# Community-Led Total Sanitation

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## Summary

We analyze the economic costs and benefits of "Community-Led Total Sanitation" (CLTS), a sanitation intervention that relies on community-level behavioral change. We estimate the benefits and costs of implementing a CLTS program in a hypothetical rural district or administrative region of a country in Sub-Saharan Africa. This region is assumed to include 200 villages, and each village has 100 households with five members (two adults, two children between five and fourteen, and one child under five), for a total population of 100,000 people. The CLTS campaign is assumed to affect villages in the region differently. In some villages a large proportion of households will build and use latrines as a result of the CLTS intervention (high-uptake villages). In other villages a medium proportion of households will build and use latrines (medium-uptake villages). And in some villages only a small proportion of households in a village will build and use latrines (low-uptake villages). We make assumptions about the distribution of these three village types in the region based on recent research. Benefits and costs are calculated at the household level for each of these three village types, and then aggregated to the village and regional levels. We find that CLTS interventions would pass a benefit-cost test in many situations, but that outcomes are not as favorable as many previous studies suggest. If all villages in the region are considered, the benefit-cost ratio is 1.6[89].

## Problem Description

One of the most important development challenges in Sub-Saharan Africa is how to end the practice of open defecation. While there is universal agreement that open defecation is a serious public health problem, governments have limited policy options for addressing it. The most common approach has been to subsidize construction of improved pit latrines, but having a latrine does not ensure that a household will use it. The economist's standard prescription of a tax or fine on the negative externality resulting from poor disposal of feces is common throughout high-income countries, but is typically judged to be politically infeasible in low-income countries. Health education interventions have met with limited success.

## Proposed Intervention: Community-led Total Sanitation (CLTS)

At the beginning of the 21st century a new and promising approach – "Community-Led Total Sanitation" (CLTS) – was added to the arsenal of policy instruments to end open defecation. This community-level behavioral change technique was developed by Dr. Kamal Kar and rolled out in Bangladesh beginning two decades ago. CLTS has since been promoted by most major donors working in the water and sanitation sector, including the World Bank, UNICEF, and the Water Supply and Sanitation Collaborative Council's Global Sanitation Fund. CLTS interventions have now been implemented in approximately sixty countries, and today the approach is mentioned in the official rural sanitation policies of about thirty countries.

CLTS takes a very approach from other health education interventions. Instead of teaching people about the health benefits that households can obtain from improved sanitation, CLTS facilitators conduct

[89] A more in-depth discussion of the benefit-cost model and results is available in Radin, Jeuland, Wang, and Whittington (2019).

community participatory exercises that aim to "trigger" behavioral change by engendering a sense of shame and disgust among village residents who engage in open defecation, leading to a community rather than just an individual or household response. The CLTS approach has offered WASH practitioners hope that there is a practical, low-cost way to end open defecation practices in situations where other policy instruments have failed.

## Costs (CLTS)

The costs of a CLTS intervention include the following three components: 1) program delivery, 2) latrine construction, and 3) the time households spend participating in CLTS activities. Program implementation costs are assumed to be independent of whether or not a household constructs a latrine after the CLTS intervention since these are costs incurred by external agencies attempting to mobilize communities to change their sanitation behaviors. Household time costs for participation in CLTS activities vary according to the level of latrine uptake in a village. We assume that not every household in a village attends the initial or follow-up CLTS meetings. Households that attend these meetings and build latrines have higher time costs on average than households that do not attend the meetings or do not build latrines. Villages where fewer latrines are built thus incur lower time costs.

The total costs of building latrines in a village vary depending on the level of latrine uptake. In villages where more people decide to construct latrines, costs will be higher. Operation and maintenance costs depend on the extent to which members of households with latrines actually use them, which evidence suggests declines over time. Our analysis assumes that all households that build a latrine use and maintain it for five years, and that a fixed percentage of households abandon their latrine in each of the subsequent five years.

## Benefits (CLTS)

In our benefit-cost analysis we include three types of benefits. First, we estimate the number of lives saved (mortality reduction) and value these lives saved using a statistical value of life (VSL) approach. Second, we estimate the number of cases of non-fatal diarrhea and value these diarrhea episodes using a cost-of-illness approach. Third, we include the time savings from not having to walk to an open defecation site, which we value as a proportion of the wage rate for unskilled labor in the rural area.

