AGAINST ALL ODDS: A Mixed-Methods Evaluation of a Behavioral Postpartum Family Planning Intervention in Tigray, Ethiopia

(RE)SOLVE PROJECT EVALUATION REPORT | MARCH 2022

PATHFINDER











About (re)solve Project and Partnership

Launched in 2016, (re)solve is a 5.5-year project funded by the Bill & Melinda Gates Foundation. It is led by Pathfinder International in partnership with Camber Collective, the International Center for Research on Women (ICRW), and ideas42. (re)solve was active in Bangladesh, Burkina Faso, and Ethiopia.

(re)solve combines expertise from consumer insights, behavioral design, and public health to discover what stops women from using contraception when they express a desire to avoid pregnancy but do not use a modern contraceptive method.

At (re)solve's heart is the conviction that one size does not fit all. (re)solve designs and customizes data-informed family planning solutions to the needs, motivations, and lived experiences of the women and girls we serve. We believe that women and girls deserve products and services designed for them.

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List of Abbreviations

ALM	adaptive learning meeting	PNC	Postnatal Care
ANC	Antenatal Care	PPE	Personal Protective Equipment
DHS	Demographic and Health Survey	PPFP	Postpartum Family Planning
ЕТВ	Ethiopian Birr	РМТСТ	Prevention of Mother-to-child
FP	Family Planning		Iransmission
FP2030	Family Planning 2030	RHB	Regional Health Bureau
HEW	Health Extension Worker	RMNCH	Reproductive, Maternal, Newborn and Child Health
HMIS	Health Management Information System	SBC	Social and Behavior Change
ICRW	International Center for Research on Women	SDP	Service Delivery Point
ЮМ	International Office of Migration	SES	Socioeconomic Status
кп	Key Informant Interview	THRI	Tigray Health Research Institute
	Lactational Amonorrhoa Mothod	UNFPA	United Nations Population Fund
LARC	Long-acting Reversible Contraceptive	USAID	United States Agency for International Development
PHCU	Primary Health Care Unit	wно	World Health Organization

Executive Summary

Family planning (FP) plays a uniquely powerful role in enabling women and men to achieve their desired family size. It is also key to building more equitable societies. For many years, we have known that investing in FP also makes economic sense: every dollar invested in FP can generate up to six dollars in savings for governments (USAID, 2006).

And yet in 2020, global FP programs were at risk of a funding gap of more than \$320 million in commodities alone (WHO, 2018). More than 200 million women and girls who said they do not want to get pregnant do not use modern contraceptives and more than 100 million pregnancies in low- and middle-income countries were unintended (Sully, et al, 2020). What more can we do to ensure that women and girls can and will voluntarily use contraceptives when they want to?

Despite progress in addressing nonuse of contraception through traditional social and behavior change (SBC), these programs can be limited by assumptions about what prevents women from using contraception. Mismatches persist between a woman's personal preferences, the barriers she faces, and the interventions designed to help her voluntarily access and use contraception correctly and consistently. The (re)solve project was designed to examine these barriers using behavioral science and to design, test, and evaluate products and services that address these barriers.

Launched in 2016, (re)solve is a 5.5-year cross-disciplinary project funded by the Bill & Melinda Gates Foundation and led by Pathfinder International in partnership with Camber Collective, the International Center for Research on Women (ICRW), and ideas42. (re)solve was implemented in Bangladesh, Burkina Faso, and Ethiopia. The project used data on and insights into women's and girls' barriers to contraceptive use and nonuse to design and test a unique solution set in each country.

In Ethiopia, where the project focused on the barriers that postpartum women face, this solution set consisted of 1) an antenatal care (ANC) Planning Prompt card that providers and clients use to plan for and record dates for future FP counseling visits; 2) a Postpartum Family Planning (PPFP) Counseling Sheet, which provides clear talking points for providers to use during PPFP counseling; 3) a Risk Referral Card, which providers complete with clients during immunization visits to assess their risk of becoming pregnant based on their own circumstances at that time; and 4) a Home Visit Tracking Log notebook that provides a structured and comprehensive way to systematically track women at risk of pregnancy during postpartum home visits. After several starts and stops due to significant local travel restrictions brought about by the COVID-19 pandemic and then the security risks resulting from the ongoing conflict in Tigray, we implemented the (re)solve solution set in seven primary health care units (PHCUs) in Tigray, Ethiopia between April and December 2021. In each PHCU, we trained providers and health extension workers (HEWs) on how to use the tools during their routine service delivery. A total of 183 providers and HEWs were trained across the intervention PHCUs in April 2021 and proceeded to implement the solutions over the coming months.

The aim of this research was to evaluate whether the (re)solve package of solutions changed postpartum women's intention to use contraception (primary outcome) and explored associations with behavioral outcomes like modern contraception use, and perceptions such as contraceptive self-efficacy and pregnancy risk (secondary outcomes). We also aimed to evaluate the implementation process to understand how the solutions were carried out and perceived by providers. We used a mixed-methods, quasi-experimental design to answer our research questions. Specifically, we used a cross-sectional, facility-based survey after approximately 6 months of implementation and recruited women who were between four and six months (16-24 weeks) postpartum conducted at intervention and comparison PHCUs (N=321). In addition, we conducted qualitative interviews with intervention providers (N=28).

The results from the evaluation indicate that the (re)solve intervention had a positive non-significant association with contraceptive intention (aOR 4.3 [CI 0.8 - 23.0]), and in our exploratory analyses, a somewhat larger and statistically significant association with other outcomes like modern contraceptive use (aOR 19.4 [CI 9.2-41.1]), long-acting reversible contraceptive (LARC) use (aOR 7.8 [CI 3.2-18.8]), contraceptive confidence and self-efficacy (aOR=6.1 [2.0-19.4]), and accurate pregnancy riskassessment (aOR=6.9 [1.7-28.4]). Qualitative data indicates that providers had a positive experience with the different (re)solve tools and found them acceptable and easy to implement. Despite the challenges of implementing the (re)solve solution set in the context of COVID-19 and regional conflict, the intervention shows promising results. Future work should explore strategies to integrate and scale-up the (re)solve solution set within the existing health system.

Introduction

Family planning (FP) plays a uniquely powerful role in enabling women and men to achieve their desired family size, contribute to strong economies, and build more equitable societies. Global commitments to Family Planning 2030 (FP2030) and the Sustainable Development Goals recognize that while access to modern contraceptives has improved dramatically in recent decades across remote and marginalized parts of the world, contraceptive uptake and continuation still present complex challenges (Deitch & Stark, 2019).

FP implementation organizations and government partners have extensive experience increasing FP access through supply-chain improvements, community- and facility-level service-delivery support, and awarenessraising. Despite progress in addressing nonuse of contraception through traditional social and behavior change (SBC), these programs can be limited by assumptions about what prevents women from using contraception. Mismatches persist between a woman's personal preferences, the barriers she faces, and the interventions designed to help her voluntarily access and use contraception correctly and consistently.

The urgent need to support women's informed contraceptive choices creates opportunities for innovation in contraceptive service-delivery design and user-responsive services. Data-informed behavior change approaches, relatively unexplored within the FP sector, can accelerate transformative progress. The (re)solve project is built on the belief that women deserve well-designed products and services that are more responsive to her life now and her hopes for her future.

(RE)SOLVE PROJECT

Launched in 2016, (re)solve is a 5.5-year crossdisciplinary project funded by the Bill & Melinda Gates Foundation and led by Pathfinder International in partnership with Camber Collective, the International Center for Research on Women (ICRW), and ideas42. (re)solve was implemented in Bangladesh, Burkina Faso, and Ethiopia.

Our unique, cross-disciplinary approach was designed to do the following:

- Combine expertise from behavioral design, consumer insight, and public health to discover what stops women from forming or following through on the intention to use a modern contraception method when they wish to avoid pregnancy;
- Challenge assumptions about contraceptive decision-making;

- Test new approaches based on local, contextualized behavioral insights;
- + Generate adaptable, scalable solutions that address unmet need for FP; and
- Design and customize data-informed FP solutions to the needs, motivations, preferences, and lived experiences of the women and girls we serve.

A common framework and approach were core to the (re)solve project (FIGURE 1). Data and insights on women's barriers to contraceptive use and nonuse generated from behavioral landscape analysis and behavioral diagnosis informed the design and user testing of unique solution sets. The solution set was then implemented and evaluated in each country.

SEXUAL AND REPRODUCTIVE HEALTH IN ETHIOPIA

In Ethiopia, knowledge of modern contraceptive methods is high, with 96% of currently married women ages 15-49 having heard of at least one method (EPHI & ICF, 2021). Access to contraceptives has also improved over time. In 2019, a UNFPA survey found that at the time of the survey, 61.2% of primary service delivery points (SDPs) had at least three modern methods of contraception available, and 95.5% of secondary and tertiary SDPs had at least five modern methods of contraception available (FP2020 & the UN Foundation, 2020). Despite these achievements, the modern contraceptive prevalence rate for currently married women ages 15-49 in Ethiopia was only 41% in 2019, increasing from 14% in 2005 (EPHI & ICF, 2021). Discontinuation of any method is relatively high, with 35% of women ages 15-49 discontinuing their chosen method of contraception within 12 months (CSA & ICF, 2016). Barriers to use and continuation of contraceptives remain, creating a gap between a woman's knowledge of and intent to use contraceptives and her effective use. This gap is reflected in that women, on average, are still having one more child than they desire (3.6 desired, 4.6 actual) (CSA & ICF, 2016).

Postpartum women have an unmet need for contraceptives 2.1 times higher than women overall (35% vs. 17%) (CSA & ICF, 2012). Studies show that women in the extended postpartum period have a higher need for contraceptive use for birth spacing than for limiting births (Embafrash & Mekonnen, 2019; Tegegn, et al, 2017). Addressing this unmet need is key — birth intervals of at least two years are associated with improved child nutrition and birthweight, decreased infant mortality, lower risk of miscarriage or stillbirth, and lower risk of maternal morbidity or mortality (Tessema, et al, 2018; WHO, 2005).

FIGURE 1. The (re)solve Framework



There is extensive literature on the factors associated with intention of postpartum women in Ethiopia to use contraception. Maternal education level, socioeconomic status, knowledge of contraceptives and the lactational amenorrhea method (LAM), and experience with previous methods of contraception are all associated with intent to use postpartum contraception (Gebeyehu, et al., 2020; Tegegn, et al, 2017; Wakuma, et al, 2020; Abraha, et al, 2017; Tessema, et al, 2018). Postpartum women frequently cited amenorrhea, fear of side effects, infrequent sexual activity, and their husband's opposition to contraception as reasons for not using a contraceptive method (Tegegn, et al., 2017; Embafrash & Mekonnen, 2019; Dev, et al, 2019).

