

# Economic Evaluation of the FIGO Postpartum IUD Initiative in Bangladesh and Tanzania

Report prepared by consultants  
Gillian Eva ([gillian.eva@gmail.com](mailto:gillian.eva@gmail.com)),  
Judy Gold ([judy.gold@gmail.com](mailto:judy.gold@gmail.com)) and  
A/Prof Kim Dalziel ([kim.dalziel@unimelb.edu.au](mailto:kim.dalziel@unimelb.edu.au)) for the  
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## Acronyms and Glossary

AGOTA	Association of Gynaecologists and Obstetricians, the initial implementing organisation of the FIGO PPIUD initiative in Tanzania
CYP	Couple-year of protection, the estimated protection provided by contraceptive methods during a one-year period. CYPs are calculated by multiplying the quantity of each method by CYP conversion factor for each method that takes into account how a method is used, failure rates, wastage, number of units of the method that are typically needed to provide one year of contraceptive protection for a couple and for long acting methods, typical time to removal.
DALY	Disability-adjusted life year, a measure of overall disease burden. A DALY is made up of the sum of years of life lost due to premature mortality in the population and the years of healthy life lost due to disability for people living with the health condition or its consequences
DHS	Demographic and Health Survey, a nationally representative household surveys covering population, health and nutrition conducted around every five years
FIGO	International Federation of Gynecology and Obstetrics, the instigators and leaders of the six country PPIUD initiative
ICER	Incremental cost effectiveness ratio. This is calculated for the PPIUD program relative to usual care for immediate postpartum contraception, and is the difference in costs divided by the difference in outcome
IEC	Information, education and communication, materials designed to support information, education and communication with either clients or providers
IUD	Intrauterine device
MoHCDGEC	Ministry of Health, Community Development, Gender, Elderly, and Children, Tanzania
OGSB	Obstetrical and Gynaecological Society of Bangladesh, who were responsible for implementing the FIGO PPIUD initiative in Bangladesh
PPFP	Postpartum family planning
PPTL	Postpartum tubal ligation, a tubal ligation performed at or around the time of delivery. Most commonly performed after a c-section delivery.
PPIUD	Postpartum IUD, IUD inserted at or around the time of delivery (generally within 48 hours of delivery, before a woman is discharged from the health facility)
RMNCAH	Reproductive, Maternal, Newborn, Child, and Adolescent Health
WHO	World Health Organization

# Executive Summary

## *Background*

There is a large global unmet need for contraception. As many pregnant women wish to delay or limit future children following childbirth, interactions with the healthcare system in this period are a key opportunity for the provision of contraceptive services. There are now multiple modern contraceptive methods that can be provided at or around the time of delivery, and the increasing number of women in low and middle income countries attending antenatal care and delivering in health facilities provides a clear way to reach a large number of women with contraceptive services.

This economic evaluation is based on the implementation of an immediate postpartum IUD (PPIUD) initiative in Bangladesh and Tanzania led by the International Federation of Gynecology and Obstetrics (FIGO). The initiatives' overall aim is to better meet postpartum contraceptive needs by increasing the capacity of healthcare providers to provide postpartum family planning (PPFP) counselling and provide PPIUD, if chosen, at or around the time of delivery, before women are discharged from facilities. Although in recent years Bangladesh and Tanzania have introduced policies to support provision of immediate PPFP, in both countries there remains a substantial unmet need for contraception and IUD is one of the least commonly used contraceptive methods. FIGO commissioned this economic evaluation to assess the cost-effectiveness of the PPIUD initiative in Bangladesh and Tanzania, for use in future national and global advocacy efforts to increase access to PPIUD and postpartum contraceptive counselling services.

## *Methods*

### Description of the PPIUD Initiative

The economic evaluation focused on Phase Two of the PPIUD initiative in Bangladesh and Tanzania which ran from January 2015 to June 2018. Each country established a central project team at national professional societies to develop and roll out the PPIUD Initiative at six large tertiary teaching and referral hospitals. After national 'training of trainer' sessions, existing clinical staff at the participating facilities were trained on immediate PPIUD insertion. Existing clinical staff in Tanzania were also provided with training in postpartum contraceptive counselling; in Bangladesh specific staff were recruited and trained as PPFP counsellors.

Women attending the facilities for antenatal care received counselling on postpartum contraception, including the option to consent for PPIUD insertion when they returned for delivery. Counseling was also offered when women were admitted for delivery, and in Tanzania, during antenatal care at satellite facilities linked to the participating hospitals. Insertion of a Copper T 380A IUD was available to any woman who was medically eligible and consented to receive an IUD, and attended a PPIUD initiative facility for delivery.

For the initiative and this evaluation, PPIUD was considered an IUD inserted immediately following delivery (after placental delivery for a vaginal and cesarean section birth) or within 48 hours of delivery, before the woman was discharged. Standard practice was assumed to be no provision of immediate PPFP as the only immediate postpartum contraceptive method available at the facilities was tubal ligation during c-section which was not routinely available to all women (and very rare in Tanzania).

### Economic Evaluation

This economic evaluation considered the incremental cost of adding postpartum contraception counselling and immediate PPIUD to the standard postpartum contraceptive practice at the participating facilities. Costs were considered from the government's perspective (excluding additional international donor-funded and research costs) and are reported as 2018 USD. Data on costs and PPIUD insertions were

primarily sourced from existing project narrative and financial reports, with additional cost data collected as needed from the national project teams. A 10% overhead rate was applied.

The economic evaluation included the following costs: training of providers in PPIUD insertion and PPFPP counselling, staff salary and honorarium payments, reusable clinical equipment, lifetime direct PPIUD service delivery costs (cost of insertion, follow up visit (if any) and eventual removal), and costs of supporting activities (behaviour change materials, advocacy, project management and monitoring).

The sector-standard Impact 2 tool developed by Marie Stopes International was used to estimate wider health and societal impacts of the PPIUD initiative using PPIUD uptake. The primary health outcomes used from Impact 2 were couple years of protection (CYP) attained, disability-adjusted life years (DALYs) averted and longer term health savings to the government as a result of the increased use of IUDs. Incremental cost effectiveness ratios (ICERs) were generated for the PPIUD initiative compared to standard care and are reported as a cost per PPIUD inserted, cost per CYP and cost per DALY averted. Two models were included in the evaluation - the actual cost and impact of the PPIUD initiative as it was conducted in the six facilities in each country (Model 1) and the estimated cost and impact of the PPIUD initiative if it were scaled up and led nationally (Model 2). Sensitivity analyses were conducted to test the robustness of estimates included in the economic evaluations and describe the impact of uncertainty on parameter values.

## **Results and Discussion**

The PPIUD initiative was highly cost-effective in both countries. In Bangladesh the cost of direct PPIUD service delivery was estimated to be USD \$1.71 per PPIUD (excluding government incentive payments), the cost per CYP was \$14.60 and cost per DALY averted was \$91.13. When projecting the future cost of delivering PPIUD at a national level in Bangladesh (Model 2), cost per CYP was \$16.23 and cost per DALY averted was \$106.64. In Tanzania, the estimated cost of direct PPIUD service delivery was \$2.05 per PPIUD, cost per CYP was \$54.57, and cost per DALY averted was \$67.67. When projecting the future cost of delivering PPIUD at a national level in Tanzania (Model 2), cost per CYP was \$34.20 and cost per DALY averted was \$43.31. The models were most sensitive to changes in rate of government incentive payments (Bangladesh) and training costs (Tanzania), but remained cost-effective when testing a number of different parameters and scenarios in sensitivity analyses.

For both models in Bangladesh and Model 2 in Tanzania, the estimated direct healthcare savings to the government resulting from PPIUD insertion exceeded the estimated cost of implementing the PPIUD initiative. In Model 1 in Tanzania, although the cost to implement the PPIUD initiative was higher than the estimated cost savings, the cost per DALY was far below the national per capita GDP indicating high value and a highly cost effective result.

Potential future national roll-out of the PPIUD initiative may be positively affected by ongoing efforts in both countries to a) encourage births in facilities b) improve the capacity of lower-level facilities c) increase awareness and availability of a range of contraceptive methods, and d) the introduction of the midwife cadre in Bangladesh. Limitations of the analyses include reliance on self-report for some time estimates, use of sector-standard CYPs that are not specific to the immediate postpartum period, and assumptions made for Model 2 roll out calculations. However it is likely that there are additional benefits, such as increased uptake of IUDs and other contraceptive methods after the immediate postpartum period, and cost savings to women that take up an PPIUD, that are not factored into the analyses.

Overall, these analyses provide a compelling case for national governments and international donors to invest in provision of quality contraceptive counselling before and around the time of delivery, and routine inclusion of PPIUD within the suite of contraceptive methods available in the immediate postpartum period in Bangladesh and Tanzania. Doing so is highly likely to produce cost savings for governments and improved outcomes for women, children and families.

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## Background

### Immediate Postpartum Contraception: Need and Advantages

**Many individuals and couples have an unmet need for contraception;** in 2017 it was estimated that there were 214 million women of reproductive age in low and middle income countries wanting to avoid pregnancy but not currently using a modern method of contraception.<sup>1</sup>

**There are key opportunities for discussion and the provision of contraceptive options to reduce this unmet need during pregnancy, and at or around the time of delivery.** It is well established in low and middle income countries that conceiving another child within six months of a previous birth doubles the risk of prematurity and low birthweight and can adversely affect maternal health,<sup>2</sup> and the World Health Organization (WHO) recommends at least two years between a live birth and attempting another pregnancy.<sup>3</sup>

Most commonly postpartum contraception has been offered at the postnatal visit around six weeks after birth, as several contraceptive methods were not recommended for use before 4-6 weeks after birth<sup>4</sup>. However many people do not attend this six week postnatal visit or have had unprotected sex prior to the visit, meaning they have already been exposed to the risk of pregnancy.<sup>5</sup> Contraceptive counselling during antenatal care visits, and delivery of immediate postpartum contraception (delivered at or around the point of delivery) offers **clear opportunities to integrate services**, given that almost three quarters of births in developing countries now occur in health facilities, and 63% of people who are pregnant receive four or more antenatal care visits.<sup>6</sup>

Furthermore, there are now **multiple contraceptive methods that can be offered** at or around the time of delivery, including progestin-only contraceptive pills and implants (previously guidance recommended waiting until six weeks postpartum).<sup>7</sup> Intrauterine devices (IUDs), can be provided within 48 hours of delivery, or at four or more weeks post delivery.<sup>8</sup> A recent review on the impact of different family planning interventions found six studies examining the effect of provision of postpartum contraceptive counselling during antenatal care and/or immediate postpartum contraception; all six studies found increased odds of postpartum contraceptive use.<sup>9</sup> Provision of immediate postpartum contraception has been identified as an evidence-based High Impact Practice for increasing the use of family planning, reducing closely spaced pregnancies and unintended pregnancies.<sup>10</sup>

There are several advantages to providing contraception at or around the time of delivery ('immediate postpartum contraception'), including that individuals are often **highly motivated** to prevent another pregnancy, and that they are commonly **already at a facility** with trained healthcare providers that can or

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<sup>1</sup> Guttmacher Institute. [Adding it Up: Investing in Contraception and Maternal and Newborn Health](#). 2017.

<sup>2</sup> Cleland J, Conde-Agudelo A, Peterson H, et al. [Contraception and health](#). *Lancet*. 2012;380:149–56.

<sup>3</sup> World Health Organization (WHO). [Report of a WHO Technical Consultation on Birth Spacing](#). 2007.

<sup>4</sup> WHO. [Programming strategies for Postpartum Family Planning](#). 2013.

<sup>5</sup> Moore Z, Pfitzer A, Gubin R, et al. [Missed opportunities for family planning: An analysis of pregnancy risk and contraceptive method use among postpartum women in 21 low- and middle-income countries](#). *Contraception*. 2015;92:31–9

<sup>6</sup> [Adding it Up: Investing in Contraception and Maternal and Newborn Health](#). Guttmacher Institute. 2017.

<sup>7</sup> WHO Department of Reproductive Health and Research (WHO/RHR) and Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs (CCP) Knowledge for Health Project. [Family Planning: A Global Handbook for Providers](#) (2018 update). Baltimore and Geneva; 2018.

<sup>8</sup> As above

<sup>9</sup> Weinberger M, Williamson J, Stover J, Sonneveldt E. [Using Evidence to Drive Impact: Developing the FP Goals Impact Matrix](#). *Stud Fam Plann*. 2020;1–28.

<sup>10</sup> High Impact Practices in Family Planning (HIPs). [Immediate postpartum family planning: A key component of childbirth care](#). Washington, DC: USAID; 2017 Oct



could provide a range of contraceptive methods.<sup>11</sup> Clients also report increased **satisfaction** with integrated services.<sup>12</sup> For IUDs, insertion of postpartum IUDs (PPIUD) following delivery of the placenta or during a c-section may also **limit the discomfort** experienced compared to insertion at another time,<sup>13</sup> and unlike tubal ligation, is suitable for women seeking to space rather than limit their number of births.

## Overview of the FIGO PPIUD Initiative

This analysis is based on the experience implementing a PPIUD initiative in **Bangladesh and Tanzania**, which formed part of a six country initiative led by the International Federation of Gynecology and Obstetrics (FIGO). The initiative has been described in detail previously.<sup>14</sup>

In brief, at the time of commencing the initiative there was mixed evidence regarding the rate of expulsions following PPIUD insertion, with some studies finding low expulsion rates and some finding high expulsion rates.<sup>15</sup> After reviewing the existing evidence FIGO found that low expulsion rates were associated with a particular insertion technique,<sup>16</sup> and wanted to demonstrate that low expulsion rates could be achieved with proper training and use of this technique. After successfully trialling this approach in six hospitals in Sri Lanka (Phase One), funding was sought and obtained to expand the initiative to five further countries (Phase Two)

The overall aim of the FIGO PPIUD initiative is to **better meet postpartum contraceptive needs** by increasing the capacity of healthcare providers to provide postpartum family planning counselling (PPFP) and provide PPIUD, if chosen, at or around the time of delivery, before women are discharged from facilities.

This economic evaluation focuses on the **experience of Phase Two of the PPIUD initiative in Bangladesh and Tanzania**. A brief summary of each country context is provided below, and further details of how the initiative was implemented in each country follows in the latter [description of the PPIUD initiative](#) in the methods section. Note that Phase Two was completed in June 2018; a Phase Three continued in both countries from July 2018 onwards but is not the focus of these analyses.

## Country Contexts

### Bangladesh

#### Demographic and Health Data

Table One provides a summary of key demographic, contraceptive and obstetric data from Bangladesh in 2014 (the year before the FIGO PPIUD initiative commenced) and 2018. In that time **use of modern methods of family planning remained fairly steady** at just over 50% of all currently married women.<sup>17</sup> At both time points just 0.6% of all currently married women reported using an IUD, and unmet need for family planning remained steady at 12%. In contrast, there were **substantial changes in provision of care**

<sup>11</sup> Aiken ARA, Aiken CEM, Trussell J, Guthrie KA. [Immediate postpartum provision of highly effective reversible contraception](#). *BJOG An Int J Obstet Gynaecol*. Blackwell Publishing Ltd; 2015;122:1050–1.

<sup>12</sup> Baxter S, Johnson M, Chambers D, Sutton A, Goyder E, Booth A. [The effects of integrated care: A systematic review of UK and international evidence](#). *BMC Health Serv Res*; 2018;18 and Kuhlmann AS, Gavin L, Galavotti C. [The integration of family planning with other health services: A literature review](#). *Int Fam Plan Perspect*. 2010;36:189–96.

<sup>13</sup> Lopez LM, Bernholc A, Hubacher D et al. [Immediate postpartum insertion of intrauterine device for contraception](#). *Cochrane Database Syst Rev* 2015.

<sup>14</sup> de Caestecker L, Banks L, Bell E, Sethi M, Arulkumaran S. [Planning and implementation of a FIGO postpartum intrauterine device initiative in six countries](#). *Int J Gynecol Obstet*. 2018;143:4–12.

<sup>15</sup> deCaestecker et al (as above) and Lopez LM, Bernholc A, Hubacher D, Stuart G, Van Vliet HA. [Immediate postpartum insertion of intrauterine device for contraception](#). *Cochrane Database Syst Rev*. 2015;

<sup>16</sup> Use of long (33 cm) curved Kelly forceps to place the IUD at the fundus (top portion) of the uterus

<sup>17</sup> Data is sourced from the [2014 and 2017-18 Bangladesh Demographic and Health Surveys](#) and the [annual Health Bulletins](#) released by the Bangladesh Ministry of Health & Family Welfare

**during the antenatal period and at delivery;** at the time the initiative commenced under a third received four or more antenatal care visits and 42% of births were delivered at facilities compared to 47% and 50% in 2018.

There is a long history of family planning programs in Bangladesh, with the Government of Bangladesh first adopting a family planning program in 1965 and rapid population growth identified as a priority area to address in 1976.<sup>18</sup> The Ministry of Health and Family Welfare oversees the health system including the six tiers of healthcare facilities. Contraception is integrated with wider health services, and available from a range of public and private providers. However, although the Bangladesh Health Facility Survey in 2017 found that 86% of health facilities provide at least one modern method of contraception, only 26% provided any long acting or permanent method of contraception.<sup>19</sup> The same survey reported that just 22% of facilities were considered 'ready' to provide quality family planning services.<sup>20</sup>

Table One: Key demographic, contraceptive and obstetric data from Bangladesh, 2014 and 2018

	2014	2018
<b>Bangladesh Demographic and Health Surveys</b>		
Population (millions)	157.9	NR
Total fertility rate (births per woman)	2.3	2.3
Use of modern method of contraception* (%)	54.1	51.9
Use of IUD* (%)	0.6	0.6
Unmet need for family planning* (%)	12.0	12.0
<i>Among women aged 15-49 years who had a live birth within three years of the survey, proportion whom:</i>		
Received antenatal care at least once from a medically trained provider~ (%)	63.9	81.9
Had four or more antenatal care visits (%)	31.2	47.0
Delivered at a health facility (%)	37.4	49.6
Deliveries attended by medically trained provider~ (%)	42.1	52.7
<b>Bangladesh Health Bulletin</b>		
	<b>2014<sup>^</sup></b>	<b>2018</b>
Number of government medical college hospitals	35	36
Proportion of facility deliveries at government health facilities (any tier) (%)	59.6	48.9
Proportion of all facility deliveries at government medical college hospitals (%)	8.7	12.6

NR Not reported

\* Among currently married women aged 15-49 years

~ Medically trained providers include qualified doctor, nurse, midwife, family welfare visitor, community skilled birth attendant. For antenatal care medically trained providers also include paramedics, medical assistants or sub-assistant community medical officer

<sup>^</sup> 2014 data on number and location of deliveries sourced from the 2015 Health Bulletin

<sup>18</sup> National Institute of Population Research and Training (NIPORT), Mitra and Associates, ICF International. [Bangladesh Demographic and Health Survey 2014](#). Dhaka, Bangladesh, and Rockville, Maryland, USA; 2016.

<sup>19</sup> National Institute of Population Research and Training (NIPORT), Associates for Community and Population Research (ACPR), ICF. [Bangladesh Health Facility Survey 2017: Preliminary Report](#). Dhaka; 2018.

<sup>20</sup> To be classed as ready to provide quality family planning services facilities had to have a) at least one person who had ever received in-service family planning training b) national or other family planning guidelines available c) blood pressure apparatus and d) oral pill, injectables and condoms available

## Provision of Immediate Postpartum Contraception including PPIUDs

In 2017 Bangladesh released its first National Action Plan for family planning during the postpartum, post-menstrual regulation and post-abortion care periods. Output 2.3 of the plan states that **all pregnant women should be provided with information and counselling on all postpartum contraceptive methods during antenatal care visits and provided with their chosen contraceptive method** (progestin-only pill, IUD, implant or tubal ligation, or vasectomy for their partner) immediately after delivery.<sup>21</sup> However the 2017-2018 DHS reported that only 13% of pregnant women were told of postpartum contraceptive options during antenatal care in the previous three years.<sup>22</sup>

There has been **some progress** in implementing the National Action Plan, including national approval of implants as an immediate postpartum contraceptive method, a national circular issued by the Director General of Family Planning and Health Services requesting health services to provide information on postpartum methods during antenatal and postnatal care and during childhood immunisation sessions, and training of healthcare workers in provision of postpartum contraception.<sup>23</sup> However the FP2020 Commitment updates notes implementation of the circular remains a **challenge**.

