Cost-effectiveness analysis evaluation plan

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Results in development

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List of acronyms

A360	Adolescents 360
BMGF	Bill & Melinda Gates Foundation
CIFF	Children's Investment Fund Foundation
CEA	Cost-Effectiveness Analysis
CYP	Couple-Year of Protection
DALY	Disability-Adjusted Life Year
GDP	Gross Domestic Product
HCD	Human-Centered Design
HEW	Health Extension Worker
ICER	Incremental Cost-Effectiveness Ratio
LGA	Local Government Area, Nigeria
LSHTM	London School of Hygiene & Tropical Medicine
M&E	Monitoring and Evaluation
mCPR	Modern Contraceptive Prevalence Rate
MOH	Ministry of Health
NDA	Non-Disclosure Agreement
SFH	Society for Family Health, Nigeria
SNNPR	Southern Nations, Nationalities and Peoples' Region, Ethiopia

Executive summary

Background

This protocol describes the proposed cost-effectiveness analysis (CEA) of the Adolescents 360 (A360) program, a four-and-a-half year US$30 million investment by the Bill and Melinda Gates Foundation and Children's Investment Fund Foundation (CIFF) to increase modern contraceptive use among girls aged between 15 and 19 in Ethiopia, Nigeria and Tanzania. The CEA links closely to other A360 evaluation components, including a companion cost analysis, process evaluation, outcome evaluation and crosscutting engagement and research uptake strategy (see Figure 1).

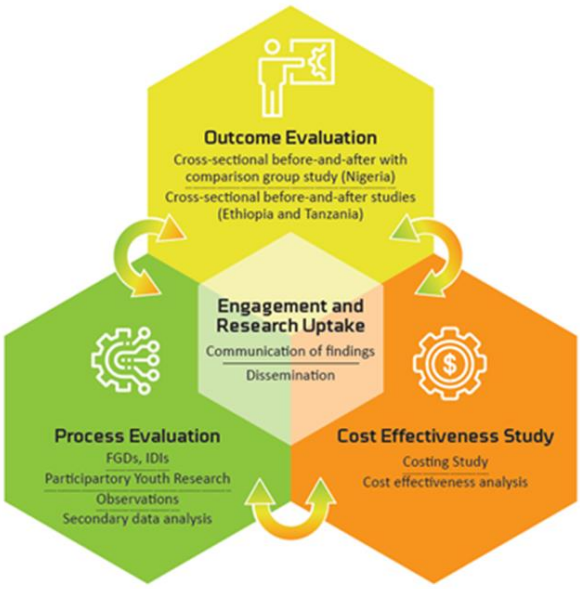


Figure 1: Evaluation components

Objectives

The cost-effectiveness study aims to answer the following questions:

- What are the main cost drivers of the A360 approach?
- Is the A360 approach considered cost-effective in relation to other methods of solution design?

The CEA will provide information on what it costs A360 to achieve those hypothesized increases in use of modern contraception and associated measures of program effectiveness, including couple-years of protection (CYPs) and disability-adjusted life years (DALYs) averted.

Methods

Measurement of costs and effectiveness will focus on four outcome evaluation study geographies, including four *woredas* (districts) in Ethiopia, three Local Government Areas (LGAs) in Nigeria and one district in Tanzania. We will put extra effort into collecting costs in Nigeria, which has the most robust outcome evaluation study of the three countries. We plan to collect the bulk of the cost data four times during the study, at roughly six month intervals beginning in Q4 2018. Costs will include both intervention and design costs. Effectiveness will be measured using indicators developed for the outcome evaluation, primarily modern contraceptive prevalence rate (mCPR). Final results from the CEA will be available only after the point at which the outcome evaluation produces data on program effectiveness, in the second quarter of 2021.

This CEA will take something less than a full societal perspective, taking the perspective of the funder or implementer of the intervention, and account for some additional economic (as opposed to financial) costs associated with running the program, limited by what is feasible and practical to collect. The study will include both intervention costs incurred by the A360 consortium and off-budget, 'leveraged', costs incurred by other partners.

We will collect data on costs incurred within the local study geography, and on related costs upstream at subnational and national levels. For price and resource use data, we will draw on financial records of the Population Services International (PSI)-led A360 consortium and partners, and on surveys.

The study will assign an economic value to inputs and report costs in constant local currency or in US dollars as appropriate.

We will carry out standard analyses, including of total costs, cost by categories, incremental cost, incremental effectiveness and incremental cost-effectiveness ratios. Incremental cost will include both design and intervention cost. Sensitivity analysis will gauge the extent to which changes in key assumptions affect CEA results.

Roles and responsibilities

The Itad consortium has overall technical responsibility for the CEA. Avenir Health will coordinate the design, supervise data collection, analysis and interpretation, and write up results. PSI and its subcontractors will provide Itad with timely cost data per agreements.

1. Cost-effectiveness analysis overview

This protocol describes the proposed cost-effectiveness analysis (CEA) for the evaluation of the Adolescents 360 (A360) approach. The CEA links closely to other A360 evaluation components, including a companion cost analysis, process evaluation, outcome evaluation and crosscutting engagement and research uptake strategy. The protocol includes a brief background on A360 and the evaluation, then describes in detail the methods, including the geographic scope, the timeframe, the costs to be collected, the data collection process and the analysis. This is followed by a specification of ethical issues, an outline of roles and responsibilities, a timeline, a description of limitations and details of expected dissemination.

1.1. Background

Although many programs in developing countries have tried to reach adolescents with family planning services, their effectiveness has mostly been limited.[1] A360 is a four-year, US$30 million investment to increase modern contraceptive use among girls aged between 15 and 19 in Ethiopia, Nigeria and Tanzania. Proponents of A360 believe it will be more effective than previous adolescent programs as it will better take into account the unique needs of this population group, and the social, cultural, religious and economic forces that underlie access to and choices about contraception.

A360 uses a multidisciplinary approach to design and scale up programs developed with and for young people that respond to their specific needs in obtaining and using contraceptives. The innovative A360 approach combines human-centered design (HCD) with social marketing, developmental neuroscience, sociocultural anthropology, public health and youth engagement to create better solutions for adolescents. The Bill & Melinda Gates Foundation (the Gates Foundation) and the Children's Investment Fund Foundation (CIFF) are funding A360 via a consortium led by Population Services International (PSI). The project began in January 2016 and will end in February 2020.

Itad is working in collaboration with the London School of Hygiene & Tropical Medicine (LSHTM) and Avenir Health to monitor, evaluate and learn from the A360 program. Data and evidence will support accelerated introduction and scale-up of interventions across multiple countries.

1.2. Rationale for the cost-effectiveness analysis

The field lacks evidence for both health impact and cost data associated with projects that employ the A360 approach, particularly its focus on HCD. Proponents expect A360 to be more effective than traditional adolescent programming but concede that the HCD-related design costs are likely higher than those of traditional approaches. A CEA can help determine whether this additional cost is worthwhile in terms of the expected additional effectiveness.

This is a multi-country study, with the methods of designing the A360 interventions standardized but the intervention package varying between countries. We are therefore interested in examining the success of this approach to intervention design in addition to evaluating the package of interventions in each setting.

1.3. The A360 program approach

A360 is a new approach to both the design and the implementation of adolescent programming.

1.3.1. The A360 design approach

The A360 approach combines six 'lenses' to create better solutions for adolescents:

1 Chandra-Mouli V, Lane C, Wong S. What does not work in adolescent sexual and reproductive health: a review of evidence on interventions commonly accepted as best practices. Glob Health Sci Pract. 2015;3(3):333-340. http://dx.doi.org/10.9745/GHSP-D-15-00126.

1. **HCD** is a generative, iterative and dynamic approach to understanding people's desires and aspirations and then designing feasible, viable solutions that satisfy them.
2. **Social marketing** applies lessons from years of social marketing of health products and services.
3. **Youth engagement/youth–adult partnership** emphasizes the role of youth in the design of programs that aim to benefit them.
4. **Application of a developmental neuroscience lens to all project design elements** takes into account stages of adolescent neurocognitive, social, emotional and sexual development.
5. **Sociocultural anthropology** takes culture into account.
6. **Public health** uses the tools of public health to inform program design and implementation.