As of 2016, the state of Tigray had lower rates of modern contraceptive use than Ethiopia overall (21% vs. 26%), and Tigrayan women tended to become sexually active at a younger age (CSA & ICF, 2012). Postpartum Tigrayan women cited similar reasons for non-use of contraceptives, often at higher rates than postpartum Ethiopian women overall. In Ethiopia overall, the median duration of postpartum amenorrhea is 14.6 months and of abstinence after giving birth is 2.3 months (CSA & ICF, 2016). Forty-three percent of postpartum Tigrayan women cited breastfeeding and 40% cited being postpartum as their reasons for contraceptive non-use, which is 1.95 and 1.34 times more often, respectively, than the average postpartum woman (CSA & ICF, 2012). Many Tigrayan women underestimate their risk of becoming pregnant during the postpartum period and assume that practicing

LAM will protect against pregnancy (Embafrash & Mekonnen, 2019; Tegegn, et al, 2017).

In 2011, 17% of postpartum Tigrayan women reported that modern contraceptive methods interfere with body processes, which is 4.25 times more likely than the average postpartum Ethiopian woman (CSA & ICF, 2012). Concerns about side effects of contraceptive methods reveal one reason why women may not follow through on their intention to take up a contraceptive method — only 30% of Ethiopian women using modern contraceptives reported being informed by their provider about the method's side effects, how to address side effects if they experience them, and other available methods (CSA & ICF, 2016).

Community-based care has greatly improved access to contraceptive methods, with the shift to primary care services at the community and home levels making it possible to reach more women (Abraha et al., 2017; Prata, et al, 2011). Engaging women with maternal healthcare services during pregnancy and postpartum has been shown to increase the likelihood of PPFP use (Abraha, et al, 2017; Tessema, et al, 2018; Dev, et al, 2019). Women utilizing antenatal care (ANC) and postnatal care (PNC) visits and women that had received contraceptive counseling were more likely to intend to use contraception postpartum (Abraha, et al, 2017; Tegegn, et al, 2017; Wakuma, et al, 2020; Gebeyehu, et al, 2020). Focusing on ANC and PNC touch points for PPFP allows (re)solve to work towards addressing the gaps in PPFP use to improve maternal and child health outcomes.

Overview of the (re)solve Intervention in Ethiopia

Through behavioral landscape analysis and behavioral diagnosis, the (re)solve project team¹ identified behavioral segments² through segmentation analysis and prioritized behavioral bottlenecks³ through behavioral diagnosis, respectively.

The combined insights from segmentation analysis and behavioral diagnosis into individual, social, and structural barriers served as primary inputs into the design of solutions. Targeting bottlenecks that affect both intention to use contraceptives and following through on that intention could maximize contraceptive uptake among postpartum women in Tigray.

We followed an iterative user testing and revision process, designing solutions that could be easily integrated into the Ministry of Health's existing set of tools such as the Family Health Guide, Family Health Card, and Health Appointment Booklet. During this process, some prototypes were discarded due to low feasibility and sustainability, likeability, acceptability, or relevance (Pathfinder International, 2021). The final set of tools that emerged from the user testing process were designed to address three dominant barriers:

- Women have heard from friends or relatives that they are protected from pregnancy by breastfeeding until their menses return.
- Women hear about or see other women experiencing severe side effects, including feeling ill due to contraceptives and contraceptive-induced infertility. The latter is perceived to be too great of a risk. Women do not hear about any downsides from breastfeeding.
- Providers explain long-acting methods to postpartum women and name them by their duration of efficacy (e.g., "the three-year") and women want to have children before that duration.

The final set of solutions (FIGURE 2) designed to reduce or eliminate these barriers for postpartum women in Ethiopia was comprised of the following four tools:

1. ANC PLANNING PROMPT. The planning prompt card is designed to provide a moment of action during antenatal care (ANC) visits for clients in their third trimester to consider and plan for FP counseling after delivery, since many women do not believe there is a risk of becoming pregnant during their postpartum period and therefore do not make a plan to take up a contraceptive method. It provides space for providers and clients to record dates for future counseling visits (at delivery, 45 days postpartum, or the 10-week immunization visit) and fits into the existing Health Appointment Booklet that facilities give to each new client. Providers deliver the planning prompt card to clients during the third and fourth ANC visits and, if the client has not been exposed to the card during ANC visits, after delivery up to seven days postpartum. The card is given directly to the client, who takes it home with her. The planning prompt serves as a commitment and reminder for the client and counteracts the perception that it is not necessary to take action to prevent pregnancy while breastfeeding.

2. RISK REFERRAL CARD. This card is a simple assessment tool that providers complete with clients during immunization visits. The client answers a series of questions based on LAM criteria (age of infant, frequency of breastfeeding, whether the child is receiving any other food/drink, and whether the mother's menses have returned). Their responses determine their need-level for PPFP counseling (low, medium, high) which is represented with a familiar, escalating green-yellow-red color scale. If the client has a need-level score of medium (yellow) or high (red), the provider is prompted to initiate or refer the client for FP counseling. The tool is used at each immunization visit, and movement along the color scale at each visit demonstrates the increased risk of pregnancy over time

¹ Throughout this report, 'project team' refers to the collective (re)solve team across all locations and partner organizations; 'global team' refers to Pathfinder International and partner organization team members outside of the implementation region of Tigray, Ethiopia; and 'implementation team' refers to the Tigray, Ethiopia-based team.

² A segment is a subgroup of people that share characteristics, such as shared needs, common interests, similar lifestyles, or even comparable demographic profiles within a segment. There is heterogeneity across segments but homogeneity within them.

³ Behavioral bottlenecks prevent individuals from making decisions or taking action that would otherwise meet their needs (for example, using a contraceptive method to avoid unintended pregnancy).

for clients. The referral card counters the perception that breastfeeding protects against pregnancy risk and that women cannot become pregnant before their menses return.

3. PPFP COUNSELING SHEET. The counseling sheet provides clear talking points for providers to use when providing PPFP counseling to clients with medium or high pregnancy risk per the Risk Referral Card. The format serves as a quick reminder of key messages for busy providers and allows them to deliver more effective counseling. It emphasizes the risk of pregnancy by highlighting deidentified stories of local women who became pregnant while breastfeeding before their menses returned. These stories are meant to counter women's beliefs that the women they know are using LAM effectively. Other talking points assure the client that the provider can help address side effects and that the method can be discontinued at the client's discretion. The counseling sheet addresses the identified barriers by highlighting the inefficacy of breastfeeding alone as a contraceptive, encouraging providers to discuss managing side effects with clients, and dispelling the perception that a contraceptive method must be used for its maximum duration.

4. HOME VISIT TRACKING LOG. This tool is a comprehensive notebook for health extension workers (HEWs) to use during home visits to clients after delivery to systematically track women at risk of pregnancy in the postpartum period. The tool promotes the integration of all the solutions by prompting HEWs to use the other tools during their visits and was designed at the suggestion of the HEWs during user testing.

FIGURE 2. (re)solve Ethiopia solution set and touch points



FIGURE 3. Ethiopia solution set Theory of Change



The theory of change (FIGURE 3 and ANNEX 1) visualized how the solutions facilitate an intention to use modern contraception at key service delivery touch points, and ultimately enable postpartum women to choose and take up a modern contraceptive method.

THEORY OF CHANGE AT THE HEALTH FACILITY LEVEL

Through the four tools shared by providers at various touch points across the reproductive, maternal, newborn and child health (RMNCH) continuum of care, clients interact with PPFP counseling during ANC visits, delivery, and post-natal home visits and child immunization visits. The first touch point between providers and pregnant clients is at ANC visits during their third trimester. Approximately 90% of women in Tigray received ANC from a skilled provider after their most recent birth (CSA & ICF, 2016), making this an important moment for providers to connect with their clients about building an intention to use contraception during the postpartum period. Using the ANC Planning Prompt, providers have the opportunity to address the misperception that women are not at risk of becoming pregnant during the postpartum period and to encourage proactive planning for taking up PPFP after delivery. The objective of this solution is to solidify a plan to take up a contraceptive method at delivery or to return for FP counseling during postnatal care or at the 45-day or 10-week immunizations, when they will already be in contact with health services.

Infant immunization, which offers a regular touchpoint for postpartum women and vaccination coverage during a child's first year, is high in Tigray. Coverage for almost all infant vaccinations exceeds 80% and fewer than 5% of children do not receive any vaccinations (CSA & ICF, 2016). Immunization and postnatal visits also provide a time for women to receive PPFP counseling and take up a method during their postpartum period, when they may not have sought this out. The objectives of administering the Risk Referral Card and PPFP **Counseling Sheet** during these visits are to elevate clients' perception of pregnancy risk during postpartum period, provide a moment of action for clients to take up contraception in the absence of one, systematically integrate FP with immunization services, and facilitate contraceptive uptake when perceived risk is elevated and when it is easiest while interacting with the health system.

At clients' next postnatal care or child immunization visit, a provider administers the **Risk Referral Card** again. This personalized risk assessment is facilitated by the provider and serves to heighten clients' understanding of their pregnancy risk. Clients who are classified as having 'medium' or 'high' risk levels are referred for PPFP counseling. Referral during community-based immunization visits and at health posts is done on-site by HEWs. In health centers and primary hospitals, clients are referred to an on-site FP counselor. It is important to note that this tool is designed to be used at multiple postnatal and immunization touch points, thereby showing that the risk of pregnancy increases over time and with changes in the clients' personal circumstances. Once clients are referred for PPFP counseling, a provider meets with them to review the **PPFP Counseling Sheet**, which providers use as a guide to facilitate more effective PPFP counseling conversations with postpartum clients. Providers emphasize risk of pregnancy and highlight stories of anonymous local women who became pregnant while breastfeeding before their menses returned. Tailored counseling offers opportunities to address concerns about side effects and method duration. Upon receiving this counseling, women form or strengthen their intention to take up a contraceptive method, ultimately leading to taking up a method at the health facility.

THEORY OF CHANGE AT THE HOME/ COMMUNITY LEVEL

The Home Visit Tracking Log offers a touch point between HEWs and postpartum women who are receiving home visits following delivery. The log prompts HEWs to complete all four postnatal care visits with postpartum women and to inquire whether clients are already using a contraceptive method following delivery. If they are not, the tracking log prompted the HEW to use either the Risk Referral Card with clients, if they did not take up a contraceptive at delivery because they did not believe they are at risk of becoming pregnant, or the **PPFP Counseling Sheet**, if they report having concerns about side effects or the durations of the available contraceptive methods. Through either tool, the clients receive high quality PPFP counseling from the HEW, leading them to form or strengthen an intention to take up a method. Depending on the method they are interested in, the clients will then take up a method directly from their HEW or follow up with a visit to their health facility to obtain the method.