Provision of IUDs at or around the time of delivery is not currently standard practice in government health facilities in Bangladesh. However some time prior to the FIGO PPIUD initiative, PPIUD had been offered under another project in some facilities. In that previous effort, PPIUD insertion was reported to be done using shorter sponge forceps which led to a high expulsion rate and a resulting negative perception of PPIUD.<sup>24</sup> Thus the **FIGO PPIUD initiative is not the first or only effort** to increase provision of PPIUD; currently the international organisations EngenderHealth and Ipas also have initiatives focusing on postpartum contraception, including PPIUD, underway in various health facilities in Bangladesh.<sup>25</sup> Data provided by the Directorate General of Family Planning Bangladesh for this evaluation reported 6697 PPIUD insertions for January to June 2018, for which insertions at the six PPIUD initiative facilities in this time frame accounted for 30.6% of the total PPIUDs being provided.

## **Tanzania**

### Demographic and Health Data

Table Two provides a summary of key demographic, contraceptive and obstetric data from Tanzania in 2015-2016. **Use of modern methods of family planning** among currently married women has **increased** in the last decade from 20% in 2004-05 to 32% in 2015-16, mostly reflected in use of injectables and implants, though this varies regionally<sup>26</sup>. In the most recent DHS, conducted in 2015-2016 as the FIGO PPIUD initiative was getting underway, just 0.9% of all currently married women reported using an IUD. The same survey found an unmet need for family planning of 22%, which was virtually unchanged since 1999.

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<sup>21</sup> Medical Education and Family Welfare Division Ministry of Health and Family Welfare Bangladesh. *Bangladesh National Action Plan for Post-Partum, Post-Menstrual Regional and Post-Abortion Care Family Planning*. 2017.

<sup>22</sup> National Institute of Population Research and Training (NIPORT), ICF. *Bangladesh Demographic and Health Survey 2017-18: Key Indicators*. Dhaka, Bangladesh, and Rockville, Maryland, USA; 2018.

<sup>23</sup> *FP2020 Commitment Update Questionnaire 2018-2019 Bangladesh*.

<sup>24</sup> de Caestecker L, Banks L, Bell E, Sethi M, Arulkumaran S. *Planning and implementation of a FIGO postpartum intrauterine device initiative in six countries*. *Int J Gynecol Obstet*. 2018;143:4-12.

<sup>25</sup> EngenderHealth initiative described in Rahman S, Abbasi B, Saha R, Anwar MUI. *Postpartum Family Planning in Bangladesh: Achievement of Mayer Hashi II*. Kigali: International Conference on Family Planning; 2018; Ipas initiative referred to in the *Bangladesh Narrative Reports for the FIGO Initiative for Jan-Mar and Apr-June 2018*

<sup>26</sup> Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) [Tanzania Mainland], Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), and ICF. 2016. *Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) 2015-16*. Dar es Salaam, Tanzania, and Rockville, Maryland, USA: MoHCDGEC, MoH, NBS, OCGS, and ICF

Almost all (98%) women in Tanzania received antenatal care at least once from a skilled provider for their most recent pregnancy/birth and just over half (51%) had four or more antenatal care visits. Sixty three percent of births were delivered at facilities, up from 50% in 2010, and for 64% of births a skilled provider was present, compared to 51% in 2010. Recent initiatives by the Government of Tanzania and international NGOs have built up infrastructure and capacity of lower level public facilities across Tanzania, in an effort to encourage women to attend these lower level facilities for uncomplicated pregnancies and deliveries, with the Regional Referral Hospitals being intended for those at high-risk or with complications.

In Tanzania, family planning services are a component of the Reproductive, Maternal, Newborn, Child, and Adolescent Health (RMNCAH) interventions provided by the Ministry of Health, Community Development, Gender, Elderly, and Children (MoHCDGEC). Contraceptive methods are available free of charge at public sector facilities although a shortage of trained providers, inconsistent availability of products and poor infrastructure limits the extent to which these can be accessed.<sup>27</sup> However, the Tanzanian government has set an ambitious target of 47% of married women using modern methods of contraception by 2023.<sup>28</sup>

Table Two: Key demographic, contraceptive and obstetric data from Tanzania, 2015-2016

	2015-16
<b>Tanzania Demographic and Health Survey</b>	
Population (millions) (Tanzania mainland)	44.9
Total fertility rate (births per woman)	5.2
Use of modern method of contraception* (%)	32
Use of IUD* (%)	0.9
Postpartum family planning uptake within one month of delivery <sup>29</sup> (%)^	7.8
Unmet need for family planning* (%)	22.1
<i>Among women aged 15-49 years who had a live birth within five years of the survey, proportion whom:</i>	
Received antenatal care at least once from a medically trained provider~ (%)	98.0
Had four or more antenatal care visits (%)	50.6
Delivered at a health facility (%)	62.6
Deliveries attended by a skilled provider~ (%)	63.7
Number of regional referral hospitals	28
Proportion of facility deliveries at government health facilities (any tier) (%)	50.6

NR Not reported

\* Among currently married women aged 15-49 years

^ Postpartum family planning use (any method) at one-month postpartum for births 12-23 months preceding the survey, tabulated using the reproductive calendar, based on Tanzania DHS 2010.

~ Medically trained providers include qualified doctor, nurse, midwife, family welfare visitor, community skilled birth attendant. For antenatal care medically trained providers also include paramedics, medical assistants or sub-assistant community medical officer

~ Skilled providers include qualified doctor, Assistant Medical Officer, Clinical officer/Assistant clinical officer, nurse, midwife, assistant nurse, Maternal and Child Health aide.

<sup>27</sup> Ministry of Health Community Development Gender Elderly and Children. Tanzania. [National Family Planning Costed Implementation Plan 2019-2023](#). 2019.

<sup>28</sup> As above

<sup>29</sup> Winfrey, William, and Kshitiz Rakesh. 2014. [Use of Family Planning in the Postpartum Period](#). DHS Comparative Report No. 36. Rockville, Maryland, USA: ICF International.

## Provision of Immediate Postpartum Contraception including PPIUDs

Data on immediate postpartum contraception are limited, but a 2014 analysis of 2010 DHS data in Tanzania found that 7.8% of women adopted family planning within one month of their most recent birth (12-23 months preceding the survey).<sup>30</sup> The same report found use of IUD as a postpartum method within three months postpartum is so low it does not even register in the data (0.0%). In 2015-16 15.5% of modern contraception users who gave birth in the five years preceding the survey had taken up a family planning method within three months of delivery.

Strategic priority 1 in the 2019 Tanzania FP2020 Costed Implementation Plan is to increase uptake of postpartum family planning, including through improving provision of contraceptive services at the time of delivery.<sup>31</sup> It is expected that postpartum family planning will have the biggest contributing effect to the uptake rate of modern methods of contraception. Postpartum family planning has recently been included in the government health data management system (DHIS2) so that progress towards this priority can be measured.

According to the 2015 Postpartum Family Planning Action Plan,<sup>32</sup> the government in Tanzania is developing a PPFPP Training Resource Package and a curriculum for training in PPIUD service delivery, in partnership with a number of international NGOs. Other goals to improve access to and uptake of immediate and delayed postpartum contraception include revising and disseminating the postpartum care guidelines and training manual to incorporate postpartum contraception service delivery, ensuring commodity security in the labour wards, and promoting service integration with other programs.

As in Bangladesh, provision of IUDs at the time of delivery is not standard practice in government facilities in Tanzania. Where it does happen, outside of the FIGO initiative, it is typically done by international NGOs (such as EngenderHealth and JHPIEGO), including as part of outreach services. FIGO worked closely with these organisations during the development phases of the PPIUD initiative to ensure all ongoing projects were not geographically overlapping.

## Economic Evaluation Rationale

Published analyses from the FIGO PPIUD initiative have demonstrated the **feasibility and safety** of immediate PPIUD provision, with tens of thousands taking up PPIUD, a low expulsion rate of 2.6% overall and no cases of uterine perforation.<sup>33</sup> As a result of the initiative, the Sri Lankan government integrated postpartum contraception including PPIUD into the national family planning program in 2017.<sup>34</sup> However while there has been increased attention and policy development around postpartum contraception in both Bangladesh and Tanzania, **gaps remain in ensuring sufficient investment and support** for wide scale provision of postpartum methods in both countries. Thus, FIGO commissioned this economic evaluation to **assess the cost-effectiveness of the PPIUD initiative**, for use in national and global advocacy efforts to increase access to PPIUD and postpartum contraceptive counselling services.

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<sup>30</sup> Winfrey, William, and Kshitiz Rakesh. 2014. *Use of Family Planning in the Postpartum Period. DHS Comparative Report No. 36.* Rockville, Maryland, USA: ICF International.

<sup>31</sup> Ministry of Health Community Development Gender Elderly and Children. [Tanzania. National Family Planning Costed Implementation Plan 2019-2023.](#) 2019.

<sup>32</sup> [Accelerating Access to Postpartum Family Planning \(PPFP\) in Sub-Saharan Africa and Asia. PPFPP Country Programming Strategies Worksheet.](#)

<sup>33</sup> Makins et al. [FIGO postpartum intrauterine device initiative: Complication rates across six countries.](#) *Int J Gynecol Obstet.* 2018;143:20–7.

<sup>34</sup> Weerasekera et al. [Four years of the FIGO postpartum intrauterine device initiative in Sri Lanka: Pilot initiative to national policy.](#) *Int J Gynecol Obstet* 2018;143:28–32.

## Methods

### Description of the PPIUD Initiative

The FIGO PPIUD initiative began in Bangladesh and Tanzania in January 2015. Phase Two of the initiative, which is the focus of this economic evaluation, ran from January 2015 to June 2018 and included six large tertiary teaching and referral hospitals in each country.

FIGO worked with national professional societies (Obstetrical and Gynaecological Society of Bangladesh (OGSB) and the Association of Gynaecologists and Obstetricians (AGOTA), then Tanzania Midwives Association (TAMA) in Tanzania) to develop and roll out the PPIUD initiative. National level teams for the initiative were recruited in each country, consisting of a clinical project coordinator, project manager, finance officer and data coordinator (or similar positions). Two existing senior clinical staff at each participating hospital were recruited as facility and deputy facility coordinator to support implementation; these staff received an honorarium payment for their role in the PPIUD initiative. The national and facility level project teams worked closely with key stakeholders at the regional and national level.

Following the development of information, education and communication (IEC) and training materials for providers, training of trainer sessions were run in each country. The training of trainer sessions trained the facility and deputy facility coordinators in each facility, as well as some additional providers in Tanzania, in PPIUD insertion and PPFPP counselling. These staff, supported by the national team, then rolled out training on immediate PPIUD insertion to facility level staff (doctors and nurses in both countries; also nurse-midwives in Tanzania). In Bangladesh specific staff were recruited and trained to act as counsellors and data collection officers in the facilities; in Tanzania existing providers (doctors, nurses, nurse-midwives, medical attendants<sup>35</sup>) were trained to provide postpartum contraceptive counselling. Thus the PPIUD initiative included both provision of postpartum contraception counselling as well as insertion of PPIUD. The national project team conducted ongoing supervision and monitoring of both training and service delivery at the participating facilities throughout the initiative. No community level demand generation activities were included as part of the initiative in these two countries.

Women attending the participating facilities for antenatal care received counselling on postpartum contraception, including the option to consent for an IUD to be inserted when they returned for delivery. In Tanzania, postpartum contraception counselling was also offered at four to six satellite facilities per hospital which serve women for antenatal and postnatal care but (usually) do not offer delivery services. Postpartum IUD services were available in both countries to any woman who was medically eligible and who consented to receive the service, and attended a PPIUD initiative facility for delivery. All IUDs inserted were Copper T 380A IUDs which have an anticipated lifespan of up to 10 years.

During the implementation period of the initiative other immediate postpartum contraception services continued to be offered as was standard for the facilities. This 'standard practice' forms the comparison point for our economic evaluation of the PPIUD initiative. However, in reality the participating facilities in both countries did not offer any immediate postpartum contraception as standard practice, apart from tubal ligation during a c-section delivery, and even this was rare in the facilities in Tanzania. Some providers and facilities offered contraceptive counselling and some contraceptive methods at the six week postnatal follow up visit, but these services were not systematically provided and are outside the definition of immediate postpartum contraception which was the focus of this initiative.

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<sup>35</sup> A medical attendant in Tanzania is similar to a Community Health Worker, typically based within a health facility.

## Economic Evaluation

This economic evaluation considered the **incremental cost of adding postpartum contraception counselling and immediate postpartum IUD (PPIUD) delivery to the standard postpartum contraception practice** at the participating facilities. The method of evaluation is a ‘decision analysis’ which compares the new PPIUD initiative to ‘standard practice’ in terms of whether or not women end up with contraception provided in the immediate postpartum period. The economic evaluation is composed of the incremental costs of the PPIUD initiative relative to ‘standard practice’<sup>36</sup> and uptake of the PPIUD. Uptake of the program was then linked to wider societal and health impacts and costs (described in detail below). For the purposes of the initiative and this evaluation, PPIUD was considered an IUD inserted immediately following delivery (after placental delivery for a vaginal birth or once the baby had been delivered during a c-section delivery) or within 48 hours of delivery, before the woman was discharged from the facility.

Costs of the PPIUD initiative were considered from the **government’s perspective**. Costs to the women or to society (such as time spent away from their income-generating activities, or travel costs to the facilities) were not included, other than where fees charged to women offset the cost to the government. Where possible a bottom-up, micro-costing approach was used, collecting primary data on actual costs ([see resources and costs section](#) below).

**No discount rate** was applied to the costs of conducting the PPIUD program or its associated uptake, due to the short timeframe of the initiative. Where costs were provided in local currencies, these were first adjusted to 2018 local currency costs based on available national inflation data.<sup>37</sup> The resulting 2018 local currency costs were then converted to USD using the average exchange rate for the year. Where costs were provided in USD, these were adjusted to 2018 USD using the [annual average US inflation rates](#)<sup>38</sup>.

In order to estimate the **wider societal and health impacts of the PPIUD initiative beyond PPIUD uptake, we used the Impact2 tool** developed by Marie Stopes International.<sup>39,40</sup> In brief, the Impact2 tool uses national and regional-level data on typical pregnancy rates, and rates of maternal deaths, unsafe abortions, child deaths and similar outcomes to estimate the impact on key health outcomes of contraceptive services delivered, based on the number of pregnancies and pregnancy-related deaths or illnesses that are averted because a woman is using contraception (Figure 1). Impact2 also estimates the direct cost savings to the government healthcare system as a result of these health outcomes being averted, based on cost of antenatal care, delivery, post-abortion care and treatment of complications that are averted. The estimated impact of the services will occur over the lifetime of the contraceptive method provided, and so results are reported in the future tense.

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<sup>36</sup> Standard practice was taken as no immediate postpartum contraception available; see paragraph above for the rationale for this

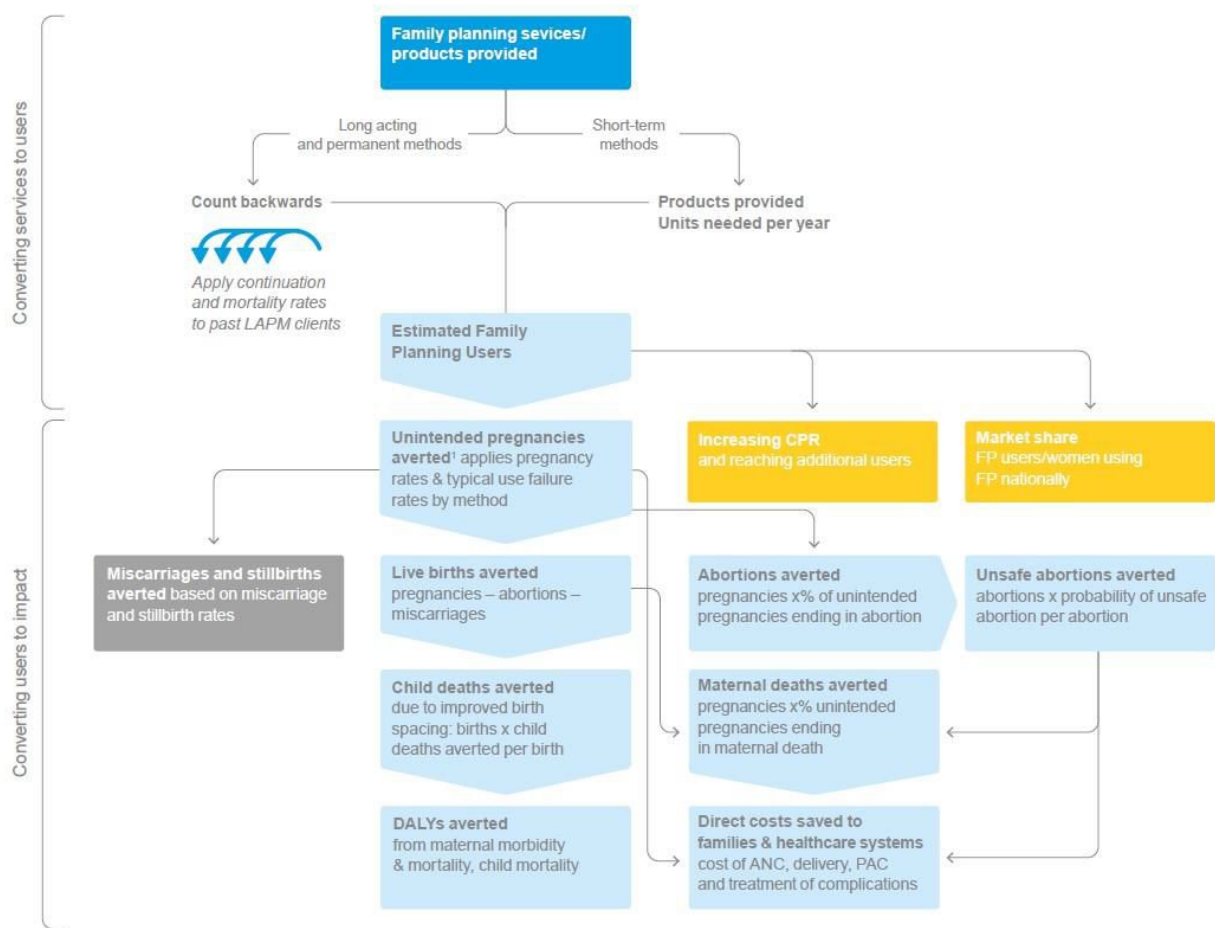
<sup>37</sup> [Central bank of Bangladesh](#) and [IMF, World Economic Outlook Database](#), April 2019.

<sup>38</sup> US Inflation Calculator <https://www.usinflationcalculator.com/inflation/current-inflation-rates/>

<sup>39</sup> Weinberger MB, Fry K, Boler T, Hopkins K. [Estimating the contribution of a service delivery organization to the national modern contraceptive prevalence rate: MarieStopes International’s Impact 2 model](#). BMC Public Health 2013, 13 (Suppl 2):S5

<sup>40</sup> Weinberger M, Berdellima A, Stephens R, Hayes G, Munroe E. [Impact 2 v5: An innovative tool for estimating the impact of reproductive health programmes—methodology paper](#). London: Marie Stopes International, 2018.

Figure 1: Overview of Impact2 model



<sup>1</sup>In the 2015 updates of Impact 2 the distribution of pregnancy outcomes averted (e.g. live births, abortions) has been recalculated to reflect outcomes of unintended pregnancies. This change was based on a joint working group to harmonize assumptions used in FP impact models: [http://www.popcouncil.org/uploads/pdfs/2014STEPUP\\_MeasuringImpact.pdf](http://www.popcouncil.org/uploads/pdfs/2014STEPUP_MeasuringImpact.pdf)

Figure source: page 8, Weinberger et al, 2018<sup>41</sup>

<sup>41</sup> Weinberger M, Berdellima A, Stephens R, Hayes G, Munroe E. *Impact 2 v5: An innovative tool for estimating the impact of reproductive health programmes—methodology paper*. London: Marie Stopes International, 2018.



## Estimating resources and costs

The costing of the PPIUD initiative is based on the incremental costs over and above the provision of 'standard practice'. The following costs are included in the economic evaluation:

- Training of providers in a) PPIUD insertion and b) postpartum contraceptive counselling
- Staff recruitment and salary or honorarium payments
- Equipment
- Service delivery costs of providing PPIUDs
- Supporting behaviour change
- Advocacy
- Project management; supervision and monitoring.