Although all adolescent-focused programs have—to a greater or lesser extent—incorporated these lenses into their design, A360 fosters a conscious effort to use all these elements. In the A360 overview, A360 implementers hypothesize that, 'through a fusion of these disciplines, combined with meaningful engagement of young people in all phases of the project, we will catalyze a series of novel approaches to program design and delivery that can be replicated and scaled by partners and governments around the world'.

A360 is funded by the BMGF and the CIFF, and is being implemented by a consortium that includes PSI, IDEO, University of California-Berkeley and Triggerise. Society for Family Health (SFH), a sub-awardee, leads implementation of the intervention in Nigeria; in Ethiopia and Tanzania, local PSI affiliates lead the intervention.

A360 has five distinct phases: Inception, Inspiration, Ideation, Pilot and Implementation, with the final phase culminating in the scale-up of programs. The first three phases ran from March 2016 through to August 2017. The pilot stage ended in October 2017, except for in northern Nigeria, where piloting went through to the end of March 2018. Scale-up and implementation began in November 2017 and was initially due to run through to December 2019, however A360 has received a six month extension, which will see the project run to June 2020.

1.3.2. The A360 interventions

Ethiopia, Nigeria and Tanzania have unique demographic, social and cultural profiles, and each is implementing A360 in different ways. Nonetheless, the A360 interventions include a combination of life skills education, counseling on family planning and improved contraceptive provision through 'adolescent-friendly' services.

1.3.2.1. Ethiopia

The Smart Start intervention in Ethiopia leverages community volunteers to recruit young married girls and their husbands to attend counseling sessions to discuss their family and financial goals. Together with the program-paid Smart Start counselor (called a 'navigator'), couples make a financial and family plan and learn how contraception can help them achieve this. Smart Start then links couples to public sector health extension workers (HEWs) to obtain contraception.

Smart Start uses a 'wave' approach. Two navigators work intensively for six weeks to saturate unmet need for family planning in a *kebele* (sub-district), then hold a transition meeting to hand over the program to the HEWs in that *kebele*. They then move on the next *kebele*, eventually covering all *kebeles* (20 on average) in a *woreda* (district). Navigators do not return to the same *kebele*.

Costing considerations:

- The degree to which HEWs continue the program after the navigators leave the *kebele* will have implications for both effectiveness and cost. Measuring the time these government workers spend on

the intervention will pose a challenge, since Smart Start is just one of many programs for which HEWs are responsible. Also, A360 is still seeking ways to track the extent to which girls continue to see the HEWs.

- The wave approach has implications for interpreting the cost and impact of the intervention. We will need to think carefully about how to calculate the effective duration of the intervention to ensure this duration is matched with the effort (and associated cost) expended by the intervention.
- The mobilisers who help recruit girls for the program are unpaid, and valuing their time is sensitive because of government concerns about keeping them as unpaid volunteers. These concerns should be kept in mind in designing data collection approaches.

1.3.2.2. Nigeria

A360 has two separate interventions, one in the south targeting unmarried girls and another in the north targeting married girls.

Southern Nigeria

The 9ja Girls program centers on the Girls Safe Space—a site where unmarried girls can take livelihood skills classes, receive group and individual counseling on health and sexuality and avail themselves of contraceptive services. Paid community mobilizers recruit girls into the program. Safe Spaces are co-located with existing Ministry of Health (MOH) clinics, with provider-counselors supplied by the MOH or other government entities. Depending on the location, the Safe Space is one of three models: a Flagship with four counselor-providers and classes three times a week; a Clinic Cluster with two counselor-providers and classes monthly; and a Clinic Cluster+, with two counselor-providers and classes weekly.

The model operating in the study Local Government Authority (LGA) is a Clinic Cluster+, with three to four facilities. Each facility has one service room and offers classes once a month on Saturday (rotating between facilities). There are two mobilisers per facility, and two provider-counselors per facility.

Costing considerations:

- Leveraged costs, in the form of providers at the clinics and staff for skills classes, constitute a significant proportion of overall intervention costs. Tracking these off-budget costs will require extra effort.

Northern Nigeria

At the time of writing this protocol, the intervention in northern Nigeria was still under design, although its contours were coming into focus. The intervention is shaping up to have a 9ja component for unmarried girls similar to the intervention in the south, and a second component for married girls. The married girls component will likely include some elements of 9ja plus elements for husbands and religious leaders. Rather than skills classes as in 9ja, the married girls will join peer groups discussing topics including nutrition, antenatal care, negotiation, finance, etc. (somewhat like the Smart Start program in Ethiopia).

Costing considerations:

- The late start of the intervention in the north (it is expected to launch in April 2018) will require modification of this protocol to take into account the approach that A360 will eventually implement. It may also shorten the duration of the intervention, and thus has implications for the collection of data and the interpretation of results.

1.3.2.3. Tanzania

The Kuwa Mjanja (Be Smart) intervention targets both unmarried and married girls. Girls and their families hear about Kuwa Mjanja through community meetings with parents, neighbors who are peer educators

(called ‘queens’), community organizations and media. Girls attend pop-up events at local clinics, which feature group and individual counseling on body changes, life goals and contraception. During the events, girls are able to obtain a contraceptive method from a trained provider. Whether they choose contraception or not, they are invited to join a Kuwa Mjanja club and remain connected to each other and to the program face to face or virtually through social media.

Costing considerations:

- The basic operational unit of the intervention is a ‘site’, which is still somewhat loosely defined as the catchment area served by the pop-up or girl-clinic session. Yet girl-clinics are fixed and integrated into existing facilities, whereas pop-up events rove from place to place. It remains somewhat unclear what constitutes a site within a district and how district management is organized. Because the outcome evaluation happens at the district level, this may affect the interpretation of the results of the endline outcome evaluation.
- Although the program will maintain a constant presence throughout the entire intervention period, the mix of activities may change over time. In the study district, for example, the plan is to scale a mix of approaches, but it will start with outreach and then continue with clinic days and pop-ups. PSI Tanzania will be reporting numbers of pop-up events, girl-clinics and parent-clinics, which will allow us to track the number and timing of events in each district, including the study district.
- PSI plans to manage pop-up events in several sites through a sub-award, in addition to those it will manage directly. If the sub-award includes the study district, we will need to make sure we adequately capture costs incurred in that district under the sub-award.
- Similarly, PSI will rely on other partners in country (such as the UK Department for International Development) to carry out and directly bear the cost of some activities. While PSI will retain control of the management of all intervention sites, these partners will carry out and pay for specific activities within sites. Similar to the challenge for tracking costs under the sub-award, there will be challenges here in collecting data from these partners on their activities and associated costs.

1.4. Study questions

In relation to the outcome evaluation, the specific evaluation questions from the inception report were:

- What impact has the A360 program had in the three countries?
- How has A360 affected key reproductive health outcomes in A360 countries?
- How has A360 affected key intermediate outcomes (as articulated in the A360 Theory of Change)?

The main study hypothesis for the outcome evaluation is that A360 will lead to increases in modern contraceptive use:

- Greater compared with in areas where A360 has not been implemented (Nigeria); or
- Greater than what would have been expected in the absence of A360 (Ethiopia and Tanzania)

In relation to the cost-effectiveness study, the specific evaluation questions from the inception report were:

- What are the main cost drivers of the A360 approach?
- Is the A360 approach considered cost-effective in relation to other methods of solution design?

The CEA will provide information on what it costs A360 to achieve those hypothesized increases in use of modern contraception and associated measures of program effectiveness, including couple-years of protection (CYPs) and disability-adjusted life years (DALYs) averted.

Specific questions this study aim to understand how cost-effective is A360 compared with:

- Other family planning approaches focused on reaching adolescents
- Other family planning approaches that do not have a specific adolescent focus
- Other closely related reproductive, maternal and child health interventions
- International standards of cost-effectiveness

The researchers have no preconceived notions or hypothesis about whether A360 will turn out to be more or less cost-effective than other approaches or interventions.

