



RESEARCH AND EVALUATION REPORT

Cost-effectiveness analysis of quality improvement: A review of studies under the USAID Applying Science to Strengthen and Improve Systems (ASSIST) Project

MAY 2020

This research and evaluation report was prepared by University Research Co., LLC (URC) for review by the United States Agency for International Development (USAID) and authored by the USAID Applying Science to Strengthen and Improve Systems (ASSIST) Project, drawing on previously completed ASSIST cost-effectiveness studies. The USAID ASSIST Project was made possible by the generous support of the American people through USAID.

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DISCLAIMER

The views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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For more information on the work of the USAID ASSIST Project, please visit www.usaidassist.org or write assist-info@urc-chs.com.

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Abbreviations

ART	Antiretroviral therapy
ASSIST	USAID Applying Science to Strengthen and Improve Systems Project
CCM	Chronic Care Model
CD4	Cluster of Differentiation 4
CEA	Cost-effectiveness analysis
DALY	Disability-adjusted life year
FTF	Face-to-face
ICER	Incremental cost-effectiveness ratio
IMNCI	Integrated management of newborn and childhood illness
HIV	Human immunodeficiency virus
JSI	John Snow International Research & Training Institute, Inc.
MNCH	Maternal, newborn, and child health
MTCT	Mother-to-child transmission of HIV
OHT	Online health training
TT	Tetanus toxoid
USAID	United States Agency for International Development
VMMC	Voluntary medical male circumcision

EXECUTIVE SUMMARY

Introduction

The USAID Applying Science to Strengthen and Improve Systems (ASSIST) Project was mandated to conduct economic analysis on at least one activity in each country. The size and scope of these analyses depended on the size of the country program and the funding available. At the very least, it involved funds spent on improvement activities, the population the funds covered, and an outline of the results achieved for that expenditure. Advanced analyses were in the form of cost-effectiveness analyses (CEAs) which compare the costs and effects of the assessed intervention to assess the extent to which it can be considered as providing good value for money. This report synthesizes findings from these CEAs.

Methodology

We reviewed all reports generated from CEAs conducted by the USAID ASSIST Project and examined them for the following information: CEA methodology, key findings, key recommendations, and conclusions as a result of the CEA.

Results

Seven CEAs conducted in five countries were included in this synthesis report: Ecuador, Kenya, Pakistan, Uganda, and Tanzania. CEAs were conducted for both QI activities carried out by ASSIST as well as by improvement programs implemented by other partners, encompassing immunization; HIV; maternal, newborn, and child health (MNCH); medical male circumcision, and Zika prevention and treatment. Overall, CEAs revealed that improvement programs provide good value for money compared to the status quo. However, findings were more mixed for the ASSIST MNCH and HIV improvement activities in Uganda, the immunization program in Pakistan, and the point-of-care testing intervention in Kenya.

The main limitation of these CEAs was the lack of long-term health outcome measures such as deaths, disability, secondary infections, and or disability-adjusted life years (DALYs) averted. This limits the ability to compare results from ASSIST CEAs to the CEAs of other interventions.

Conclusions and Recommendations

CEAs conducted under the USAID ASSIST Project shed light on the value for money provided the project. Lessons learned from conducted CEAs under ASSIST and recommendations for successful CEAs include planning to collect CEAs from the beginning of the activity, tracking all expenses, selecting the perspective and outcome, differentiating direct from indirect costs, and using DALYs whenever possible. In addition, it is important to create a dissemination plan for CEA results and involve key stakeholders in data use and data use. Finally, even in the absence of CEA experts, it is possible to conduct a basic CEA to determine the relative efficiency of a program.

I. INTRODUCTION

The USAID Applying Science to Strengthen and Improve Systems (ASSIST) Project was created with the objective of enabling health systems to more effectively improve key health care outcomes through the application of improvement science. Through a combination of capacity building, institutionalization, and competency development, the USAID ASSIST Project has played a crucial role in improving health care processes in a diverse set of health areas, ranging from maternal, newborn, and child health (MNCH), to HIV, to family planning (FP) and beyond. A critical ingredient in the establishment of effective health programming has been economic analysis. By measuring changes in key health indicators and analyzing those changes in light of the program's economic expenditure, the USAID ASSIST Project has been able to quantify not only the reach of the improvement activities, but also the return on investment for specific activities.