The following costs were **excluded from the analysis** because they are not reflective of how much it would actually cost national governments to roll out a PPIUD initiative and would result in unrealistically high cost per impact:

- Costs associated with the fact that the FIGO PPIUD initiative was an internationally run, donor-funded initiative (for example costs for the team from FIGO in London to visit the country teams, time spent preparing reports for donors);
- Costs related to the research focus of the initiative, including costs related to the research project conducted by Harvard University that was run alongside the initiative.

Consistent with previous contraceptive costing exercises,<sup>42</sup> we calculated the **lifetime costs** of PPIUD provision including insertion, follow up visit (if any) and cost of eventual removal. This also allowed us to calculate cost/CYP (see [outcomes below](#)) and make like-for-like comparisons with other postpartum contraceptive methods where relevant. We included costs for all postpartum contraception counselling sessions delivered at the participating facilities during the initiative, regardless of whether or not the counselled woman adopted a PPIUD, because more women will need to receive counselling than eventually receive a PPIUD. We factored in a 100% removal rate, acknowledging that this does not account for the small number of IUD expulsions.

We have included costs for people to attend **one follow up visit**, using an attendance rate of 25%, based on follow up rates achieved during the initiative. It was assumed that all women returning for a follow up visit or PPIUD removal attended public (not private or NGO) facilities (although not necessarily the same public facility where the PPIUD was inserted) and thus all of these costs were included in the analyses as costs that would be incurred by the government.<sup>43</sup>

Consistent with sector standards, costs to treat **complications** are not considered in the analyses<sup>44</sup>. Complications are rare and can occur with all postpartum contraceptive methods, and so excluding them is unlikely to impact the overall incremental cost estimate.

### Collecting and valuing each resource item

Initially, data on activities, costs and resources was collected through a review of existing project narrative and financial reports. Where needed this information was supplemented by standardised data collection tools developed by the evaluation team, which the project teams in each country used to gather

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<sup>42</sup> Darroch JE. [Adding It Up: Investing in Contraception and Maternal and Newborn Health, 2017 Estimation Methodology](#). 2018.

<sup>43</sup> *Switching from a public to private (or NGO) facility for follow-up or removal is likely to be uncommon and cancelled out by switching in the other direction (from private to public).*

<sup>44</sup> *Complications are excluded in The Avenir Health [OneHealth Tool](#) and the [Guttmacher Institute Adding It Up report](#), and complications of all family methods were excluded from the [Bangladesh FP2020 costed implementation plan](#) (and other FP2020 costed plans)*

information directly from project, facility and Ministry of Health staff and providers. **Project management and coordination** cost information was based on the actual salaries paid to individuals with paid project management/coordination responsibilities under the PPIUD initiative. Estimates of the proportion of time spent on different types of tasks during the timeframe of the PPIUD initiative were collected using a standardised data collection form so that time spent on tasks related to the research and international management elements of the initiative could be excluded. Honorariums paid to facility coordinators and deputy facility coordinators to coordinate implementation of the initiative at each facility are included in the analysis.

**Costs of training** included in the analyses include costs of travel for facilitators and/or participants to the training (travel, accommodation and per diems), clinical equipment and any other materials used for the training and meeting venue hire and venue costs. To account for opportunity costs, training costs also include the cost of the time for participants to attend the training (calculated as for clinical time – see below). Facilitators fee (or cost of their time) is only included where trainers costs are not otherwise accounted for in the analysis.

**Overhead costs** are included as a proportion of the total budget for the PPIUD initiative, consistent with standard costing analysis practice. Based on standard practice in each country, an overhead rate of 10% was used in both Bangladesh and Tanzania.

The analysis included the cost of all reusable **equipment** needed specifically for provision of postpartum contraceptive methods, such as Kelly forceps for PPIUD insertion. Cost for equipment needed for provision of postpartum contraceptive methods but generally available within facilities as part of standard obstetrics service provisions, such as certain forceps and speculums, are only included if additional purchases were needed to enable provision of the postpartum contraceptive method. The cost of single use medical supplies not specific to provision of a postpartum contraceptive method that are routinely available at government facilities (e.g. gloves, swabs) were excluded from the analyses.

For each **clinical task** (insertion, follow-up visits and removal), the cost of the task was calculated based on the time required to accomplish that task (in minutes) multiplied by the value of those minutes (based on the average salary of the provider cadre(s) performing that task) plus the cost of any specific single use equipment<sup>45</sup> required to perform that task. Time estimates were provided by multiple providers, based on observations of tasks where possible, using standardised data collection forms and the estimates were then compared across the two countries and with existing literature<sup>46</sup> and confirmed by PPIUD initiative staff. Outliers were removed and where time ranges were given, an average time estimate was taken. To calculate the value of those minutes, weighted averages were used for tasks that could be provided by different cadres, based on the proportion of each task performed by each cadre (based on service data or provider estimates), to account for the different salaries for different cadres. Similarly, for clinical tasks that only apply to some women (for example not all women attend a follow-up visit), a weighted average was calculated based on the proportion of women receiving each task. In Bangladesh, the cost of incentives paid by the government to providers and women for long acting and permanent methods of contraception are also included in the service delivery costs.<sup>47</sup>

Due to differences in how the initiative was implemented in each country, different approaches were used to calculate **counselling costs**. In Bangladesh specific counselling staff were employed and so the value of counselling sessions was based on their salary costs, discounting time not spent on non-counselling tasks such as data collection (consistent with the approach used for project management staff costs). In

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<sup>45</sup> *Specific single use equipment included IUDs for PPIUD insertion and thread retrievers for PPIUD removals. See section above on [equipment](#) for information about how costs of reusable equipment and single use medical supplies were considered in the analysis.*

<sup>46</sup> *Avenir Health [OneHealth Tool](#); Bangladesh FP202 Costed Implementation Plan*

<sup>47</sup> *In Tanzania no incentives are paid to either providers or clients.*

Tanzania, counselling costs were based on the average number of postpartum contraception counselling sessions received by each woman who delivered at the participating facilities, regardless of whether or not they adopted a PPIUD. The value of a counselling session was based on the average time required multiplied by the value of those minutes (as above for clinical tasks).

## Outcomes

This is an economic evaluation based alongside a program evaluation. The measure of effectiveness is uptake of immediate PPIUD, based on data gathered pre and during a single study conducted in two countries. The focus of the economic evaluation is to support evaluation of the program in order to **inform future policy and investment decisions** in these countries, and to contribute to the global evidence base around the cost-effectiveness of PPIUD.

The rates of uptake of the PPIUD initiative are taken directly from the recorded data in the two countries, pre and during implementation. The rates of 'standard practice' were also assessed and were judged to be relatively stable over time. Displacement (women taking up an immediate PPIUD who would otherwise have taken up an immediate postpartum tubal ligation) is not included in the main analysis because we do not have data to show how many women 'switched' from one method to another, however we believe this impact to be minimal. It is also possible that the PPIUD initiative would increase uptake of other postpartum family planning methods (e.g. implants, once introduced), as was observed in other countries involved in the initiative,<sup>48</sup> but assessment of this was not included in analyses.

The primary outcomes for this economic evaluation are **cost per PPIUD, cost per couple years of protection (CYP) and cost per Disability-Adjusted Life Year (DALY) averted**. CYP is a metric used throughout the sexual and reproductive health sector to measure how many years of protection from pregnancy each contraceptive method offers. The CYP metric takes into account method failure and discontinuation rates. For this evaluation we used the USAID CYP factors.<sup>49</sup> The CYP factor for an IUD is 4.6 years and for a tubal ligation is 10 years in Tanzania and 13 years in Bangladesh.<sup>50</sup> CYPs allow like-for-like comparisons with other contraceptive methods, even those with much shorter duration. Comparing cost per contraceptive method delivered without taking into account the duration of each method hides the true cost-effectiveness of the long acting and permanent methods. A DALY is a 'healthy' life year lost due to mortality or morbidity and is a common metric used to represent the cost-effectiveness of health interventions.

As well as the immediate outcomes of the PPIUD initiative, we estimated the wider health impact to society, using the Impact2 tool ([see earlier](#)). These outcomes include: unintended pregnancies averted; maternal deaths averted; and child deaths averted.

Using the Impact2 tool, we also capture the estimated costs saved by the government healthcare system due to the services provided during the PPIUD initiative, allowing us to assess both the cost-effectiveness of the PPIUD initiative and the potential overall cost savings.

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<sup>48</sup> *Uptake of other contraceptive methods may increase due to the initiative including training and roll out of PPFPP counselling across a range of methods, raising awareness and potentially acceptance of all available methods among both providers and women. The FIGO team reports uptake of immediate postpartum implants increased in PPIUD facilities in Sri Lanka, as did uptake of interval IUD uptake in Kenya.*

<sup>49</sup> USAID. [Couple Years of Protection \(CYP\) conversion factors](#). [Internet]. [cited 2019 Dec 11].

<sup>50</sup> *A different CYP factor is afforded to female sterilisation in Bangladesh to account for the fact that women typically use this method earlier than elsewhere in the world, and so are protected for more reproductive years.*

## Analysis

### Model 1 and Model 2

Two models are included in the economic evaluation:

- **Model 1 evaluates the actual cost and impact of the PPIUD initiative as it was conducted**, taking into account the exclusions described above around research and international donor costs
- **Model 2 estimates the cost and impact of the PPIUD initiative if it were to be scaled up and led nationally.** The design of Model 2 was based on the actual scale-up that is likely in each country, based on guidance from the national PPIUD initiative staff. In Bangladesh, Model 2 estimates the cost of scaling up the PPIUD initiative to all medical college hospitals nationally. In Tanzania, Model 2 estimates the cost of scaling up the PPIUD initiative to all Regional Referral Hospitals nationally, as well as to four to six satellite facilities per hospital.

The economic evaluations are composed of two time periods:

- **Set-up period:** the three months preceding the first training of trainers, plus the month in which the training of trainers was conducted (four month set up period in total).
- **Implementation period:** the month following the first training of trainers to the end of Phase 2 of the PPIUD initiative (June 2018).

In Bangladesh the set-up period for Model 1 is from March to June 2015 inclusive and the implementation period is from July 2015 to June 2018. In Tanzania the set-up period for Model 1 is from December 2015 to March 2016 inclusive and the implementation period is from April 2016 to June 2018. The set-up period includes fixed costs, but no impact. The implementation period includes ongoing costs and impact (number of PPIUDs delivered).

For Model 2, we used a four month future set up period and a 36 month future implementation period, with costs and impact estimated for each year of implementation. While we refer to the Model 2 scale-up timeframe as years 1, 2 and 3, for the purpose of projecting future impact we used available birth rate data and impact projections for 2020-2022. PPIUD insertion rates for Model 2 were based on the insertion rates during the PPIUD initiative. See [Appendix 2](#) and [Appendix 3](#) for further detail of these calculations in each country.

While generally Model 2 costs were based on the approach used in Model 1 (scaled up to reach the increased number of facilities), some changes were made to the costs based on the learnings during Model 1 implementation. Key changes to costs in Model 2 are described in brief below.

#### **Main Model 2 Adjustments for both countries**

- **Reduction of some costs** to align with actual expected government costs: no honorariums paid to existing facility level staff; reduction of costs associated with clinical supervision and meetings with facilities as government has regionally based staff and already conducts some supervision visits (translating into lower travel costs)
- **Central staff coordination costs were based on expected needs.**<sup>51</sup> some increase in project management, data and finance staffing compared to Model 1 but no increase in senior staff allocation

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<sup>51</sup> It was assumed in Model 2 that some dedicated central coordination staffing costs would be needed by the government to manage the introduction of a new method of contraception. This would be the case for most new interventions of this kind, until they are fully integrated with pre-service training, ongoing professional development and service delivery, at which point some of the roles we have included in Model 2 would no longer be needed as they would be absorbed into existing government staff and processes.

- **No costs assigned for development of IEC and training materials**, since they were developed in Model 1 and are now available for future scale up

**Main Country Specific Model 2 Adjustments**

- **Bangladesh:** Assumption that 80% of incentives will be paid (vs 50% in Model 1) as processing and payment of incentives has improved in recent years and addition of two hours of time to each training to build interpersonal communication skills of providers (i.e. increase the quality of the training).
- **Tanzania:** Refresher training delivered as ‘on-the-job’ supervision rather than a separate one day training (so no associated meeting costs, reduced travel costs, and no costs for the time of the provider or facilitator to attend training). Insertion and counselling training were combined and reduced from six to five days, resulting in a reduction in accommodation costs, per diems, allowances, attendance costs, and travel costs.

These changes in approach modify the cost estimates for Model 2 to reflect a ‘real world’ future scale up (with some changes leading to increasing costs, others decreasing costs compared to Model 1 facilities). No changes were made to the expected uptake rates applied to Model 2 (outcome side of the cost-effectiveness calculation, see below). Further detail on these revised approaches to training can be found in the [lessons learnt section](#) of the results.

**Incremental cost effectiveness ratio (ICER)**

Cost-effectiveness is estimated using the following formula and is reported as an incremental cost per each additional outcome achieved for the new PPIUD initiative compared to Standard Practice:

$$\text{Incremental cost effectiveness ratio (ICER)} = \frac{\text{Cost PPIUD} - \text{Cost of Standard Practice}}{\text{Outcomes PPIUD} - \text{Outcomes of Standard Practice}}$$

Standard Practice activities are also assumed to form part of the PPIUD initiative which is built on top of usual platforms. This will mean that the cost of standard practice can be estimated as zero cost in both study groups without any impact on the ICER, and the ICER and cost per outcome will be the same numerical value. The ICER is repeated for each study outcome listed in the [outcomes section](#) above. ICERs are reported both with and without the estimated direct healthcare savings from Impact2 factored in; when these estimated savings from Impact2 are factored in this is referred to as ‘ICER with cost offset’.

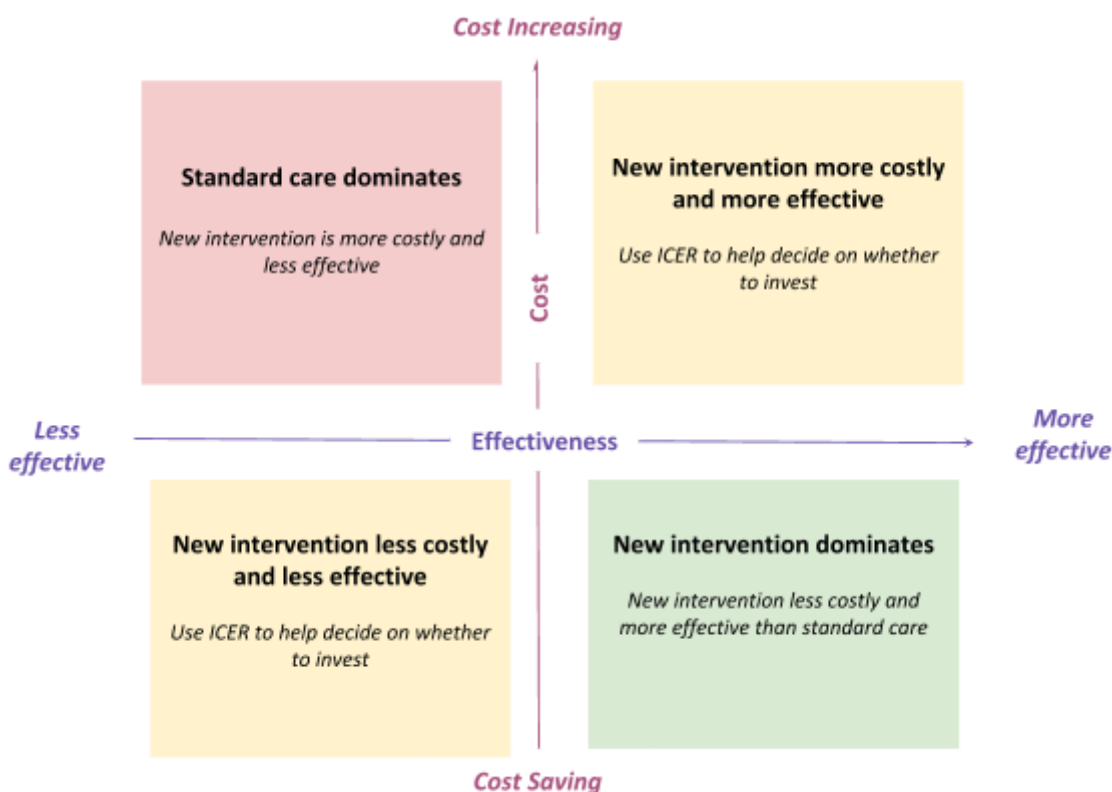
The incremental costs and incremental benefits (outcomes) of a new intervention (in this case the PPIUD initiative) can be visualised on a cost-effectiveness plane (Figure 2)<sup>52</sup>.

- The middle of the figure (plane intercept) represents Standard Practice or the scenario prior to the introduction of the PPIUD initiative. Standard Practice in this case, meant no provision of immediate postpartum contraception.<sup>53</sup>
- The top half of the figure is where the new intervention costs more than Standard Practice - which is what typically happens when a new intervention or program is introduced.
- The right hand side of the figure is where an intervention is more effective than Standard Practice.

<sup>52</sup> Cost-effectiveness plane figure adapted from Cohen et al [Interpreting the Results of Cost-Effectiveness Studies](#). J Am Coll Cardiol. 2008 Dec 16; 52(25): 2119–2126

<sup>53</sup> See last paragraph of [Description for the PPIUD Initiative](#) for the rationale for the definition of standard practice

Figure 2: Cost-effectiveness plane



If a new intervention falls into the bottom right quadrant, it means it is cheaper to implement than standard practice, **and** more effective. In this case the intervention is said to ‘dominate’ and is thus preferred over standard care. Often new interventions fall into the top right quadrant - more effective but also more costly - and a cost-effectiveness ratio (the ICER) is calculated to help decide if the additional cost is worth the additional benefit.

There is no single rule around what is considered an ‘acceptable’ cost effectiveness ratio for investment, although in low and middle income settings interventions that avert one DALY for less than average per capita GDP are considered very cost-effective, and interventions that cost less than three times average per capita GDP per DALY averted are still considered cost-effective.<sup>54</sup>

### Sensitivity Analyses

In order to test the robustness of our cost-effectiveness estimates and describe the impact of uncertainty on parameter values, we conducted **sensitivity analyses**, allowing us to show how cost-effectiveness estimates will change for different scenarios. We performed sensitivity analyses for both models:

Model 1:

- Variation to cost of direct service delivery (+/- 10%)
- Variation to training costs (+/- 10%)
- Bangladesh only: variation of proportion of incentives paid (in base model 1 estimated 50% of the time; varied in sensitivity analysis for paid 0% or 80% of the time)

<sup>54</sup> Hutubessy R, et al. [Generalized cost-effectiveness analysis for national-level priority-setting in the health sector](#). *Cost Eff Resour Alloc.* 2003;1.8

Model 2:

- Variation to cost of direct service delivery (+/- 10%)
- Variation to training costs (+/- 10%)
- Variation to national project staff management costs (+/- 10%)
- Bangladesh only: variation of proportion of incentives paid (in base model 2 estimated incentives paid 80% of the time; varied in sensitivity analysis for if paid 0% of the time)

We also re-ran our analyses with **specific adjustments to the implementation design**. This was done to examine how further changes to the design<sup>55</sup> might affect the cost-effectiveness of rolling out PPIUD. The design adjustments tested were:

Bangladesh:

- Estimating the effect of removing the initial training of counsellors in Model 2 to account for the potential scenario in which Medical College Hospitals already have trained counsellors in place
- Estimating the effect of removing the initial training of trainers for PPIUD providers in Model 2 to account for the potential scenario in which Medical College Hospitals already have providers in place who are able to train others in PPIUD provision

Tanzania:

- Estimating the potential effect of extending the training length in Model 1 and Model 2 to align with the standard government PFP training of 14 days
- Estimating the potential effect in Model 2 of halving the number of providers trained, to account for the potential scenario in which there is less frequent rotation of providers between clinical departments
- Estimating the potential effect in Model 2 of expanding provision of PPIUD services to satellite facilities (as is being trialled in Phase 3 of the PPIUD initiative)

Sensitivity analyses including the design adjustments are reported for the main outcome of 'CYP ICER with cost offset'.

For Model 1 in Bangladesh, we also estimated the potential effect of 'displacement', that is, women taking up PPIUD who *may* have otherwise taken up immediate postpartum tubal ligation.