Implementation of (re)solve Solutions in Ethiopia

We implemented the solution set in seven PHCUs in Tigray, Ethiopia (see ANNEX 2) from April to December 2021 after two previous starts and pauses brought on by COVID-19 (in early 2020) and the regional conflict in Tigray (late 2020).

As part of our launch activities, our project team oriented the principal and parent-teacher association of each school to the solution set. We invited parents of girls from participating schools and grades to a meeting at which we introduced and explained the solutions and addressed questions and concerns.

(re)solve utilized the experience of and relationships with health facilities in PHCUs which were already working with the USAID-funded flagship TRANSFORM: Primary Health Care project, which Pathfinder International implements with a consortium of partners. This project works to improve quality of service delivery across the continuum of primary health care by strengthening the management and performance of Ethiopia's national health system. (re)solve received support throughout training and implementation from the Health Center Directors of the PHCU intervention sites and woreda health office staff.

(re)solve conducted trainings on the four tools in the solution set for providers and HEWs at each of the intervention PHCUs prior to implementation. These trainings took place between late April and early June 2021. They consisted of an overview of the (re)solve project; an in-depth review of each tool, including its objectives, how and when it should be implemented, and by whom; and practice sessions for the providers. A total of 183 male and female providers, including supervisors, midwives, HEWs, nurses, doctors, and other clinical and facility staff, were trained across the seven intervention PHCUs. The implementation team distributed the printed tools for each PHCU during the trainings and replenished supplies during on-site monitoring visits.

Trainings began at the end of April 2021 and continued through the first week of June 2021. Implementation began in a staggered fashion, with each PHCU starting implementation of the tools as soon as its providers completed the training. The implementation team conducted two follow up monitoring visits with the PHCUs in August 2021 and late September into early October 2021. These visits assessed whether all PHCUs were functional and implementing all RMNCH activities, including the (re)solve tools. They checked the supply of printed tools and met with providers to discuss the strengths or weaknesses of the tools and challenges or gaps in implementation. The implementation team recorded the feedback and shared it with the global team via a written report after each monitoring visit. The implementation period ended in December 2021 when the evaluation and project activities in Tigray concluded.

DISRUPTIONS TO IMPLEMENTATION AND EVALUATION

Implementation and evaluation of the solution set was disrupted, rescheduled, and adapted on multiple occasions due to the global onset of the COVID-19 pandemic in March 2020 and the emergence of the conflict in Tigray (and later, in surrounding regions) in November 2020. For a timeline of the project's implementation and evaluation, see **ANNEX 3**.

The COVID-19 pandemic brought travel restrictions, limitations on public gatherings, and requirements for personal protective equipment (PPE) and social distancing to Tigray, as it did to most of the world. The project team collectively decided to pause implementation from April to August 2020 to protect the health and safety of the implementation team, data collectors, providers, and clients.

On November 4, 2020, regional conflict erupted in the Tigray region of Ethiopia. The conflict quickly led to widespread violence, food insecurity and famine, and displacement of thousands of Tigrayan residents (Green, 2021). Once again, the project team paused implementation from November 2020 to March 2021 during a complete communication blackout. The cell phone and internet blackout persisted throughout the implementation and evaluation period, preventing most communications within and outside of Tigray and between the global and implementation teams. We relied on our Tigray-based implementation team's weekly half-hour access to the internet at the International Office of Migration (IOM) office to receive updates, data, and email responses. On-site monitoring visits to health facilities had to be curtailed or cancelled due to evolving and shifting security issues in and around Mekelle, preventing consistent collection of monitoring data. We were only able to collect complete monitoring data during September 2021.

The multiple pauses and restarts disrupted our evaluation design and plan, as well. We had initially planned a randomized control trial of 16 intervention and control PHCUs using a longitudinal design and completed the baseline in December 2019 — February 2020. We designed this evaluation to follow women between ANC and immunization visits. However, the almost year-long pause meant that we had to discard the baseline and redesign the evaluation with fewer available resources. We therefore developed a crosssectional quasi-experimental design. The ongoing security challenges resulted in health posts closing and other facilities being looted, forcing the project team to make changes to the number and location of implementation PHCUs, number of participants per training, and frequency of monitoring visits due to safety considerations and budget constraints. The project team made all changes following thorough discussion with the implementation team, the Transform team in Mekelle and Addis, ICRW staff, and the Program Officer at the Bill & Melinda Gates Foundation.

It is important to note that the (re)solve solution set was not designed to be used in conflict or post-conflict settings. Local reports indicated that not only was health facility infrastructure damaged, but supply chains were affected, on-hand supplies were limited, and health providers were often absent from the facilities because they were called to provide emergency medical assistance for the conflict. This period also saw increased risk associated with travel, making home visits by HEWs challenging or impossible in some areas and making travel to facilities difficult and/or unsafe for clients, resulting in a temporary drop in client volume due to security, followed by high demand and volume in functioning health facilities. The intended use of these tools was likely affected as a result of these contextual changes. Despite these challenges, the intervention PHCUs were mostly able to apply the four tools throughout the April - December 2021 period.

Study Design and Methodology

OVERVIEW OF THE EVALUATION

The aim of this research was to evaluate whether the (re)solve package of solutions changed postpartum women's intentions to use contraception (primary outcome) and explored associations with behavioral outcomes like modern contraception use and perceptions, such as contraceptive self-efficacy (secondary outcomes). We also aimed to evaluate the implementation process to understand how the solutions were carried out and perceived by providers.

The primary hypothesis of the impact evaluation was that postpartum women who were exposed to the set of (re)solve interventions would be more likely to report having a current intention to use contraception compared to similar postpartum women who were not exposed to this solution set. We also hypothesized that exposed postpartum women would be more likely to have better fertility awareness, more accurate pregnancy risk assessment, better contraceptive self-efficacy, and increased modern contraceptive use.

We used a quasi-experimental, mixed-method design to answer our research question and reach our study aims. Specifically, we used the following methods:

- Cross-sectional, facility-based surveys at endline with women who were between four and six months (16-24 weeks) postpartum conducted at intervention and comparison PHCUs; and
- + Qualitative interviews with health providers

Recruitment, training, and piloting for the quantitative and qualitative components took place in September and October 2021, followed by data collection in October through December of 2021. Training of the data collection team, which was comprised mostly of staff from Pathfinder International - Ethiopia and Ahadu Consulting, was supported by Pathfinder International and ICRW staff.

SAMPLING, RECRUITMENT, CONSENT, AND DATA COLLECTION

QUANTITATIVE DATA

For the quasi-experimental design, we purposively assigned PHCUs to receive the package of facilitybased (re)solve solutions or serve as comparison PHCUs. Due to the limitations presented by the pandemic and conflict situations, including a decreased budget and shortened timeline due to multiple pauses and restarts, the project team made the decision to revise the original, experimental evaluation design for this intervention. We reduced the number of implementation and evaluation sites to seven from eight and were more selective about where those sites were located to ensure the safety of our Tigray team during training and implementation. This site selection allowed us to minimize potential conflict-related disruptions to services, which was more common in certain regions of Tigray than others. Consequently, our site selection excluded certain zones, and we purposively selected PHCUs close to Aksum, Shire, and Mekelle to limit travel duration.

Intervention PHCUs implemented for approximately 6 months before study enrollment began. Women at both intervention and comparison PHCUs were eligible for study enrollment if they were attending the healthcare facility for any reason while they are 16-24 weeks postpartum. Recruited women completed a quantitative questionnaire at the point of interception.

Sampling approach and sample size

The PHCU was the primary sampling unit for the quantitative study. The project conducted sampling of PHCUs for the main intervention and comparison sites in the nine woredas (60 PHCUs) in which the platform project (TRANSFORM) was currently implementing their FP and maternal and child health programming. We removed 13 PHCUs from the sampling frame because of accessibility concerns, which would limit the applicability of the results of this study for the most remote PHCUs in Tigray. Ultimately, we selected 16 PHCUs for the (re)solve project based on their availability to participate, comparability on client flow, accessibility to clients, and types of services/service providers available to clients. Originally, the project team randomly selected sixteen PHCUs as matched pairs based on the percentage uptake of modern PPFP, percentage of women who attended at least one postnatal care visit, type of largest health facility, and population. Following the specifications provided by the Tigray Health Research Institute (THRI), we separated the PHCUs geographically and randomly selected four intervention and four comparison woredas, such that eight intervention PHCUs fell into four woredas, with the eight comparison PHCUs in the other four woredas. However, due to accessibility, client flow, and escalating security concerns, we had to purposively select new PHCUs that were open, functional, accessible, and safer for the implementation and data collection teams to reach. Following this selection, more health facilities were either looted or remained closed due to lack of staff. In the end, we included seven intervention and seven comparison PHCUs.

Due to the changes in PHCU sampling and implementation, and to conform to changing project timelines and budget realities, we adjusted the sample size for the quasi-experimental design. We used the comparison of two proportions formula to facilitate with our sample size calculation:

n = D [(Z α + Z β)² * (P1 (1 - P1) + P2 (1 - P2)) / (P2 - P1)²]:

- + n = required minimum sample size
- + D = design effect
- + P1 = estimated measure of key outcome (measured as %) for group 1 (comparison)
- + P2 = estimated measure of key outcome (measured as %) for group 2 (intervention)
- + Z α = the Z-score corresponding to the degree of confidence with which it is desired to be able to conclude that an observed change of size (P2 - P1) would not have occurred by chance (α - the level of statistical significance)
- + $Z\beta$ = the z-score corresponding to the degree of confidence with which it is desired to be certain of detecting a change of size (P2 - P1) if one actually occurred (β - statistical power).

We used the following assumptions in our formula:

- + D = Design effect of 1.5 (to account for cluster sampling at the PHCU level)
- + P1 = 50% (a conservate estimate that allowed us to look at all outcomes of interest)
- + P2 = 70% (20 percentage point difference between group 1 [comparison] and group 2 [intervention])
- + a = 0.05
- + β (power)=0.80

Applying these assumptions into the formula, we obtained n= 306. Factoring in a 10% non-participation rate, we had a final sample size of 336 eligible postpartum women recruited across the seven intervention and seven comparison PHCUs (n=168 comparison group; n=168 intervention group).

⁴ We conducted a baseline survey with postpartum women in 2019. Due to the COVID-19 pandemic, and then the civil conflict, implementation was delayed by nearly two years and the availability of the PHCUs to participate in later rounds of the project changed such that we could not use the baseline results.