Under the Cooperative Agreement, the USAID ASSIST Project was mandated to conduct economic analysis on at least one activity in each country supported by the project. During the life of the project, ASSIST supported a total of 46 countries, expenditures were tracked for all country programs and in addition, 13 formal economic analysis reports were produced. The size and scope of these analyses depended on the size of the country program and the funding available. The most basic analyses looked at funds spent on improvement activities, what population the activities covered, and an outline of what results were achieved for that expenditure. Advanced analyses were in the form of cost-effectiveness analysis (CEA), which compared the costs and effects of an intervention to assess the extent to which it can be considered as providing good value for money. ASSIST interventions were compared with the status quo or business as usual scenario.

In their 2016 article, Broughton and Marquez argue for the use of cost-effectiveness measures within health systems improvement interventions not only as a way of evaluating the ability of programs to engender positive health care outcomes, but also as a means of providing transparency in the allocation of oft-scarce resources. Moreover, economic analyses can pinpoint ineffective approaches that create an imbalanced or wasteful use of resources. Actionable evidence on resource maximization can be a powerful tool in both program scale-up and advocacy. By knowing the precise return on investment for program activities, managers, donors and governments can make educated decisions on funding successful approaches and maintain ethical clarity on distribution of resources across the populations they serve (Broughton and Marquez 2016).

This report reviews CEAs conducted under the USAID ASSIST Project and summarizes findings and key recommendations from these CEAs. The report also provides guidelines and lessons learned from applying CEA methods to health quality improvement programs.

II. METHODOLOGY

We reviewed all reports generated from CEAs conducted by the USAID ASSIST Project and examined them for the following information:

- CEA methodology
- Key findings
- Key recommendations and conclusions as a result of the CEA

The reports reviewed are listed in **Annex 1**.

III. RESULTS

A. Sample Characteristics

Under ASSIST, eight CEA were conducted. However, one CEA study was removed from this synthesis report due to study design limitations. A total of seven CEAs from five countries were therefore included in this synthesis report (Ecuador, Kenya, Pakistan, Uganda and Tanzania). CEAs were conducted for ASSIST's HIV, MNCH, VMMC, and Zika activities. The USAID Mission in Pakistan asked ASSIST to carry out a CEA of interventions to improve immunization. The list of CEA studies reviewed is presented in **Annex 1**.

B. Results

Table 1 shows the methodology used in each CEA (study design, clinical data collected, cost data collected, CEA methods) along with key findings, recommendations, and conclusions. Five studies used a pre-post design with a comparison group; one used a retrospective design; and one relied on a prospective design.

With regard to effectiveness measures, only one study assessed effectiveness using disability-adjusted life years (DALYs), a weighted combination of mortality and morbidity effects of an intervention. One study used a clinical outcome (CD4 count) while the remaining six studies assessed effectiveness using quality of care process indicators. Cost data were collected from the perspective of the USAID ASSIST Project for all but one study in Pakistan which collected cost data from the perspective of another implementing partner as well as the provincial government.

Overall, CEAs revealed that ASSIST activities provided good value for money compared to the status quo. In Ecuador, the ASSIST online training was found to be more cost-effective than the ASSIST face-to-face training. In addition, three CEAs conducted in Uganda also showed that ASSIST programs were cost-effective in those settings. The Chronic Care Model implemented in Uganda involved modest costs and provided good value for the program duration examined. An additional 1,300 patients improved their CD4 counts, and 6,700 more patients had the same or better adherence to antiretroviral therapy (ART). In addition, sharing a detailed manual describing improvement interventions was found to be a good option for disseminating information to facility-based health care workers to improve voluntary medical male circumcision (VMMC) services in Uganda compared to using both the manual and a face-to-face handover meeting or using both the manual and coaching visits. An integrated management of newborn and childhood illness (IMNCI) intervention was also found to be cost effective in improving the case management of sick children in Uganda. However, findings were more mixed for the ASSIST MNCH and HIV program in Tanzania, the immunization program in Pakistan, and the point-of-care testing improvement intervention program in Kenya.