## Ethical considerations and consent

In Bangladesh, data collected under the PPIUD initiative did not require ethical approval as it was considered as part of ongoing initiative monitoring data for quality improvement processes. A formal letter from FIGO was sent in June 2019 to the Director General of Family Planning to inform them of the economic evaluation being undertaken.

In Tanzania, ethical approval for this economic evaluation was received from the National Institute for Medical Research (NIMR) on 9th August 2019 (NIMR/HQ/R.8c/Vol.1/729). The NIMR Data Transfer Agreement for Researchers was also completed.

This report has been prepared in accordance with the Consolidated Health Economic Evaluation Reporting Standards (CHEERS).<sup>56</sup>

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<sup>55</sup> These design adjustments are beyond those already incorporated into Model 2 based on the learnings from Model 1 (see [analysis section](#) of the methods for details of the Model 2 design)

<sup>56</sup> Husereau D, Drummond M, Petrou S, Carswell C, Moher D, Greenberg D, et al. Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement. *BMJ*. 2013;346:1–6.

# Results

## Bangladesh

### *Model 1: What was done during PPIUD Initiative*

Phase Two of the PPIUD initiative in Bangladesh ran from January 2015 to June 2018. For the purpose of this evaluation, we are including March to June 2015 as the set-up period, and July 2015 to June 2018 as the implementation period in the Bangladesh analysis (see [Analysis section in the methods](#) for further details). During the implementation period, the six participating facilities delivered 8031 PPIUDs.

#### Service Provision Costs

The cost of direct service provision of a PPIUD excluding cost of government incentives was estimated to be USD \$1.71 per PPIUD including cost of initial insertion, cost of follow up visit (if any) and cost of eventual removal (see [Appendix 2](#) for detail). This cost included the time of the provider to perform the clinical task and the cost of specific disposable equipment required<sup>57</sup>, with any fees paid by clients factored in as a cost offset.<sup>58</sup>

The Government of Bangladesh also pays incentives to women and providers for provision of long term methods of contraception. The total incentive payment possible per PPIUD provided is USD \$6.24. However, it was estimated that this incentive was only paid 50% of the time during the period of the PPIUD initiative, thus USD\$3.12 is also tested in the analysis in addition to the costs of direct service provision of USD \$1.71.

#### Total Cost

The total cost of delivering the PPIUD initiative was estimated as \$539,285, including a 10% overhead as per the Bangladesh government's project budgets. The first four months of the initiative, referred to as the set-up phase, cost \$35,532 or 7% of the overall cost. The remaining 93% of costs (\$503,752) were incurred during the 36 month implementation phase (Table 3). The main cost drivers were facility level staffing costs (58% of total costs; included facility and deputy facility coordinators and counsellors) and national level staffing costs (17% of total costs). The estimated costs of implementing the initiative was just under \$28,000 per facility per year (Table 3)

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<sup>57</sup> IUD for PPIUD insertion, thread retriever for removals where threads were not visible (other standard disposable medical supplies such as gloves and swabs were excluded from the analysis)

<sup>58</sup> Only fees included were a fee for ultrasound at follow up visit when required (estimated to be 30% of women returning for follow up who did not have threads that could be seen or felt)



Table 3: Bangladesh Model 1 Total Costs of Implementation

Cost Categories	PPIUD + Standard PFP Care	
	Total Cost* (2018 USD)	% of total cost
<b>Set up costs</b>	<b>\$ 35,532.20</b>	<b>7%</b>
<b>Implementation period costs (36 months)</b>	<b>\$503,752.31</b>	<b>93%</b>
Training costs	\$43,630.76	8%
Staffing costs - national level staff	\$93,065.85	17%
Staffing costs - facility level staff	\$311,614.82	58%
Service delivery costs - direct provision	\$15,130.56	3%
Service delivery costs - incentives	\$27,542.61	5%
Ongoing support costs^	\$12,767.71	2%
<b>Total cost of delivering PPIUD intervention</b>	<b>\$539,284.51</b>	<b>100%</b>
Cost per year of implementation <i>(excludes costs incurred during set up period)</i>	\$167,917.44	
Cost per year of implementation per facility <i>(excludes costs incurred during set up period)</i>	\$27,986.22	

\* Includes 10% overhead

^ Includes cost of clinical supervision, ongoing meetings with facilities and other stakeholders, distribution of IEC materials and sharing of lessons learnt

## Cost Effectiveness

Table 4 displays the main outcomes of interest from Impact2, the estimated cost per outcome achieved and the ICER presented both with and without including the cost offset of the estimated direct healthcare savings from Impact2. Results are estimated as \$14.60 per CYP and \$91.13 per DALY averted before the estimated direct healthcare savings from Impact2 are factored in.

Using internationally accepted thresholds,<sup>59</sup> the PPIUD initiative appears highly cost-effective, as the cost per DALY of \$91.13 is far below the 2018 per capita gross domestic product (GDP) of Bangladesh of \$1,698.<sup>60</sup> Using Impact2, the 8,031 PPIUD insertion services provided in 2015-2018 will lead to estimated direct costs saved to the healthcare system of **\$802,368**. Thus the total cost of implementing Model 1 (\$539,285) is less than the estimated costs saved in the future (\$802,368), suggesting that the approach is cost-saving to the Government in the longer term. In addition, once the estimated savings from direct healthcare costs averted are factored in to the ICER calculations, the cost-effectiveness of PPIUD ‘dominates’ meaning that it is both cheaper and more effective to provide the PPIUD intervention compared to standard care (bottom right quadrant of the [cost-effectiveness plane](#)).

Table 4: Bangladesh Model 1 Cost Effectiveness

Outcome of interest~	Estimated Number	Cost per outcome achieved	ICER* without cost offset	ICER* with cost offset
PPIUDs inserted	8031	\$67.15 <sup>#</sup>	67.2	PPIUD Dominates <sup>^</sup>
CYPs	36943	\$14.60	14.6	PPIUD Dominates <sup>^</sup>
Unintended pregnancies averted	16,683	\$32.33	32.3	PPIUD Dominates <sup>^</sup>
Maternal deaths averted	11	\$50,727.62	50731.0	PPIUD Dominates <sup>^</sup>
Child deaths averted	63	\$8,612.44	8613.0	PPIUD Dominates <sup>^</sup>
Maternal DALYs averted	623	\$864.96	865.0	PPIUD Dominates <sup>^</sup>
Child DALYs averted	5294	\$101.86	101.9	PPIUD Dominates <sup>^</sup>
Total DALYs averted (maternal + child DALYs)	5918	\$91.13	91.1	PPIUD Dominates <sup>^</sup>

~ Outcomes are estimated service lifespan impacts from Impact2 tool

\* Incremental cost effectiveness ratio - difference in cost of PPIUD intervention to standard PFP care divided by difference in outcomes of PPIUD intervention compared to standard care

# Note this is the total cost of delivering the PPIUD initiative, divided by the number of PPIUDs provided. This includes the the direct service delivery cost of providing each PPIUD (clinical time, disposable equipment etc) plus all the other costs of delivering the PPIUD initiative. See [Appendix 2](#) for details.

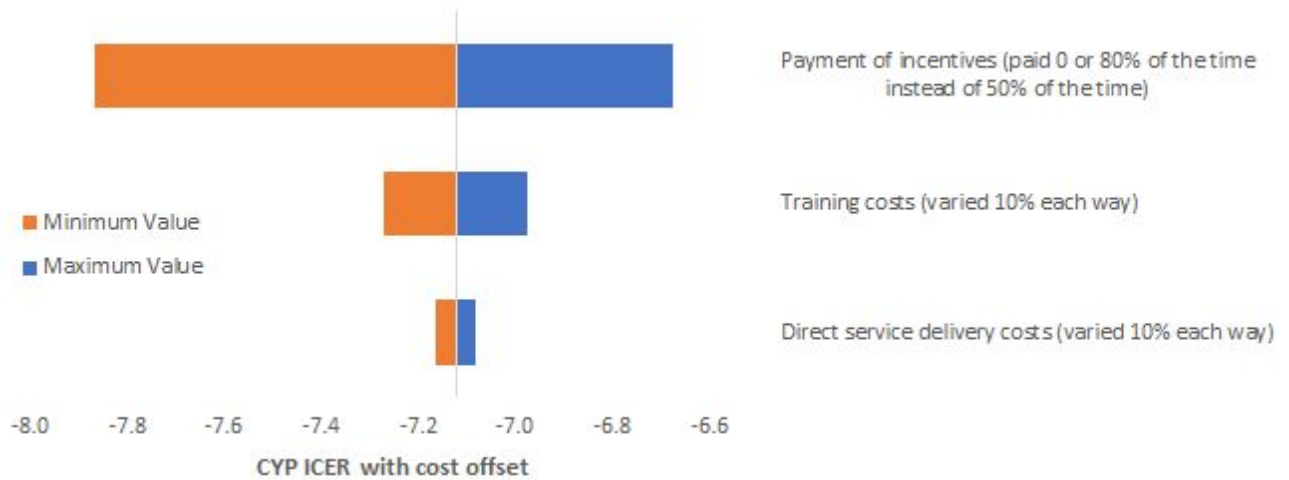
<sup>^</sup> PPIUD dominates - providing PPIUD intervention is cheaper than providing standard care (due to estimated direct costs savings) and is more effective (as more people take up contraception and thus more outcomes of interest generated)

<sup>59</sup> Interventions that avert one DALY for less than average per capita GDP for a given country or region are considered very cost-effective; interventions that cost less than three times average per capita GDP per DALY averted are still considered cost-effective (source: Hutubessy R, et al. [Generalized cost-effectiveness analysis for national-level priority-setting in the health sector](#). Cost Eff Resour Alloc. 2003;1.8)

<sup>60</sup> World Bank. [GDP per capita \(current US\\$\) - Bangladesh](#) [Internet]. [cited 2019 Dec 18].

**Sensitivity analyses** included alternative parameters that reflect varying the proportion of PPIUD insertions resulting from the government incentive being paid, and variation in cost estimates for direct service delivery and training costs (Figure 3; see description in [methods](#) for more details). The ICER was most sensitive to the rate of payment of incentives. With all of the parameters and scenarios tested the PPIUD intervention remained cheaper and more effective than standard care, indicating it was the 'dominant' strategy in terms of cost-effectiveness (bottom right quadrant of the [cost-effectiveness plane](#))

Figure 3: Bangladesh Model 1 Sensitivity Analyses



## **Model 2: Projected national roll out of the PPIUD initiative**

Model 2 roll out in Bangladesh examined the estimated future cost and impact of expansion of PPIUD to **all Government Medical College Hospitals** in Bangladesh. According to the most recent data available, there are 36 Government Medical College Hospitals in Bangladesh,<sup>61</sup> thus the Model included the costs of set-up of the initiative in 30 additional facilities. To facilitate comparisons with Model 1, implementation was considered over a 36 month period at all 36 Medical College Hospitals (the 30 additional facilities plus the six facilities where the PPIUD initiative was conducted in Model 1).

Note that in recent years there has been some variation in the number of Medical College Hospitals, as lower level hospitals are upgraded. There is also a large range in the size of these facilities, and number of births they attend to each year. These analyses are based on scaling up the results in the six PPIUD initiative facilities to all 36 facilities.<sup>62</sup>

### **Estimated Total Cost**

The estimated total cost of scaling up the PPIUD initiative to all Medical College Hospitals in Bangladesh for three years is estimated as \$1,979,140. The first four months of the scale up, referred to as the set-up phase, is estimated to cost \$102,865, or 5% of the overall cost. The remaining 95% of costs (\$1,876,275) would be incurred during the 36 month implementation phase (Table 5). As in Model 1, the main cost driver is facility-level staffing costs (53% of all costs). The estimated costs of implementing the scale up is \$17,373 per facility per year (Table 5).

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<sup>61</sup> Bangladesh Ministry of Health & Family Welfare. [Health Bulletin 2018](#).

<sup>62</sup> I.e. the analyses assumes that the variation within the six original facilities in terms of size etc is similar to the variation in all 36 facilities.

Table 5: Bangladesh Model 2 Estimated Total Costs of Implementation

Cost Categories	PPIUD + Standard PFP Care	
	Total Cost* (2018 USD)	% of total cost
Set up costs	\$102,865.13	5%
<b>Implementation period costs (36 months)</b>	<b>\$1,876,274.52</b>	<b>95%</b>
Training costs	\$329,938.86	17%
Staffing costs - national level staff	\$267,189.43	14%
Staffing costs - facility level staff	\$1,039,757.56	53%
Service delivery costs - direct provision	\$49,940.08	3%
Service delivery costs - incentives	\$145,451.92	7%
Ongoing support costs <sup>^</sup>	\$43,996.68	2%
<b>Total cost of delivering PPIUD intervention</b>	<b>\$1,979,139.65</b>	<b>100%</b>
Cost per year of implementation (excludes costs incurred during set up period)	\$625,424.84	
Cost per year of implementation per facility (excludes costs incurred during set up period)	\$17,372.91	

\* Includes cost of clinical supervision, ongoing meetings with facilities and other stakeholders, distribution of IEC materials and sharing of lessons learnt

### Estimated Cost Effectiveness

Table 6 presents the main outcomes of interest for Model 2 from Impact2, the estimated cost per outcome achieved and the ICER presented both with and without including the cost offset of the estimated direct healthcare costs saved from Impact2. Results are estimated as \$16.23 per CYP and \$106.64 per DALY averted before the estimated direct healthcare savings from Impact2 are factored in.

Using internationally accepted thresholds,<sup>63</sup> the PPIUD initiative appears highly cost-effective, as the estimated cost per DALY of \$106.64 is far below the 2018 per capita gross domestic product (GDP) of Bangladesh of \$1,698.<sup>64</sup> Using Impact2, the estimated 26,507 PPIUD insertion services provided in the three year implementation period of Model 2 would lead to estimated direct costs saved to healthcare system of **\$2,648,284**. Thus the total estimated cost of implementing Model 2 (\$1,979,140) is less than the estimated costs saved in the future. In addition, once the estimated savings from direct healthcare costs averted are factored in it is seen to 'dominate' meaning that it is both cheaper and more effective to provide the PPIUD intervention over standard care (bottom right quadrant of the [cost-effectiveness plane](#))

<sup>63</sup> Interventions that avert one DALY for less than average per capita GDP for a given country or region are considered very cost-effective; interventions that cost less than three times average per capita GDP per DALY averted are still considered cost-effective (source: Hutubessy R et al. [Generalized cost-effectiveness analysis for national-level priority-setting in the health sector](#). Cost Eff Resour Alloc. 2003;1.8)

<sup>64</sup> World Bank. [GDP per capita \(current US\\$\) - Bangladesh](#) [Internet]. [cited 2019 Dec 18].

Table 6: Bangladesh Model 2 Estimated Cost Effectiveness

Outcome of interest~	Estimated Number	Cost per outcome achieved	ICER* without cost offset	ICER* with cost offset
PPIUDs inserted	26507	\$74.66	74.7	PPIUD Dominates^
CYPs	121932	\$16.23	16.2	PPIUD Dominates^
Unintended pregnancies averted	55062	\$35.94	35.9	PPIUD Dominates^
Maternal deaths averted	18	\$107,057.85	107057.9	PPIUD Dominates^
Child deaths averted	207	\$9,576.21	9576.2	PPIUD Dominates^
Maternal DALYs averted	1084	\$1,825.44	1825.4	PPIUD Dominates^
Child DALYs averted	17474	\$113.26	113.3	PPIUD Dominates^
Total DALYs averted (maternal + child DALYs)	18558	\$106.64	106.6	PPIUD Dominates^

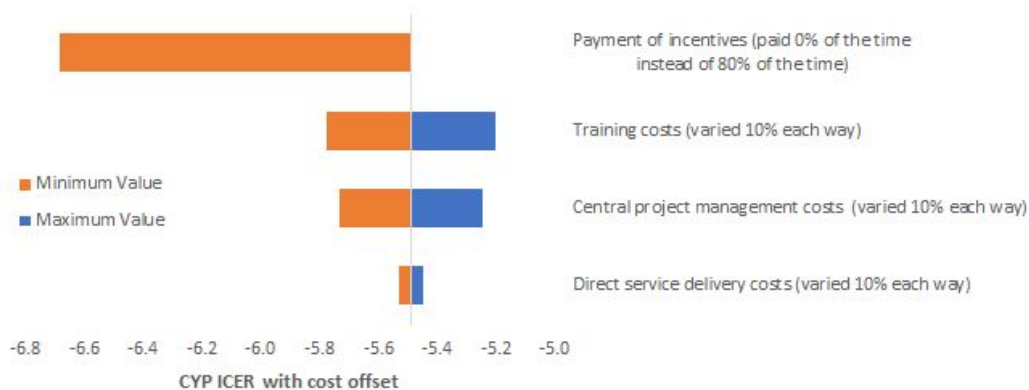
~ Outcomes are estimated service lifespan impacts from Impact2 tool

\* Incremental cost effectiveness ratio - difference in cost of PPIUD intervention and standard care divided by difference in outcomes of PPIUD intervention compared to standard care

^ PPIUD dominates - providing PPIUD intervention is cheaper than providing standard care (due to estimated direct costs savings) and is more effective than standard care (as more people take up contraception and thus more outcomes of interest generated)

**Sensitivity analyses** included alternative parameters that reflect varying the proportion of PPIUD insertions resulting from the government incentive being paid, and variation in cost estimates for direct service delivery, central project management cost and training costs (Figure 4; see description in [methods](#) for more details). The ICER was most sensitive to the rate of payment of incentives. With all of the parameters and scenarios tested the PPIUD intervention remained cheaper and more effective than standard care, indicating it was the 'dominant' strategy in terms of cost-effectiveness (bottom right quadrant of the [cost-effectiveness plane](#))

Figure 4: Bangladesh Model 2 Sensitivity Analyses



## *Bangladesh Design Adjustments and Assessment of Displacement*

As well as running sensitivity analysis to test the robustness of our models, we re-ran our analysis with **several adjustments to the implementation design**. This was done to examine how changes to the design might affect the cost-effectiveness of rolling out PPIUD. These design adjustments are beyond those already incorporated into Model 2 based on the learnings from Model 1 (see [analysis section](#) of the methods for details of the Model 2 design). Removing the cost of the initial training of trainers in PPIUD insertion or removing the cost of the initial training of counsellors from Model 2 made minimal difference to the estimated total cost of Model 2 implementation, or the resulting assessment of cost effectiveness presented as ICERs (See [Appendix 4](#) for full details of the analyses and results)

As immediate postpartum tubal ligation is offered to some women in Bangladesh, **we attempted to estimate the level and effect of 'displacement' in Model 1** (that is, women taking up PPIUD who *may* have otherwise taken up immediate postpartum tubal ligation). Displacement was estimated to have potentially occurred among 275 women (3.4% of the PPIUDs provided in Model 1). While there were some immediate cost-savings in providing PPIUDs to these women instead of tubal ligation (because tubal ligations are more expensive to deliver than PPIUDs), the overall impact in terms of CYPs gained and DALYs averted was a reduction in outcomes achieved because tubal ligation services have longer lifespans than IUDs. See [Appendix 4](#) for full details of the analyses and results.

## Tanzania

### *Model 1: What was done during PPIUD Initiative*

Phase Two of the PPIUD initiative in Tanzania ran from January 2015 to June 2018. For the purpose of this evaluation, we are including December 2015 to March 2016 as the set-up period, and April 2016 to June 2018 as the implementation period in the Tanzania analysis (see [Analysis section in the methods](#) for further details). During the implementation period, the six participating facilities inserted 7448 immediate PPIUDs.

#### **Service Provision Costs**

In Tanzania, the cost of direct service provision of a PPIUD was estimated to be USD \$2.05 per PPIUD. This includes the cost of provider time to perform clinical tasks and equipment needed (including the IUD) for: initial insertion; follow up visit (if any); and eventual removal (see [Appendix 3](#) for details). This cost was offset by any client fees, which in Tanzania only included a fee for ultrasound at follow-up when needed.<sup>65</sup> No incentives are paid to either clients or providers in Tanzania.

#### **Total Cost**

The total cost of delivering the PPIUD initiative was estimated as \$1,869,507, including a 10% overhead as per the Tanzanian government's project budgets. The first four months of the initiative, referred to as the set-up phase, cost \$105,098, or 6% of the overall cost. The remaining 94% of costs (\$1,764,408) were incurred during the 27 month implementation phase (Table 7). The main cost driver was training costs (76% of all costs), including Training of Trainers, PPIUD insertion training, and PPFPP counselling training. The estimated costs of implementing the initiative was \$130,697 per facility per year (Table 7).