Recruitment

The data collection team recruited willing and eligible postpartum women who attended the selected PHCU sites for a variety of reasons including infant vaccination, growth monitoring, and FP counseling services. Women were eligible to participate in the survey if they were between 16 and 24 weeks (four to six months) postpartum, presented at a participating PHCU, resided in that PHCU, were 18 years of age or older, and had only received ANC and postnatal care in the PHCU where intercepted. We chose women between 16 and 24 weeks postpartum to maximize the likelihood that they had been exposed to many or all of the (re)solve intervention tools. Women who were currently pregnant or who had enrolled in a previous round of the (re)solve study were ineligible.⁴

Consent procedures and survey administration

Members of the data collection team used consent forms to consent participants into the quantitative component of the study before any survey administration took place. The data collectors read the consent form aloud to the potential participants in Tigrigna, allowing time for questions as needed. Informed consent was provided verbally, which is consistent with the consent procedure for previous phases of the (re)solve research in Ethiopia. Trained members of the data collection team administered the quantitative surveys in a private location. Data collection staff determined with health facility staff which on-site locations allowed for 2-3 meters of safe social distancing between interviewees and interviewers. The data collectors used printed copies of the survey to record the participants' answers during survey administration. The project provided participants with ETB 200 (approximately \$US 4) for their participation.

Piloting

To understand feasibility and acceptability of the research tools and processes, we conducted a pilot study in 2020 with a convenience sample of pregnant women who did not live in the PHCUs selected for the evaluation were asked to participate in a pilot project. The pilot demonstrated that the research tools and processes were appropriate. We also conducted a pilot of newly added questions right before data collection in 2021. None of the data collected as part of the pilot was used as data for this analysis.

QUALITATIVE DATA

Provider Key Informant Interviews (KII)

The objective of the key informant interviews (KII) with providers was to better understand the implementation experience and perceived impact of the (re)solve solution set in intervention PHCUs in Tigray, Ethiopia. From a list of eligible providers (age ≥18 years, trained in the (re)solve solution set, and worked in assigned PHCU throughout the implementing period), we purposively selected two health providers and two HEWs from each of the seven intervention PHCUs to participate in semi-structured Klls. Interviewers coordinated with providers to find a convenient time to conduct these interviews. Interviews took place in-person in a private location in the facility. Providers consented to participating in the interview and to have the interview audio recorded. The project did not provide incentives for providers' participation in these interviews. We replaced providers with another purposively selected provider from the same facility if the provider did not want to participate in the study. We piloted all qualitative interview guides prior to conducting the KIIs. Interviews were conducted in Tigrigna and each interview took approximately 20-30 minutes to complete. A total of 28 intervention providers, 14 health providers, and 14 HEWs were interviewed as part of this evaluation.

ANALYSIS

QUANTITATIVE ANALYSIS

We first examined demographic and other covariates of interest, followed by exposure to various (re)solve intervention components, using descriptive statistics. We also assessed correlation and multicollinearity for all included variables.

Our primary outcome of interest was current intention to use modern contraception at any time in the future. Initially, we were interested in understanding whether women changed their intention (from not having a clear intention, or from not intending to use modern contraception) over time, specifically from right before birth to several months postpartum. However, when we investigated whether women changed intention in our sample – as calculated by comparing their answers to a retrospectively asked question about intention during late-stage pregnancy to their current intention – we found we were unable to proceed because retrospective intention was already high (e.g. only 17% of the intervention group said they did not intend to use modern contraceptives in the future at any point while they were in late-stage pregnancy), and the change in intention over time was negligible. Therefore, we assessed only whether women at the moment of survey administration (i.e., at four, five or six months postpartum) had a current intention to use modern contraception.

As secondary outcomes, we looked at modern contraceptive and long-acting and reversible method (LARCs) uptake in the postpartum period. Both variables were modeled as binary: reported uptake of a modern method (or LARC) at one of three postpartum visits, versus everyone else. Specific visits were at delivery, at or around 45 days (6 weeks) and at or around 10 weeks for immunization. During the survey, for each of these visits women were asked if they had taken up a method to date since the birth of their child and if so, which method. Other secondary outcomes of interest included having accurate fertility awareness, accurate pregnancy risk assessment, and contraceptive self-efficacy. For accurate fertility awareness, we created a binary variable that combined accurate answers for two questions related to when a woman can become pregnant, compared to all other women. For the remaining variables, we created a score, where higher scores meant better accuracy and self-efficacy.

We reported results as odds ratios with 95 percent confidence intervals. A priori alpha level was set at 0.05; all analyses were two-tailed tests. We adjusted all analyses for clustering (PHCU) and conducted all analyses using Stata.

To prepare for the full analyses, we analyzed the association between key sociodemographic variables

and covariates and the primary and secondary outcomes within the regression framework described above. For each, we developed two models: in the first model (unadjusted model) we reported the crude estimate of the impact of the intervention on our outcome of interest. For the adjusted analyses, we fit one model adjusted for the key demographic variables and covariates. We ran goodness of fit statistics such as Receiver Operating Characteristic (ROC) and Hosmer-Lemeshow tests to ensure all models were appropriate.

ANNEX 4 has a full description of the demographic, covariates, and outcome variables used in this analysis.

QUALITATIVE ANALYSIS

Provider Key Informant Interviews (KII)

Ahadu Consulting transcribed all audio recordings from the provider interviews and translated the data from Tigrigna to English. The global team iteratively generated a codebook based on the interview guide, incorporating relevant theoretical frameworks (Damschroder, 2009), and following an in-depth review of the transcripts. We double-coded 20% of interviews to reach consistency in code applications and thematic analysis. We used Microsoft Excel to assist with thematic framework analysis (Green & Thorogood, 2004; Ritchie, et al, 2003) to better understand implementation experience and perceived impact of the (re)solve solution set among intervention providers.

ETHICAL CONSIDERATIONS

The Tigray Health Research Institute (THRI) provided ethical review and approval for this research study (IRB00012103).

Results

QUANTITATIVE RESULTS

CHARACTERISTICS OF THE SAMPLES

In total we interviewed 321 postpartum women, 49.5% of whom were in the comparison group (N=159). **TABLE 1** shows the demographic and other key characteristics of the sample. There were several notable differences between comparison and intervention-group women. Compared to comparison group, women in the intervention group were more likely to have fewer assets (56.8% versus 44.7%, p=0.03), have an occupation (48.8% versus 33.3%, p=0.01), had at least four ANC visits (61.1% versus 36.9%, p<=0.00), and ever used contraception (82.1% versus 53.5%, p<=0.00). There were also statistically significant differences between intervention and comparison women on where they were intercepted for the study (location of interview) and receiving care (p<=0.00) and where they delivered (p<=0.00).

	COMPARISON N= 159 (49%)	INTERVENTION N= 162 (51%)	TOTAL N= 321 (100%)
AGE (YEARS), MEAN (SD)	28 (6)	28 (5)	28 (6)
HIGHEST LEVEL OF SCHOOLING, N (%)			
No school	51 (32%)	62 (38%)	113 (35%)
Primary	35 (22%)	33 (20%)	68 (21%)
Secondary	50 (31%)	37 (23%)	87 (22%)
More than Secondary	23 (15%)	30 (19%)	53 (17%)
MARITAL STATUS, N (%)			
Married and living with partner	84 (53%)	65 (40%)	149 (46%)
Not married but living together	69 (43%)	91 (57%)	160 (50%)
Not in union, or other	6 (4%)	5 (3%)	11 (3%)
HUSBAND'S AGE (YEARS), MEAN (SD) (N=293)	35 (7)	35 (7)	35 (7)
PARITY, MEAN (SD)	3 (2)	2 (2)	3 (2)
ASSETS*			
High assets	88 (53%)	70 (43%)	158 (49%)
Low assets	71 (45%)	92 (57%)	163 (51%)
WOMAN HAS AN OCCUPATION**			
No occupation	106 (67%)	83 (51%)	189 (59%)
Occupation, mainly farmer, petty trade, or wage employment	53 (33%)	79 (49%)	132 (41%)

TABLE 1. Participant characteristics by intervention and comparison sites

CONTINUED

	COMPARISON N= 159 (49%)	INTERVENTION N= 162 (51%)	TOTAL N= 321 (100%)
FACILITY TYPE (LOCATION OF INTERVIEW)***			
Primary hospital	38 (24%)	13 (8%)	51 (16%)
Health center	48 (30%)	78 (48%)	126 (39%)
Health post	73 (46%)	71 (44%)	144 (45%)
NO. MONTHS POSTPARTUM			
Four	35 (22%)	43 (27%)	78 (24%)
Five	87 (55%)	84 (52%)	171 (53%)
Six	37 (23%)	35 (22%)	72 (22%)
HAD AT LEAST FOUR ANC VISITS (N=288)*			
No	51 (54%)	44 (46%)	95 (44%)
Yes	75 (37%)	118 (61%)	162 (56%)
WHERE WOMAN DELIVERED BABY (N=320)***			
At home	44 (28%)	18 (11%)	62 (19%)
Govt Hospital	67 (42%)	38 (24%)	105 (33%)
Govt health center	47 (30%)	106 (65%)	153 (48%)
EVER USED CONTRACEPTION***			
No	74 (47%)	29 (18%)	103 (32%)
Yes	85 (54%)	133 (82%)	218 (68%)

Assets are a combination of livestock/herd/farm animal/poultry ownership + agricultural land ownership + household ownership of 10 items (e.g., electricity, television, etc.)

Statistically significant at * p<0.05, **p<0.01, ***p<0.001

EXPOSURE TO INTERVENTION

TABLE 2 reports information related to exposure to the (re)solve solution set. Overall, postpartum women in the intervention group had high exposure to the different tools. The majority of postpartum women were exposed to the **ANC Planning Prompt** during any ANC visits (96%). Regarding the **Risk Referral Card**, exposure was almost perfect at the 45-day immunization visit (99%) but dropped to about a quarter at the 10-week immunization visit⁵ (27%). Finally, exposure to the **PPFP Counseling Sheet**, which was targeted to postpartum women who were assessed with the risk referral card, was very high at both the 45-day immunization visit (97%) and 10-week immunization visit (100%). As the Home Visit Tracking Log was only used by HEWs as a comprehensive reminder to use the various health tools that existed during different postpartum visits, the Home Visit Tracking Log was not visually shown to clients. As a result, there were no survey questions that were directly related to the exposure to the Home Visit Tracking Log.