Key CEA limitations include lack of long-term health outcome measures such as deaths, disability, secondary infections, and or disability-adjusted life years averted. This limits the ability to compare results from ASSIST CEAs to CEAs of other interventions.

Table 1: USAID ASSIST Cost-effectiveness Analysis Studies

Country	Content Area	Methodology	Cost-effectiveness Findings	Conclusions and Key Recommendations
Ecuador	Zika	<p>Comparing the effectiveness and cost-effectiveness of on-line versus face-to-face (FTF) training for strengthening the Zika response in Ecuador</p> <ul style="list-style-type: none"> • Pre-post study comparing on-line and FTF groups • Survey data: Zika knowledge and satisfaction with each training modality assessed via surveys at three points: 1) Prior to the training; 2) Immediately following training; and 3) Eight to twelve weeks after completing the training. • Cost data: Focus of costing was on implementation costs of the Ecuador-based training. Costs for main activities in both training modalities; within each activity, the specific inputs used, the quantities of each input, and the price of each input were noted (materials/ supplies, and capital, trainer time; trainer travel and per diem; provider travel and per diem; venue expenses; administrative costs, costs of maintaining a server/platform, course coordinator time, and online tutor time. • CEA analysis: incremental cost-effectiveness measure (i.e., incremental cost per unit of knowledge gained for both training modalities). Cost-effectiveness analysis focused on pre-test to post-test changes only. 	<ul style="list-style-type: none"> • Descriptive data from provider surveys show that while providers trained with both modalities increased their scores between pre-test and post-test, the percentage of providers who correctly answered knowledge items was higher in the online health training (OHT) group. • The total cost of OHT was higher (US \$25,628) than FTF (US \$15,526), but the cost per provider completing training was lower for OHT (US \$43 versus US \$119), reflecting the much higher number of providers trained online (598) as compared to FTF (130) 	<ul style="list-style-type: none"> • Findings suggest that OHT offered better value for money in this context. It is unlikely that class size for the FTF training could be increased enough to approach the lower average cost of OHT; even doubling the FTF cohort (and maintaining the same instructional resources) would still result in an average cost of US\$85 per trained provider, and such a large change in enrollment would likely be impractical and affect learner performance.

Country	Content Area	Methodology	Cost-effectiveness Findings	Conclusions and Key Recommendations
Uganda	HIV	<p>To measure the incremental cost-effectiveness of the Chronic Care Model (CCM) approach in U.S. dollars.</p> <ul style="list-style-type: none"> • Controlled pre-post intervention design • Three intervention sites in intervention district implemented CCM approaches with support from ASSIST. • Three control sites in neighboring district received the standard level of HIV care available in Uganda. • Clinical data: Data on CD4 counts and treatment adherence from a simple random sample of patient medical records. • Cost data: Included personnel time for participation in intervention activities, incidentals for activities, and staff per diem. 	<ul style="list-style-type: none"> • Three-fold increase in CD4 count (p value = 0.022) among patients in CCM intervention sites, as compared to clients at non-intervention sites. • Adherence to ART was also 60% (p value = 0.001) higher among intervention-site clients than those at non-intervention sites. • The total cost of the project was US \$11,740. Total cost of the intervention per patient was \$1.67. • It cost \$6.90 for each additional patient with improved CD4 count and \$3.40 per patient to maintain or improve adherence. 	<ul style="list-style-type: none"> • For a modest expenditure, it is possible to improve process and outcome indicators of the quality of care by implementing the CCM. • It is recommended that the method of implementing the chronic care model described here be implemented widely in Uganda, and it may be suitable for application in other similar settings. • Future studies should use longer follow-up periods to capture long-term health outcomes such as deaths, disability, secondary infections, and or DALYs averted. This would have allowed expressing the effectiveness and efficiency of the intervention in more meaningful terms and allowed comparison to interventions targeting other health problems.

