



# TAMANI

## Tabora Maternal Newborn Health Initiative

### Impact Evaluation Report

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# 1 OVERVIEW

## 1.1 Introduction

Tanzania has one of the highest maternal mortality ratios (MMR) in sub-Saharan Africa at 556 per 100,000 live births.(1, 2) Despite making progress on reducing the MMR, Tanzania failed to meet its Millennium Development Goal target (3), and is still far from the Sustainable Development Goal (SDG) goal of 70 per 100,000 live births. Childhood mortality rates have diminished substantially over the last 25 years, however, progress in reducing preventable newborn deaths has been slow compared to the under-5 mortality rate. Tanzania's 2015/16 Demographic and Health Survey (TDHS) survey indicates that the neonatal mortality rate is 25 per 1,000 live births; however urban and rural differences exist, and neonatal health is intimately connected to maternal health and access to essential maternal and newborn health interventions.(4) Nationally, only 63.8% of deliveries are assisted by a skilled birth attendant, with large differences between pregnant women in rural areas and those in urban areas.(2) Neonatal deaths contribute to 40% of child deaths, and averting neonatal deaths and reducing maternal mortality are key priorities for the Government of Tanzania, as highlighted in the One Plan II 2016-2020.(5)

Key barriers to achieving national health targets include the shortage of qualified staff and the insufficient availability of healthcare infrastructure, equipment, and supplies.(6, 7) Gender-related attitudes, norms and beliefs also contribute to poor health outcomes for women and girls. The mid-term review of Tanzania's plan for reducing maternal and newborn deaths (2008-2015) concluded that more concentrated efforts are needed to reduce the maternal and newborn mortality rates in the country and that priority should be given to health facilities and providers in rural, underserved regions in the Lake and Western zones in Tanzania.(5)

Tabora region is one of Tanzania's 30 administrative regions and is located in the central-western part of the country within the Western Zone. According to the 2012 national census, the region had a population of just over 2 million and is the 24th most densely populated region in the country, with 30 people per square kilometer. The region's average household size is six persons and is the third highest in the country with a high population growth rate (2.9% average 2002-2012). Most economic activity in the region is agricultural, primarily subsistence farming and smallholder tobacco production. A paved road that links Mwanza with the Tabora Urban district has increased regional economic activity. The region has the lowest level of educational attainment in the country, with 37.8% of women and 32.7% of men reporting never attending school.(2)

According to the 2015-2016 DHS survey, Tabora region has the highest percentage population (45.8%) in the lowest wealth quintile in the country, which reflects high levels of structural inequality that have a direct bearing on reproductive, maternal, newborn, child, and adolescent health outcomes.(2) Polygamy is most prevalent in the Western zone with approximately one-third of marriages polygamous, contributing to high fertility rates. Tabora has a low contraceptive prevalence rate of 21.9%, and the Western Zone has the highest levels of teenage childbearing in Tanzania (38%). The latest DHS survey (2015-2016) indicated that 44.3% of women in Tabora deliver at home. (2)

Given this context, the international aid organization CARE began reproductive health programming in Tabora in 2012 with the aim of improving maternal and reproductive health. This paper presents an impact evaluation of CARE's second stage of reproductive, maternal and newborn health programming in Tabora, the Tabora Maternal and Newborn Health Initiative (TAMANI), which builds on the experience of CARE in the region and spans from 2017-2021.

## Location

The intervention takes place in the Tabora region of central-western Tanzania, which is divided into seven administrative districts, specifically Igunga, Kaliua, Urambo, Nzega, Tabora Urban, Urambo, and Uyui. For the logistical purposes of the intervention, Nzega is being treated as two districts to reflect the two councils governing the district (Nzega Town and Nzega District (rural) Councils).

**Figure 1. Map of Tabora, Tanzania**



## Aims and hypotheses

The primary aim of the evaluation is to assess the impact of CARE's multi-component intervention on several indicators of reproductive maternal and newborn health. This analysis will evaluate the impact of two specific elements of the intervention, specifically the training of health care workers in basic and comprehensive Emergency Obstetric and Newborn Care and family planning (EmONC) and the training of community health workers (CHWs). The ultimate outcomes of interest are the maternal mortality rate and the neonatal mortality rate. However, because these outcomes are difficult to measure in Tabora region, the primary outcomes will be directly measured via household survey.