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<sup>65</sup> *One third of women who return for follow-up and have non-visible threads would be given an ultrasound.*



Table 7: Tanzania Model 1 Total Costs of Implementation

Cost Categories	PPIUD + Standard PFP Care	
	Total Cost* (2018 USD)	% of total cost
Set up costs	\$105,098.29	6%
<b>Implementation period costs (27 months)</b>	<b>\$1,764,408.29</b>	<b>94%</b>
Training costs	\$1,425,356.65	76%
Staffing costs - national level project staff	\$136,561.91	7%
Staffing costs - facility level staff	\$49,408.87	3%
Service delivery costs - direct provision	\$16,774.64	1%
Ongoing support costs <sup>^</sup>	\$136,306.22	7%
<b>Total cost of delivering PPIUD intervention</b>	<b>\$1,869,506.58</b>	
Cost per year of implementation (excludes costs incurred during set up period)	\$784,181.46	
Cost per year of implementation per facility (excludes costs incurred during set up period)	\$130,696.91	

\* Includes 10% overhead

<sup>^</sup> Includes cost of clinical supervision, ongoing meetings with facilities and other stakeholders, distribution of IEC materials and sharing of lessons learnt

### Cost Effectiveness

Table 8 presents the main outcomes of interest from Impact2, the estimated cost per outcome achieved and the ICER presented both with and without including the cost offset of the estimated direct healthcare savings from Impact2. Results are estimated as \$54.57 per CYP and \$67.67 per DALY averted before the estimated direct healthcare savings from Impact2 are factored in.

Using internationally accepted thresholds,<sup>66</sup> the PPIUD initiative appears highly cost-effective, as the cost per DALY averted of \$67.67 is far below the 2018 per capita gross domestic product (GDP) of Tanzania of \$1,051.<sup>67</sup> Using Impact2, the 7448 PPIUD services provided in 2016-2018 will lead to estimated direct healthcare costs of **\$1,348,744**. Thus the total cost of implementing Model 1 (\$1,869,507) is more than the estimated costs saved in the future. Once the estimated savings from direct healthcare costs averted are factored in to the ICER calculation, the PPIUD initiative is more expensive and more effective than standard care (top right quadrant of the [cost-effectiveness plane](#)), while the cost per DALY averted suggests the intervention is highly cost effective using the GDP threshold.

<sup>66</sup> Interventions that avert one DALY for less than average per capita GDP for a given country or region are considered very cost-effective; interventions that cost less than three times average per capita GDP per DALY averted are still considered cost-effective (source: Hutubessy R et al. [Generalized cost-effectiveness analysis for national-level priority-setting in the health sector](#). Cost Eff Resour Alloc. 2003;1.8)

<sup>67</sup> World Bank. [GDP per capita \(current US\\$\) - Tanzania](#) [Internet]. [cited 2020 Jan 27].

Table 8: Tanzania Model 1 Cost Effectiveness

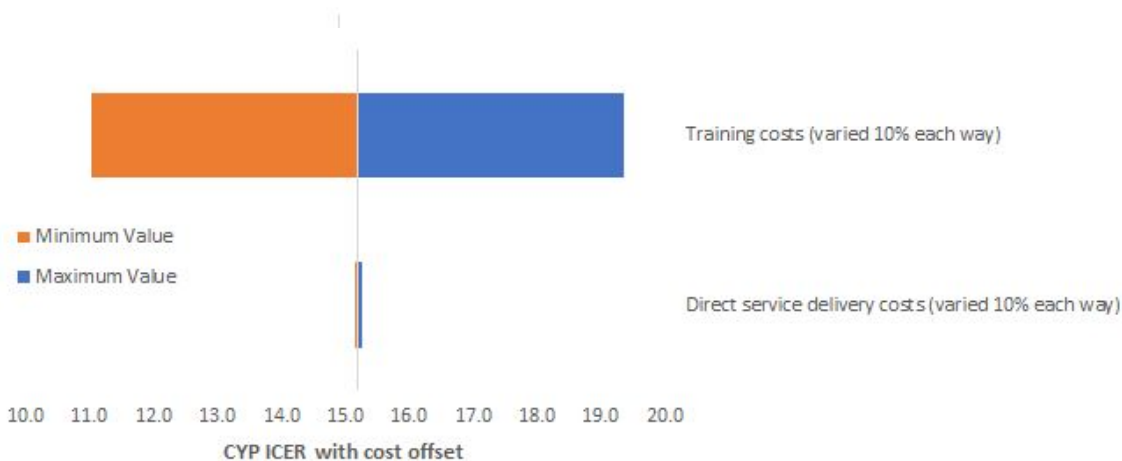
Outcome of interest~	Estimated Number	Cost per outcome achieved	ICER* without cost offset	ICER* with cost offset
PPIUDs inserted	7448	\$251.01	251.01	69.92
CYPs	34261	\$54.57	54.57	15.20
Unintended pregnancies averted	15471	\$120.88	120.8	33.66
Maternal deaths averted	30	\$62,316.89	62,316.89	17358.75
Child deaths averted	306	\$6,109.50	6,109.50	1701.84
Maternal DALYs averted	1753	\$1,066.46	1,066.46	297.07
Child DALYs averted	25874	\$72.25	72.25	20.13
Total DALYs averted (maternal + child DALYs)	27626	\$67.67	67.67	18.85

~ Outcomes are estimated service lifespan impacts from Impact2 tool

\* Incremental cost effectiveness ratio - difference in cost of PPIUD intervention to standard practice divided by difference in outcomes of PPIUD intervention compared to standard practice

**Sensitivity analyses** included alternative parameters that reflect variations in cost estimates for direct service delivery, and training costs (Figure 5; see description in [methods](#) for more details). The ICER was most sensitive to variations in costs of training. For all of the parameters and scenarios tested the PPIUD intervention remained highly cost-effective. The scenario with the highest cost per DALY tested was an increase of 10% of training costs which resulted in a cost per DALY of \$72.83 before estimated health savings were factored in, which would be considered highly cost-effective according to established WHO DALY cost-effectiveness thresholds.

Figure 5: Tanzania Model 1 Sensitivity Analyses



## Model 2: Projected national roll out of the PPIUD initiative

Model 2 roll out in Tanzania projected the estimated future cost and impact of expansion of the PPIUD initiative to **all Regional Referral Hospitals** in Tanzania, as well as 4-6 satellite facilities per hospital. There are 28 Regional Referral Hospitals in Tanzania, according to MoH guidance released in 2016, all of which provide similar levels of antenatal care, delivery and obstetrics services and postnatal care.<sup>68</sup> Since the PPIUD initiative modelled in Model 1 included six of these Regional Referral Hospitals, Model 2 included the costs of *set-up* of the initiative in the 22 ‘new’ facilities. To facilitate comparisons with Model 1, *implementation* was considered over a 36 month period for all 28 Regional Referral Hospitals.

### Estimated Total Cost

The estimated total cost of scaling up the PPIUD initiative to all Regional Referral Hospitals over three years is estimated at \$6,910,494, including a 10% overhead as per the Tanzanian government’s project budgets. The first four months of the scale-up, referred to as the set-up phase, cost \$255,802, 4% of the overall cost. The remaining 96% of costs (\$6,654,692) are incurred during the 36 month implementation phase (Table 9). As in Model 1, the main cost driver is training costs (80% of all costs). The estimated costs of implementing the initiative is \$79,223 per facility per year (Table 9).

Table 9: Tanzania Model 2 Estimated Total Costs of Implementation

Cost Categories	PPIUD + Standard PPFP Care	
	Total Cost* (2018 USD)	% of total cost
<b>Set up costs</b>	<b>\$255,801.98</b>	<b>4%</b>
<b>Implementation period costs (36 months)</b>	<b>\$6,654,691.52</b>	<b>96%</b>
Training costs	\$5,550,096.23	80%
Staffing costs - national level staff	\$529,072.23	8%
Staffing costs - facility level staff	N/A	0%
Service delivery costs - direct provision	\$98,936.27	1%
Ongoing support costs <sup>^</sup>	\$476,586.79	7%
<b>Total cost of delivering PPIUD intervention</b>	<b>\$6,910,493.50</b>	<b>100%</b>
Cost per year of implementation (excludes costs incurred during set up period)	\$2,218,230.51	
Cost per year of implementation per facility (excludes costs incurred during set up period)	\$79,222.52	

\* Includes cost of clinical supervision, ongoing meetings with facilities and other stakeholders, distribution of IEC materials and sharing of lessons learnt

<sup>68</sup> Ministry of Health, Community Development, Gender, Elderly and Children. President Office Regional Administration and Local Government Guideline for Regional Referral Hospital Advisory Board (RRHAB). June 2016.

## Estimated Cost Effectiveness

Table 10 presents the main outcomes of interest from Impact2, the estimated cost per outcome achieved and the ICER presented both with and without including the cost offset of the estimated direct healthcare savings from Impact2 for the Model 2 scale-up. Results are estimated as \$34.20 per CYP and \$43.31 per DALY averted before the estimated direct healthcare savings from Impact2 are factored in.

Using internationally accepted thresholds,<sup>69</sup> the PPIUD initiative appears highly cost-effective, as the cost per DALY averted of \$43.31 is far below the 2018 per capita gross domestic product (GDP) of Tanzania of \$1,051.<sup>70</sup> Using Impact2, the 43,928 PPIUD insertion services provided over the three years of the implementation of Model 2 would lead to estimated direct healthcare costs saved of **\$7,954,649**. Thus the total cost of implementing Model 2 (\$6,910,494) is less than the estimated costs saved in the future. In addition, once the estimated savings from direct healthcare costs averted are factored in to the ICER calculations, the cost-effectiveness of PPIUD ‘dominates’ meaning that it is both cheaper and more effective to provide the PPIUD intervention compared to standard care (bottom right quadrant of the [cost-effectiveness plane](#)).

Table 10: Tanzania Model 2 Estimated Cost Effectiveness

Outcome of interest~	Estimated Number	Cost per outcome achieved	ICER* without cost offset	ICER* with cost offset
PPIUDs inserted	43928	\$157.31	157.31	PPIUD Dominates^
CYPs	206064	\$34.20	34.2	PPIUD Dominates^
Unintended pregnancies averted	91248	\$75.73	75.73	PPIUD Dominates^
Maternal deaths averted	120	\$57,587.45	57,587.45	PPIUD Dominates^
Child deaths averted	1804	\$3,830.65	3,830.65	PPIUD Dominates^
Maternal DALYs averted	6968	\$991.75	991.75	PPIUD Dominates^
Child DALYs averted	152593	\$45.29	45.29	PPIUD Dominates^
Total DALYs averted (maternal + child DALYs)	159561	\$43.31	43.31	PPIUD Dominates^

~ Outcomes are estimated service lifespan impacts from Impact2 tool

\* Incremental cost effectiveness ratio - difference in cost of PPIUD intervention to standard PFP care divided by difference in outcomes of PPIUD intervention compared to standard care

^ PPIUD dominates - providing PPIUD intervention is cheaper than providing standard care (due to estimated direct costs savings) and is more effective than standard care (as more people take up contraception and thus more outcomes of interest generated)

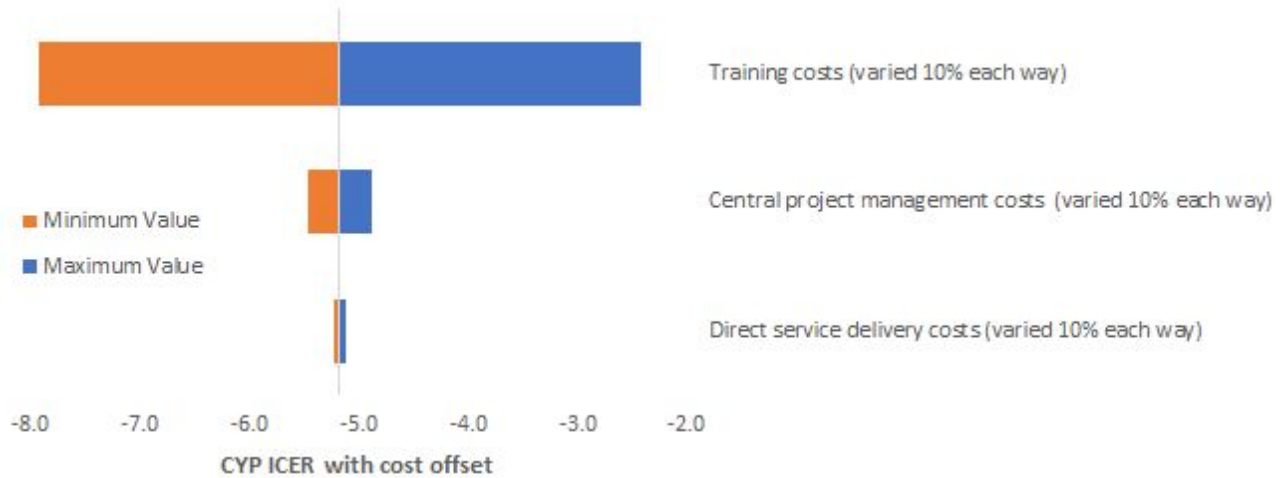
**Sensitivity analyses** included alternative parameters that reflect variation in cost estimates for direct service delivery, central project management cost and training costs (Figure 6; see description in [methods](#)

<sup>69</sup> Interventions that avert one DALY for less than average per capita GDP for a given country or region are considered very cost-effective; interventions that cost less than three times average per capita GDP per DALY averted are still considered cost-effective (source: Hutubessy R et al. [Generalized cost-effectiveness analysis for national-level priority-setting in the health sector](#). Cost Eff Resour Alloc. 2003;1.8)

<sup>70</sup> World Bank. [GDP per capita \(current US\\$\) - Tanzania](#) [Internet]. [cited 2020 Jan 27].

for more details). The ICER was most sensitive to variations in the cost of training. With all of the parameters and scenarios tested the PPIUD intervention remained cheaper and more effective than standard care, indicating it was the 'dominant' strategy in terms of cost-effectiveness (bottom right quadrant of the [cost-effectiveness plane](#))

Figure 6: Tanzania Model 2 Sensitivity Analyses



### Tanzania Design Adjustments

As well as running sensitivity analysis to test the robustness of our models, we re-ran our analysis with several **adjustments to the implementation design**. This was done to examine how changes to the design might affect the cost-effectiveness of rolling out PPIUD. These design adjustments are beyond those already incorporated into Model 2 based on the learnings from Model 1 (see [analysis section](#) of the methods for details of the Model 2 design)

The full results of the design adjustments can be found in [Appendix 4](#); in short the key findings were:

- **Reducing the number of providers trained by half** in Model 2 (to consider the scenario where there is less frequent rotation of providers between clinical departments): this made a substantial reduction to the cost of national roll out of the initiative (an estimated total cost of \$4.1 million compared to \$6.9 million in the original Model 2 analysis)
- **Extending the training length to align with the standard government PFP training of 14 days** (vs six days in Model 1 and five days in Model 2) - this resulted in a much higher cost to implement both models, and the estimated direct healthcare savings in Model 2 no longer exceeded the total cost to implement. However, even with the extended training duration, cost per DALY averted is still below the 2018 per capita GDP of Tanzania of \$1,051 and thus still considered very cost-effective.
- **Expanding PPIUD services to satellite facilities** - expanding to four satellite facilities in Model 2 (as is being done in Phase Three of the project) resulted in a 13% rise in cost for an estimated 5% additional PPIUDs provided. Expanding PPIUD services to 105 satellite facilities (75% of the total estimated number of satellite facilities) resulted in a 329% rise in cost for an estimated 38% additional PPIUDs provided. Note that due to a lack of certainty of how PPIUD might be rolled out at satellite facilities, and a lack of data on which to base our projections, these estimates should be treated with caution, and will be influenced by changes such as proportion of women delivering at satellite facilities. In addition, other factors including equity of access to services, should also be included when considering future potential expansion to satellite facilities.

## Country Comparison

Table 11 displays some of the key data and results for Model 1 and Model 2 in both Bangladesh and Tanzania. Overall costs were higher in Tanzania compared to Bangladesh in both models, on a per facility per year basis and on a cost per CYP basis. This was driven by the much higher cost in Tanzania to conduct trainings, as well as higher salary levels and higher cost associated with travel. The only major cost category with a higher cost in Bangladesh were costs of facility level staffing, as honorariums were paid to Hospital Directors and Unit Heads in Bangladesh in Model 1, as well as to the coordinator and deputy coordinator at each facility, and for Bangladesh this line item also included the counsellor salaries.<sup>71</sup> The Bangladesh analyses also included cost of incentives paid for PPIUD insertion, whereas no incentives are paid by the government in Tanzania.

The PPIUD initiative was highly cost-effective in both countries. In Bangladesh, in both Models 1 and 2, the estimated direct healthcare savings to the government resulting from PPIUD insertion exceeded the estimated cost of implementing the PPIUD initiative. In Tanzania, the direct healthcare savings exceeded the cost of implementation when scaled up to represent national roll out (Model 2). Despite the overall higher costs in Tanzania, cost per outcomes related to deaths averted and DALYs averted were less in Tanzania compared to Bangladesh as the overall maternal health outcomes in Tanzania are much poorer, thus the estimated impact of averting a pregnancy is much greater.

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<sup>71</sup> In Tanzania counselling was performed by existing providers rather than dedicated counselling staff, so counselling costs in Tanzania are included within the costing of direct PPIUD service provision rather than as facility level staffing costs

Table 11: Comparison of key data and results in Bangladesh and Tanzania

	Bangladesh		Tanzania	
	<b>Model 1</b> <i>What was done during PPIUD Initiative</i>	<b>Model 2</b> <i>Projected national roll out of the PPIUD intervention</i>	<b>Model 1</b> <i>What was done during PPIUD Initiative</i>	<b>Model 2</b> <i>Projected national roll out of the PPIUD intervention</i>
<b>Program Design</b>				
Number of facilities*	6	36	6	28
Set up period (months)	4	4	4	4
Implementation period (months)	36	36	27	36
Number of PPIUDs inserted	8,031	26,507	7,448	43,928
<b>Costing Analysis</b>				
Estimated cost of direct PPIUD service provision~	\$1.71	\$1.71	\$2.05	\$2.05
<b>Estimated total cost</b>	<b>\$539,284.51</b>	<b>\$1,979,139.65</b>	<b>\$1,869,506.58</b>	<b>\$6,910,493.50</b>
Cost per facility/year^	\$29,960.25	\$17,372.92	\$130,696.91	\$79,222.52
Main cost driver	Facility staff# (58% of total cost)	Facility staff# (53% of total cost)	Training (76% of total cost)	Training (80% of total cost)
Impact2 estimated direct healthcare costs saved	\$802,367.91	\$2,648,283.68	\$1,348,744.00	\$7,954,649.33
<b>Cost Effectiveness</b> <i>Estimated cost per...(without cost offset)</i>				
PPIUD inserted	\$67.15	\$74.66	\$251.01	\$157.31
CYP	\$14.60	\$16.23	\$54.57	\$34.20
DALY averted	\$91.13	\$106.64	\$67.67	\$43.31
Maternal death averted	\$50,727.60	\$107,057.85	\$62,316.86	\$57,587.45
Child death averted	\$8,612.44	\$9,576.21	\$4,748.14	\$4,027.47

All costs in 2018 USD

\* Note Model 2 facilities include Model 1 facilities plus additional facilities at the equivalent level of the public healthcare system. For Tanzania, each hospital in Model 2, as there was in Model 1, is assumed to have 4-6 associated satellite facilities that are trained in PFP counselling, given IEC materials to distribute and refer clients to the hospitals

~ Includes cost of initial insertion, follow up visit and eventual removal using weighted averages. Cost of counselling is included for Tanzania but not for Bangladesh (see [methods](#) for details). Government incentives paid in Bangladesh are not included here.