2. Design and methodology

2.1. Design overview

Measurement of costs and effectiveness will focus on the outcome evaluation study geographies, including four *woredas* in Ethiopia, three LGAs in Nigeria and one district in Tanzania. We will put extra effort into collecting costs in Nigeria, which has the most robust outcome evaluation study of the three countries. We will collect intervention costs four times at roughly six month intervals beginning in Q3 2018. For the cost-effectiveness calculation, costs will include both intervention and design costs. Effectiveness will be measured using indicators developed for the outcome evaluation, primarily the modern contraceptive prevalence rate (mCPR). Final results from the CEA will be available only after the point at which the outcome evaluation produces data on program effectiveness, in the second quarter of 2021.

2.2. Study perspective

The choice of perspective or viewpoint is important because it determines the scope of the costs and benefits to be analyzed. Ideally, any CEA should adopt the perspective of society, and include all effects and all related costs, regardless of who benefits from or pays for them. This CEA will take something less than a full societal perspective, instead taking the perspective of the funder or implementer of the intervention, and account for some additional economic (as opposed to financial) costs associated with running the program, limited by what is feasible and practical to collect.

The primary audiences for the CEA include a global audience of program managers who decide on the design and intervention approach their institutions will use, as well as the donors, governments or other agencies that fund such programs. These audiences care primarily about what they need to budget from their own resources. However, who pays for what may vary from country to country—hence the importance of including both on- and off-budget costs, as well as economic costs of non-financial items such as volunteers' time and donated goods. The choice of this perspective has implications for which costs to collect and which not, explored in more detail below.

2.3. Geographic scope and outcome evaluation focus

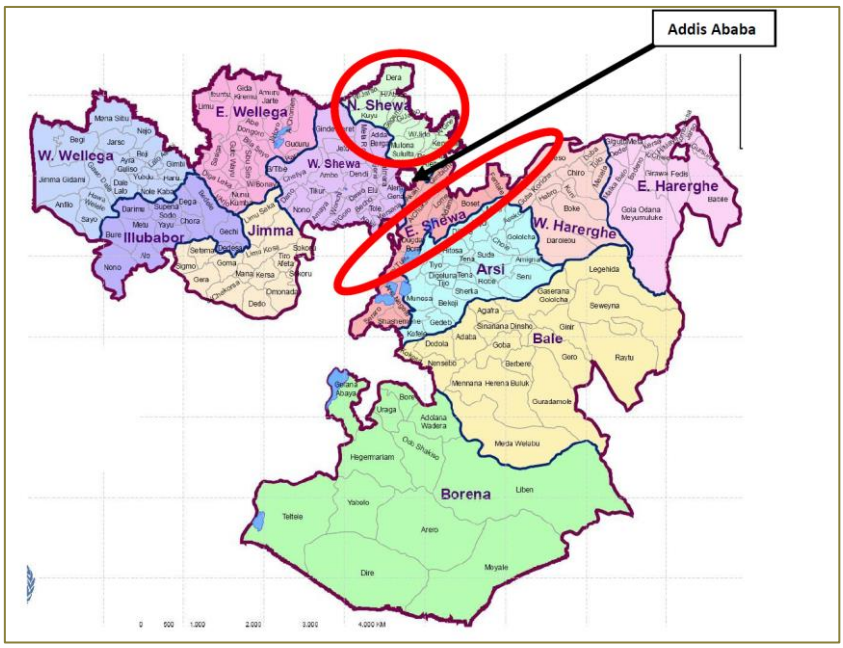
Both the context and the implementation of A360 vary by country. This section describes where A360 will operate within each country, and the outcome evaluation approach in each. For more information on the A360 and study geographies and how they were chosen, see the outcome evaluation protocols.

2.3.1. Ethiopia

In Ethiopia, A360 is being implemented in two city administrations and five regional states (Addis Ababa, Amhara, Dire Dawa, Harari, Oromia, Southern Nations, Nationalities and Peoples' Region (SNNPR) and Tigray). Each regional state is subdivided into administrative zones; each administrative zone is subdivided into *woredas*. Within each of the selected regional states, A360 will be implemented in selected *woredas*.

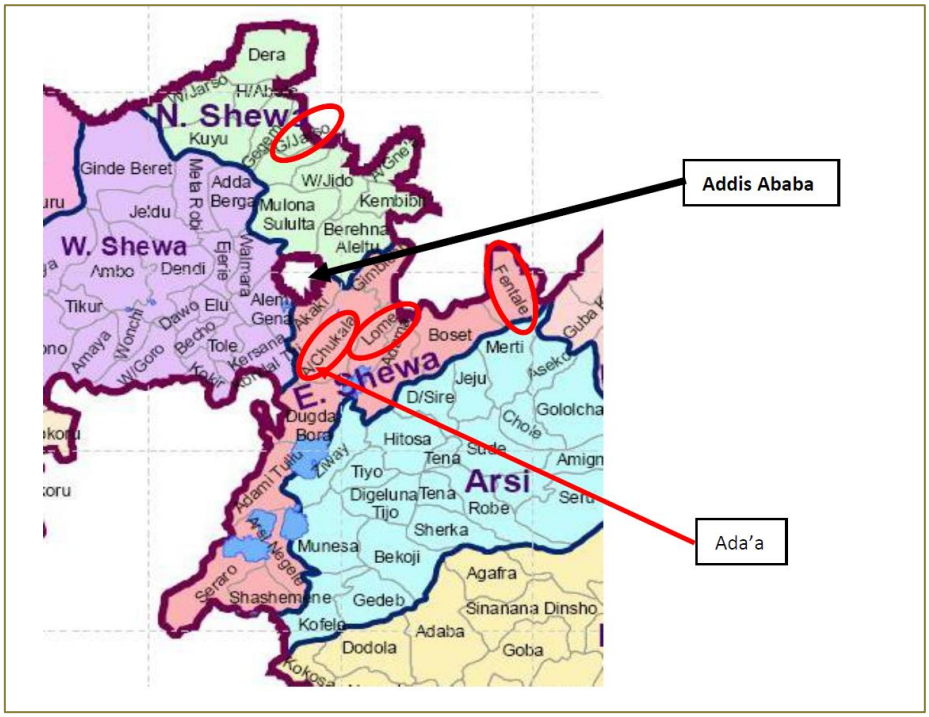
The cross-sectional before-and-after outcome evaluation study will take place in four *woredas* of Oromia region where A360 will be implemented (Wara Jarso, Lome, Ada'a, Fentale) (Figure 1 and Figure 2). In Ethiopia, PSI is implementing the same intervention in all *woredas*. The intervention focuses on reaching married girls, or in some instances girls who are engaged.

Figure 1: Map of Oromia region showing administrative zones containing *woredas* where intervention study will take place



Source: Outcome evaluation protocol.