The primary hypothesis is that increased training of healthcare staff, as well as community health outreach workers (i.e., "the intervention") will: 1) increase the availability and use of maternal and newborn health services; 2) improve respectful maternal care; and 3) increase men's respect for women's health and reproductive rights.

## Study design

The study was initially planned as a stepped wedge cluster randomized trial that would phase in the interventions to clusters of two districts over four steps, until full coverage was achieved (Figure 2), with random assignment of which districts would receive the interventions at each step.(8-10) However, the last two steps were altered post-randomization to accommodate in-project changes. Therefore, the study follows a non-randomized experimental design.

**Figure 2. Conceptual design for stepped wedge trial**

	Nov/Dec 2017 (Baseline)	Jan/March 2018 (EmONC)	May/June 2018 (HHS 1)	Jul/Sep 2018 (EmONC)	Oct/December 2018 (HHS 2)	March 2019 (EmONC)	May/June 2019 (HHS 3)	June 2019 (EmONC)	February 2021 (HHS 4)
Step #1 (2 Districts)	Untreated	Treated	Treated	Treated	Treated	Treated	Treated	Treated	Treated
Step #2 (2 Districts)	Untreated	Untreated	Treated	Treated	Treated	Treated	Treated	Treated	Treated
Step #3 (2 Districts)	Untreated	Untreated	Untreated	Treated	Treated	Treated	Treated	Treated	Treated
Step #4 (2 Districts)	Untreated	Untreated	Untreated	Untreated	Treated	Treated	Treated	Treated	Treated

Note: EmONC=Emergency Obstetric and Newborn Care;  
HHS=Household Survey

Untreated

Treated

## Intervention

The overarching objective of this intervention is to address the challenges linked to (1) the decision to seek care, (2) the barriers to accessing care, and (3) the provision of the highest possible quality of care, collectively known as the “three delays”. Addressing these delays requires a complex set of changes in behaviors, attitudes, access to and use of resources, skills, and knowledge of clients and service providers. The intervention will target the supply side through improving the quality of care at health facilities, and the demand side through increasing utilization of care through community engagement activities and addressing gender barriers to accessing care by women and their families.

The health care worker training was initially designed as two sets of trainings, with basic and comprehensive EmONC provided separately. The comprehensive EmONC course was three weeks long and offered at larger health facilities, and the basic EmONC course was two weeks long and was offered to workers at smaller facilities like dispensaries. However, after the first 4 districts received the original training program, a consolidated 5-day training was implemented in the final 4 districts. This curriculum emphasized ‘hands-on’ training over lectures. According to the evaluation by the Society of Obstetricians and Gynecologists of Canada (SOGC), this training format resulted in a comparable overall performance in follow-up clinical evaluations to the BEmONC 2-week training, although slightly lower than the CEmONC 3-week training. All participants received two coaching and mentoring visits over the 12 months post-training.

Community Health Workers underwent a three-week training following the EmONC trainings, designed to increase demand for services. The curriculum included social behaviour change communication (SBCC) skills related to gender norms identified through the formative research. The CHW program covered antenatal, postpartum and newborn care, family planning, how to plan community based Maternal, Neonatal and Child Health activities, a referral system, maternal death reporting, and reporting and monitoring of community MNCH services. CHWs were provided with job aids. The aim was to train at least 1,000 CHWs and assign two for each health facility and the final number of CHWs trained was 997. Figure 3 describes the timing and location of the primary interventions, as well as when data collection waves occurred.

**Figure 3. Intervention and data collection timing**

	Nov/Dec 2017	Jan/Apr 2018	Jun/July 2018	Aug/Oct 2018	Nov/Dec 2018	Mar/Apr 2019	May/June 2019	May/June 2019	Jan/February 2021
Intervention Guide		Wave 1	HHS	Wave 2	HHS	Wave 3	HHS	Wave 4	HHS
Kaliua	Baseline	Bemonc/Cem onc & CHW	Wave 1		Wave 2		Wave 3		Wave 4
Urambo	Baseline	Bemonc/Cem onc & CHW	Wave 1		Wave 2		Wave 3		Wave 4
Nzega District (rural)	Baseline		Wave 1	Bemonc/Cem onc & CHW	Wave 2		Wave 3		Wave 4
Igunga	Baseline		Wave 1	Bemonc/Cem onc & CHW	Wave 2		Wave 3		Wave 4
Tabora	Baseline		Wave 1		Wave 2	B/Cemonc & CHW	Wave 3		Wave 4
Uyui	Baseline		Wave 1		Wave 2	B/Cemonc & CHW	Wave 3		Wave 4
Nzega Town	Baseline		Wave 1		Wave 2		Wave 3	B/Cemonc & CHW	Wave 4

