by the output they contributed to and count only those that are relevant to that particular output. Many of the line items in grant budgets are shared costs, such as finance staff or office rent, which contribute to an entire program's outputs. When costs are shared across multiple outputs, it is necessary to further specify what proportion of the input was used for the particular output. Specifying such costs in detail, while time-consuming, is important because it provides lessons about the structure of a program's inputs. We can divide costs into categories and determine whether resources are being allocated to the most important functions of program management, and enable us to model alternative program structures and quantify the cost implications of different decisions.

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