Figure 2: Map of North Shewa and East Shewa administrative zones showing *woredas* where intervention study will take place



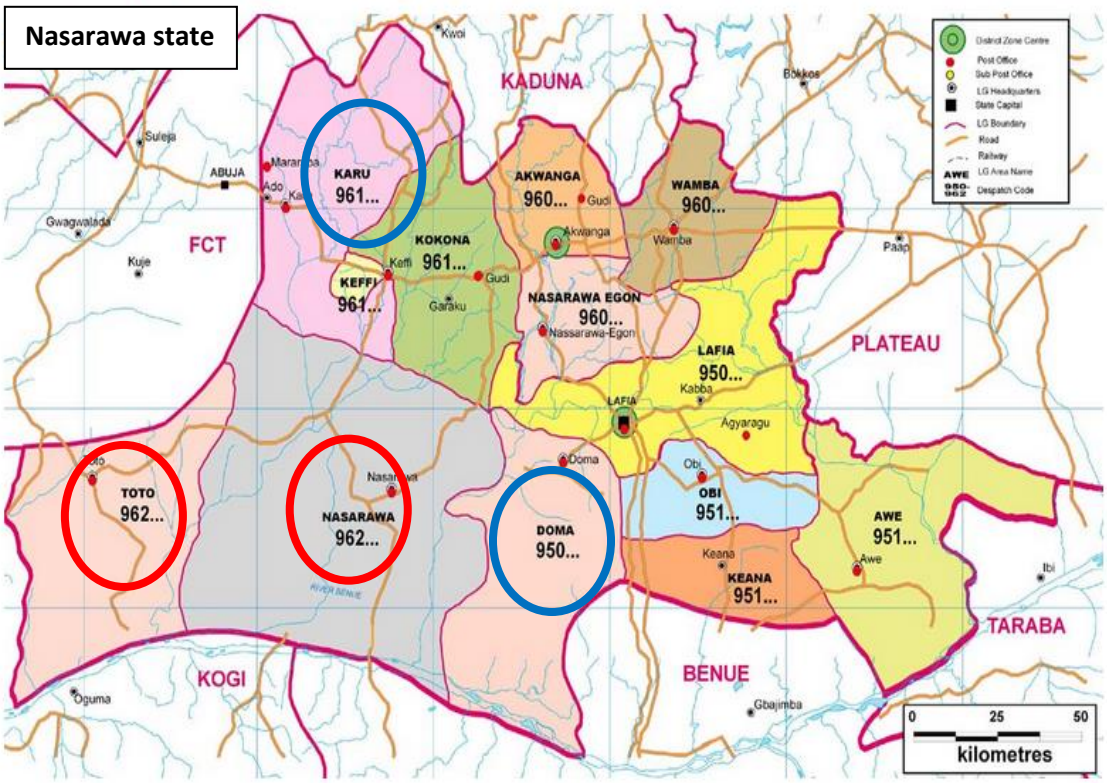
Source: Outcome evaluation protocol.

2.3.2. Nigeria

In Nigeria, A360 is being implemented by Society for Family Health (SFH) in three states in the north of Nigeria (Federal Capital Territory, Nasarawa and Kaduna), and in seven states in the south of Nigeria (Lagos, Osun, Ogun, Oyo, Edo, Delta and Akwa Ibom). Each state is subdivided into LGAs. Within each of the selected states, A360 will be implemented in approximately 60% of the LGAs.

The outcome evaluation in Nigeria, a cross-sectional study with comparison groups, will compare A360 intervention and control groups in three pairs of LGAs, two in the northern state of Nasarawa (Figure 3) and one in the southern state of Ogun (Figure 4).

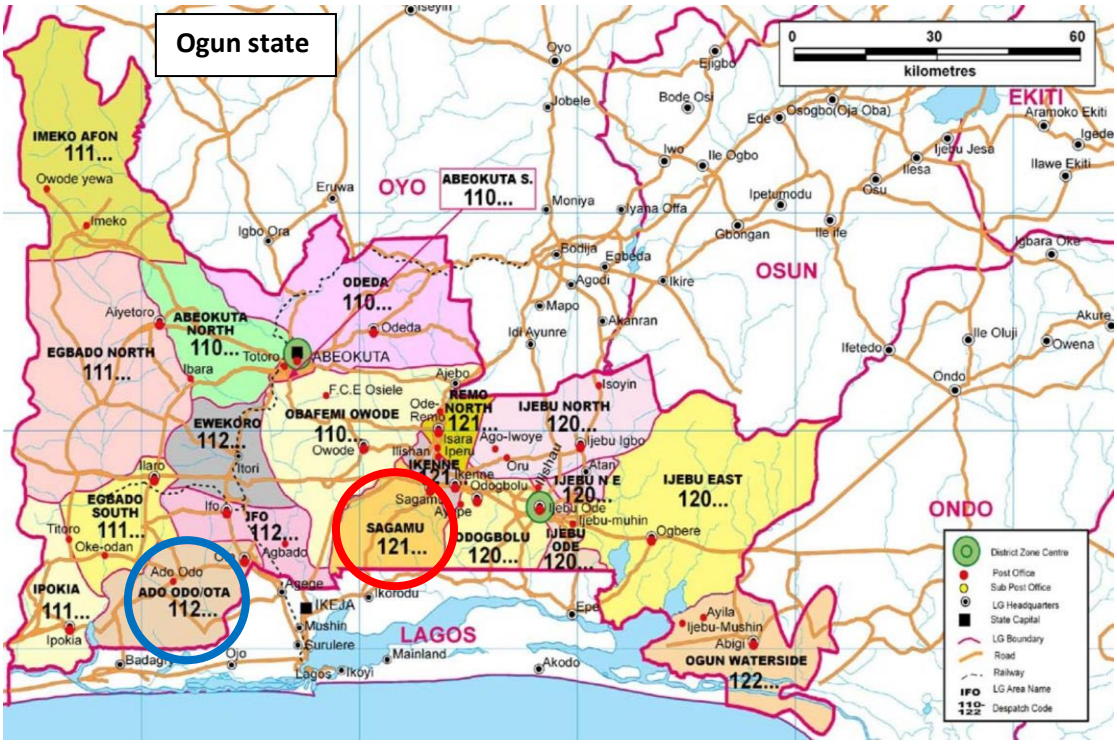
Figure 3: **Map of Nasarawa state, northern Nigeria, showing LGAs by their boundaries**



Note: Intervention LGAs in blue and comparison LGAs in red.

Source: Outcome evaluation protocol.

Figure 4: Map of Ogun state, southern Nigeria, showing LGAs by their boundaries



Source:

Note: Intervention LGAs in blue and comparison LGAs in red.

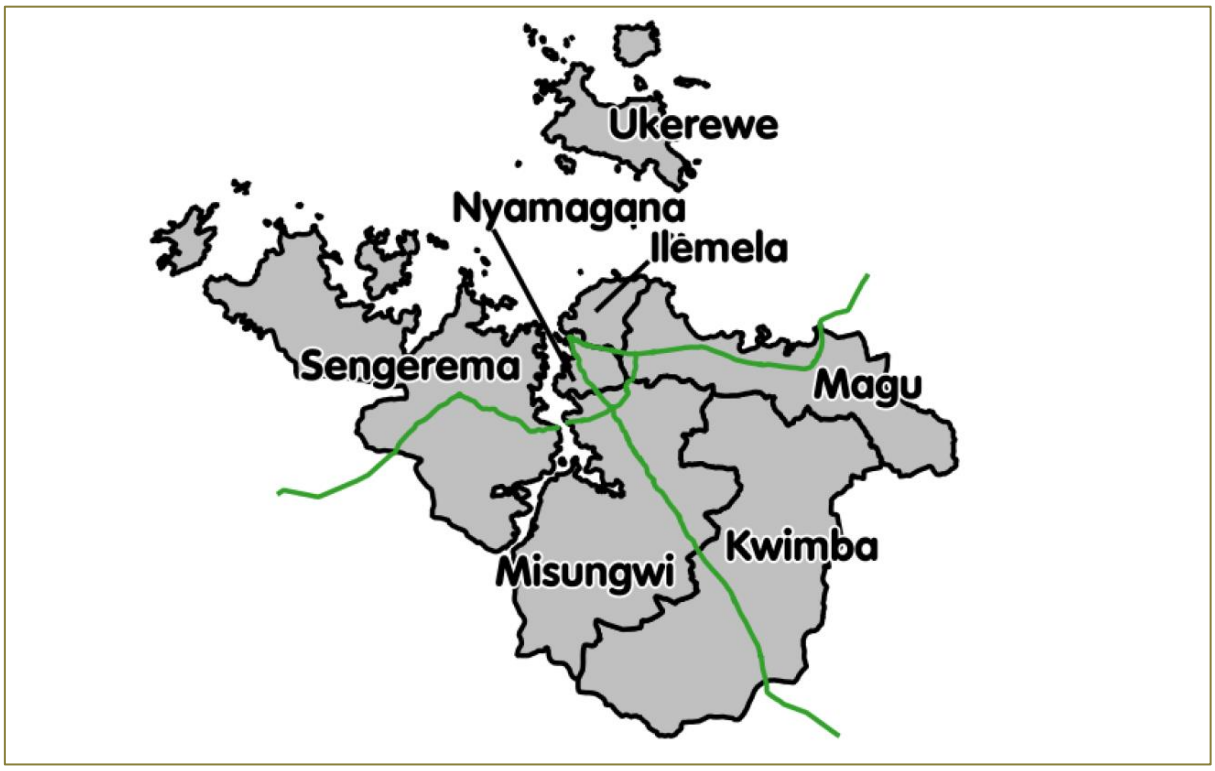
Source: Outcome evaluation protocol.