TOOL EXPOSURE	QUESTION ASKED IN SURVEY AND TIMING OF EXPOSURE (NUMBER OF ELIGIBLE WOMEN)	NUMBER OF WOMEN EXPOSED, (%)
ANC Planning Prompt	Provider completed planning prompt at any ANC visit (n=162; all postpartum women in intervention group)	156 (96%)
Risk Referral Card	Provider completed card and gave risk score at 45-day immunization visit (n=76; postpartum women who had a 45-day immunization visit and were not using contraception)	75 (99%)
PPFP Counseling Sheet	Provider talked about contraception at 4 5-day immunization visit (n=75, postpartum women who were assessed with risk referral card at 45-day immunization visit)	73 (97%)
Risk Referral Card	Provider completed card and gave risk score at 10-week immunization visit (n=11, postpartum women who had a 10-week immunization visit and were not using contraception)	3 (27%)
PPFP Counseling Sheet	Provider talked about contraception at 10-week immunization visit (n=3, postpartum women who were assessed with risk referral card at 10-week immunization visit)	3 (100%)

TABLE 2. Exposure to (re)solve intervention components (among intervention group women)

WOMEN'S CONTRACEPTIVE INTENTIONS, BEHAVIORS, AND PERCEPTIONS

The distribution of our primary outcome, contraceptive intention, is shown below in **TABLE 3**, along with uptake of modern contraceptive and LARC methods. In all three cases, intention and uptake is high in the sample, and statistically significantly higher for intervention-group women as compared to comparison-group women.

We also assessed three additional outcomes that theoretically would be impacted by exposure to the (re)solve solution set, including accurate fertility awareness, risk of pregnancy assessment and contraceptive self-efficacy. **TABLE 3** below shows the comparison of the scores on these three variables between intervention and comparison. For all three variables, intervention group women scored higher than comparison group women; specifically, intervention group women were more likely to have answered the fertility awareness questions correctly (27.8% versus 15.1%, p=0.01), and scored at the median or higher on the pregnancy risk assessment question set (84.6% versus 66.7%, p<=0.00) and the contraceptive self-efficacy question set (72.8% versus 42.8%, p<=0.00).

Additional details about the individual items comprising these variables are found in **ANNEX 5**.

		Comparison (N= 159, 49%)	Intervention (N= 162, 51%)	Total (N=321, 100%)
INTENTION TO USE CONTRACEPTION (N=320)*	Yes	147 (93%)	157 (98%)	304 (95%)
REPORTED UPTAKE OF MODERN CONTRACEPTIVE***	Yes	55 (35%)	138 (85%)	193 (60%)
REPORTED UPTAKE OF A LARC METHOD***	Yes	52 (33%)	125 (77%)	177 (55%)
ACCURATE FERTILITY AWARENESS*	Did not answer correctly	135 (85%)	117 (72%)	252 (79%)
	Answered correctly	24 (15%)	45 (28%)	69 (22%)
PREGNANCY RISK ASSESSMENT ***	Scored below median	53 (33%)	25 (15%)	78 (24%)
	Scored at median, or higher	106 (67%)	137 (85%)	243 (76%)
CONTRACEPTIVE SELF-EFFICACY ***	Scored below median	91 (57%)	44 (27%)	135 (42%)
	Scored at median, or higher	68 (43%)	118 (73%)	186 (58%)

TABLE 3. Outcomes in contraceptive intentions, use, and perceptions in comparison and intervention sites

Statistically significant at * p<0.05, **p<0.01, ***p<0.001

IMPACT OF (RE)SOLVE ON WOMEN'S CURRENT INTENTION TO USE MODERN CONTRACEPTION, AND OTHER OUTCOMES OF INTEREST

For our main analyses, we assessed the impact of being in the intervention group on having a current intention to use modern contraception at any point in the future. We also looked at three additional outcomes of interest, including accurate fertility awareness, accurate pregnancy risk assessment, and contraceptive self-efficacy. **TABLE 4** below shows the results of the unadjusted and adjusted models for the logistic regressions. In the attempt to control for key confounding variables among the sample of postpartum women, the adjusted model included key sociodemographic variables (woman's age, education level, marital status, husband's age, parity, socioeconomic status (SES), work status, months postpartum, and facility type at survey interception) and behavioral characteristics (number of ANC visits, location of delivery, and ever use of contraception).

We found that intervention women had a higher odds in both the unadjusted and adjusted models of having a current intention to use contraception; however, although this finding was statistically significant in the unadjusted model (OR 2.3 Cl 1.3-8.2) it was not in the adjusted model (aOR 4.3, Cl 0.8 – 23.0).

For behavioral secondary outcomes, we found a positive and statistically significant association among postpartum women in the intervention and comparison group and uptake of a modern or LARC method in the immediate postpartum period. In both unadjusted and adjusted models, and as compared to comparison-group women, women in the intervention group had significantly higher odds of both reported modern use uptake (OR 10.9, CI 5.9-20.2; aOR 19.4, CI 9.2-41.1) and LARC uptake (OR 7.0 CI 3.7-13.2; aOR 7.8, CI 3.2-18.8)

Intervention group women had higher odds of having accurate fertility awareness in both models but neither reached statistical significance. However, intervention group women were more likely to be at the median or higher on both the pregnancy risk assessment and the contraceptive self-efficacy scores. In adjusted models, compared to comparison-group women, intervention group women had 6.9 higher odds of having a high pregnancy risk assessment score (CI 1.7-28.4) and 6.1 higher odds of having high contraceptive self-efficacy score (CI 2.0 – 19.4).

Presentation of descriptive statistics for the secondary outcomes can be found in **ANNEX 5**.

TABLE 4. Association among comparison and intervention group and key outcomes in adjusted and unadjusted models

	UNADJUSTED MODEL OR/95% CI	ADJUSTED MODEL OR/95% CI
CURRENT INTENTION TO USE CONTRACEPTION AT TIME OF SURVEY	N=320	N=263
No school	51 (32%)	62 (38%)
Comparison	1.0	1.0
Intervention	3.2 (1.3-8.2)	4.3 (0.8-23.0)
UPTAKE OF MODERN METHOD	N=321	
Comparison	1.0	1.0
Intervention	10.9 (5.9-20.2)	19.4 (9.2-41.1)
UPTAKE OF LARC METHOD	N=320	N=263
Comparison	1.0	1.0
Intervention	6.96 (3.7-13.2)	7.8 (3.2-18.8)
	UNADJUSTED MODEL OR/95% CI	ADJUSTED MODEL OR/95% CI
ACCURATE FERTILITY AWARENESS	UNADJUSTED MODEL OR/95% CI N=321	ADJUSTED MODEL OR/95% CI N=264
ACCURATE FERTILITY AWARENESS Comparison	UNADJUSTED MODEL OR/95% CI N=321 1.0	ADJUSTED MODEL OR/95% CI N=264 1.0
ACCURATE FERTILITY AWARENESS Comparison Intervention	UNADJUSTED MODEL OR/95% CI N=321 1.0 2.2 (0.6-8.1)	ADJUSTED MODEL OR/95% CI N=264 1.0 1.2 (0.5-3.0)
ACCURATE FERTILITY AWARENESS Comparison Intervention ACCURATE PREGNANCY RISK ASSESSMENT (BASED ON MEDIAN SCORE CUT OFF)	UNADJUSTED N=321 1.0 2.2 (0.6-8.1) N=321	ADJUSTED MODEL N=264 1.0 1.2 (0.5-3.0) N=264
ACCURATE FERTILITY AWARENESS Comparison Intervention ACCURATE PREGNANCY RISK ASSESSMENT (BASED ON MEDIAN SCORE CUT OFF) Comparison	UNADJUSTED N=321 1.0 2.2 (0.6-8.1) N=321 1.0 1.0	ADJUSTED MODEL N=264 1.0 1.2 (0.5-3.0) N=264 1.0
ACCURATE FERTILITY AWARENESS Comparison Intervention ACCURATE PREGNANCY RISK ASSESSMENT (BASED ON MEDIAN SCORE CUT OFF) Comparison Intervention	UNADJUSTED N=321 1.0 2.2 (0.6-8.1) N=321 1.0 2.7 (0.7 - 10.4)	ADJUSTED MODEL N=264 1.0 1.2 (0.5-3.0) N=264 1.0 6.9 (1.7-28.4)
ACCURATE FERTILITY AWARENESS Comparison Intervention ACCURATE PREGNANCY RISK ASSESSMENT (BASED ON MEDIAN SCORE CUT OFF) Comparison Intervention CONFIDENCE AND SELF-EFFICACY FOR CONTRACEPTION (BASED ON MEDIAN SCORE CUT OFF)	WNADJUSTED N=321 1.0 2.2 (0.6-8.1) N=321 1.0 2.7 (0.7 - 10.4) N=321	ADJUSTED MODEL N=264 1.0 1.2 (0.5-3.0) N=264 1.0 6.9 (1.7-28.4) N=264
ACCURATE FERTILITY AWARENESS Comparison Intervention ACCURATE PREGNANCY RISK ASSESSMENT (BASED ON MEDIAN SCORE CUT OFF) Comparison Intervention CONFIDENCE AND SELF-EFFICACY FOR CONTRACEPTION (BASED ON MEDIAN SCORE CUT OFF) Comparison Intervention Conscience and self-efficacy for contraception (BASED ON MEDIAN SCORE CUT OFF) Comparison	UNADJUSTED N=321 1.0 2.2 (0.6-8.1) N=321 1.0 2.7 (0.7 - 10.4) N=321 1.0 1.01 1.01 1.01 1.01 1.02 1.03 1.04 1.05 1.05 1.05	ADJUSTED MODEL N=264 1.0 1.2 (0.5-3.0) N=264 1.0 6.9 (1.7-28.4) N=264 1.0

Adjusted for woman's age, education, marital status, husband's age, parity, SES, work status, months postpartum, number of ANC visits, location of delivery, facility type at survey interception, and ever use of contraception

QUALITATIVE INSIGHTS

CHARACTERISTICS OF KEY INFORMANT INTERVIEW PARTICIPANTS

We conducted a total of 28 KIIs with two health providers and two Health Extensions Workers (HEWs) from each of the seven PHCUs implementing the (re)solve intervention. Slightly more than half (54%) of KII participants were 25-34 years of age with a few (14%) younger than 25 years of age. All but two participants were female (93%) with approximately two-thirds (64%) having a diploma as their highest educational degree. Half of the providers interviewed were HEWs (as intended by the qualitative interview design), 11 (39%) were midwives, and three (11%) were nurses. Slightly less than half of KII participants were interviewed in health posts (46%) and health centers (46%), with two (7%) KIIs taking place in primary hospitals.