Sikonge	Baseline	Wave 1	Wave 2	Wave 3	B/Cemonc & CHW	Wave 4
Note: Bemonc/Cemonc: Basic and Comprehensive Emergency Obstetric and Newborn Care given separately; B/Cemonc: Combined Basic and Comprehensive Emergency Obstetric and Newborn; CHW: Community Health Worker HHS=Household Survey					Untreated	
					Treated	

## 1.2 Household Survey

Data presented here is collected from the baseline survey conducted in November 2017 and four subsequent serial cross-sectional surveys administered at roughly 6-month intervals, corresponding with the rollout of the interventions. The household survey is adapted from the Demographic and Health Surveys as well as supplementary CARE, White Ribbon Alliance, and Johns Hopkins RADAR resources. The target population for the household survey comprises the direct beneficiaries of the interventions, including adolescent and adult women of reproductive age (15 to 49 years), as well as men of the same age groups living in the same household. A series of repeated cross-sectional surveys were carried out, with samples drawn using a cluster sampling procedure that gives each household in the population an equal chance of being included in the sample.<sup>1</sup> Households were selected using a two-stage, self-weighting sampling design.<sup>12</sup> The listing of villages within each district was obtained from the Tabora district authorities, and within each sampled village we obtained a household listing. Households within each village were assigned a unique random number generated via computer. We sampled a roughly equivalent number of households from each village until our target sample size was achieved. At baseline 1,497 women were interviewed and at endline 1,492. All eligible respondents were selected for interviews in each household.

The household questionnaire was translated from English to Swahili and administered in Swahili. Responses were electronically recorded using handheld devices with skip and quality check functions to minimize errors. Electronic data were securely backed up daily, and hard copies of the project documents are kept in a secure location. All electronic databases are anonymized.

The survey consists of the following sections and modules: (1) Household Questionnaire with an information panel, household members panel, and household assets module; (2) Men's Questionnaire with an information panel and men's information module; and (3) Women's Questionnaire including an information panel and modules on demographic information, fertility, most recent birth, antenatal care, respectful maternal care, postnatal care, family planning, and women's empowerment.

## 1.3 Analysis

The ultimate outcomes of interest for the TAMANI project are the maternal mortality rate and the neonatal mortality rate. However, because these outcomes are difficult to measure in the Tabora region and would require larger sample sizes, the primary outcomes (**Table 1**) are proximal indicators measured

via household survey, including: (1) percentage of births attended by skilled health personnel (doctors, nurses or midwives); (2) percent of women ages 15 to 49 with a live birth within the past five years who reported four or more antenatal care (ANC) visits during their most recent pregnancy; (3) percentage of women of reproductive age who are using (or whose partner is using) a contraceptive method at a given point in time; (4) percentage of women who feel confident to go to a health facility even if their partner objects (autonomy in healthcare decision-making); and (5) percentage of childbearing adolescents (women ages 15-19) who are pregnant or already mothers. The distributions of variables were presented as frequencies with percentages. The definition of our primary outcomes followed the methodology adapted from the 2015-16 Tanzania Demographic and Health Survey.<sup>3</sup>

Women’s self-reported experiences during their last birth in a health facility was assessed as part of the Respectful Maternal Care (RMC) module. The RMC module included questions on whether women were allowed to move around during labour, choose their birthing position and their birthing partner, were treated with respect and listened to. Secondary outcomes will also be assessed among men, specifically: perceptions of women’s health and reproductive rights, including whether a woman is justified in refusing to have sex with her husband or partner in various situations (e.g., if she knows he has sex with other women, if she is tired or not in the mood); whether a woman has the right to go to the health facility without her husband’s permission; and whether a woman can use family planning without her husband’s permission.