In southern states there will be one intervention targeting unmarried girls only. In northern states, at the time of writing our study protocols, a different intervention targeting only married girls was planned.

2.3.3. Tanzania

In Tanzania, PSI is implementing A360 across the entirety of 10 regions (Kagera, Geita, Mwanza, Arusha, Tabora, Tanga, Dar es Salaam, Mbeya, Iringa and Morogoro). The cross-sectional before-and-after outcome evaluation study is taking place in urban and semi-urban wards of Ilemela district, Mwanza region (Figure 5). A360 plans the same intervention in all 10 regions, targeting both unmarried and married girls.

Figure 5: Map of Mwanza region showing districts by their boundaries



Source: Outcome evaluation protocol.

2.4. Timeframe and analytic horizon

For any cost-effectiveness study, the timeframe (the period over which the program is carried out) and the analytic horizon (the period over which the costs and outcomes that occur as result of the program are considered) should be long enough to capture all relevant program effects. For this CEA, the timeframe will correlate with the period of the interventions—about two years. The exact timeframe may vary slightly, and depend on the timing of the start of the intervention in each study geography. The analytic horizon will be the same as the timeframe, converting any program effects such as DALYs averted that may accrue beyond the intervention timeframe to the intervention period.

The approximate start dates for the intervention in the study geographies are as follows:

Study geography	Approximate Start date
Ethiopia	February 2018
Nigeria (south)	October 2017
Nigeria (north)	April 2018
Tanzania	March 2018

It is important to note that scale-up will be gradual in the three countries. Thus, intervention costs are likely to increase over time as the program fully scales up. The data collection and analysis plan will consider this.

2.5. What costs to include

Given the study perspective, the CEA should include the following costs:

- On-budget A360 costs, including direct and indirect (overhead) costs
- Off-budget A360 consortium costs (not included in the A360 budget but essential to the functioning of the interventions)
- Off-budget 'leveraged' partner costs, including the market value of in-kind provision of goods and services from PSI-affiliated, public sector or private sector providers, such as:
  - Health worker time counseling or delivering services to adolescents
  - Contraceptive and other health supplies
  - Materials for education and counseling
  - Print, media or digital materials or services for the promotion of the interventions

The study excludes the following costs:

- The opportunity cost of client time to participate in programs, and to receive services
- Client out-of-pocket fees
- Donor management costs
- Itad external evaluation costs (except to the extent to which they contribute to the functioning of the interventions)
- A360 partner 'learning' and other non-core costs that do not support the interventions. Examples:
  - Developing and carrying out the A360 learning strategy
  - A360 evaluation efforts that track project progress beyond routine monitoring
  - International and national dissemination activities (conferences, brochures, briefs, etc.)
  - Advocacy activities unrelated to the functioning of the interventions

2.6. Cost categorization

The study will tag costs according to the following categories, to allow appropriate analysis and consistency with data collected during the design phase:

- Country
- Intervention model (within country, if applicable)
- Input type (following the categories used in the cost analysis, to the extent possible)
- Service element (variable by country, depending on the specific service model)
- Level at which cost is incurred (local, subnational, national, international; variable by country depending on the specific service model and country context)
- Funding source (A360 consortium on-budget costs; A360 consortium off-budget costs; leveraged costs incurred by non-consortium partners)
- Financial versus economic (to distinguish between costs someone pays versus imputed costs of donated goods and services)
- Fixed versus variable (fixed costs do not change with the volume of services provided; variable costs change with the volumes of services provided)

- Capital versus recurrent (capital costs are for those items with a useful life of greater than one year; recurrent costs are for those items with a useful life of less than or equal to one year)
- Timing of cost (by month, quarter and year, as feasible)

2.7. Data collection and processing

2.7.1. Data on intervention costs

We will collect data on costs incurred within the local study geography, and on related costs upstream at subnational and national levels.

For the individual line item resources associated with each intervention, we will collect data on price (unit cost) and resource use (amount used).[2]

We plan to collect the cost data four times during the study, beginning in the fourth quarter of 2018 at roughly six month intervals through the third quarter of 2020.[3]

As an example, Table 1 shows the proposed data collection strategy for southern Nigeria's 9ja Girls program.[4]

- For line items paid through the A360 budget, price data will be available through SFH's routine financial tracking system.
- For items funded by the government (or other donors), such as provider time and contraceptives, we will request price information directly from those funders. If such information is not available from those sources, we will rely on estimates from SFH or previous calculations made by PSI to estimate leveraged costs.
- Data on actual resource use for each line item will come mainly from annual surveys applied at the LGA, state, regional and national level. Surveys will include questions on time and resource use as relevant to the items mapped to each level. Survey respondents will include relevant program staff at each level, and include both A360-funded staff and staff funded through other sources such as the government.

If sufficient evaluation resources exist, we plan to use a similar approach to intervention cost data collection in Ethiopia and Tanzania, with Table 1 and associated data collection forms adapted to the specifics of the interventions in those two countries. If evaluation resources are not sufficient, we will apply less expensive data collection techniques in Ethiopia and Tanzania. These cheaper alternatives will rely on allocating a portion of national-level intervention costs to the study geographies.

2 Cost = price times amount of resource used.
3 Waiting until the fourth quarter of 2018 to begin cost data collection has the advantage of letting the A360 consortium settle on the final intervention design through its proposed 'optimization' strategy, which will continue to test changes to the intervention over the first six months after initiation.
4 Costs shown for the Clinic Cluster+ model, the model being applied in the study geography in southern Nigeria.

Table 1: Source of data on unit cost and resource use, 9ja intervention in Nigeria, Ado Odo Ata

	Price data			Resource use data					
Service element and line item	**Govt' records**	**SFH financials**	**Reports**	**Service statistics**	**Survey, LGA**	**Survey, LGA, repts**	**Survey, state**	**Survey, regional**	**Survey, national**
Demand creation									
9ja Girls materials		**X**			**X**				
Community-level advocacy meetings		**X**			**X**				
Consumables		**X**			**X**				
Mobilization		**X**			**X**				
Mobilizer review meetings		**X**				**X**			
Mobilizer trainings		**X**				**X**			
Production printed media—mobilizer materials		**X**			**X**				
Production printed media—vinyls Cluster/Cluster+		**X**			**X**				
Van/4x4		**X**			**X**				
Young designers orientation		**X**	**X**						

	Price data			Resource use data					
Service element and line item	**Govt' records**	**SFH financials**	**Reports**	**Service statistics**	**Survey, LGA**	**Survey, LGA, repts**	**Survey, state**	**Survey, regional**	**Survey, national**
Project management									
National SFH management/support		**X**							**X**
Regional SFH management/support		**X**						**X**	
Assessment of health facilities		**X**			**X**				
General contractor		**X**			**X**				
M&E attendance book		**X**			**X**				
M&E counseling log		**X**			**X**				
M&E registration book		**X**			**X**				
Mystery client girls surveys		**X**			**X**				
Other surveys and mid-term review		**X**			**X**				
Pre- and post-pilot evaluation		**X**			**X**				
Program assistants		**X**			**X**				
Supporting the national ATWG		**X**							**X**
Young designers		**X**			**X**				