Country	Content Area	Methodology	Cost-effectiveness Findings	Conclusions and Key Recommendations
Uganda	VMMC	<p>To determine the impact and cost-effectiveness of three modes of disseminating information to facility-based health care workers to improve VMMC services: Manual (M), manual+ handover meeting (MH), manual+ handover meeting + coaching visits (MHC)</p> <ul style="list-style-type: none"> Controlled pre-post intervention study randomized health facilities to receive M, MH, or MHC. Clinical data: Compliance with predetermined quality indicators in the domains of consent, history taking, anesthesia administration, and post-operative instructions. Cost data: ASSIST expenditures associated with implementation of the three information dissemination methods, excluding MOH staff time and any other costs incurred as part of routine treatment activities. CEA analysis: Decision tree analysis was used to determine the incremental cost-effectiveness ratios of the three information dissemination methods compared with the business-as-usual (pre-intervention level of compliance with the quality indicators). Analysis controlled for patients' ages and other potential demographic confounders. 	<ul style="list-style-type: none"> Cost of receiving the M intervention was \$1.13 per patient, for the MH intervention, \$20.77 per patient, and for the MHC intervention, \$28.83 per patient. The outcome return for \$10,000 investment in terms of number of additional patients receiving appropriate consent form was 443 for M, 29 for MH, and 17 for MHC. The outcome return for \$10,000 investment in terms of number of patients having 75% post-operative instructions was 443 for M, 43 for MH, and 42 for MHC. All three intervention groups showed improvement in the domains of consent, history-taking, and post-operative instructions, with the MHC group showing significantly higher improvements than the M and MH groups. 	<ul style="list-style-type: none"> The handover meeting was the most expensive dissemination method. However, it did not have a large effect on quality indicator improvement. The manual alone was the least costly method of dissemination, but it was also the least effective in achieving improvements. If funds are limited, the intervention involving sharing the manual has some merit because it improves informed consent and compliance with history-taking and post-operative instruction provision more efficiently than the two more intensive interventions, assuming any negative effects of suboptimal anesthesia administration could be eliminated.
Uganda	MNCH	To assess the effectiveness and cost-effectiveness of the integrated management of newborn and childhood illness (IMNCI)	<ul style="list-style-type: none"> Cost of the intervention was 8,584 US dollars (USD) from January to November 2017 	<ul style="list-style-type: none"> IMNCI is an appropriate target for quality improvement

Country	Content Area	Methodology	Cost-effectiveness Findings	Conclusions and Key Recommendations
		<p>improvement intervention in 10 intervention health facilities in Northern Uganda.</p> <ul style="list-style-type: none"> • Prospective, non-randomized before and after controlled design • Clinical data: IMNCI-related process indicators (e.g., case management of sick children, including documentation of signs of serious infection and/or relevant diagnosis, immunization status, etc.) • Cost data: Program costs included cost of labor, cost of transportation for coaching activities, venue and supplies for the learning sessions, lodging and per-diem, meals, and incidentals of the project staff leading the intervention and other expenses directly related to the intervention (printing, reproduction of materials, etc.) • CEA analysis: Decision tree analysis was used to model the cost-effectiveness of the improvement intervention. Probabilities of different results for the indicators were determined from difference-in-differences calculations. 	<ul style="list-style-type: none"> • 9,951 USD incremental cost saving by reducing prescription of non-EB medications for abovementioned common childhood conditions. Incremental cost-effectiveness ratios per patient who benefitted from rationalized antibiotic prescription practices for cough or cold, pneumonia, and diarrhea were 0.08 USD, 0.25 USD, and 0.30 USD, respectively. 	<p>interventions in Uganda and other similar settings.</p> <ul style="list-style-type: none"> • Improvement strategies focused on group problem solving and strengthening local clinical and improvement capacities can improve access, efficiency, and effectiveness of IMNCI in primary care settings of sub-Saharan African countries. • Scaling up these strategies would result in associated short- and long-term health and economic benefits for patients and society and would enhance national and global efforts to improve the quality of pediatric care.
Tanzania	MNCH and HIV	<p>To determine the effectiveness and cost-effectiveness of a program to integrate prevention of mother-to-child HIV transmission (MTCT) and maternal, neonatal, and child health (MNCH) services using quality improvement methods</p> <ul style="list-style-type: none"> • Controlled pre-post design 	<ul style="list-style-type: none"> • There were improvements of 13 – 60 % in the indicators used for the cost-effectiveness analysis • Total cost of the intervention was US\$ 43,000. The largest share of the costs were for 	<ul style="list-style-type: none"> • Difficult to compare the cost-effectiveness of this program to other health programs because this intervention included multiple outcomes for the given level of expenditure.