**Table 1. Primary and secondary study outcomes from Household Survey**

Measure	Indicator
Primary outcomes	
Availability of maternal and newborn health services	% of deliveries assisted by a skilled birth attendant among women who have given birth in the last five years
Increased utilization of maternal and newborn health services	% of women 15 - 49 with a live birth attending ANC 4 or more times
	Contraceptive Prevalence Rate (% of women currently using, or whose sexual partner is currently using, at least one method of contraception, regardless of the method used).
	Unmet need for family planning (% of women who had a mistimed pregnancy, or need for family planning that were not using a method of contraception)
	Autonomy in making healthcare decisions (% of women who agreed that they should be able to go to a health facility even if their partner objects).
Adolescent birth rate	% of childbearing adolescents (women ages 15-19) become mothers for the first time
Secondary outcomes	

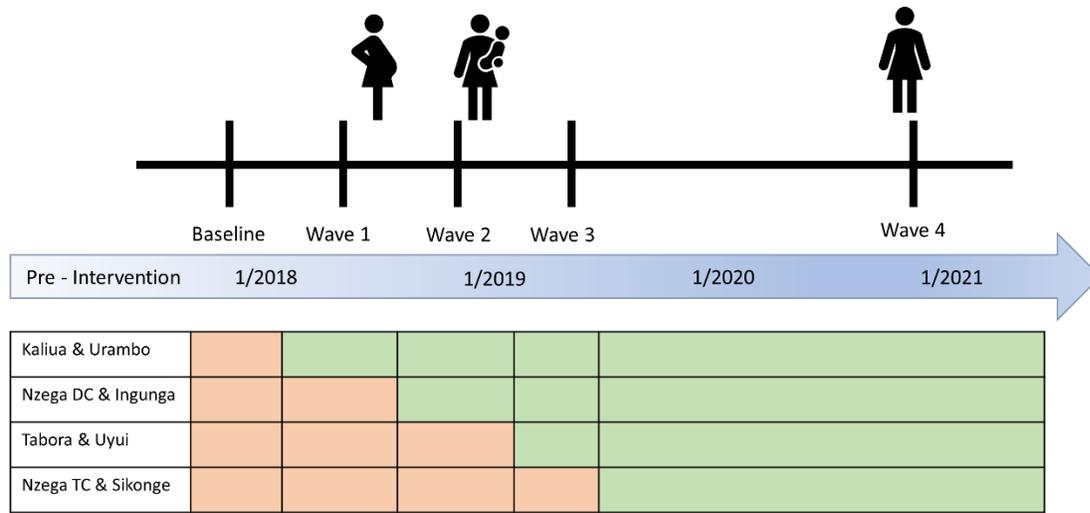
Respectful Maternal Care	<p>Whether women's beliefs, independence, emotions, dignity, privacy and preferences were respected during their most recent childbirth in a health facility, such as:</p> <ul style="list-style-type: none"> <li>· Option to choose preferred birthing position</li> <li>· Allowed to move around while in labour</li> <li>· Told everything about the care being received</li> <li>· Given time to ask questions and voice opinions</li> <li>· Confidence in health facility and HCWs keeping information private</li> <li>· Not treated with respect/insulted/physically hurt or coerced into something didn't want to do</li> <li>· Allowed to have a birth companion</li> <li>· Allowed to choose who the birth companion is</li> </ul>
Perceptions of women's health and reproductive rights	<p>Whether a woman has the right to go to the health facility without her husband's permission</p> <p>Whether a woman can use family planning without her husband's permission</p>

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*Who is considered "treated":* For this analysis, who is considered treated depends on where they lived, the time at which the outcome occurred, and whether the district had received the intervention or not at the time the outcome occurred. For outcomes that were captured at the time of data collection (immediate outcomes), an individual was considered treated if the district in which they lived had received the intervention at the time of data collection. These outcomes included: the unmet need for family planning, contraceptive prevalence rate, adolescent first pregnancies, women's autonomy in healthcare decision-making, and men's support for women's reproductive and health rights. For outcomes related to delivery (e.g., skilled birth attendance), an individual was considered treated if the delivery occurred *after* the district received the intervention. Delivery related outcomes included whether a delivery was attended by a skilled birth attendant, and respectful maternal care. For outcomes related to pregnancy, an individual was considered treated if the entire pregnancy occurred *after* the district received the intervention.