	Price data			Resource use data					
Service element and line item	**Govt' records**	**SFH financials**	**Reports**	**Service statistics**	**Survey, LGA**	**Survey, LGA, repts**	**Survey, state**	**Survey, regional**	**Survey, national**
Provider network									
Provider materials		**X**			**X**				
Provider review meetings		**X**				**X**			
Provider services		**X**			**X**				
Provider trainings		**X**				**X**			
Providers—30% salaries paid starting period 3	**X**				**X**				
Government-leveraged providers	**X**					**X**			
Condoms—male	**X**			**X**					
Implants	**X**			**X**					
Oral contraceptives	**X**			**X**					
Sexually transmitted disease kits	**X**			**X**					
Quality assurance									
Quality focal persons		**X**					**X**		

	Price data			Resource use data					
Service element and line item	**Govt' records**	**SFH financials**	**Reports**	**Service statistics**	**Survey, LGA**	**Survey, LGA, repts**	**Survey, state**	**Survey, regional**	**Survey, national**
Safe spaces									
Furniture—Cluster/Cluster+		**X**			**X**				
Medical equipment and supplies—Cluster/Cluster+		**X**			**X**				
Painting—Cluster/Cluster+		**X**			**X**				
Rent one room	**X**				**X**				
Utilities	**X**					**X**			
Skills classes									
Civil society organization training		**X**			**X**				
Civil society organization skills training		**X**			**X**				
Providers-counselors for Saturday Classes—Cluster+	**X**	**X**			**X**	**X**			

	Price data			Resource use data					
Service element and line item	**Govt' records**	**SFH financials**	**Reports**	**Service statistics**	**Survey, LGA**	**Survey, LGA, repts**	**Survey, state**	**Survey, regional**	**Survey, national**
Supportive supervision									
Airfares—local in-country		**X**							**X**
Local transportation		**X**						**X**	
Local vehicle costs—maintenance		**X**							**X**
Local vehicle costs—operations		**X**						**X**	
Per diem—local in-country, field staff		**X**						**X**	
Per diem—local in-country, HQ staff		**X**							**X**

2.7.2. Data on intervention design costs

Most cost-effectiveness analyses do not include intervention design costs. In this case, however, because the design approach itself is hypothesized to produce the greater impact, we felt it necessary to include design costs in the calculation.

Data on the A360 design cost will come from the companion cost study, which should be completed by the second quarter of 2018.

We will calculate the incremental cost of the design approach, by measuring the cost difference between A360 and PSI's DELTA Design approach. DELTA is a marketing planning tool that PSI has traditionally used to design and plans its interventions. DELTA typically begins with formative research that feeds into a planning workshop. After the workshop, the design continues with solidifying activities and pretesting concepts. Data on DELTA costs was collected in 2017 from interviews with PSI and a review of DELTA Design spending reports.

2.7.3. Data on effectiveness

The outcome evaluation will provide information on program effectiveness in each of the four study geographies. See the outcome evaluation protocols for further details on methods.

2.8. Valuing inputs

The value of an input should, whenever possible, reflect its economic (opportunity) cost. In most cases, the economic cost will be the same as the financial cost (the amount somebody paid for it). In other cases, however, they will not be the same if the input was not purchased at market price (e.g. donated drugs or volunteer labor).

The study will collect information in sufficient detail to be able to identify both financial and economic cost of the inputs. Examples of this are contraceptive commodities sold to non-governmental organizations at a subsidized rate and volunteer time. For any input given in kind, cost will be imputed and valued at the market rate.

The study will value inputs in local currency or in US dollars as appropriate, and show results in both local currency and US dollars for comparison, using average exchange rates for the relevant periods. To adjust for inflation, we will report all costs in constant prices, using an appropriate month and year (e.g. January 2018) as a base. Recognizing the global interest in the results, we will report results in both nominal and international dollars, using purchasing power parity dollars according to the World Bank methodology.

2.9. Analyses

2.9.1. Cost

We will calculate an incremental cost by adding incremental intervention cost to incremental design cost.

2.9.1.1. Intervention cost

For each intervention model, we will analyze costs based on the cost categorizations described above. We will produce cost estimates for the study geography over the roughly two years of the study. For example, Table 2 shows how the analysis will break down total cost by input type, using illustrative numbers for the 9ja program in the study LGA in southern Nigeria, Ado Odo Ota.

Table 2: Illustrative cost by input type, Nigeria, Ado Odo Ota

Input	Cost
Commodities	$1,315
Equipment	$806
Indirect	$480
Materials	$2,201
Personnel	$23,058
Space	$840
Training	$14,322
Transport	$1,270
Grand total	**$44,291**

We also will present costs according to service element (here using the service element categories from the 9ja intervention in Nigeria) and by level at which the cost is incurred (Table 3).

Table 3: Illustrative cost by service element and level, Nigeria, Ado Odo Ota

	LGA	National	Regional	State	Grand total
Demand generation	$6,487				$6,487
Project management	$1,371	$3,929	$408		$5,708
Provider network	$12,131				$12,131
Quality Assurance				$616	$616
Safe spaces	$2,013				$2,013
Skills classes	$13,243				$13,243
Supportive supervision	$584	$269	$719		$1,572
Youth Engagement	$2,522				$2,522
Grand Total	**$38,350**	**$4,198**	**$1,127**	**$616**	**$44,291**

Table 4 shows how we will present costs by whether they are fixed or variable costs.

Table 4: Illustrative cost by fixed versus variable cost, Nigeria, Ado Odo Ota

	Fixed	Variable	Grand total
Demand generation	$4,385	$2,101	$6,487
Project management	$5,708		$5,708
Provider network	$10,786	$1,345	$12,131
Quality Assurance	$616		$616
Safe spaces	$2,013		$2,013
Skills classes	$5,352	$7,891	$13,243
Supportive supervision	$1,572		$1,572
Youth Engagement	$2,522		$2,522
Grand Total	**$32,954**	**$11,338**	**$44,291**

Because we will be tagging costs by funding source, we will also be able to show what the A360 budget supports directly and what costs the project is leveraging from other sources (Table 5).

Table 5: Illustrative cost by service element and funder, Nigeria, Ado Odo Ota

	A360	Leveraged	Grand total
Demand generation	$6,487		$6,487
Project management	$5,708		$5,708
Provider network	$2,368	$9,763	$12,131
Quality Assurance	$616		$616
Safe spaces	$693	$1,320	$2,013
Skills classes	$7,891	$5,352	$13,243
Supportive supervision	$1,572		$1,572
Youth Engagement	$2,522		$2,522
Grand Total	**$27,857**	**$16,435**	**$44,291**

2.9.1.2. Design cost

To calculate incremental design cost we will subtract the cost of PSI's DELTA Design process from the cost of the A360 design process.

A360 design cost

The A360 design cost comes from the costing study. That study will calculate a country-specific design cost (excluding learning costs and other project costs not associated with the design process). Table 6 shows illustrative design costs by phase and country.

Table 6: Illustrative country design costs A360

Phase	Ethiopia	Nigeria	Tanzania
Inspiration	$600,278	$727,432	$226,853
Ideation	$1,067,982	$1,485,683	$1,020,214
Pilot	$200,000	$250,000	$200,000
Total	**$1,868,261**	**$2,463,115**	**$1,447,067**

DELTA Design cost

PSI has provided the evaluators with estimates of typical national-level design costs under its DELTA process, with a range of costs corresponding to effort and level of complexity (Table 7).

Table 7: Illustrative DELTA Design costs

	Level of effort and complexity		
Phase	**Low**	**Middle**	**High**
Formative research	$150,000	$200,000	$250,000
Design workshop	$15,000	$21,191	$25,000
Post-workshop	$20,000	$30,000	$40,000
Total	**$185,000**	**$251,191**	**$315,000**

Source: PSI reports and interviews.

Incremental design cost

To calculate incremental design cost, we will subtract the 'high' DELTA costs from the A360 country-specific costs (Table 8). We choose the high DELTA cost as the comparator because it better reflects the level of effort and complexity of the A360 process.