The time stream of benefits to households in a village depends on how many households construct and use latrines. The estimated diarrhea reduction for households in a village targeted by a CLTS intervention assumes there is a positive health externality, but this positive externality only "kicks in" once village coverage with improved latrines exceeds a sufficient threshold. The magnitude of the diarrhea risk reduction is assumed to be different for households that i) adopt latrines due to the CLTS intervention, ii) do not adopt latrines, and iii) already had latrines before the intervention.

We do not include estimates of the benefits from reduced risks of assault, enhanced dignity, and increased privacy, which are especially relevant for women and may result from households switching from open defecation practices to the use of latrines at their homes. Nor do we include estimates of any disamenities associated with the use of improved latrines, such as the unpleasantness of defecating in foul-smelling latrines or increased exposure to flies and mosquitoes.

## Benefit-Cost Ratio (BCR)

Because many of the more than 50 parameters in the benefit-cost model are uncertain, we conduct a Monte Carlo Analysis varying the key model parameters over a specified range of what we judge to be reasonable values, assuming a uniform probability distribution. We model 10,000 realized benefit-cost outcomes. Table 1 presents the mean benefit-cost results of this Monte Carlo Analysis for three benefit-cost metrics (Present Value of Net Benefits, Economic Internal Rate of Return, and Benefit/Cost Ratio) for all villages in the region,

as well as for a single low-uptake village, a medium uptake village, a high-uptake village.

The results suggest that for many combinations of plausible parameter values in the benefit-cost model, a CLTS intervention would pass an economic test. If we consider all villages in the region, all three metrics are positive. The benefit-cost ratio is 1.6. The model results are sensitive to baseline conditions, including the income level used to calculate the VSL, the discount rate, the value of time, and the case fatality rate, the diarrhea incidence, and the time spent traveling to defecation sites. We conclude that many communities likely have economic investment opportunities that are more attractive than CLTS, and recommend careful economic analysis of CLTS in specific locations.

## Concluding Remarks

Our analysis assumes that the CLTS intervention is rolled out in a rural region with a population of 100,000 people. Scaling up the CLTS intervention to additional regions of similar size could stretch the government's ability to effectively administer multiple CLTS programs. On the other hand, lessons may be learned from early roll outs that can be deployed to increase effectiveness in subsequent regions.

The parameter values assumed in the analysis are believed to be typical of many rural regions in Sub-Saharan Africa, but cultural and social differences may well affect how communities respond to the CLTS intervention. This is thus a risk that the program may not be as effective in some regions and in some villages as assumed in our analysis. It is also possible that the CLTS intervention could be more effective than we have assumed. Further research is needed on the magnitude of the positive public health externality.

TABLE 1: MEAN BENEFIT-COST RESULTS FOR THREE BENEFIT-COST METRICS (PRESENT VALUE OF NET BENEFITS, ECONOMIC INTERNAL RATE OF RETURN, AND BENEFIT/COST RATIO)

| | Low-Uptake Village | Medium-Uptake Village | High-Uptake Village | All Villages (n = 200) |
|---|---|---|---|---|
| Benefits | $3,415 | $9,350 | $28,380 | $2,156,275 |
| Mortality Benefits | $1,430 | $4,290 | $13,335 | $991,090 |
| Morbidity Benefits | $900 | $2,695 | $8,485 | $626,870 |
| Time Savings | $1,085 | $2,365 | $6,560 | $538,315 |
| Costs | $5,810 | $6,580 | $8,365 | $1,325,790 |
| Program Costs | $4,900 | $4,900 | $4,900 | $980,000 |
| Time Costs | $535 | $535 | $535 | $107,265 |
| Capital Costs | $270 | $805 | $1,880 | $161,175 |
| O&M Costs | $100 | $340 | $1,050 | $77,350 |
| Net Benefits | ($2,395) | $2,770 | $19,750 | $830,485 |
| ERR | -7% | 11% | 49% | 16% |
| BC ratio | 0.6 | 1.4 | 3.4 | 1.6 |

## References

Radin, M., M. Jeuland, H. Wang, and D. Whittington (2019). Benefit-Cost Analysis of Community-Led Total Sanitation: Incorporating Results from Recent Evaluations. Harvard T.C. Chan School of Public Health. Guidelines for Benefit-Cost Analysis. Working Paper. https://sites.sph.harvard.edu/bcaguidelines/methods-and-cases/