Pregnancy related outcomes included the percentage of women receiving 4 or more antenatal care visits. Because women were asked about pregnancies up to five years before data collection, a woman might have been living in a district that had received the intervention at the time of data collection, but her pregnancy and delivery occurred before the intervention. She would therefore be considered "treated" for immediate outcomes, and "untreated" for pregnancy and delivery outcomes. (See Figure 4 For delivery and pregnancy related outcomes, we assumed that women did not move districts since the last birth. This way of measuring time is slightly different from the endline report, in which all outcomes are reported for the time of data collection.

**Figure 4. Who is “treated”**



Note: A woman living in Tabora could answer questions at wave 4 (January 2021). For immediate outcomes (contraceptive prevalence, unmet need for family planning and autonomy), she is considered “treated”. The SAME woman reports on a child that was born in January 2019, before the intervention was implemented, so for delivery outcomes (skilled birth attendance and respectful maternity care), she is considered “untreated”. Similarly, her pregnancy began in the spring of 2018, so pregnancy outcomes (antenatal care visits) are considered “untreated”.

### Statistical Analysis

*Sociodemographic Information:* In this report we provide a descriptive analysis of the household survey data and use information on the differential timing of TAMANI interventions implemented across the eight Tabora districts to evaluate their impact on outcomes of interest. We calculate and present descriptive statistics for various socio-demographic characteristics in two ways. First, to provide an overall sense of how the population changed over time, we show distributions of socio-demographics measured at baseline, when no districts had received the intervention, and at endline, by which time all districts had been exposed to the intervention. These comparisons are useful for understanding broadly how the population changed over the course of the study, but do not provide us with a way to estimate the impact of the intervention, since factors other than the intervention may also have been changing between baseline and endline.

Second, we show the distribution of characteristics in the population according to treatment status. That is, we compare the distribution of socio-demographic characteristics during “Treated” time when communities were exposed to the intervention, as well as “Untreated” time when they were not. Analyses were conducted using Stata SE 15.

### Outcomes:

For each indicator, we provided a figure showing the unadjusted outcome for each district in each time wave. For example, the percentage of births that were attended by a skilled birth attendant in each district at each wave of data collection.

To assess the impact of the intervention, we used mixed effects regression models to control for differences between district and time effects. The modeling strategy provides an overall estimate of the

impact of the intervention, adjusting for differences that might be attributable to variation between the various districts, and for any secular trends across time. Absolute and relative estimates of the overall impact of the intervention are presented as marginal risk ratios and risk differences. These estimates are provided for each outcome, and in a summary table at the end. This modeling strategy allowed us to estimate the impact of the healthcare worker trainings, as well as the community health worker trainings, as these were rolled out at different times in different districts. It did not, however, allow us to estimate the impact of the other parts of the intervention, which were rolled out at the same time across the districts, and become indistinguishable from general time trends. The impact analysis differs from a “pre-post” analysis in the following ways. First, it accounts for differences at the district level. For example, instead of averaging all of the outcomes across all of the districts, it groups responses together by district, so that the effect of living in a particular district on an outcome is taken into account. Second, it accounts for effects of time that are unrelated to the intervention. This is crucial for a study like this where the intervention is delivered to different districts over time. So, for example, if we saw a general increase in the contraceptive prevalence rate over time, regardless of when the intervention started, a “pre and post” comparison would show an increase, but the impact analysis would not. This means that an impact analysis will differ from a baseline and endline report by taking into account effects associated with districts, and with general time trends.

## 2 Socio-Demographic Characteristics

Socio-demographic characteristics are shown in **Table 2**. A similar number of women were interviewed at baseline and endline (1,497 vs 1,492), although slightly fewer adolescent women (15-19 years) were interviewed at endline (19.9% at baseline vs 16.4% at endline). In addition, the endline sample included a lower proportion of adolescent girls who were married or living with a man as if married. Almost 39% of baseline adolescent girls were married compared to 32.7% of those interviewed at endline.

A slightly higher percentage of women reported having already given birth at the endline vs baseline survey (82.9% vs 86.1%), with the average number of children per woman similar between the two waves (3.8 at baseline vs 3.7 at endline).

Levels of educational attainment and literacy were similarly distributed among women at baseline and endline.