AGE (YEARS)	N (%)
<25	4 (14%)
25-34	15 (54%)
≥35	9 (32%)
SEX	
Female	26 (93%)
Male	2 (7%)
EDUCATION	
Diploma	18 (64%)
Certificate	2 (7%)
Bachelor of Science	8 (29%)
PROVIDER TYPE	
Health provider: nurse	3 (11%)
Health provider: midwife	11 (39%)
Health Extension Worker (HEW)	14 (50%)
HEALTH FACILITY TYPE	
Health post	13 (46%)
Health center	13 (46%)
Primary hospital	2 (7%)

TABLE 5. Characteristics of KIIs

FACTORS THAT ENABLE AND INHIBIT SUCCESSFUL IMPLEMENTATION

All KII participants had a strong understanding of how to properly implement the different intervention tools, which included the ANC Planning Prompt, Risk Referral Card, PPFP Counseling Sheet, and Home Visit Tracking Log. Across the different (re)solve tools, there was no clear favorite tool but instead an even distribution of tool preference among providers (with the exception of the Home Visit Tracking Log, which was also only used by HEWs). Furthermore, there was near-universal appreciation of the ease of use for the different tools as part of their daily roles and responsibilities. As one provider stated, "it is very easy to apply because the components are very few, easy to remember and written in [an] easily understandable way" (Health provider #11). In addition, the availability of different tools in the local language, Tigrigna, was lauded as an important element that facilitated the successful implementation of these tools, and an important factor associated with its acceptability and feasibility. As one provider noted, "[The ANC Planning Prompt] is easy to use. You can easily counsel the mother without difficulty; this is because it is prepared in the local language. Mothers who can read and write can easily understand it by themselves; however, for those mothers who cannot read and write the health professional will read [it to them]" (HEW #4). Another provider also stated, "[The Risk Referral Card] is simple to teach to the mothers and the cards are simple to handle. In addition, it is developed in Tigrigna with colored and *figurative illustrations"* (Health provider #2).

Specific to each of the (re)solve intervention tools, several key factors were identified as enabling **successful implementation**.

ANC Planning Prompt

Providers mentioned how the tool was helpful in *raising the awareness and importance of FP* to the ANC clients that they supported. One health provider drove this point home: "the main aim of the planning card is to help [remind] the mothers to take a contraceptive. They may not be aware about the possibility of pregnancy [during] the postpartum period but if they are told during ANC visits maybe a couple of times, it makes them ready for it" (Health provider #28). Providers also reported that the card helped reinforce the importance of FP among participating mothers, reminded them of postpartum contraceptive use, and supported them to take charge of their own fertility. In the succinct words of another provider, "before having had such tools, every midwife was expected to counsel about family planning,

but the difference is that the mothers are taking this card home as a means of reminder" (Health provider #10).

Risk Referral Card

Providers appreciated the use of the color scale that clearly showed pregnancy risk and made it very easy to understand for clients. This was demonstrated by a provider who explained, "We also show them the colors of exposure, namely the green, yellow, and red. We ask them what red indicates, and they reply red indicates a [high risk of being pregnant]. This is a positive side. Most of them understand it easily and agree to use family planning. So, the colored presentation is appreciable" (HEW #6). Other providers emphasized how the different colors of the cards helped mothers to easily assess and understand their pregnancy risk, noting that the cards were easy to **apply across multiple** touchpoints and visits among postpartum women reinforcing key FP messages and offering reminders to women at different timepoints. As one provider noted, "the tool is prepared in such a way that it fits to each status of the mother in the different stages of the postpartum period. Not only this, but also it gives more opportunities in the subsequent visits if they did not decide [during] the last visit" (Health provider #11).

PPFP Counseling Sheet

One of the key factors that enabled successful implementation is how the tool provided *practical*, real-life examples of pregnancy risk while breast *feeding*. As one provider explained, "we ask her a question like: don't you know any mother around your community or neighborhood who became pregnant while she was breastfeeding? And then she will start to tell you a story of other mothers who got pregnant while they were breastfeeding. In such a way, she will start to realize that she isn't also different from the others and after that type of counseling...a lot [of] mothers have taken contraceptives" (Health provider #10). In addition, the PPFP Counseling Sheet was recognized by many providers as an important tool that made PPFP counseling more effective. Generally, providers agreed that the content of the PPFP Counseling Sheet made their work easy and added a much-needed structure to their sessions with women. It enabled the providers to learn of and address common misperceptions related to pregnancy during the postpartum period. The tool reportedly allowed providers to elicit questions from women and to provide them with correct and comprehensive information on pregnancy risks and prevention methods. One provider's experience was

that the "majority of mothers think pregnancy will not occur in the first 45 days postpartum; other mothers believe [that] if they breastfeed for two years, they can avoid pregnancy. So [the] PPFP [Counseling] Sheet is used to counsel such mothers. Mothers may say to you: I was breastfeeding and I avoided pregnancy [with] my first child. We should counsel them. Current and previous pregnancies and postpartum conditions are different; it does not mean that you will avoid pregnancy in the same manner at this time" (HEW #4). Finally, many providers noted that this tool served to *fill an important gap in* **PPFP training and counseling** that was not provided by the Regional Health Bureau (RHB). As one provider stated, "It is one of the best tools... the reason why I say that this is one of the best tools is I am trained for long-acting family planning by [the] Regional Health Bureau. In this training, counseling was one part... it has notes for counseling new clients, repeat clients, and clients with side effects... but it doesn't include [a] counseling tool for postpartum clients" (HEW #8).

Home Visit Tracking Log

HEWs were the only provider type that used this tool. With the wide range of health activities that HEWs support, the Home Visit Tracking Log was noted to be useful in helping with client follow-up. As one HEW explained, "as HEWs, we didn't even have any formal tools that could help us to track the status of the mother. As you know, HEWs are [very] busy and engaged in different types of tasks like maternal and child health services, but having had these tools has helped us to ease our day-to-day activity. So, these tools are generally very short and precise [and] that helps us to follow the status of a mother" (HEW #13). This view was supported by another HEW: "Once you register a pregnant mother you are not expected to register her during each ANC or PNC visits; this saves our time and allows us to follow the mother until she uses family planning" (HEW #8). HEWs also appreciated how the comprehensive and structured tool facilitated their daily activities. As one HEW described, "the [Home Visit] Tracking Log is very organized to write all the necessary information and gives direction by itself. It is helpful to us since we can write all the information of pregnant and postpartum mothers in the community. Previously we wrote the information in different papers in unorganized way" (HEW #23).

Despite the various factors that promoted and enabled successful implementation of the different interventional tools, several **implementation challenges** were identified across the (re)solve solution set.

Struggles of demanding workload and high client volume

Although the different (re)solve intervention tools were described by most providers as "easy to use," it was clear that during instances of high workload and client volume there were challenges of proper usage of these tools to all eligible clients. As one provider stated, "there are some immunization days with high client flow; during these days it is very difficult to fill the [Risk Referral] card" (HEW #9). Other providers shared how they adapted use in situations of high client volume by using the tools in a group setting: "Yes, sometimes if the client flow is high, I might not have enough time to ask the questions... I gather all the mothers and teach them about FP including about [the Risk Referral Card]" (HEW #26).

Difficulties of using multiple tools

Despite the overall positive experience using the different (re)solve intervention tools, several providers noted the challenges of using different provider-based reference guides and tools. As stated by a provider, "In our health post we have many tools like the [ANC] Planning Prompt given by many organizations and [the Tigray RHB], but it is difficult to use all the different tools, so what I suggest is to combine all the tools to two or three cards. If you integrate the tools this will save our time and we can use them continuously" (HEW #26). This frustration was felt strongly by one provider who explained that "it is difficult to use all the tools at a time; every organization pushes us to use their tool only but this [is] not fair. In my seven years of work experience I didn't see any organization including [Tigray] RHB trying to integrate the different tools in our health post. What I suggest is to integrate the different tools to one" (HEW #6). These pointed grievances resulted in many suggestions to find ways to integrate these tools within routine existing tools rather than having standalone tools.

Importance of FP influencers

All the (re)solve intervention tools were targeted to women across the continuum of maternity care. However, we are aware that there are social and gender norms in this setting that limit women's ability to decide on and use contraception in an equitable manner. As one provider notes, "most of my clients in my area are Muslims and their husbands are not [very] supportive in the use of contraceptives" (HEW #7). As a result, a few providers noted the importance of FP influencers — in particular, the role of husbands — in women's contraceptive autonomy and decision making and how the tools likely helped women start important conversations. One provider explains, "we give mothers [ANC] Planning Prompt, [Risk Referral Card] ... this helps mothers to discuss with their husbands at home" (HEW #26)

Limitations of operating in a conflict setting

The (re)solve project experienced major implementation challenges and disruptions as a result of the regional conflict that occurred during the project timeline. Challenges associated with the conflict were raised by several providers. One provider said, "during the conflict period we were not stable and sometimes we might fail to apply [the (re)solve tools] because it was the issue of life and we were not delivering services freely. This was also further complicated due to lack of communication and other problems during the conflict related crisis" (HEW #5). Multiple HEWs mentioned not being able to complete their usual home visits during various points of the conflict. Another provider described the personal challenges that they faced: "yes, not only for the ANC Planning Prompt but in general for all the tools... we [were not] able to use it. Because every health professional was targeted... we were afraid to work at our health post" (HEW #13). One provider was appreciative of the project's effort to attempt to tackle the additional burden of unintended pregnancies faced by communities during the crisis: "You come here in this difficult time to study and solve the community problem which is unintended pregnancy; an additional burden for the communities in crisis. I thank the organization conducting this research" (Health provider #16).

RECOMMENDATIONS AND CONSIDERATIONS FOR FUTURE DESIGN AND SCALE

Although most providers found the (re)solve intervention tools highly acceptable and easy to use in their daily routine, **opportunities for improvement** were commonly noted.

Make tools sturdier

Several providers requested that the (re)solve intervention tools use a plastic or durable cover to make them stronger: "[the ANC Planning Prompt] is an interesting card and guide, but it would be better if it is covered by plastic material in order to prevent damage" (HEW #5).

Increase font size

Some providers mentioned that the font size used for some tools was too small, As explained by one provider, "It is easy to use; but the font size of [the Risk Referral Card] is too small and [makes it] difficult to serve all mothers during [heavy] workload" (HEW #19).

Design considerations

As providers became familiar with using the tools, they made requests and suggestions for design modifications across the (re)solve solution set:

ANC Planning Prompt: Some providers mentioned this tool should be **used anytime during ANC visits**: "we are giving this card during third and fourth ANC visits, but it is better if given [during] any ANC visit because we don't know when pregnant mothers [will] start their follow up visit" (HEW #26). In addition, a few providers explained it would be helpful to **integrate additional ANC reminders** into the tool, such ANC follow-up schedules.

Risk Referral Card: A small number of providers noted that it would be beneficial to *add a specific question on resuming sexual activity* to the Risk Referral Card: "The negative side of the tool is there is no question that asks whether the couples have started sexual intercourse or not. We simply classify the mothers as low, medium, or high risk for pregnancy without [this question]" (HEW #7). Furthermore, there were a few requests to *add a section to note the agreed upon contraceptive method type*: "The drawback I observed with [the Risk Referral Card] is after telling a mother the risks of getting pregnant, the mother may agree to use FP but there is no space to write what type of FP she agreed to use. It is good to plan [which] method she is going to use, not only when to use contraceptives" (HEW #24).