Country	Content Area	Methodology	Cost-effectiveness Findings	Conclusions and Key Recommendations
		<ul style="list-style-type: none"> • Clinical data: Number of women receiving HIV testing and counselling, women initiating ART, HIV+ women receiving family planning methods, HIV testing among infants/children, infants/children enrolled in HIV care, infants/children screened for TB. • Cost data: Direct costs for providing technical assistance, including transportation costs and meals and incidentals for project staff. • CEA analysis: Analysis was conducted using a decision tree comparing the intervention sites to the control sites for the two sets of indicators of interest. Probabilities of different results for the indicators were determined from difference-in-differences calculations. 	<p>the salaries of the project staff.</p> <ul style="list-style-type: none"> • The number of patients receiving service at the clinics participating in the intervention was 3,945 people. This gives an approximate cost per patient of US\$11 for the intervention. • For every one percent increase in HIV-positive pregnant or lactating women who are newly initiated on ART to reduce MTCT risk, the cost is US\$ 36.50 (95% CI: \$28.10 - \$51.70) • The outcome return on every \$10,000 investment ranged from 9 for of HIV+ infants / children <15 years enrolled in HIV care to 3496 for children tested for HIV at outpatient services • For example, for every \$10,000 spent on the intervention, there were 20 additional pregnant or lactating women who were newly initiated on ART to reduce the risk of MTCT of HIV and there were an 	<ul style="list-style-type: none"> • Use of DALYs or HIV-related deaths averted would have allowed direct comparisons with other interventions to determine the relative efficiency of this program. • However, authors still recommend implementation of similar QI interventions to improve HIV service performance more widely in Tanzania and elsewhere.

Country	Content Area	Methodology	Cost-effectiveness Findings	Conclusions and Key Recommendations
			additional 31 HIV-exposed children who received their second HIV test after cessation of breast milk and an additional 588 children tested for HIV at pediatric in-patient wards.	
Pakistan	Immunization	<p>To determine the effectiveness of the intervention to increase immunization uptake and to estimate the incremental cost-effectiveness of the program compared to the business-as-usual from both the USAID and health system perspectives.</p> <ul style="list-style-type: none"> • Retrospective study design. • Clinical data: Childhood immunization and tetanus toxoid (TT) vaccination rates. • Cost data from collected from both the USAID implementing partner (staff time, transportation and incidentals, consultation fees, administrative costs) and Government of Sindh Province perspectives (Cost of local staff to implement the intervention, operational costs, vaccine costs) • Two separate decision trees were used: one to compare the TT immunization program component for pregnant women to business-as-usual, and one to compare the childhood immunization intervention to business-as-usual. 	<ul style="list-style-type: none"> • Program provided childhood immunization to over 329,000 children, and TT vaccination to over 111,000 pregnant women. • Total cost of the program for USAID was US\$1.56 million for activities from February 2014 to June 2016. • From the perspective of USAID, the incremental cost-effectiveness ratio (ICER) of the program compared to our estimate of the business-as-usual scenario was US\$1.30 per disability-adjusted life years (DALY) averted (95% CI: US\$1.08 – 1.58). • From the perspective of the Government of Sindh Province, the ICER related to treating vaccine-preventable morbidity and mortality was approximately US\$97 per 	<ul style="list-style-type: none"> • The program saved the government money by eliminating the treatment costs of those cases of morbidity and mortality averted from the vaccination promotion. Using these estimates, the \$1.56 million initial investment in the program would save the Government of Sindh Province more than \$10 million, suggesting it is a highly cost-effective and sustainable investment.