Among the 782 and 715 male respondents to the household survey at baseline and endline, respectively, the percentages of married adults were similar. However, the percentage of male adolescents who reported being married varied substantially between the two waves (21.7% at baseline vs 4.8% at the final wave). This might reflect the small sample sizes since 19.4% of interviewed males were adolescents at baseline compared to 17.6% at endline.

Heads of households reported similar distributions of characteristics (religion, ethnicity) and household assets (land and livestock ownership) across both survey waves.

**Table 2. Socio-demographic characteristics**

	Baseline	Endline
<b>Women</b>		
Total women respondents (n)	1497	1492
Adolescents, % (n)	19.9% (298/1497)	16.4% (245/1492)
Married women, % (n)	74.7% (1118/1497)	73.5% (1097/1492)
Adolescents, % (n)	38.9% (116/298)	32.7% (80/245)
Any schooling, % (n)	80.4% (1203/1497)	82% (1224/1492)
Highest level completed		
Less than Primary School	18.6% (224)	15.4% (188)
Primary School	63.5% (764)	63.6% (779)
Some Secondary School	7.4% (89)	8.9% (109)
Secondary School 1st cycle	8.1% (97)	11% (135)
More than Secondary 1st cycle	2.4% (29)	1.1% (13)
Literacy, % (n)		
Cannot read	23% (345)	18.6% (277)
Not well	10.4% (156)	9.6% (143)
Well	51.1% (765)	52.2% (779)
Very well	15.4% (230)	19.6% (293)
Blind/Impaired	0.1% (1)	0% (0)
Ever given birth	82.9% (1241/1497)	86.1% (1285/1492)
<b>Households</b>		
Religion of head of household, % (n)		
Christianity	52.4% (785)	48.0% (716)
Islam	34.7% (519)	37.9% (566)
Other	0.5% (8)	0.2% (3)
No religion	12.4% (185)	13.9% (207)
Ethnic group of head of household, % (n)		

Nyamwezi	30.1% (450)	31.5% (470)
Sukuma	36.1% (540)	34.9% (521)
Waha	0% (0)	10.8% (161)
Other	33.9% (507)	22.8% (340)
Households owning livestock, % (n)	64.7% (969/1497)	61.7% (921/1492)
Households owning agricultural land, % (n)	69.9% (1046/1497)	71.3% (1064/1492)
<b>Men</b>		
Total men respondents (n)	782	715
Adolescents, % (n)	19.4% (152/782)	17.6% (126/715)
Married men, % (n)	76.1% (595/782)	73.6% (526/715)
Adolescents, % (n)	21.7% (33/152)	4.8% (6/126)

## 2.2 Covariate Balance by Treatment

Estimating the impact of the intervention on outcomes without bias relies on making sure that it is a ‘fair’ comparison between the study period during the intervention vs. the period without the intervention. Since the initial order of when each district would be treated was random, we should expect demographic characteristics during “Treated” vs. “Untreated” time to be similar. However, as noted above this initial random ordering was altered to accommodate in-project changes, so some imbalances could have resulted. The table below shows how the treated and untreated time compares with respect to the socio-demographic characteristics given in the previous table. Importantly, because the “Untreated” period generally occurred earlier in time (i.e., before any interventions were implemented) and the “Treated” period was later in time, these numbers are corrected for any general secular trends in covariates. For example, in the first row we show that, after accounting for any general secular trends in age in the population, the proportion of adolescents in the sample during “Treated” time was similar (20%) to the proportion during “Untreated” time (18%). Comparisons of marriage rates were also similar between treated and untreated time. Generally speaking, the proportions of most socio-demographic variables are similar when comparing treated vs. untreated time, though there are a few notable differences. The distribution of education appears to be shifted slightly upward (i.e., higher levels of education) for the “Untreated” period relative to the “Treated” period. The distribution of religion and ethnic group also suggest some differences between treated and untreated time, though differences are mostly estimated imprecisely.