Table 8: Illustrative incremental country design costs

	Ethiopia	Nigeria	Tanzania
A360 design cost	$1,868,261	$2,463,115	$1,447,067
DELTA method	$315,000	$315,000	$315,000
Incremental design cost	$1,553,261	$2,148,115	$1,132,067

From the total incremental design cost, we will calculate a design cost allocated to the study areas. We do that by dividing the total incremental design cost by the total number of geographies (district, *woreda* or LGA) in the country, then multiplying by the number of study geographies in the countries. That generates a project lifetime incremental design cost—the first row in Table 9. We will then annualize that cost by

assuming the design has a useful life of five years,[5] producing an annual incremental design cost (row 2). Finally, we will multiply that annual cost by the duration of the study interventions (assumed two years), generating a total incremental design cost (row 3). Although the illustration shows costs split equally in Nigeria between the intervention in the north and that in the south, the final split will attempt to reflect more accurately the relative level of effort expended on each design. In the illustration (Table 9), we have split costs equally between north and south.

Table 9: Illustrative incremental design cost allocated to study areas

	Ethiopia	Nigeria (north)	Nigeria (south)	Tanzania
Lifetime incremental design cost allocated to study areas	$22,973	$16,914	$8,457	$16,407
Annual incremental design costs allocated to study areas*	$4,595	$3,383	$1,691	$3,281
Total incremental design costs allocated to study areas **	$9,189	$6,766	$3,383	$6,563

* Based on useful life of 5 years; ** Based on intervention length of 2 years.

2.9.1.3. Total cost

The total incremental cost is simply the sum of the intervention cost and the incremental design costs (Table 10).

Table 10: Total incremental cost

	Ethiopia	Nigeria (north)	Nigeria (south)	Tanzania
Design	$9,189	$6,766	$3,383	$6,563
Intervention	$30,000	$46,000	$51,785	$35,000
Total	$39,189	$52,766	$55,168	$41,563

2.9.2. Effectiveness

The outcome evaluation will estimate change in mCPR in each study area. From change in mCPR we will calculate additional effectiveness measures to use in the cost-effectiveness calculations.

mCPR

mCPR change is the primary indicator from the outcome evaluation, though the definition varies slightly by study area (Table 11). For more on how mCPR change is calculated, see the outcome evaluation protocol.

Table 11: Definition of mCPR by study area

Country	mCPR definition
Ethiopia	% of sexually active, married, 15–19 girls using modern contraception

5 The assumption of five years of useful life is a convention to reflect that interventions, once designed, have an average lifespan of five years before they need to undergo redesign. Sensitivity analysis can test the impact of varying this five-year assumption.

Nigeria (north)	% of sexually active, married, 15–19 girls using modern contraception
Nigeria (south)	% of sexually active, unmarried, 15–19 girls using modern contraception
Tanzania	% of sexually active 15–19 girls using modern contraception

Family planning users

From mCPR change, we will calculate number of family planning users by multiplying mCPR at baseline and at endline by the relevant population (married, unmarried sexually active) of girls in the study population at baseline and endline. This population will use census data from the three countries, and project population growth to estimate total adolescent girls at baseline and endline. Then, these population figures will be multiplied by results from the outcome evaluation survey on the proportion of girls who are married and the proportion of girls who are unmarried and sexually active.

Comparing these two figures will give us the number of additional family planning users in the study populations.

Note this differs from the calculation that the A360 consortium is using for 'adopters', which it is deriving from service statistics. This captures a programmatic perspective, while the outcome evaluation is looking at population-level changes. The population-level changes account for demographic changes and the dynamics of contraceptive continuation and discontinuation.

Unintended pregnancies averted

The number of unintended pregnancies averted will be calculated for both baseline and endline family planning users; comparing the two will allow for calculation of additional unintended pregnancies averted. These calculations will be done based on existing methodologies taking into account the method mix of adolescent users (to calculate method failure) and the risk of pregnancy they would have faced if they were not using contraception. We will follow the agreed harmonized methodology outlined in Askew et al. (2017).[6]

Note that this outcome will be modeled based on changes in mCPR and method mix; it is not a direct measure of reduction in unintended pregnancy in the study areas.

DALYs averted

We will convert family planning users to DALYs averted using country- and method-specific coefficients from Marie Stopes International's Impact 2 model. This model is also used to develop coefficients for PSI's Impact Calculator, so will be consistent with DALY measures used internally at PSI.[7] Since the unit of interest for this evaluation is users, rather than products distributed, different coefficients will be to estimate the impact per family planning method user.

Illustrative effectiveness calculations

Table 12 illustrates the effectiveness calculations we will perform by country. The number of sexually active girls is drawn from our preliminary calculations based on census and other data. mCPR prevalence derives from the outcome evaluation protocols and does not reflect actual baseline data. Family planning users are calculated based on number of sexually active girls and mCPR prevalence. Unintended pregnancies averted and DALYs averted are calculated using appropriate conversion factors as defined above. The 'difference' columns represent the incremental effectiveness result. Note that the differences

6 Askew I, Weinberger M, Dasgupta A, Darroch J, Smith E, Stover J, Yahner M. Harmonizing methods for estimating the impact of contraceptive use on unintended pregnancy, abortion, and maternal health. Glob Health Sci Pract. 2017, GHSP-D-17-00121. https://doi.org/10.9745/GHSP-D-17-00121

7 http://impactcalculator.psi.org/

in mCPR prevalence are from the outcome evaluation, and include both the increase that would occur in the absence of A360 and the expected increase attributable to A360.

Table 12: Illustrative effectiveness calculations

	Baseline	Endline	Difference
Ethiopia			
# sexually active, married, 15–19	6,084	6,392	308
mCPR prevalence	45.1%	51.8%	6.7%
Family planning users	2,744	3,311	567
Unintended pregnancies averted	757	913	156
DALYS averted	678	818	140
Nigeria (north)			
# sexually active, married, 15–19	6,192	6,505	313
mCPR prevalence	3.0%	5.1%	2.1%
Family planning users	186	332	146
Unintended pregnancies averted	51	92	40
DALYS averted	46	82	36
Nigeria (south)			
# sexually active, unmarried, 15–19	4,900	5,148	248
mCPR prevalence	64.4%	72.6%	8.2%
Family planning users	3,156	3,738	582
Unintended pregnancies averted	870	1,031	161
DALYS averted	779	923	144
Tanzania			
# sexually active, 15–19	12,506	13,139	633
mCPR prevalence	26.7%	30.2%	3.5%
Family planning users	3,339	3,968	629
Unintended pregnancies averted	921	1,094	173
DALYS averted	825	980	155

2.9.3. Cost-effectiveness

Putting together costs and effectiveness will generate incremental cost-effectiveness ratios (ICERs).

Table 13: Illustrative incremental cost-effectiveness ratios

	Ethiopia	Nigeria (north)	Nigeria (south)	Tanzania
Incremental cost	76,230	52,766	55,168	49,787
Incremental effectiveness				
mCPR prevalence	6.7%	2.1%	2.1%	3.5%
Family planning users	567	146	582	629
Births averted	156	40	161	173
DALYS averted	140	36	144	155
ICERs				
Per family planning user	$134	$361	$95	$79
Per birth averted	$487	$1,310	$344	$287
Per DALY averted	$544	$1,463	$384	$320

Interpretation of the ICER

We will gauge the relative cost-effectiveness of the A360 approach by comparing the A360 ICERs against (1) standard international cost-effectiveness thresholds and (2) published data on the cost-effectiveness of youth-focused family planning interventions.

Comparison against cost-effectiveness thresholds

Following the recommendations of the Commission on Macroeconomics and Health, WHO-CHOICE sets standards for cost-effectiveness across health interventions in terms of cost per DALY averted, classifying interventions as:

- Highly cost-effective (if the ICER is less than one time gross domestic product (GDP) per capita)
- Cost-effective (if the ICER is between one and three times GDP per capita) or
- Not cost-effective (if the ICER is higher than three times GDP per capita)

We will set the A360 ICERs against the cost-effectiveness thresholds shown in Table 14. The GDP per capita figures are for 2017. We will adjust these GDP per capita benchmarks to match the actual intervention period, which will span roughly two years between 2017 and 2020, depending on the start date of each intervention.