^ Total cost divided by number of facilities, included to assist with comparison between the two settings (does not indicate the actual cost incurred directly by facilities; includes central level project management and support costs, some of which remain fixed even as the number of facilities changes)

# Facility staff include counsellors and honorariums in Model 1; and counsellors only in Model 2

## Other Findings and Learnings

### *Additional Potential Benefits*

For the purpose of our cost-effectiveness analysis, the impact of the PPIUD initiative was defined as change in uptake of immediate PPIUD at the participating facilities. However, there are further additional benefits likely to occur due to the introduction of the initiative. These benefits should be considered when reviewing the overall evaluation findings, particularly as those that impact on access to and uptake of PPIUD are likely to further strengthen the case for cost-effectiveness of scaling up PPIUD nationally. Country teams in Tanzania and Bangladesh reported observing the following benefits:

- Trained providers **moving to other facilities** and providing PPIUDs there (where supplies and support are available), thus expanding the reach of the PPIUD initiative beyond the participating facilities
- The introduction of quality postpartum family planning counselling during antenatal visits and around the time of delivery leading to **increased awareness of all available methods** among women and providers, and ultimately **increased future uptake of methods** (e.g. at postnatal visits or later when birth spacing or birth limiting is desired)
- **Improved collection of data on uptake of postpartum contraception** at facility and regional/central levels, enabling more efficient provision of resources (e.g. stocks of IUDs) and allowing for 'feedback loops' to continually improve provision of postpartum family planning services

Furthermore, this cost-effectiveness evaluation was based only on the perspective of costs to the government. An important benefit of providing immediate postpartum contraception is the **benefits to women of receiving an IUD in the immediate postpartum period** compared to at another time. These benefits include reduced costs (time, financial, opportunity costs) by having the PPIUD inserted while at a facility for delivery, and follow up appointment at the same time as a postnatal visit, and limiting the discomfort associated with PPIUD insertion.

### *Lessons Learned from the PPIUD initiative*

The experiences of the teams who implemented the initiative in each country also offered some lessons for how cost-effectiveness could be maximised by considering how roll-out of immediate PPIUD to facilities is managed, for example the importance of having motivated PPIUD 'champions' at all facilities.

Some of these lessons learned during Phase Two of the PPIUD initiative were incorporated into the continuation of the initiative, known as **Phase Three**, which commenced in July 2018. Phase Three included **further adaptations** that again likely strengthen the cost-effectiveness of the approach. Although beyond the scope of the cost-effectiveness analyses, which was limited to Phase Two, these adaptations are noted here for completeness when considering the cost-effectiveness of introducing PPIUD. Where possible and appropriate these adjustments were built into our Model 2 projections. The main Phase Three adaptations in each country are described in brief below.

#### ***Bangladesh Phase Three Adaptations***

- **'Branch-led training'**, whereby local branches of the OGSB (the organisation implementing the PPIUD initiative) conducted training at a regional branch level, rather than tied to a specific Medical College Hospital. These branch-led trainings included providers from a variety of health facilities in the local area, including private and public providers, doctors, midwives and nurses, and lower-level facilities than Medical College Hospitals, which were the focus of Phase Two. This



approach means that a much wider cohort of providers are able to offer counselling and PPIUD insertions, and that PPIUD insertions are now available at some lower-level facilities, increasing the number of women potentially able to access PPIUDs (as well as provider awareness and ability to support and refer women for these methods, even if they don't insert PPIUD themselves). The cost of these trainings is likely also different to the training costs incurred under Phase Two.

- **PPIUD incorporated into midwifery curriculum**, and training-of-trainers conducted in midwifery schools to cascade down trainings

### **Tanzania Phase Three Adaptations**

- **On-the-job refresher training**, whereby refresher training shifted from a one-day repetition of insertion training to 'on-the-job' supervision by the facility-based trainer. Providers who were identified as having a need for additional support were observed inserting PPIUDs and coached until their skills improved and they achieved competency. This reduced training costs, including travel to training (factored into Model 2).
- **Mama-U Stations** were set up at all facilities with labour and delivery wards to encourage on-the-job training and practice and to allow trained providers to train and support new providers on PPIUD insertion.
- **Satellite facilities** are lower level facilities where most ANC and postnatal care is provided, and who refer more complicated cases to the Regional Referral Hospitals. Nationally there is a concerted effort to increase the capacity of these lower level facilities and increase the proportion of uncomplicated deliveries performed there. Towards the end of Phase Two and in Phase Three, the PPIUD initiative trained satellite facilities in provision of PPIUD. This will potentially have a large impact on PPIUD access and uptake (considered in [design adjustments](#)).
- In Phase Three the **duration of training** was reduced from six days (three days for PPIUD delivery training, three days for postpartum contraception counselling training) to five days for both trainings combined (same adjustment made for Model 2).<sup>72</sup>

### **Comparison with Other Methods of Immediate PostPartum Contraception**

Within this evaluation it was not possible to include direct cost-effectiveness comparisons with other immediate postpartum methods of contraception as PPIUD is the only method of immediate postpartum contraception routinely offered to all women delivering at the facilities<sup>73</sup>. Thus there were no direct comparison data available (either for cost or impact).

**Short-acting methods**, such as the pill or injectables, are likely to cost less at the point of delivery than PPIUD (no or little equipment or clinical time is needed and the commodity cost of the method is generally cheaper) but be less cost-effective than PPIUD because their impact is far lower (due to the shorter duration of effectiveness) and have fewer cost savings in the long-term because women have to return to health providers frequently for re-supply (which has cost implications for both the facility and the women)<sup>74,75,76</sup>. **Long-acting and permanent methods (implants and tubal ligations)** are more likely to 'compete'

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<sup>72</sup> The FIGO team reports that the reduction in this training length did not adversely affect quality of service provision, as monitoring data indicated there were no increases in rates of expulsion etc

<sup>73</sup> Note that in Bangladesh tubal ligation is offered as a method of immediate postpartum contraception, but generally only to women delivering via c-section and commonly only women who already have multiple children (i.e. the method is not available to all women). In Tanzania it is delivered only rarely during c-sections.

<sup>74</sup> Rademacher KH et al. [Expanding access to a new, more affordable levonorgestrel intrauterine system in Kenya: service delivery costs compared with other contraceptive methods and perspectives of key opinion leaders](#). *Glob Health Sci Pract*. 2016;4 Suppl 2:S83-S93.

<sup>75</sup> Babigumira JB et al. [Surgery for Family Planning, Abortion, and Postabortion Care](#). In *Essential Surgery: Disease Control Priorities. Third Edition*, H.T. Debas, et al., Editors. The International Bank for Reconstruction and Development / The World Bank: Washington DC. 2015:109-128

with PPIUD in terms of cost-effectiveness. Immediate postpartum tubal ligation is occasionally offered at the facilities participating in the PPIUD initiative (more often in Bangladesh where it may be offered to a women undergoing a c-section who already has multiple children, than in Tanzania, where it is extremely rare). As such, estimates of cost data were collected from providers, based on equipment needed and clinical time to provide tubal ligations. In Bangladesh cost of service delivery for immediate postpartum tubal ligation including follow-up visit, was estimated to be \$1.41 (compared to \$1.71 for PPIUD), while in Tanzania it was \$4.20 (compared to \$2.05 for PPIUD). When government incentive payments are taken into account,<sup>77</sup> the cost of immediate postpartum tubal ligation is higher than PPIUD in Bangladesh also. Tubal ligation is a permanent method of contraception with more than double the CYPs assigned compared to IUDs (10 in Tanzania, 13 in Bangladesh).<sup>78</sup> As a result, a tubal ligation has greater impact (for example more pregnancies and DALYS averted). However availability of methods should not only be based on costs, especially given the differences between PPIUDs and immediate postpartum tubal ligation.<sup>79</sup>

During the timeframe of focus of this evaluation, no immediate postpartum implants were routinely delivered at the participating PPIUD initiative facilities and so no cost estimates could be directly collected. Factors that are likely to affect the **cost-effectiveness of immediate postpartum implants** compared to alternative postpartum contraceptive methods are:

- **No specific training or equipment is needed** for postpartum implant insertion compared to implant insertion at other times. This would increase cost effectiveness of immediate postpartum implants compared to PPIUD *if* providers have already been trained in implant insertion as there would be no or lesser training costs ; and
- Immediate postpartum implants have only recently been recommended by the WHO – previously it was only recommended at six weeks postpartum. However, **implants are more widely used than IUDs as interval contraception** in both Bangladesh and Tanzania.<sup>80</sup> This may mean that uptake of immediate postpartum implants would be higher and may grow more rapidly than uptake of PPIUD, which would increase the cost-effectiveness of immediate postpartum implants compared to PPIUD; and
- Implants generally have a **higher commodity cost** compared to alternative postpartum methods such as IUDs or oral contraceptive pills: the 2018 UNFPA contraceptive price indicator report finds IUDs cost USD 0.07 per CYP compared to USD 2.87 for implants,<sup>81</sup> and
- Implants have a CYP factor of 2.5 to 3.8 depending on the type of implant (three, four or five year). This means the **impact of an implant is lower** than both tubal ligations (CYP of 10 in most countries; 13 in India, Nepal and Bangladesh) and IUDs (CYP of 3.6 or 4.6 depending on type).<sup>82</sup>

Although we do not have data on the cost of providing immediate postpartum implants, because no additional training is needed and the time for providers to provide the method would be similar regardless of when it is inserted, we might expect cost-effectiveness of immediate postpartum implant to be similar to that of interval implants, for which we can refer to cost-effectiveness literature (see [comparison of cost effectiveness results](#) in the Discussion section).

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<sup>76</sup> Stover J et al. [Empirically Based Conversion Factors for Calculating Couple-Years of Protection](#), *Evaluation Review*, 24(1), February 2000, 3-46

<sup>77</sup> The Government of Bangladesh also pays incentives to women and providers for provision of long term and permanent methods of contraception; the maximum combined incentive payment possible for tubal ligation is \$35.65 compared to \$6.24 for IUD

<sup>78</sup> USAID. [Couple Years of Protection \(CYP\) conversion factors](#). [Internet]. [cited 2019 Dec 11].

<sup>79</sup> These differences include tubal ligation only being suitable for women who do not want any more children (not suitable for spacing of future children) and the method not being easily reversible

<sup>80</sup> See most recent Demographic and Health Surveys from [Bangladesh](#) and [Tanzania](#)

<sup>81</sup> United Nations Population Fund (UNFPA) 2019. [Contraceptive Price Indicator for the year 2018](#)

<sup>82</sup> USAID. [Couple Years of Protection \(CYP\) conversion factors](#). [Internet]. [cited 2019 Dec 11].

## Discussion

### Key Findings

The PPIUD initiative was highly cost-effective in both countries. In Bangladesh the cost of direct service provision of a PPIUD was estimated to be USD \$1.71 per PPIUD (excluding incentive payments), cost per CYP was \$14.60 and cost per DALY averted was \$91.13. When projecting the future cost of delivering PPIUD at a national level in Bangladesh (Model 2), cost per CYP was \$16.23 and cost per DALY averted was \$106.64. In Tanzania, the estimated cost of direct service provision was \$2.05 per PPIUD, cost per CYP was \$54.57, and cost per DALY averted was \$67.67. When projecting the future cost of delivering PPIUD at a national level in Tanzania (Model 2), cost per CYP was \$34.20 and cost per DALY averted was \$43.31. The models were most sensitive to changes in rate of government incentive payment (Bangladesh) and training costs (Tanzania) but remained cost-effective when a range of different parameters, scenarios and assumptions were tested.

For both models in Bangladesh and Model 2 in Tanzania, the estimated direct healthcare savings to the government resulting from PPIUD insertion exceeded the estimated cost of implementing the PPIUD initiative. In Model 1 in Tanzania, although the cost to implement the PPIUD initiative was higher than the estimated cost savings the cost per DALY was far below the national per capita GDP indicating high value and a highly cost effective result.

### Country Context

When projecting likely cost-effectiveness of delivering immediate PPIUD, it is important to note the current and future landscape of obstetrics care in both countries.

In **Bangladesh** the largest cost driver was **staffing costs**, both at a national/central level, and at facility level. Most of the facility level staffing costs were due to salaries for dedicated counselling staff, unlike in Tanzania where counselling was provided by existing providers (and the time of this counselling factored into the cost of the direct service provision of PPIUD rather than to staffing costs). It is possible that in the future **contraceptive counselling in Bangladesh could be delivered by existing providers**, such as Lady Health Visitors or the new midwife cadre currently being introduced to some health facilities. While transitioning of counselling to providers other than dedicated counsellors may reduce cost, it is important to also consider how the **quality of counselling can be maintained** to ensure women are able and encouraged to make informed choices about postpartum contraception. Dedicated counsellors were used in the PPIUD initiative due to the limited time of doctors and nurses to provide contraceptive counselling;<sup>83</sup> which is something to consider in any future move to transition counselling to existing providers.

As noted above, Bangladesh is currently introducing a **midwife cadre**; initially to lower level facilities (Upazila Health Complexes) but potentially in the future to higher level facilities such as District Hospitals and Medical College Hospitals. These midwives could potentially be trained to provide PPIUD insertions along with counselling. Experience from the PPIUD initiative in India suggests that the introduction of nursing staff who can provide counselling and method provision, combined with incentive payments, can lead to higher PPIUD uptake rates.<sup>84</sup> Provision of PPIUD by midwives may increase access to PPIUDs, as those women who have vaginal deliveries without a doctor in attendance would be able to have a 'one stop procedure' with a midwife performing both the delivery and PPIUD insertion (vs currently predominant reliance for doctors to perform the PPIUD insertion). This **would likely have a favourable**

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<sup>83</sup> Fatima et al [Impact of contraceptive counselling training among counsellors participating in the FIGO postpartum intrauterine device initiative in Bangladesh](#). *Int J Gynecol Obstet*. 2018;143:49–55.

<sup>84</sup> Bhadra B et al [The impact of using nurses to perform postpartum intrauterine device insertions in Kalyani Hospital, India](#). *Int J Gynecol Obstet* 2018;143:33–7.

**impact on cost-effectiveness** as provision by midwives would likely be cheaper than the initiative where doctors provided most of the insertions, as well as and potentially lead to higher uptake rates. The recent incorporation of PPIUD into obstetric and gynecology specialist exams in Bangladesh may further increase access to PPIUDs, and reduce training costs, in the future.

In **Tanzania**, by far the main cost driver was **training costs** (69% of all costs). This is in part due to high travel costs within Tanzania, but also due to the frequent rotation of providers to other clinical departments, meaning multiple trainings had to be run to train new providers. While some adjustments to training were made in the modelling to national scale up to streamline costs (reducing the duration of the initial training and shifting to an 'on-the-job' refresher training model), it is likely that the cost of training providers will remain a large cost driver while rotation of providers remains so prevalent or until PPIUD is embedded fully in national pre-service training curriculum and service delivery. The PPIUD initiative implemented a six-day (then five-day) training compared to the standard government PPFP training of 14 days. As demonstrated in the results, increasing the training length to 14 days was estimated to substantially increase total costs. However if PPIUD is included within pre-service training, training costs will likely reduce; under the PPIUD initiative the curriculum for nurses, midwives and doctors at three medical schools associated with the PPIUD facilities have now been updated to include PPIUD including practical skills assessment.

An important note for interpretation of the results in Tanzania is that, although overall costs in Tanzania were higher than in Bangladesh, in some cases **cost per health outcome were lower**. This is likely to be because of the higher number of PPIUD insertions projected in Model 2 in Tanzania, but also because maternal outcomes in Tanzania remain poor, and averting pregnancies through use of family planning has a big impact of women's health outcomes.

In both Tanzania and Bangladesh, active efforts are underway to increase the overall number of facility births and specifically to increase deliveries at lower level facilities, in part by improving the infrastructure and provider capacity at these facilities. In Tanzania the satellite facilities will continue to play an important role in antenatal and postnatal care, but may additionally be able to support uncomplicated deliveries and postpartum contraception. Assuming the providers at the lower level facilities are also training in immediate PPIUD provision, this could greatly increase efficiency, access to and uptake of PPIUD, which in turn may improve cost-effectiveness.

It is also worth considering that although PPIUD uptake increased over time, by the end of the period of analysis it appeared the vast majority of women delivering in PPIUD facilities in both countries were being discharged without being provided with a modern method of contraception. This suggests the ongoing potential to 'grow the market' of women taking up contraception at or around the time of delivery with a range of methods to choose from.

### **Comparison of Cost Effectiveness Results**

There are **few comparable studies** on the cost-effectiveness of delivering postpartum contraception, and even fewer specifically on immediate postpartum contraception. In addition, comparisons with other studies are limited due to different implementation approaches (for example the extent to which demand generation was included) and different methodology for calculating cost (what is included and how it is measured).

Previous studies comparing contraceptive methods (not specifically within the postpartum period) have consistently found **IUD to have a lower cost per CYP** compared to other methods of contraception (\$13 per CYP for IUD (no comparison methods)<sup>85</sup>; \$1.37 per CYP for IUD, compared to \$1.60 for female sterilization,

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<sup>85</sup>Neukom J et al. [Dedicated providers of long-acting reversible contraception: new approach in Zambia](#). *Contraception*. 2011;83(5):447-452

\$4.06-\$6.17 for implants, \$6.88 for oral contraceptives, and \$7.07-\$12.47 for injectables (ranges represent different types of implant and injectables)<sup>86</sup>; \$5 per CYP for IUD compared to \$20 per CYP for postpartum implant<sup>87</sup>.

The only other known studies to have considered the cost effectiveness of immediate PPIUD provision is Wall et al in Rwanda<sup>88</sup> and a study from the US that found immediate PPIUD results in cost savings of \$282,540 per 1,000 women, and a gain of 10 quality adjusted life years.<sup>89</sup> Wall et al used a similar micro-costing approach as our PPIUD evaluation to estimate the incremental cost of PPIUD and postpartum implants compared to standard methods, from the perspective of the health system, in Kigali, Rwanda<sup>90</sup>. The authors included and excluded similar costs as our analyses, but unlike the PPIUD initiative, they included the costs of promotional activities. The resulting cost per PPIUD inserted was \$25 and cost per CYP for PPIUD was \$5, lower than the results in our analyses. However the Rwanda initiative did include incentives paid directly to providers and community health workers referring women to providers, and had a higher uptake rate of PPIUDs of 16%<sup>91</sup> (compared to 5-8% in our analyses).

Compared to previous analyses, our estimates of cost per PPIUD inserted and cost per CYP for PPIUD were generally higher than those reported in peer-reviewed publications (see above). Nonetheless, our results indicate that even with these higher costs, national introduction and roll out of PPIUD in Bangladesh and Tanzania is expected to be highly cost-effective. As noted above, the range of results across studies is in part due to the differences in implementation and costing methodology. However, it's worth noting that the PPIUD initiatives in Bangladesh and Tanzania were very similar and the costing methodologies were almost identical but results were still different, suggesting that making comparisons of actual costs across countries may be of limited value. Potentially more useful is to **compare cost and cost-effectiveness results across different contraceptive methods within the same country**, which, as described above, demonstrate that IUDs are cheapest in all studies and countries.<sup>92</sup> However it is important to remember that decisions around introducing new methods should not only be guided by cost, as we know women and their families have different needs and preferences for timing of future births, and that method choice is paramount to encourage contraceptive uptake and continued use.<sup>93</sup>

When introducing a new method of contraception, particularly a long-acting method, it is important to consider **sustainability** of implementation. It is well established that providers need to maintain their skills and competency to maintain quality of method provision and uptake,<sup>94</sup> and women should continue to have access to the method, including eventual removal when desired. Sustainability is also important when considering cost-effectiveness, as you expect some **costs to decrease over time** (e.g. no repeat set-up costs, all facilities have trained providers in place) while **impact may increase** as awareness and

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<sup>86</sup> Rademacher KH et al. [Expanding access to a new, more affordable levonorgestrel intrauterine system in Kenya: service delivery costs compared with other contraceptive methods and perspectives of key opinion leaders](#). *Glob Health Sci Pract*. 2016;4 Suppl 2:S83-S93.

<sup>87</sup> Wall KM et al. [Cost per insertion and couple year of protection for postpartum intrauterine devices and implants provided during service scale-up in Kigali, Rwanda](#). *Gates Open Res*. 2019;2:39.

<sup>88</sup> As above

<sup>89</sup> Washington CI et al [Timing of postpartum intrauterine device placement: A cost-effectiveness analysis](#). *Fertil Steril*. Elsevier Inc.; 2015;103:131-7.

<sup>90</sup> Wall KM et al. [Cost per insertion and couple year of protection for postpartum intrauterine devices and implants provided during service scale-up in Kigali, Rwanda](#). *Gates Open Res*. 2019;2:39.