**Table 3. Covariate distribution by treatment status**

	Treated		Untreated		Difference	
	Mean	SE	Mean	SE	Mean	SE
<hr/>						

Age						
15-19 years	20.2%	(1.1)	18.4%	(0.7)	1.8%	(1.4)
20-29 years	39.0%	(1.3)	42.9%	(1.4)	-3.9%	(1.8)
30-49 years	40.9%	(1.3)	38.8%	(1.4)	2.1%	(2.2)
Married						
Married	24.7%	(1.6)	25.2%	(1.7)	-0.5%	(1.9)
Married adolescents	56.5%	(2.8)	57.9%	(4.9)	-1.4%	(5.5)
Any schooling						
Any schooling	74.7%	(1.8)	83.8%	(2.8)	-9.1%	(2.4)
Less than primary	22.2%	(2.3)	15.3%	(1.5)	6.9%	(2.5)
Completed primary	63.6%	(1.7)	61.4%	(2.9)	2.2%	(3.0)
Beyond primary	14.9%	(1.4)	24.5%	(4.2)	-9.6%	(3.4)
Literacy						
Cannot read or not well	38.7%	(2.2)	27.0%	(3.2)	11.7%	(2.8)
Reads well or very well	61.3%	(2.2)	73.0%	(3.2)	-11.7%	(2.8)
Ever given birth	83.6%	(0.8)	84.9%	(0.9)	-1.3%	(1.1)
Religion						
Christian	55.9%	(8.1)	39.8%	(4.8)	16.2%	(9.1)
Islam	24.4%	(6.8)	48.1%	(7.4)	-23.8%	(6.5)
Other religion	20.6%	(7.8)	13.6%	(6.3)	7.0%	(6.8)
Ethnic group						
Nyamwezi	20.7%	(6.0)	42.9%	(7.6)	-22.2%	(7.8)
Sukuma	45.6%	(9.4)	30.8%	(8.6)	14.8%	(9.0)
Waha	10.0%	(4.2)	5.9%	(3.3)	4.1%	(4.3)
Other	26.4%	(8.0)	23.2%	(4.0)	3.2%	(7.7)
Owens livestock	69.9%	(4.2)	60.5%	(9.8)	9.5%	(8.3)
Owens agricultural land	74.2%	(3.2)	64.6%	(10.3)	9.5%	(9.5)

Note: Marginal predicted probabilities after logistic regression adjusting for survey wave.