Include maternal and child health danger signs in tools: Across the tools, several providers recommended adding in *danger signs relevant to the timing of each tool*. They recommended adding danger signs during pregnancy to the ANC Planning Prompt, postpartum danger signs to the PPFP Counseling Sheet, and child health danger signs along with postpartum danger signs to the Home Visit Tracking Log. Incorporating these danger signs would allow providers to integrate life-saving maternal and child health messages within these PPFP tools.

Integration of tools with health system

As indicated from the design consideration comments identified above, there is an overriding sentiment expressed by most providers that it is key to find ways to integrate the (re)solve solution set within the existing health system. As one provider explains, "all the tools are helpful in counseling and reminding the women [to take] contraceptives, especially if [they are] properly integrated with the existing health care system and with routine service. For example, integrating [the Risk Referral Card] with [the] immunization card [and] integrating [the] PPFP Counseling [Sheet] with [the] routine counseling guides of [the] Ministry of Health. I am sure remarkable change can be seen if all the tools [are scaled up] with good follow up" (HEW #8). The proper integration of the (re) solve intervention tools within national health guidelines would also streamline the training and deployment of these tools. For example, one provider suggested that some of the tools could be integrated within the national health guidelines that seek to integrate FP: "I do recommend all these supportive materials to be included at every short course training like family planning and prevention of mother to child transmission of HIV/AIDs (PMTCT) guidelines. This is because these guidelines have contraceptive utilization as part of their course. Therefore, if we incorporate these tools within these guidelines, it will be simple to administer the short course training as part of it" (Health provider #15). Furthermore, integrating the tools into the existing health system and guidelines would help to address the difficulties providers face with working with multiple tools, as noted above. Faced with the daunting challenge of integrating a wide array of guidance documents and health tools used by providers in this setting, some providers recommended digitizing these disparate tools. One provider explained, "it is good to consider changing these tracking logs [to] tablets as this will allow you to add more child health and maternal health [activities] for the future" (HEW #8).

A majority of providers were very supportive of the different (re)solve tools and believed the intervention was making a difference and should therefore be scaled-up. Several positive perceptions of impact were offered by providers on why they would advocate for the scale-up of the (re)solve solution set.

Improved quality of counseling

Several providers highlighted how the (re)solve tools were beneficial in improving the quality of FP counseling. As one provider explained, *"there is a huge difference in counseling via these supportive materials [rather] than that* of blindly implementing the counseling process. Because of such [an] effect, it is advisable to scale up these tools to other facilities" (HEW #13). One provider noted how the tools helped them better connect with their clients: "Yes, I recommend... counseling using the tools makes the mothers hopeful and happy, because they understand we are concerned about them. They will say: they educate me, they read the content of the tool for me and register me, so I should use family planning" (Health provider #21).

Improved changes in behavior

Most providers noted that the (re)solve solution set was helpful in raising FP awareness and changing attitudes and intentions. As described by one provider, "the perception of mothers towards contraceptives has already begun to change... mothers start to understand the risk of unwanted pregnancy. The overall intention to use and utilization of contraceptives started to change, so it is really good to implement it in a large scale" (Health provider #1). This sentiment was supported by another provider who said, "[the (re)solve tools] [have] improved community awareness and knowledge. The community belief was not supportive [of] postpartum family planning utilization, but after we start[ed] using the new solutions, uptake of PPFP has increased" (Health provider #25).

Improved health outcomes

Most providers believed that the implementation of the different (re)solve tools resulted in improvements in various health outcomes. Observing increased FP uptake was commonly cited by most providers, as described by this particular provider: "Mothers take family planning immediately after delivery...previously most mothers didn't take postpartum family planning. But by these tools, they start[ed] to understand the situation and start[ed] taking family planning and change was observed" (Health provider #28). Reductions in unintended pregnancies and improvement in birth spacing was also touted as an anticipated positive effect of these tools: "Yes, because if we scale up these tools to other health facilities, we will prevent mothers from unwanted pregnancy and improve birth spacing. I hope that other health facilities will get such training and tools to be applied [in] time" (HEW #14). One provider explained: "As I have told you earlier, many mothers perceive that they can't get pregnant before the coming back of their menstruation period. Due to this, unintended pregnancies and abortions were higher. Nowadays, contraceptive uptake increased in turn, abortion and unintended pregnancies have decreased. Many mothers get pregnant in any convenient time they wish... I highly recommend and need this project for scale up to other health facilities" (Health provider #27).

Discussion

KEY RESULTS:

- + Exposure to the intervention among women 16-24 postpartum was quite high.
- The (re)solve intervention had a positive, yet nonsignificant association with contraceptive intention. These exploratory findings indicate that the (re)solve intervention is able to move postpartum women along the intention-action continuum to actualize changes in key contraceptive behavior.
- Exploratory analyses showed a somewhat larger and statistically significant association with other outcomes like modern contraceptive use, LARC use, contraceptive confidence and self-efficacy, and accurate pregnancy risk assessment.
- Qualitative data indicates providers had a positive experience with the (re)solve tools and found them acceptable and easy to implement.
- + Providers indicated that the behavior change mechanism associated with the solution set can contribute to contraceptive uptake.

The results from this study build upon earlier findings from low- and middle-income countries that suggest PPFP interventions can have a positive effect on contraceptive intention and use (Blazer & Prata, 2016). In addition, our results are in alignment with other studies from Northern Ethiopia that show the high prevalence of intention to use among postpartum women (Abajobir, 2014; Abraha, et al, 2018; Gebremariam & Addissie, 2014; Mesfin & Kibret, 2016; Tiruneh, et al, 2016). The results from this mixed-methods, quasi-experimental study shows that the (re)solve solution set appears to have had a positive association with contraceptive intention, and in our exploratory analyses, a somewhat larger and significant association with other outcomes like contraceptive use, contraceptive self-efficacy, and pregnancy riskassessment. Qualitative data indicates that providers had a positive experience with the different (re)solve tools and found them acceptable and easy to implement. This was supported by survey data among postpartum women that showed that exposure to the different (re)solve tools was

quite high. Despite the challenges of implementing the (re)solve solution set in the context of COVID-19 and regional conflict, the intervention shows some promising results.

The (re)solve intervention appears to have a positive association with intention to use contraception in the unadjusted model (OR=3.2 [1.3-8.2]), but this association no longer becomes statistically significant in the adjusted model (aOR=4.3 [0.8-23.0]). The lack of a statistically significant finding is due to the smaller sample size in the adjusted model (n=263) because of missing data across key covariates which reduces the overall power and increases the width of the confidence interval. Furthermore, intention to use contraception was very high among this study population (93% in comparison group vs. 98% in the intervention group) which means there was not a lot of room for improvement among the intervention group to get results that are statistically significant.

Despite not seeing statistically significant results in the adjusted model for intention to use, the results from the evaluation suggest that the (re)solve intervention had a significant association with key behaviors of interest importantly, modern contraceptive use (aOR=19.4 [9.2-41.1]) and LARC use (aOR=7.8 [3.2-18.8]. Although these results are exploratory and limited by the current study design (non-random assignment to the intervention, cross-sectional study cannot assess causality, short study timeframe, small sample size, etc. - see Considerations section, below), it appears that the (re)solve intervention is able to move postpartum women along the intentionaction continuum to actualize changes in key contraceptive behavior. This can partly be supported by some of the observations in the qualitative interviews with providers which indicate that the behavior change mechanism associated with the (re)solve solution set tools written in the local language (Tigrigna), multiple touchpoints to reinforce key messages, improved clientprovider counseling, and practical risk assessment tools - can contribute to contraceptive uptake. In addition, statistically significant associations with the (re)solve intervention can be seen in both the accurate pregnancy risk assessment (aOR=6.9 [1.7-28.4]) and confidence and self-efficacy for contraception (aOR=6.1 [2.0-19.4]) further support the positive findings seen with contraceptive uptake.

CONSIDERATIONS FOR THE IMPLEMENTATION AND EVALUATION CONTEXT

The key consideration for the (re)solve implementation and evaluation context is the dual crises of the COVID-19 pandemic and the ongoing civil unrest, both of which significantly altered initial plans and created unexpected and unusual circumstances for the project. These changes not only impact how the solution tools should and would be used under normal circumstances, but also the interpretation and generalizability of study results.

IMPLEMENTATION CONSIDERATIONS

Notable changes to implementation plans included where and how the solution tools were implemented, especially related to which PHCUs were included in the project. Additionally, despite a comprehensive training of (re)solve staff, providers noted that increased work burdens, high client volume and unstable environments due to the ongoing conflict made it difficult at times to use the tools with fidelity.

We have little specific insight into how the dual crises disrupted travel and security of providers and clients, and thus impacted healthcare experiences. For example, we know little about how many ANC and postpartum/ pediatric appointments women were able to keep. Due to the difficulty in connectivity and mobility, Pathfinder staff were unable to collect regular monitoring data on these aspects. With the communication blackout, regular reporting into the national HMIS from health facilities had also stopped.

We acknowledge and applaud the diligence, perseverance, and commitment of the implementation team, data collectors, and health providers in the region. Without them, this evaluation would not be possible.

CHALLENGES AND LIMITATIONS OF THE EVALUATION

We note several important challenges and limitations with sampling, design choice, data collection, and interpretability of the data.

As mentioned, our original design specified that we would randomly assign intervention or comparison to PHCUs. However, due to the pandemic and the conflict, we purposively selected sites that were easier to travel to and less likely to be disrupted by violence. This decision not only biased our sample but likely led to a key limitation of our study, which is notable and resulted in statistically significant differences between our intervention and comparison groups. For example, intervention-group women are much more likely to have ever used contraception — a characteristic related to our primary and secondary outcomes, intention to use contraception and uptake of a method. It may be that we found a significant association with uptake because intervention women were more likely to have ever used a method, rather than due to the (re)solve project, although we did control for this in our adjusted analyses. As a result, our adjusted logistic regression models included key sociodemographic variables, but also key behavioral characteristics such as having at least 4 ANC visits (yes vs no), location of delivery (home, govt hospital, or govt health center), and ever used contraception (yes vs no) in attempt to control for these variables — which were different between the comparison and intervention group — when looking at the potential effect of the (re)solve solution set with our primary and secondary outcomes of interest.