<sup>91</sup> Ingabire R et al. [Evaluation of a multi-level intervention to improve postpartum intrauterine device services in Rwanda](#). *Gates Open Res* 2019; 2; 38

<sup>92</sup> See [Neukom et al](#), [Rademacher et al](#) and [Wall et al](#) cited above in footnotes 83-85

<sup>93</sup> Ross J, Stover J. [Use of modern contraception increases when more methods become available: Analysis of evidence from 1982-2009](#). *Glob Heal Sci Pract*; 2013;1:203-12 and Institute of Medicine (US) Committee on New Frontiers in Contraceptive Research; Nass SJ, Strauss JF III, editors. [New Frontiers in Contraceptive Research: A Blueprint for Action](#). Washington (DC): National Academies Press (US); 2004. 4, Improving Contraceptive Use and Acceptability

<sup>94</sup> Farmer M, Webb A. [Intrauterine device insertion-related complications: Can they be predicted?](#) *J Fam Plan Reprod Heal Care* 2003;29:227-31 and Thiery M et al [Immediate postplacental IUD insertion: The expulsion problem](#). *Contraception* 1985;31:331-49.

acceptability of the method increases among providers, women and their families and community. The level of staffing and thus staffing cost to coordinate the introduction of a new method may also decrease over time once the method is established as 'standard practice' of service delivery and incorporated into pre-service provider training, as some roles of dedicated staff are absorbed into existing government staff and processes.

## Assumptions and Limitations

There are a number of limitations to this analysis, primarily due to the availability of data. We relied on **self-report** for the proportion of national staff time spent on various types of tasks, to enable exclusion of time spent on tasks predominantly related to the initiative being an international donor funded project with a large research component. Similarly, most of the estimates of time spent on delivering counselling and service provision was based on provider estimates, rather than direct observation, due to the limited availability of staff time and infrequency of PPIUD and postpartum tubal ligation services. As these were done retrospectively there may be some errors in the estimates. However, we worked to minimise the likelihood of reporting errors by obtaining multiple estimates, removing outliers, averaging remaining estimates and 'sense checking' the resulting average estimates with the country and FIGO teams.

We have used the **sector standard CYP factors**,<sup>95</sup> which do not consider whether a family planning method is provided postpartum or at another time. Similarly we have used standard impact factors from the Impact2 tool, which are not specific to the timing of family planning provision. The health outcomes are based on likely pregnancies per year of a couple not using any contraception method. We would expect fertility to be lower during the postpartum period, due to postpartum abstinence and postpartum amenorrhea and as such the true health outcomes averted might be lower than we have reported. However in the absence of direct postpartum specific models we believe that the impact factors used are applicable and valid.

This evaluation did not include cost of **community demand generation activities**, such as community sensitisation, mass media promotional campaigns, and male engagement (although IEC materials produced and disseminated at the facilities themselves were included). This may lead to an underestimate of the true cost of rolling out PPIUD, since community demand generation would in reality be a crucial element of any roll-out of a new method such as PPIUD. However, since demand generation campaigns are often performed for family planning in general and not necessarily for a specific method of contraception, in many cases the additional cost would only be components that related specifically to PPIUD (e.g. additional information and dissemination channels to reach those potentially eligible or interested in immediate postpartum contraception).

Consistent with sector standards, costs to treat **complications** are not considered in the analyses<sup>96</sup>. Complications from PPIUD insertion are rare<sup>97</sup> and so excluding them is unlikely to impact the overall incremental cost effectiveness estimate.

As discussed earlier in the results, we focussed this analysis on benefits directly related to PPIUD uptake and did not quantify the **additional benefits** such as later increased uptake of other contraceptive methods due to improved counselling and awareness. Similarly, we did not quantify the cost benefits to women of

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<sup>95</sup> See USAID [Couple Years of Protection \(CYP\)](#)

<sup>96</sup> Complications are excluded in *The Avenir Health OneHealth Tool* and the *Guttmacher Institute Adding It Up report*, and complications of all family methods were excluded from the [Bangladesh FP2020 costed implementation plan](#) (and other FP2020 costed plans)

<sup>97</sup> Makins et al. [FIGO postpartum intrauterine device initiative: Complication rates across six countries](#). *Int J Gynecol Obstet.* 2018;143:20–7.

receiving an IUD in the immediate postpartum period, including reduced out-of-pocket costs thanks to receiving their contraception and follow-up while at the health facility for delivery and postnatal care. This potentially underestimates the true cost-effectiveness of the approach.

In Model 2, we attempted to reflect 'real world' roll out costs of implementing PPIUD based on changes that would be made to the approach and lessons learned during the PPIUD initiative. In many instances this served to reduce the cost inputs. However, we did not adjust the expected PPIUD insertion rates to account for any effect these changes to the approach may have had on PPIUD uptake or the changing family planning landscape in both countries. This may lead to our results underestimating the true cost-effectiveness of Model 2. On the other hand, for Model 2, we entered the projected number of PPIUD insertions into years 2020, 2021 and 2022 into the Impact2 tool, but maintained costs at 2018 levels, due to the difficulty of predicting future inflation rates. This is likely to result in an underestimate of the costs, and may overestimate the cost-effectiveness, of national scale-up. We have also assumed, based on guidance from the country teams, that governments would not pay the facility coordinators and deputy coordinators honorariums on top of their existing salaries, as was done during the PPIUD initiative. This may have a negative effect on the motivation and commitment of the facility staff overseeing PPIUD introduction, which in turn could have a negative effect on PPIUD uptake and thus reduce cost-effectiveness of Model 2.

The costing undertaken for these analyses was done for the purpose of assessing cost-effectiveness of the PPIUD initiative, to consider the national case for future investment, and to inform resource allocation by identifying the main cost drivers. Costing estimates were based as much as possible on what was done to implement the PPIUD initiative in each country relying on local data and staff reports. The costs do not serve as a direct template for budget planning, which may be affected by factors outside the scope of these analyses.

## Conclusion

The PPIUD initiative was found to be **highly cost-effective in Bangladesh and Tanzania**, with national roll-out of PPIUD very likely to produce long term savings in healthcare costs. It is likely that the true benefits to national governments is even greater than estimated, due to additional likely benefits not quantified in the analyses such as provision of PPIUD outside of the participating facilities and increased awareness and future uptake of contraceptive methods outside the immediate postpartum period. It is also likely there are benefits to women who choose to take up a PPIUD, such as time and cost savings, that are not considered in these analyses. Estimates were robust to a range of additional scenarios and assumptions tested in sensitivity analyses.

These analyses provide a **compelling case** for national governments and international donors to invest in provision of quality contraceptive counselling before and around the time of delivery, and routine inclusion of PPIUD within the suite of contraceptive methods available in the immediate postpartum period in Bangladesh and Tanzania.

# Appendices

## Appendix 1: PPIUD Initiative Facilities

### Bangladesh Facilities

- Bangabondhu Sheikh Mujib Medical University
- Chittagong Medical College Hospital
- Dhaka Medical College Hospital
- Khulna Medical College Hospital
- Shaheed Sahrawardy Medical College Hospital
- Sylhet MAG Osmani Medical College

### Tanzania Facilities

- Dodoma Regional Referral Hospital
- Muhimbili National Hospital
- Meta Hospital, Mbeya
- Mount Meru Regional Hospital
- Nyamagana District Hospital, Mwanza
- Tumbi Hospital



## Appendix 2: Bangladesh Costs

### Bangladesh Model 1

#### ***Bangladesh Model 1 Set Up Costs (first four months)***

<b>Item</b>	<b>Costs (2018 USD \$)</b>
Recruitment advertising costs	\$61.72
National project staff costs for four months	\$9,400.59
Initial meetings with facilities and stakeholders	\$4,268.75
Purchase of fixed equipment for provision of PPIUD training and services	\$3,145.13
Delivery of initial PPIUD training of trainers (TOT)	\$9,833.73
Development of IEC materials, including any equipment needed	\$5,592.08
<b>TOTAL COST</b> <i>Without overhead</i>	<b>\$32,302.00</b>

#### ***Bangladesh Model 1 Implementation Costs (36 months)***

<b>Item</b>	<b>Costs (2018 USD \$)</b>
Training of providers on PPIUD services, including refresher training	\$34,841.07
Training of dedicated family planning counsellors, including refresher training	\$4,823.25
National level project staffing costs	\$84,605.32
Facility level staff costs - counsellors	\$157,539.02
Facility level staff costs - honorariums	\$125,747.18
Costs of clinical supervision	\$4,442.23
Ongoing meetings with facilities and stakeholders	\$1,989.10
Ongoing distribution costs of IEC materials	\$439.05
Sharing of data and learnings	\$4,736.64
<b>TOTAL COST</b> <i>Without overhead</i>	<b>\$419,162.86</b>

### Bangladesh Model 1 Service Delivery Costs

Service delivery costs take into account: the **provider cadre**; the **time in minutes** to deliver the service; the **value of the minutes** (based on the provider cadre); **disposable (single-use) equipment** costs; and **cost paid by client** (if any) A weighted average cost is calculated based on the number of clients that each task applies to. For example, in Bangladesh, 70% of women had a PPIUD inserted by a doctor during a c-section delivery, while 5% of women had a PPIUD inserted by a nurse immediately post vaginal delivery.

PPIUD Clinical Tasks	Weighted Cost (2018 USD \$)	Inclusions
<b>1. PPIUD Counselling</b>		
<b>TOTAL WEIGHTED COUNSELLING COST</b>	<b>Not applicable</b>	Not applicable as dedicated counsellors were employed under the PPIUD initiative and these salaries accounted for under facility-level staffing costs rather than within service delivery costs
<b>2. PPIUD Insertions</b>		
<b>TOTAL WEIGHTED INSERTION COST</b>	<b>\$0.87</b>	Tasks included: <ul style="list-style-type: none"> <li>• PPIUD insertion during c-section (doctor); or</li> <li>• PPIUD insertion immediately post vaginal delivery (doctor or nurse); or</li> <li>• PPIUD insertion delayed post vaginal delivery (doctor or nurse).</li> </ul> Other inclusions: cost of IUD
<b>3. PPIUD Follow Up</b>		
<b>TOTAL WEIGHTED FOLLOW UP COST</b>	<b>\$0.01</b>	Tasks included: <ul style="list-style-type: none"> <li>• Physical examination with speculum* (immediate post-vaginal, delayed post-vaginal, post-c-section by doctor); or</li> <li>• Physical examination with speculum AND ultrasound* (immediate post-vaginal, delayed post-vaginal, post-c-section by doctor)</li> </ul> * If required due to threads not being visible [no examinations done if threads not visible] Note time for PPIUD counselling at follow up is not included in this estimate as counselling costs are accounted for separately (see counselling section above) Other inclusions: fee to clients of an ultrasound (which is discounted from the overall cost) <sup>98</sup> .
<b>4. PPIUD Removals</b>		
<b>TOTAL WEIGHTED REMOVAL COST</b>	<b>\$0.84</b>	Tasks included: <ul style="list-style-type: none"> <li>• Simple removal (by doctor); or</li> <li>• Difficult removal^ (by doctor).</li> </ul> Other inclusions: Cost of thread retriever for difficult removals
<b>5. Tubal Ligation</b>		

<sup>98</sup> During the PPIUD initiative it was estimated that 2.8% of PPIUD clients in Bangladesh required an ultrasound at follow-up.

<b>TOTAL WEIGHTED TUBAL LIGATION COST</b>	<b>\$1.41</b>	Tasks included: <ul style="list-style-type: none"> <li>• Tubal ligation at c-section (one doctor and one nurse); and</li> <li>• Tubal ligation counselling at follow-up (doctor)</li> </ul> Other inclusions: None
<b>Data Sources</b>		
<ul style="list-style-type: none"> <li>• Provider type and % of PPIUD clients - insertion data provide by FIGO; follow up and removals by country team</li> <li>• Time for insertions - provided by country teams based on observations and provider estimates - average taken from multiple estimates (after removing outliers where appropriate)</li> <li>• Value per min - based on Government of Bangladesh salary scale for doctors and nurses (using mid-point of ranges)</li> <li>• Disposable equipment cost - provided by project team and from financial reports</li> </ul> <p>^ A difficult removal includes where the IUD threads are not visible (most common reason), the IUD itself is not visible on an ultrasound, or the IUD is intra-abdominal.<sup>99</sup> It is estimated that 15% of the clients receiving PPIUD under the PPIUD initiative will have a difficult removal, based on information provided by FIGO staff from unpublished data from a Scottish study of percentage of threads visible and not visible at 12 months after a PPIUD insertion after a c-section delivery.<sup>100</sup> It is possible that the proportion of women with threads not visible at time of follow up will decrease over the full lifetime of the PPIUD.</p>		

## Bangladesh Model 2

### Bangladesh Model 2 Projected Impact

The table below details the estimated number of PPIUDs to be provided in Model 2, based on the annual number of deliveries at Medical College Hospitals in Bangladesh and the PPIUD uptake rates observed in Model 1.

The starting uptake rate of 7.39% for Year 1 of Model 2 was based on the PPIUD uptake rate from Jan-June 2018 (last six months of Model 1). This starting rate was chosen as although the Model 2 facilities are not currently providing any immediate PPIUD, there is more awareness and acceptability of family planning in Bangladesh now compared to 2015 when the PPIUD initiative started, suggesting a likely higher Year 1 PPIUD insertion rate in Model 2 compared to what was observed in Model 1.

			Model 2 Estimates			
	2018	2019	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Total
Estimated number of deliveries at medical college hospitals*	105573	108529	111568	114692	117903	344163
Uptake rate of PPIUD <sup>^</sup>			7.39%	7.69%	8.02%	7.70%
Estimated number of PPIUD insertions			8241	8815	9451	26507

\* Number of deliveries at government medical college hospitals in 2018 (Table 4.1.2 of the 2018 Bangladesh Health Bulletin). Projections for future year based on 2.8% annual increase in births at Medical College Hospitals observed 2015-2017 (sourced from the annual Bangladesh Health Bulletins, available at <https://dqhs.gov.bd/index.php/en/publications/health-bulletin/dqhs-health-bulletin>). Note that three of the six original PPIUD facilities have a large number of annual deliveries (10,15,000 births per year) and thus account for disproportionate amount of the total deliveries at Medical College Hospitals.

<sup>^</sup> Year 1 of Model 2 uptake is the insertion rate from Jan-June 2018 (last six months of Model 1). Increased uptake rates in Year 2 and 3 of Model 2 based on linear trends in uptake observed in Years 2 and 3 of Model 1

<sup>99</sup> Milton SH et al. *Intrauterine Device Extraction Technique: Approach Considerations*. Medscape 2018

<sup>100</sup> Heller R et al. *Routine provision of intrauterine contraception at elective cesarean section in a national public health service: a service evaluation*. *Acta Obstet Gynecol Scand*. 2017;96:1144–51

Bangladesh Model 2 Projected Set Up Costs (first four months)

Item	Costs (2018 USD \$)	Notes on adjustments
Recruitment advertising costs	\$308.58	No recruitment costs for facility coordinators etc. Recruitment costs for Model 2 scaled up to reflect an increase in the number of project staff (see below).
Central level project staff costs for four months	\$26,988.83	Senior staffing and national project manager staffing maintained (not scaled up for increased number of facilities). Addition of three full time regional project managers to manage relationships with facilities, at 80% of salary of national project manager. Finance and data coordinator staff allocation increased to full time to account for increased facility numbers. Salaries retained at Model 1 levels as while government salaries may be lower, allowances may be higher
Initial meetings with facilities and stakeholders	\$12,806.26	Costs scaled for number of new facilities but at 60% of Model 1 costs to reflect lower travel costs due to some government staff being regionally based and needing to travel less
Purchase of fixed equipment for provision of PPIUD training and services	\$15,725.67	Scaled up by the number of Model 2 facilities (excluding the six PPIUD initiative facilities which already have the necessary equipment).
Delivery of initial PPIUD training of trainers (TOT)	\$19,717.40	Costs scaled to number of new facilities but replaced the cost of international trainer as used in Model 1 as now have in-country trainers available to lead training. Increased travel, accommodation and per diem costs by 40% compared to Model 1 to reflect current increased government per diem rate and how the government calculates days of travel required.
Development of IEC materials, including any equipment needed	\$17,967.00	Removed translation and design costs (as already done so don't need to repeat for Model 2) and scaled purchased and installation of TVs and initial production of IEC poster for new facilities
<b>TOTAL COST</b> Without overhead	<b>\$93,513.76</b>	

Bangladesh Model 2 Projected Implementation Costs (36 months)

Item	Costs (2018 USD \$)	Notes on adjustments
Training of providers of PPIUD services, including refresher training	\$263,764.23	Scaled costs to implement at all facilities, with an increase of two hours to all trainings for interpersonal communication training as suggested by PPIUD project team. Same adjustments made as noted above in set up table to travel, accommodation and per diem costs
Training of dedicated family planning counsellors, including refresher training	\$36,180.19	Scaled costs to implement at all facilities with same adjustments made as noted above in set up table to travel, accommodation and per diem costs
Central level project staffing costs	\$242,899.48	See notes in Set Up Costs table above for staffing details
Facility level staff costs - counsellors	\$945,234.14	Scaled costs to implement at all facilities
Facility level staff costs - honorariums	\$0.00	Government wouldn't pay honorariums on top of salaries to existing staff, so assigned as zero cost
Costs of clinical supervision	\$15,992.02	Reduced per facility cost to 60% of Model 1 costs based on guidance from the project team that, as government has locally/regionally based staff, travel costs etc will be reduced.
Ongoing meetings with facilities and stakeholders	\$7,160.75	
Ongoing distribution costs of IEC materials	\$2,634.29	IEC printing costs scaled up by number of facilities in Model 2
Sharing of data and learnings	\$14,209.92	Costs for lessons learned meetings halved to be closer to likely implementation costs
<b>TOTAL COST</b> Without overhead	<b>\$1,528,075.02</b>	

Bangladesh Model 2 Service Delivery Costs

Same service delivery costs used as per Model 1 (see above)

## Appendix 3: Tanzania Costs

### Tanzania Model 1

#### ***Tanzania Model 1 Set Up Costs (first four months)***

<b>Item</b>	<b>Costs (2018 USD \$)</b>
Recruitment advertising costs	\$584.19
National project staff costs for four months	\$18,392.18
Initial meetings with facilities and stakeholders	\$12,601.48
Purchase of fixed equipment for provision of PPIUD training and services	\$6,213.43
Delivery of initial PPIUD training of trainers (TOT)	\$37,572.80
Development of IEC materials, including any equipment needed	\$20,179.82
<b>TOTAL COST</b> <i>Without overhead</i>	<b>\$95,543.90</b>

#### ***Tanzania Model 1 Implementation Costs (27 months)***

<b>Item</b>	<b>Costs (2018 USD \$)</b>
Training of providers on PPIUD delivery, including refresher training	\$663,298.74
Training of providers on PPFPP counselling, including refresher training	\$632,480.04
National level project staffing costs	\$124,147.19
Facility level staff costs - honorariums	\$44,917.15
Costs of clinical supervision	\$22,830.60
Ongoing meetings with facilities and stakeholders	\$12,267.98
Ongoing distribution costs of IEC materials	\$13,882.06
Sharing of data and learnings	\$74,934.12
<b>TOTAL COST</b> <i>Without overhead</i>	<b>\$1,588,757.86</b>

### Tanzania Model 1 Service Delivery Costs

Service delivery costs take into account: the **provider cadre**; the **time in minutes** to deliver the service; the **value of the minutes** (based on the provider cadre); **disposable (single-use) equipment** costs; and **cost paid by client** (if any) A weighted average cost is calculated based on the number of clients that each task applies to. For example, in Tanzania, 29% of women had a PPIUD inserted by a doctor during a c-section delivery, while 51% of women had a PPIUD inserted by a nurse immediately post vaginal delivery.