Table 14: Illustrative GDP per capita thresholds for cost-effectiveness comparisons

	Highly cost-effective	Cost-effective	Not cost-effective
Ethiopia	< $706	> $706 and < $2,118	>$2,118
Nigeria	< $2,178	> $2,178 and < $6,534	>$6,534

	Highly cost-effective	Cost-effective	Not cost-effective
Tanzania	< $879	> $879 and < $2,637	>$2,637

Comparison against cost-effectiveness of other youth-focused family planning interventions

Setting the A360 ICERs against the international standards for cost-effectiveness will give a general sense of the cost-effectiveness of A360. Comparing with ICERs of other youth-focused family planning efforts will allow for further judgment as to the cost-effectiveness of A360. For the comparisons, we will draw from the literature, starting with 15 studies recently reviewed for inclusion in the Family Planning Goals model that include both cost and effectiveness results for youth programs. For comparison, we can also include recent estimates of the ICERs for family planning programs aimed at users of all ages, and closely related reproductive, maternal and child health interventions.

When comparing with other studies, it is important to ensure that methodologies for valuing inputs and discounting of costs and effectiveness match those used in the approach we use. For example, DALYs reported in many previous included discounting and age weighting. Comparing cost per DALY averted for non-discounted and non-age-weighted DALYs with previously published cost per DALY averted benchmarks that include discounting and age weighting cannot be done, as the DALYS are not comparable. These were removed in the most recent revision of the DALY, and so will not be included in this analysis (and are not included in the PSI DALY estimates). Similarly, many previous estimates of family planning impact on DALYs averted included child mortality impacts; current guidance discourages inclusion of child health impacts in calculating DALYs averted.

2.10. Sensitivity analysis

The results of any cost study depend to a significant extent on the assumptions used to calculate costs and outputs. It is, therefore, important to determine via sensitivity analyses whether changes in these assumptions might substantially alter the findings. We will carry out sensitivity analysis on selected key assumptions, to be determined in the course of the data collection and analysis. These sensitivity analyses will produce upper and lower bounds on the findings.

3. Ethical and other research concerns

The study does not involve human subjects, nor does it require review of individual client records. Therefore, there should be no need for intensive review by an institutional review board either in the US or in countries chosen.

The A360 study draws on potentially sensitive cost data. This includes, for example, individual salaries and overhead rates. Recognizing understandable concerns about making this information public, Itad has signed a non-disclosure agreement (NDA) with the PSI consortium that permits Itad and its subcontractors to view and analyze cost data needed to carry out the study analyses while protecting confidentiality. The NDA allows the publication of cost data at an appropriate level of aggregation.

To protect the identity of individual facilities, we will not identify them by name in any publicly circulated document, if individual facilities are visited as part of data collection efforts.

In terms of handling of data, no results will be publicly released until all institutions whose data has been used have had a chance to review.

4. Roles and responsibilities

The Itad consortium has overall technical responsibility for the CEA. Avenir Health will coordinate the design, supervise data collection, analysis and interpretation, and write up results.

PSI and its subcontractors will provide Itad with timely cost data per agreements.

5. Steps and timeline

The CEW will begin in Q2 2018 and end in Q3 2021. See the study timeline below for details (Table 15).

Table 15. CEA study timeline

	2018			2019				2020				2021		
Activity	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Finalize protocols	X													
Draft instruments	X	X												
Validate instruments and first data draw		X	X											
Second CEA data draw					X									
Third CEA data draw							X							
Fourth CEA data draw										X				
Final CEA report													X	

6. Challenges and study limitations

While the evaluation team will do the best job possible given the data and information available, it is important to note some key challenges and limitations.

1. *Obtaining spending data from PSI and sub-awardees and from non-A360 partners.* As for the design cost analysis, the CEA will require PSI and it sub-awardees to share very detailed spending to allow for proper allocation of costs to different inputs and activities. With the NDA in place, and with the close working relationship with PSI financial staff developed during the costing of the design phase, we should be able to overcome this challenge. PSI and SFH financial systems are unlikely to provide sufficient detail on resource use and unit cost in the study geographies. To address this limitation, we are proposing additional in-country data collection as noted in the methods section. To obtain information on leveraged resources from non-A360 funding sources (e.g. the MOH) we will work closely with PSI and sub-awardees to develop intervention-specific data collection approaches.
2. *Allocating national and subnational costs to the study geographies.* We plan to use surveys (primarily of staff time use) to allocate national and subnational costs to the study geographies. Nonetheless, some error may enter into the estimates. We will address this limitation through sensitivity analysis around the estimates.
3. *Sampling of cost data*. For most of the cost items, we will undertake a census of costs in the study geographies. Some cost items may, however, require a sampling approach where it is not feasible or it is too costly to undertake a census (e.g. to understand better time spent by volunteer community workers). For those items, we will make sure to use an appropriate approach to achieve a representative sample of costs.

4. *Collecting costs retrospectively.* Our proposed surveys at the one and two year marks will ask respondents to think back on time use during the previous year, thus generating potential recall error. To the extent possible, we may rely on PSI monthly tracking of costs, although at the time of writing of these protocols it appears that PSI will not use a monthly tracking tool consistently in the study geographies. We will use sensitivity analysis to address this potential error
5. *Comparability of results*. Differences among the three countries means we need to be very careful in comparing costs and cost-effectiveness across countries. Reports will present the results from the three countries; however, no analysis will be done to show that A360 is more or less cost-effective in one country versus another. Caution is similarly warranted in the comparison of A360 results to other studies that likely use different methods to calculate both costs and effectiveness. To the extent possible, we will address this limitation by noting where such differences might affect comparability.
6. *Interpreting the cost of a new intervention like A360.* New interventions typically cost more at the beginning, and get cheaper over time as managers figure out how to do things more efficiently. We will try to capture this dynamic by analyzing how costs evolve over the two years of the study, and incorporate those results into the interpretation of the overall cost-effectiveness result.
7. *Missing some of the longer-term impacts owing to time lag.* Since the evaluation occurs soon after implementation finishes, there may be longer-term impacts of A360 that are not captured in this evaluation. This is inherent to the design, and should be noted as a limitation when reviewing results of the CEA.
8. *Including of design costs in the incremental cost-effectiveness calculation.* Only a minority of cost-effectiveness analyses include design costs, and our inclusion of those costs for this analysis thus complicates the interpretation of the results. We will address this challenge by making our assumptions related to design costs transparent and noting how their inclusion may affect comparison with results reported by other studies.
9. *Comparing at different operational scales*. Scale can affect costs and efficiency, complicating the interpretation of results and comparison with results from other studies. Analysis of the fixed and variable costs of the interventions will highlight the potential that scale may affect such comparisons.
10. *Managing the interaction between the CEA and other evaluation components.* As during the design costing phase, the CEA, process evaluation and outcome evaluation components will interact along a range of dimensions. The current A360 management and governance structure should provide an adequate platform to ensure harmonization and clear data flow across the three evaluation components.

7. Reporting and dissemination

A full report of the CEA will be ready by September 2020. The report will cover the analysis discussed in this section. Depending on the content of the report, it is possible that an internal and external version of this report will be developed, to ensure proper handling of sensitive data.

Because of the global audience for the results, we plan to publish in a peer-reviewed journal, jointly with the results of the outcome evaluation.

References and bibliography

Text citations

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Outcome evaluation protocols

LSHTM, A360 PROTOCOL ETHIOPIA 22 August 2017 FINAL

LSHTM, A360 PROTOCOL NIGERIA 22 June 2017 FINAL

LSHTM, A360 TANZANIA PROTOCOL 22 June 2017 FINAL

Business cases and budget narratives

PSI, A360 Ethiopia Business Case, 30 November 2017

PSI, A360 Southern Nigeria Business Case, 30 November 2017

PSI, A360 Tanzania Business Case, 30 November 2017

PSI, A360 Master Budget Narrative, 30 November 2017

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