The prevalence of our main outcome — current intention to use contraception — was extremely high in both groups and much higher than national average estimates from the DHS (48.6%) (CSA & ICF, 2016). There are several plausible reasons for this, such as the fact that we were conducting a facility-based rather than a communitybased survey or that the conflict and the subsequent insecurity increased women's resolve to use contraceptives, but the implications for our analysis were that we needed to detect an even smaller difference between the groups than had been calculated for in our sample size. It is also possible that asking women about future intentions of using contraceptive methods may be a poor measure in evaluating the effects of an FP intervention among postpartum women, which is the reason why we also analyzed the association of the (re)solve intervention with other key behavioral outcomes of interest. Future research work should explore additional measurement approaches that better define and measure intention to use across the different life stages of women. As a result, interpretation of our intention to use analysis should be done with some caution.

Given the sample included women of diverse postpartum ages, some women may not have yet had the opportunity to be exposed to (re)solve tools at later visits or be ready for uptake of contraception. However, we did control for months postpartum in our analyses. In addition, women's postpartum status may have influenced outcomes like intention in the context of crises; for example, women may have been more highly motivated to avoid pregnancy during moments of conflict escalation. In addition, we had some missing data that reduced the available analytic sample in our adjusted models. The variable with a high number of missing data was reported ANC visits, which could be related to outcome. Our measures of association therefore come with large confidence intervals (as a result of missing data leading to a smaller sample size) and must be interpreted with caution.

Furthermore, there are other study limitations that are important to note. The short implementation timeline (approximately 6 months) associated with the (re)solve project may be insufficient to detect changes in key outcomes for a behavior change intervention that may require at least 1 full year of implementation. In addition, this was a cross-sectional study which limits assessment of the temporal relationship between exposure and outcome. Without longitudinal data (following individuals over multiple timepoints), it is not possible to establish causal effect of the (re)solve intervention on key outcomes of interest. Finally, social desirability bias was likely present, especially in the qualitative data, as the providers included in the research were likely to speak favorably of interventions that provide them with tools and resources.

Despite these limitations, our quantitative findings indicate that exposure for the intervention group was associated with our outcomes in positive and significant ways. Along with qualitative findings that suggest good implementation despite challenges, this suggests the intervention likely had the desired effects intended. We approached our analysis conservatively, conducted several regression diagnostic tests (goodness-of-fit and collinearity tests) within our logistic regression models, and cautiously present findings couched in these considerations.

FUTURE CONSIDERATIONS FOR THE (RE)SOLVE SOLUTION SET

A majority of providers were very supportive of the different (re)solve tools and most believed the intervention was making a difference in improving counseling, behaviors, and FP outcomes, and therefore advocated for the scale-up of the (re)solve solution set. In addition, providers liked using the (re)solve tools as they filled gaps in existing counseling, tools, and training related to PPFP. However, with a multitude of health tools and reference guides currently used by health providers — some approved by the government, others piloted by other INGOs — future iterations of the (re)solve solution set will need to consider ways to integrate within the existing tools to make this easier for end-users and facilitate ownership by the MOH. The proper integration of the (re)solve solution set within national health guidelines — through integration with technical domains such as FP, RMNCH, and HIV — would also streamline the training and deployment of these PPFP tools. Applications of digital solutions, either through mHealth interventions that can digitize and streamline these tools for providers, or creation of an online repository to house MOH-approved and INGO-tested health tools, could also be explored as part of the health system integration and scale-up strategy.

Conclusion

The (re)solve intervention had a positive non-significant association with contraceptive intention, and in our exploratory analyses, a somewhat larger and statistically significant association with other outcomes like modern contraceptive use, contraceptive confidence and selfefficacy, and pregnancy risk-assessment. Qualitative data indicates that providers had a positive experience with the different (re)solve tools and found them acceptable and easy to implement. Despite the challenges of implementing the (re)solve solution set in the context of COVID-19 and regional conflict, the intervention shows some promising results. Future work should explore strategies to integrate and scale-up the (re)solve solution set within the existing health system.

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ANNEX 1. Theory of Change



ANNEX 2. Implementation PHCUs

Woreda	NAME OF PHCU	CATCHMENT POPULATION	NUMBER OF HPS	FACILITY TYPE	RURAL/URBAN
Shire town	Shire Town	88,567	2	НС	Urban
L/koraro	Selekleka HC	44,745	3	НС	Rural
Adigudem	Adigudem PHL	68,550	6	PHL	Urban
Hintalo	Hiwane HC	41,086	5	НС	Rural
Raya Azebo	Hawelti HC	20296	2	НС	Rural
	Kara HC	21000	2	HC	Rural
	Kukufto HC	12765	2	HC	Rural

TABLE 6. (re)solve Project Intervention PHCUs

ANNEX 3. Implementation and Evaluation Timeline



ANNEX 4. Description of key variables used in the quantitative analysis

We presented and adjusted for the following demographic variables: women's age, education, marital status, husband's age, parity, assets, and whether the woman was working outside the home. We believed these variables to be theoretically related to the outcome of interest, a current intention to use contraception. The participant's age and husband's age were somewhat correlated (0.83) but as we felt that husband's age was a separate construct, and as such kept it in all adjusted models. Participant's age and parity were continuous, and women's education, marital status, and assets were categorical. Women's assets was modeled as a binary outcome of low versus high. Women's occupation was binary: they either reported they had one, or they reported they did not.

Other covariates of interest included facility type, number of months postpartum, ANC visits, where women delivered the baby, and ever use of contraception. Facility type, which contained information about where women were recruited, was categorical and included at the primary hospital, health center or health post. Based on recruitment and eligibility criteria, women were either four, five or six months postpartum at the time of interception. We included ANC visits as a binary variable: had four or more visits (per WHO recommendations), or less than four. And finally, location of birth was either at home, at the government hospital, or a government health center. Ever use of contraception was binary (yes/no). Unfortunately, we were unable to include a variable related to urbanicity due to oversight in data collection.

We ran a correlation matrix for all demographic and covariables and found that no variables were highly correlated (except for age and husband's age, as previously mentioned above). We also checked multicollinearity but assessing VIFs, which were found to all be under 5.

We selected our primary and secondary outcomes of interest because we believed they would directly be impacted by exposure to the (re)solve intervention components. They were modeled as follows:

- Primary outcome: current intention to use contraception women were asked whether they thought they would use a modern contraception method to delay or avoid pregnancy any time in the future. Answers were categorized as yes or no.
- + Secondary outcomes

Modern contraceptive and LARC uptake: Both variables were modeled as binary: reported uptake of a modern method (or LARC) during the immediate postpartum period at one of three designated postpartum visits, versus everyone else. Specifically, women were asked if they took up a method at delivery, and at the 45 day and 10-week immunization visits. If yes, women were asked which methods. LARC methods were sterilization (male and female), IUDs, implants and injectables; modern contraceptive methods included LARC methods as well as contraceptive pills.

Accurate fertility awareness: This variable was created by combining responses to two questions related to when during a women's cycle is she able to get pregnant. Women either got both answers correct, or not (binary). These questions came from the DHS.

Accurate pregnancy risk assessment: This variable was created by first creating binary variables based on correct answers to three questions related to whom is more at risk for pregnancy, then combining into a continuous variable (where higher score means more accurate knowledge), and finally using the median score as a cutoff point. There was a fourth question that we excluded as there was no variability. Scores at or above the median were compared to scores below the median (binary variable). The three questions delt with comparing risk between a woman who is breastfeeding (exclusively, then only partially) as well as a woman using traditional methods, compared to women using modern contraception. Higher scores indicated better pregnancy risk accuracy.

Contraceptive self-efficacy: This variable was created as a binary variable, where women at the median or higher were compared to women below the median. Higher scores indicated higher self-efficacy. Items used to create this variable related to women's agreement/disagreement to various statements such as "I feel confident in my ability to suggest to my husband that we use a modern contraceptive method" and "If I wanted to use family planning to delay getting pregnant, I feel confidence in my ability to be able to get the modern method of my choice." We assessed differences between self-efficacy with different individuals (i.e., husbands versus providers) but found no differences and therefore combined. Higher scores indicated increased contraceptive self-efficacy.

Goodness-of-fit statistics from the ROC and Hosmer-Lemeshow tests indicated that all models were appropriate.

ANNEX 5. Additional analyses

TABLE 4. Other outcomes

		COMPARISON (N= 159, 49%)	INTERVENTION (N= 162, 51%)	TOTAL (N=321, 100%)
ACCURATE FERTILITY AWARENESS				
When during menstrual cycle woman can	Did not answer correctly	135 (85%)	117 (72%)	252 (79%)
Serpresidint	Answered correctly	24 (15%)	45 (28%)	69 (22%)
When breastfeeding women can become	Did not answer correctly	36 (23%)	10 (6%)	46 (14%)
programent menses has not retained	Answered correctly	123 (77%)	152 (94%)	275 (86%)
BREASTFEEDING (BF) RISK ASSESSMENT SCORE				
Exclusively BF woman's chance of	Did not answer correctly	66 (42%)	29 (18%)	95 (30%)
versus using modern method	Answered correctly	93 (59%)	133 (82%)	226 (70%)
Partially BF woman's chance of pregnancy	Did not answer correctly	23 (15%)	18 (11%)	41 (13%)
	Answered correctly	136 (86%)	144 (89%)	280 (87%)
After menses returns, using traditional	Did not answer correctly	67 (42%)	68 (42%)	135 (42%)
	Answered correctly	92 (58%)	94 (58%)	186 (58%)
CONTRACEPTIVE SELF-EFFICACY				
I have enough info about FP to make my decisions and plans	Other	29 (18%)	3 (2%)	32 (10%)
	Strongly agree or agree	130 (82%)	159 (98%)	289 (90%)
I have the knowledge (skills) to use FP if and when I want to	Other	36 (23%)	2 (1%)	38 (12%)
	Strongly agree or agree	123 (77%)	160 (99%)	283 (88%)
I feel confident in my ability to suggest to my husband that we wait a healthy amount	Other	42 (26%)	22 (14%	64 (20%
of time between pregnancies	Strongly agree or agree	117 (74%)	140 (86%)	257 (80%)
I feel confident in my ability to suggest to my husband that we use a modern	Other	41 (26%)	21 (13%)	62 (19%)
contraceptive	Strongly agree or agree	118 (74%)	141 (87%)	259 (81%)
I feel confident in my ability to persuade my husband to allow me to use a modern	Other	39 (25%)	19 (12%)	58 (18%)
contraceptive	Strongly agree or agree	120 (76%)	143 (88%)	263 (82%)
If I wanted to use FP to delay getting pregnant, I feel confident in my ability	Other	14 (9%)	4 (3%)	18 (6%)
to do so	Strongly agree or agree	145 (91%)	158 (98%)	303 (94%)
If I wanted to use FP to delay getting pregnant, I feel confident in my ability	Other	29 (18%)	6 (4%)	35 (11%)
to do so	Strongly agree or agree	130 (82%)	156 (96%)	286 (89%)

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