PPIUD Clinical Tasks	Weighted Cost (2018 USD \$)	Inclusions
<b>1. PPIUD Counselling</b>		
<b>TOTAL WEIGHTED COUNSELLING COST</b>	<b>\$11.79</b>	These calculations account for the counselling sessions delivered to women who deliver at the facilities, regardless of whether or not they take up a PPIUD. Tasks included: <ul style="list-style-type: none"> <li>• PFP counselling during an antenatal care visit (doctor or nurse); and</li> <li>• PFP counselling at the time of delivery (doctor or nurse).</li> </ul> Note that women could receive neither, one or both of these. Other inclusions: None
<b>2. PPIUD Insertions</b>		
<b>TOTAL WEIGHTED INSERTION COST</b>	<b>\$0.81</b>	Tasks included: <ul style="list-style-type: none"> <li>• PPIUD insertion during c-section (doctor or nurse); or</li> <li>• PPIUD insertion immediately post vaginal delivery (doctor or nurse); or</li> <li>• PPIUD insertion delayed post vaginal delivery (doctor or nurse).</li> </ul> Other inclusions: cost of IUD
<b>3. PPIUD Follow Up</b>		
<b>TOTAL WEIGHTED FOLLOW UP COST</b>	<b>\$0.46</b>	Tasks included: <ul style="list-style-type: none"> <li>• PPIUD counselling at follow-up (nurse); and</li> <li>• Physical examination with speculum (immediate post-vaginal, delayed post-vaginal, post-c-section, doctor or nurse); or</li> <li>• Physical examination with speculum AND ultrasound* (immediate post-vaginal, delayed post-vaginal, post-c-section, doctor or nurse)</li> </ul> * If <i>required</i> due to threads not being visible Other inclusions: fee to clients of an ultrasound (which is discounted from the overall cost) <sup>101</sup> .
<b>4. PPIUD Removals</b>		
<b>TOTAL WEIGHTED REMOVAL COST</b>	<b>\$0.78</b>	Tasks included: <ul style="list-style-type: none"> <li>• Simple removal (doctor or nurse); or</li> <li>• Difficult removal^ (doctor or nurse).</li> </ul> Other inclusions: none
<b>5. Tubal Ligation</b>		
<b>TOTAL WEIGHTED TUBAL LIGATION COST</b>	<b>\$4.20</b>	Tasks included: <ul style="list-style-type: none"> <li>• Tubal ligation during c-section (two doctors,, nurse, nurse-anaesthetist); or</li> <li>• Tubal ligation following a vaginal delivery (doctor, clinical officer, nurse, nurse-anaesthetist); and</li> <li>• Tubal ligation counselling at follow-up (nurse)</li> </ul> Other inclusions: None
<b>Data Sources</b>		

<sup>101</sup> During the PPIUD initiative it was estimated that 2.8% of PPIUD clients in Tanzania required an ultrasound at follow-up.

- Provider type and % of PPIUD clients - insertion data provide by FIGO; follow up and removals by country team
- Time for insertions - provided by country teams based on observations and provider estimates - average taken from multiple estimates (after removing outliers where appropriate)
- Value per min - based on Government of Tanzania standard salary scale for doctors and nurses
- Disposable equipment cost - provided by project team and from financial reports

^ A difficult removal includes where the IUD threads are not visible (most common reason), the IUD itself is not visible on an ultrasound, or the IUD is intra-abdominal.<sup>102</sup> It is estimated that 15% of the clients receiving PPIUD under the PPIUD initiative will have a difficult removal, based on information provided by FIGO staff from unpublished data from a Scottish study of percentage of threads visible and not visible at 12 months after a PPIUD insertion after a c-section delivery.<sup>103</sup> It is possible that the proportion of women with threads not visible at time of follow up will decrease over the full lifetime of the PPIUD.

## Tanzania Model 2

### **Tanzania Model 2 Projected Impact**

The table below details the estimated number of PPIUDs to be provided in Model 2, based on the annual number of deliveries at Regional Referral Hospitals in Tanzania and the PPIUD uptake rates observed in Model 1.

The starting uptake rate of 4.6% for Year 1 of Model 2 was based on the PPIUD uptake rate from Year 1 of Model 1. This starting rate was chosen because the Model 2 facilities are in a similar situation now as the Model 1 facilities were in 2015/16 (Year 1 of Model 1) in that they are not currently providing any immediate PPIUD. Although there may be slightly more general awareness and acceptability of family planning in Tanzania now compared to 2015 when the PPIUD initiative started, we don't believe the family planning landscape has changed enough to lead to a higher Year 1 uptake rate. Similarly, the annual *increase* in PPIUD uptake rate is based on annual increase in Model 1.

The estimated number of deliveries at Regional Referral Hospitals is based on 1) the number of deliveries at the PPIUD initiative facilities in 2019 (scaled up to all 28 facilities), and 2) the UN's projected annual increase in number of births (1.02% annual increase)<sup>104</sup>.

		Model 2 Estimates			
	2019	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Total (Y1-Y3)
Estimated number of deliveries at Regional Referral Hospitals (n=28)	218997	223463	228019	232668	684150
Uptake rate of PPIUD		4.6%	6.9%	7.7%	6.4%
Estimated number of PPIUD insertions		10279	15733	17915	43928

<sup>102</sup> Milton SH et al [Intrauterine Device Extraction Technique: Approach Considerations](#). Medscape 2018

<sup>103</sup> Heller R et al. [Routine provision of intrauterine contraception at elective cesarean section in a national public health service: a service evaluation](#). Acta Obstet Gynecol Scand. 2017;96:1144–51

<sup>104</sup> United Nations, Department of Economic and Social Affairs, Population Division (2019). [World Population Prospects 2019, custom data acquired via website](#)



**Tanzania Model 2 Projected Set Up Costs (first four months)**

Item	Costs (2018 USD \$)	Notes on adjustments
Recruitment advertising costs	\$3,407.80	No recruitment costs for facility coordinators etc. Recruitment costs for Model 2 scaled up to reflect an increase in the number of project staff (6 project staff for Model 1, 35 project staff for Model 2) (see below).
Central project staff costs for four months	\$53,441.64	Project management staff costs maintained. Regional project managers added to project staff (one per region, part-time junior role). FIGO pay scales, honorariums and per diems were based on government rates so no need to adjust for these.
Initial meetings with facilities and stakeholders	\$24,714.24	Travel costs halved based on government staff being located regionally and needing to travel less.
Purchase of fixed equipment for provision of PPIUD training and services	\$22,782.56	Scaled up by the number of Model 2 facilities (excluding the six PPIUD initiative facilities which already have the necessary equipment).
Delivery of initial PPIUD training of trainers (TOT)	\$120,399.19	Costs based on two additional Training of Trainers, with 15 participants and 4 trainers at each. Per diems were paid at government rate so no change needed. For model 2 adjustment participant time is costed but not facilitator time because facilitators would be government staff who are paid an allowance and per diems.
Development of IEC materials, including any equipment needed	\$7,801.84	Removed translation and design costs (as already done so don't need to repeat for Model 2). Multiplied TVs by number of facilities. Even though some TVs were bought for satellite facilities, it's still appropriate to multiply costs by number of Model 2 facilities because the costs for satellite facilities are included in facility costs.
<b>TOTAL COST</b> Without overhead	<b>\$232,547.26</b>	

**Tanzania Model 2 Projected Implementation Costs (36 months)**

<b>Item</b>	<b>Costs (2018 USD \$)</b>	<b>Notes on adjustments</b>
Training of providers on PPIUD delivery, including refresher training	\$3,237,681.25	Insertion and counselling training was combined and reduced from 6 to 5 days - so reduction in accomodation costs, per diems, allowances, attendance. Travel costs reduced further because participants attending only 1 combined training. Refresher training shifted to 'on-the-job' approach resulting in: no meeting costs; travel costs reduced by 1/3 (only one central project staff and only occasional quality control visits); facilitator allowance and per diem stay the same; no time costs for provider or facilitator to attend training.
Training of providers on PPFPP counselling, including refresher training	\$1,807,860.78	
Central project staffing costs	\$480,974.75	See notes in Set Up Costs table above.
Facility level staff costs - honorariums	\$0.00	Government wouldn't pay honorariums on top of salaries to existing staff, so assigned as zero cost
Costs of clinical supervision	\$71,028.52	Reduced per facility cost to 50% of Model 1 costs based on guidance from the project team that, as government has locally/regionally based staff, travel costs etc will be reduced.
Ongoing meetings with facilities and stakeholders	\$42,726.59	Travel costs cut by 50% due to local/regional travel.
Ongoing distribution costs of IEC materials	\$86,377.25	IEC printing and dissemination costs scaled up by number of facilities and duration of Model 2.
Sharing of data and learnings	\$233,128.36	Costs for lessons learned meetings halved (absorbed into existing FP Technical Working Group meetings).
<b>TOTAL COST Without overhead</b>	<b>\$5,959,777.50</b>	

**Tanzania Model 2 Service Delivery Costs**

Same service delivery costs used as per Model 1 (see above)

## Appendix 4: Further Analyses

### Design Adjustments in Bangladesh

We estimated the effect of removing:

- Initial training of counsellors in Model 2 to account for the potential scenario in which Medical College Hospitals already have trained counsellors in place
- Initial training of trainers for PPIUD providers in Model 2 to account for the potential scenario in which Medical College Hospitals already have providers in place who are able to train others in PPIUD provision

As can be seen from the table below these adjustments made minor differences to the estimated cost of Model 2, and the resulting ICERs remained negative, indicating the dominance of the PPIUD intervention over standard care (cheaper and more effective).

	Estimated total cost	% change in cost from original Model 2 results	Estimated direct healthcare savings	Total costs with offset of costs saved included	CYP ICER with cost offset	DALY ICER with cost offset
<b>Model 2 - original results</b>	\$1,979,139.65	N/A	\$2,648,283.68	-669,144.03	-5.49*	-36.06*
<b>Model 2 - adjusted to remove initial training of counsellors</b>	1,942,959.46	-1.8%	\$2,648,283.68	\$-708,942.23	-5.81*	-38.20*
<b>Model 2 - adjusted to remove initial training of trainers</b>	1,959,422.25	-1.0%	\$2,648,283.68	\$-690,833.17	-5.67*	-37.22*

\* PPIUD dominates (cheaper and more effective than standard care). ICERs are uninterpretable as a result so please ignore actual negative number

### Estimating Displacement in Bangladesh

As tubal ligation was available as an immediate postpartum contraceptive method to some women delivering at the PPIUD facilities in Bangladesh, we considered the potential effect of 'displacement' when conducting our analyses. Our definition of displacement was that **some women who may have otherwise taken up tubal ligation as a method of contraception post delivery instead took up PPIUD**. This would potentially change both the cost and impact of delivering the PPIUD initiative, since we are otherwise assuming that all women taking up PPIUDs would have not taken up immediate postpartum contraception whereas in reality some of those women may have instead have taken up tubal ligation.

As there was no direct data available on the number of women who had a PPIUD inserted who would have chosen to have an immediate postpartum tubal ligation (PPTL) service if PPIUD had not been available, **we**

examined the trends of provision of both methods of immediate postpartum provision<sup>105</sup> at the six participating facilities.<sup>106</sup> 2015 is considered as the ‘baseline’ year, to which subsequent year trends were compared, as PPIUDs only began being provided in the second half of 2015 with a much lower uptake rate than subsequent years.

In 2015 4.9% of women delivering at PPIUD facilities took up PPTL; this **appeared to decrease slightly in 2016 and 2017** (4.6% taking up PPTL each year) before rising in 2018 to 5.4% of all women delivering at the PPIUD facilities.<sup>107</sup> It is hypothesised that this drop of 0.3% in 2016 and 2017 *may* represent displacement i.e. women taking up PPIUD whereas they may have otherwise taken up PPTL. The observed decrease in rate of uptake of PPTL in 2016 and 2017 translates into an estimated **275 women** who *may* have taken up PPIUD rather than a PPTL,<sup>108</sup> or 3.4% of the PPIUDs provided by the initiative during the Model 1 implementation period.

The **cost savings** of providing these 275 women with PPIUD instead of immediate postpartum tubal ligation is estimated as **\$3,960** (see table below) because PPIUD is cheaper to provide than tubal ligation. This represents a minimal proportion (0.7%) of the total cost of delivering the overall PPIUD initiative.

Cost Effect of Estimated Displacement	Cost per woman	Cost for estimated displacement
Number of women	1	275
<b>PPIUD Costs</b>		
Direct service provision	\$1.71	\$470.25
Incentives*	\$3.12	\$858.00
<i>Total estimated PPIUD Cost</i>	<b>\$4.83</b>	<b>\$1,328.25</b>
<b>PPTL Costs</b>		
Direct service provision	\$1.41	\$387.75
Incentives*	\$17.82	\$4,900.50
<i>Total estimated PP tubal ligation cost</i>	<b>\$19.23</b>	<b>\$5,288.25</b>
<b>Cost Effect</b>		
Cost difference of providing PPIUD instead of PPTL	\$14.40	<b>\$3,960.00</b>

\* Government incentives estimated to have been paid half of the time for both methods, thus incentive amounts here are 50% of the full incentive amount for each method

<sup>105</sup> Noting that immediate postpartum tubal ligation is only offered to some women delivering at facilities, some of the time

<sup>106</sup> Note that for 2015 complete data was only available from four facilities, so only these facilities are included in the 2015 data. Running the analysis with only these four facilities for each year resulted in very similar results as including only these four facilities in 2015 (the baseline year) and all six facilities for the subsequent years

<sup>107</sup> This upswing in PPTL uptake in 2018 above the baseline 2015 rate may be due to multiple factors related to the initiative (e.g. increased awareness and acceptance of contraception among providers or efforts by the PPIUD initiative to ensure government incentives for long term and permanent methods of contraception are correctly claimed and paid) or external factors (e.g. wider community awareness and acceptance of contraception, economic or other pressures for limiting family size etc).

<sup>108</sup> In 2016 there were 45,087 deliveries at PPIUD facilities; PPTL was observed to decrease by 0.25% compared to 2015 uptake rates which translates to an estimated 114.8 women. In 2017 there were 46,917 deliveries at PPIUD facilities; PPTL was observed to decrease by 0.34% compared to 2015 which translates to an estimated 160.6 women

While there is some cost-saving by providing PPIUDs instead of PPTLs as demonstrated in the table above, there is also lesser impact due to tubal ligation providing longer protection from pregnancy (see table below). **Providing PPIUDs instead of PPTLs results in an estimated 2284 fewer CYPs gained and 412 fewer DALYs averted.**

Estimated Impact Effect* of Estimated Displacement	PPIUD	PPTL	Difference
Number of women	275	275	N/A
CYPs	1265	3549	-2284
DALYs averted	201	613	-412
Maternal deaths averted	0	1	-1
Child deaths averted	2	7	-5
Estimated direct healthcare costs saved	\$27,474.67	\$86,468.00	-\$58,993.33

\* Service lifespan results from Impact2 tool, entering 137 women in 2016 and 138 women in 2017 for each method

Although the cost of delivering PPIUDs is lower than PPTLs, the estimated direct healthcare costs saved for providing PPTLs instead of PPIUDs are almost \$60,000 higher, far outweighing the extra cost in providing PPTLs compared to PPIUDs. However cost is not the only factor in deciding which contraceptive methods to offer, and giving women a choice of method is crucial, particularly as PPTLs are only offered to some women, and are not suitable for those who wish to have more children in the future.

Note that there are **several limitations** to these analyses including that only direct service delivery costs are considered (not training costs; PPIUD provision required specialised training whereas PPTL does not); the analyses is based on relatively small numbers and thus the observed drop in PPTL uptake in 2016 and 2017 may not be significantly different to the 2015 uptake rates; and it was assumed that there was a causal link between the drop in PPTL uptake due to women choosing to taking up PPIUD instead which may not be accurate.

## Design Adjustments in Tanzania

As well as running sensitivity analysis to test the robustness of our models, we re-ran our analysis with several adjustments to the implementation design. This was done to examine how changes to the design might affect the cost-effectiveness of rolling out PPIUD. The adjustments considered here are more substantial than the mostly minor changes made to Model 2 (modelling to national scale up) which were based on learnings from Phase 2 to reduce costs, including reducing the duration of the training and shifting to an 'on-the-job' refresher training model.

### Training

In Tanzania, training costs were by far the largest cost driver. In our analysis we considered two adjustments to the training design to explore how that would affect cost-effectiveness. We would not expect these adjustments to increase uptake of PPIUD, but to decrease the cost of rolling out PPIUD delivery.

The first adjustment was to **halve the number of providers trained** in Model 2. The rationale for this adjustment is that providers are frequently moved between clinical departments. This adjustment allows us to model what the effect would be of keeping more practitioners working in labour and delivery departments for a longer period, and thus reducing the need to continually train new providers. The results of our modelling (see table below) shows a large decrease in total cost, and thus an **increase in overall costs saved** when the number of providers trained is halved.

	Estimated total cost	Estimated direct healthcare savings	Total costs with offset of costs saved	CYP ICER with cost offset	DALY ICER with cost offset
<b>Model 2 original results</b>	\$6,910,493.50	\$7,954,649.33	-\$1,044,155.83	-5.17*	-6.54*
<b>Model 2 50% fewer providers trained</b>	\$4,135,445.38	\$7,954,649.33	-\$3,819,203.95	-18.90	-23.94

\* PPIUD dominates (cheaper and more effective than standard care). ICERs are uninterpretable as a result so please ignore actual negative number

The second adjustment was to **extend the duration of training to 14 days** (compared to six days in Model 1 and five days in Model 2), which is the standard duration of the Government of Tanzania's postpartum family planning methods training. This adjustment shows us both how much the FIGO PPIUD initiative would have cost if the 14 day training had been used (Model 1), and how much it would cost to roll out PPIUD delivery nationally if the 14 day training were used in the future (Model 2).

As shown in the table below, the shorter training is more cost-effective for Model 1, although even the 14 day training remains cost effective (based on the cost to avert one DALY being less than the average per capita GDP for Tanzania). For Model 2, based on a five day training, the PPIUD initiative 'dominates', meaning it is both cheaper and more effective than standard care. However, if the PPIUD initiative were rolled out with the 14 day training, it would continue to be cost-effective but would no longer be said to 'dominate' since it would cost more than standard care.

	Estimated total cost	Estimated direct healthcare savings	Total costs with offset of costs saved	CYP ICER with cost offset	DALY ICER with cost offset
<b>Model 1</b>					
<b>Original model (six days training)</b>	\$1,869,506.58	\$1,348,744.00	\$520,762.58	15.20	18.85
<b>Adjustment to 14 days training</b>	\$3,060,645.46	\$1,348,744.00	\$1,711,901.46	49.97	61.97
<b>Model 2</b>					
<b>Original model (five days training)</b>	\$6,910,493.50	\$7,954,649.33	-\$1,044,155.83	-5.17*	-6.54*
<b>Adjustment to 14 days training</b>	\$18,998,326.91	\$7,954,649.33	\$11,043,677.58	54.65	69.21

\* PPIUD dominates (cheaper and more effective than standard care). ICERs are uninterpretable as a result so please ignore actual negative number

### Satellite Facilities

We also explored an adjustment to Model 2 to explore the potential cost and impact of **introducing provision of PPIUDs at the satellite facilities** attached to each of the Regional Referral Hospitals. Most antenatal and postnatal care is delivered through these lower level facilities, suggesting that they are in a good position to offer counselling in postpartum contraception. In addition, efforts are underway nationally to increase the proportion of deliveries that are done at lower level facilities, which would enable these facilities to also deliver immediate PPIUD once providers are trained.

Our analysis is **based on delivery data from the four satellite facilities that were trained in PPIUD provision during Phase 3 of the PPIUD initiative**. We used the same assumptions as in Model 2 (a 1.02% annual increase in delivery numbers and the same annual PPIUD uptake rate as in Model 1). We modelled the number of PPIUDs delivered over three years if PPIUD insertions were provided by:

1. Only the 28 Regional Referral Hospitals (original Model 2);
2. The 28 Regional Referral Hospitals plus the four satellite facilities trained in Phase 3;
3. The 28 Regional Referral Hospitals plus 75% of satellite facilities (assuming an average of 5 satellite facilities per hospital).

The table below shows the possible number of additional PPIUDs delivered, and costs incurred, if satellite facilities were able to provide the service.

	28 Regional Referral Hospitals (Model 2)	28 Regional Referral Hospitals plus 4 satellite facilities	28 Regional Referral Hospitals plus 105 satellite facilities
<b>Estimated PPIUDs delivered over 3 years</b>	43,928	46,243	60,755
<b>Estimated total cost over 3 years</b>	\$6,910,493.50	\$7,776,660.92	\$29,647,388.20

It would cost 13% more to deliver services at four satellite facilities in addition to the 28 Regional Referral Hospitals, but would only see an increase of 5% in PPIUDs delivered. It would cost 329% more to scale up PPIUD delivery to 75% of satellite facilities, while only gaining 38% more PPIUDs delivered. This is likely due to the average lower number of deliveries at the satellite facilities, compared to hospitals. However, these results should be treated with caution because much is unknown about how many satellite facilities will offer deliveries, how many deliveries they will do, how many facilities and providers will be trained in PPIUD, and to what extent they will increase the number of women receiving PPIUDs, or simply replace the location of PPIUD insertion from Regional Referral Hospitals to lower level facilities. Furthermore our model is based on data from just three months at four facilities, so we need to be cautious when extrapolating into the future. In addition, other factors including equity of access to services, should also be included when considering future potential expansion to satellite facilities.