Country	Content Area	Methodology	Cost-effectiveness Findings	Conclusions and Key Recommendations
			DALY averted (95% CI: -US\$129 – -US\$66).	
Kenya	HIV	<p>To evaluate the effectiveness and cost-effectiveness of an intervention to improve the processes of point-of-care rapid testing for HIV in participating facilities in western Kenya.</p> <ul style="list-style-type: none"> • Prospective pre-/post-intervention • Clinical data: 23 indicators, within three counseling and testing thematic areas, were assessed: “Skills and Knowledge” area that had nine indicators, “HIV Testing” component which had ten indicators, and “Data Management” with four indicators. • Compliance with nine HIV testing services standards (e.g., % of patients receiving HIV pre-test counseling, % of results recorded accurately, % HIV-positive patients linked to HIV care) • Cost data: From the perspective of the implementers and included personnel costs, transport, and consumable costs of designing and conducting the improvement activity, per diems, and accommodations • CEA analysis: Decision trees were used to determine the incremental cost-effectiveness ratios of the intervention versus business-as-usual (control group), controlling for secular trends in the control group from baseline to end line. 	<ul style="list-style-type: none"> • While there were marked differences between the intervention and control groups in terms of improvement in performance in HIV counseling, there was no or very little difference in actual HIV testing and data management. • The incremental cost-effectiveness of the improvement intervention was less than \$9 per person receiving testing services. Implementation of the intervention in this current study to improve the testing and counseling quality in antenatal testing and multi-disease testing would add about 50% to their implementation costs. 	<ul style="list-style-type: none"> • This quality improvement intervention would be a significant additional investment. • It is possible that this intervention would be more cost-effective if it had been conducted at a time when facility operations had not been adversely affected by the health workers’ strikes or if the intervention could have lasted longer to achieve greater effectiveness.

IV. DISCUSSION/LESSONS LEARNED

CEAs conducted by ASSIST demonstrate the importance of tracking and analyzing the cost of improvement interventions in order to better understand their impact, feasibility, and long-term sustainability. ASSIST CEA studies contribute to our understanding of the overall impact of an intervention and can be used as an important advocacy tool for maintenance of expansion of similar programs. Particularly given USAID's focus on building the capacity of local partners to enact effective interventions, CEAs can help local and regional government and civil society groups estimate the necessary resources to effect change and approximate a return on their financial investments. ASSIST has described measurement challenges related to CEAs in the context of health systems improvement interventions such as the USAID ASSIST Project (Broughton and Marquez 2016). Challenges described include clearly defining the improvement intervention, defining what is meant by effectiveness, mitigating the limitations of process measures, costing the intervention, and capturing all economic consequences of effect.

In addition, from ASSIST's experience implementing CEAs, we recommend a number of guidelines to help conduct successful CEAs for improvement projects:

Plan to document costs from the beginning: Just as a project evaluation plan benefits from early consideration, so too should a project provide for a costing analysis from the outset of program development. Prospective CEAs are more accurate and reliable than analyses done retrospectively and should be the standard for which all CEAs aim. As elements of the intervention are developed, analysts should categorize each input in terms of both its financial valuation and its direct or indirect relationship to program operations. Properly setting up the accounting early-on greatly improve the chances of comprehensive and comprehensible cost data at the end of the project.

Track all expenses: All resources consumed as a result of program implementation are relevant to the CEA and should be actively tracked throughout the life of the intervention. These include tangible financial inputs such as supplies, per diems, and transportation costs, but they might also include less obvious resources such as the increased number of health provider hours needed to implement the intervention. Real-time tracking of expenses allows for an accurate cost picture and helps account for any deviations from the original project plan on which many initial budgets are based.

Select the perspective and the outcome: As shown in the ASSIST CEAs, cost studies can be performed from a number of perspectives, including that of the donor or of a local in-country entity such as the Ministry of Health. In order to provide the most accurate analysis, one must first clearly identify the perspective from which the costing is being performed. Once a perspective is determined, the costs associated with that actor's role in the implementation can more easily be collated and compared to outcomes. Similarly, one should explicitly define the outcome of interest related to the costing study. Unlike cost-benefit analyses, which estimate the overall benefit of a program to society, a CEA focuses on specific outcomes or aims of the project, such as the ones used in the studies above.

Segregate direct costs from indirect/overhead costs: Direct budget inputs necessary for implementation should be segregated from indirect or overhead costs that would be incurred regardless of the quality improvement intervention. One common example of an indirect cost is staff time, with the presumption being that even if health providers work differently, they will still work the same number of hours and thus would not constitute an additional cost to the

improvement intervention. However, every input should be considered in light of the project and its implementation approach. Although staff time is typically considered an overhead expense, notable shifts in labor hours compared to pre-intervention services should be tracked as they may be relevant to an intervention's overall cost.

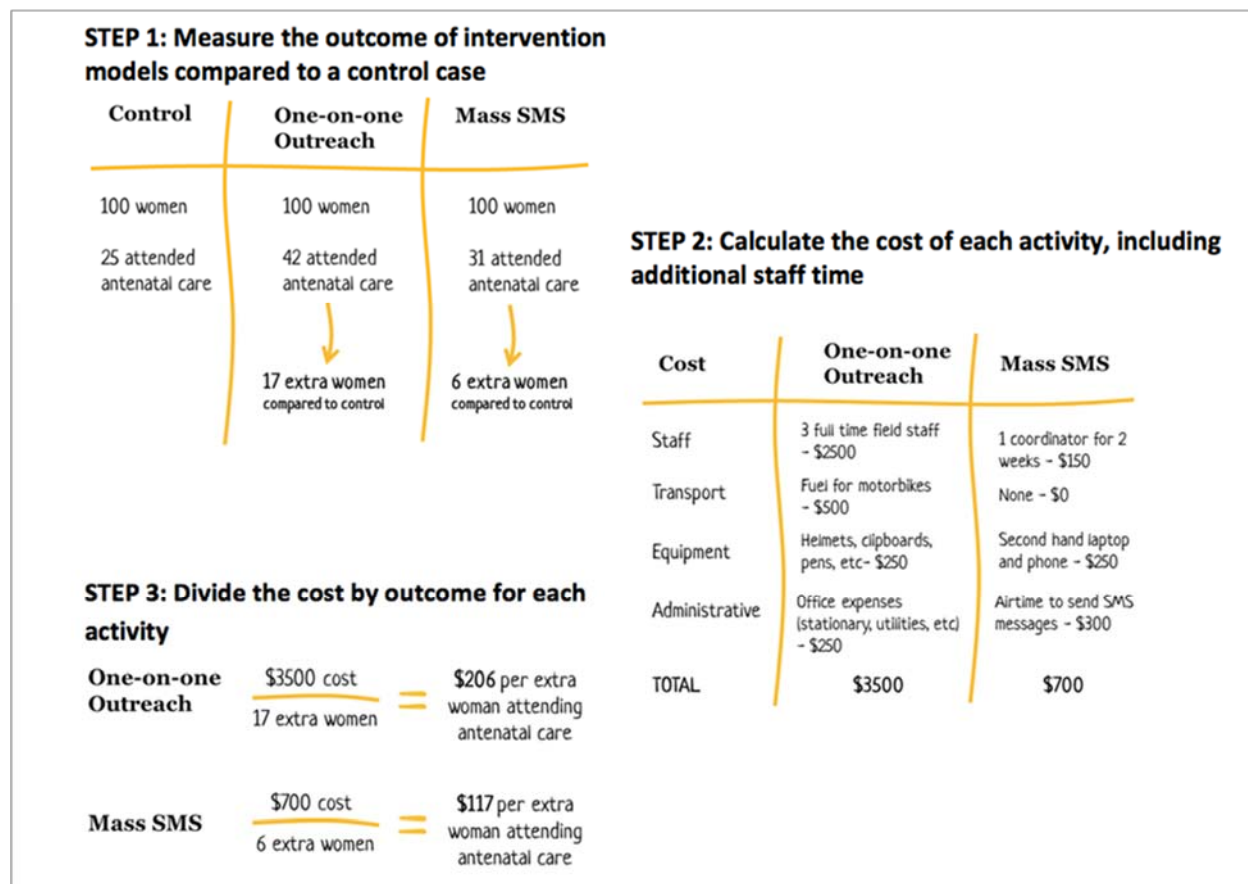
Use DALYs where possible: Where possible, costing studies should use disability-adjusted life years (DALYs) as a unit of outcome measure for interventions that may directly impact client morbidity or mortality. The use of DALYs, which can be calculated using existing epidemiological research literature, is a standard recommendation from the World Health Organization and can be helpful in comparing cost-effectiveness data across different contexts and programs.

Create a plan for dissemination of findings: CEAs can be a useful tool for decision-making around program investments and future funding. However, results of an analysis are only as good as the plan to disseminate the findings. It is imperative to include the presentation of CEA findings as part of the standard close-out and hand-over of project documentation to both donors and stakeholders. Furthermore, care should be taken to put complex economic analysis results in a format that is comprehensible to the wider development audience for which the study is undertaken. Broader distribution of study results through international and regional conferences as well as peer-reviewed literature would also help strengthen the body of CEA work in the health development field.

Include stakeholders in CEA planning to increase use of data: To ensure ownership of the CEA findings in any context, researchers should include key stakeholders and decision-makers as part of the CEA planning process. Conferring with program staff, local government entities, and other stakeholders about the aim and structure of the CEA will not only increase cooperation for data collection but will also encourage the use of the findings at the end of the analysis. A successful dissemination of CEA findings can lead to tangible outcomes in public health resource allocation.

Even a basic CEA is better than nothing: Cost-effectiveness analyses, which often rely on knowledge of health econometrics and advanced statistics, can seem like a daunting prospect for organizations that lack the requisite in-house expertise. However, even in the absence of an expert-level economist, research staff can use a simpler model of CEA to approximate the value of the investment made for the intervention. In its simplest form, a basic costing study will divide the overall budget associated with the intervention (keeping in mind to include only the relevant costs discussed above) by the units of the desired outcome reached by the project. This can then be compared to the standard care prior to intervention or to other intervention approaches, to determine the relative cost-effectiveness of the model. **Figure 1** provides an easy example of a “quick & dirty” CEA that any project can use. For a more thorough introduction to cost-effectiveness analysis in public health, please refer to the Cellini and Kee’s chapter on CEAs in the *Handbook on Practical Program Evaluation* (Cellini and Kee 2015).

Figure 1: Example of a simple CEA for a program comparing antenatal care attendance through either one-on-one outreach or mass SMS to the standard of care (control)



Source: Cellini SR, Kee JE. 2015. Cost-Effectiveness and Cost-Benefit Analysis, in *Handbook of Practical Program Evaluation*, Fourth Edition (eds Newcomer KE, Hatry HP, Wholey JS). John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/9781119171386.ch24.

V. CONCLUSION

CEAs conducted by ASSIST have shed light on the value for money provided the project. They demonstrate the importance of tracking and analyzing the cost of interventions in order to better understand their impact, feasibility, and long-term sustainability. ASSIST CEA studies contribute to our understanding of the overall impact of an intervention and can be used as an important advocacy tool for maintenance of expansion of similar programs. However, ASSIST's CEAs would have benefited from using long-term health outcome measures such as deaths, disability, secondary infections, or disability-adjusted life years averted. This would have allowed comparison of how efficient activities implemented by ASSIST were compared to other projects and interventions. Key lessons learned from conducted CEAs under ASSIST and recommendations for successful CEAs include planning to collect adequate cost data from the beginning of the activity, tracking all expenses, selecting the perspective and outcome, differentiating direct from indirect costs and using DALYs whenever possible. In addition, it is important to create a dissemination plan for CEA results and involve key stakeholders in data analysis and use. Finally, even in the absence of CEA experts, it is possible to conduct a basic CEA to determine the relative efficiency of a program.

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ANNEX 1: LIST OF CEA STUDIES INCLUDED IN THIS SYNTHESIS

Ecuador

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Kenya

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