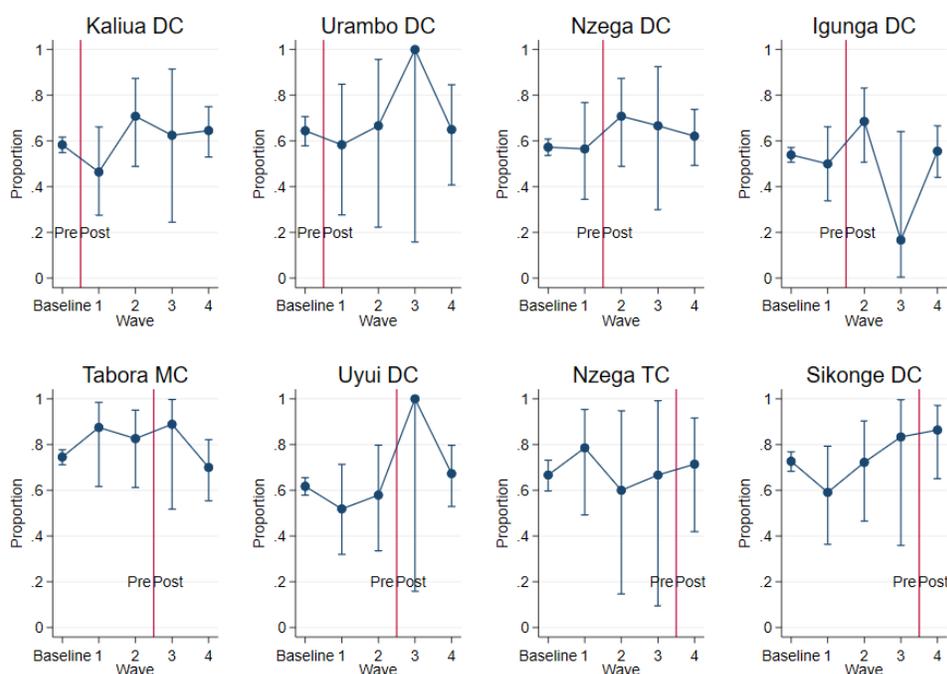
### 3 Results for Key Indicators

#### 3.1 Women Attending Antenatal Care Four Or More Times

This indicator refers to women ages 15-49 who attended antenatal care services at a health facility four or more times during their most recent live birth. Based on an estimated time that the pregnancy began, women's pregnancies were considered exposed to the intervention (i.e., "treated") if the entire pregnancy occurred in a district that had received the Emergency Obstetric and Newborn Care training and the Community Health Worker Training. Figure 5 describes the proportion of women receiving 4 or more ANC visits by district at each wave of data collection. Due to the low number of pregnancies during some waves of time, the district-specific confidence intervals are very wide. The percentage of women receiving 4 or more ANC visits appears to modestly increase in some districts over time, but there is a lot of variability between districts and a lack of precision. The results based on the random effects model

(which accounts for time trends and district effects) show an adjusted estimate of 63.8% (95% CI: 46.7%, 81.1%) of pregnancies receiving 4 or more ANC visits before the intervention and 65.2% (95%CI: 47.4, 83.0%) after the intervention. This corresponds to an estimated risk ratio of 1.02 (0.91, 1.12) or a increase of 1.3 percentage points (95% CI: -5.3, 7.9). Overall, these results demonstrate little evidence that the intervention affected whether a woman had 4 or more ANC visits.

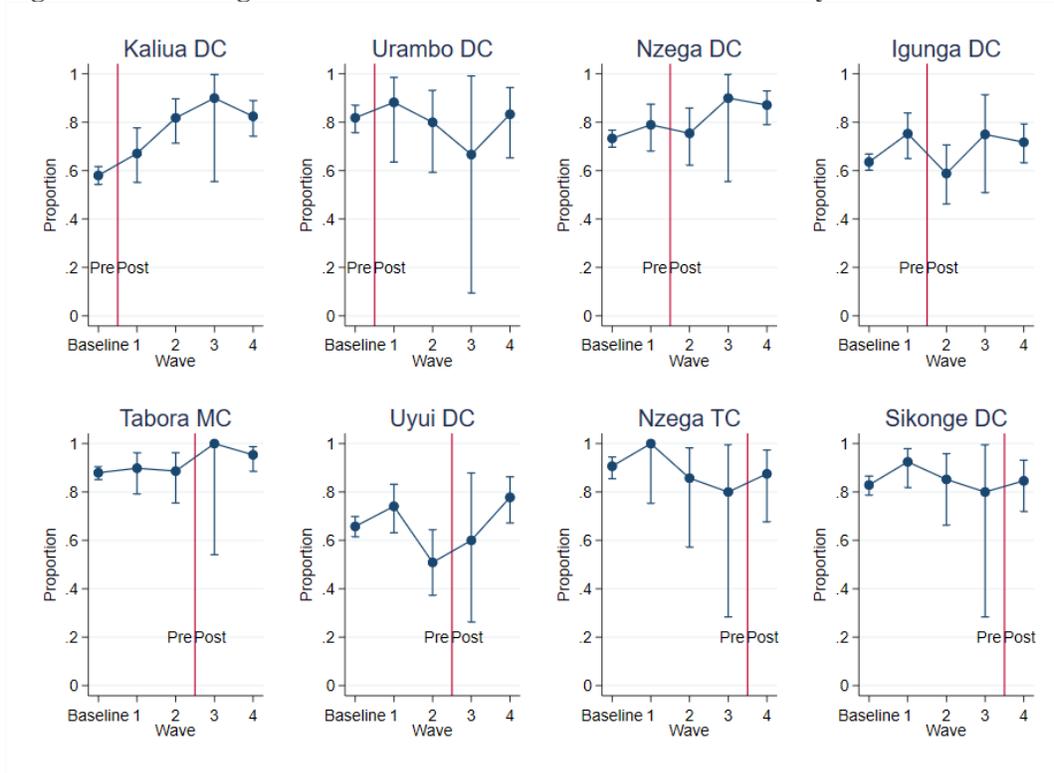
**Figure 5: Percentage of women receiving 4 or more ANC visits by district**



### 3.2 Deliveries Assisted by Skilled Birth Attendant

Figure 6 shows district-level trends in the percentage of deliveries assisted by a skilled birth attendant, before and after the intervention. In smaller districts, or during shorter data collection waves (i.e. in wave 3) there were sometimes very few deliveries during a given wave or district, which resulted in imprecise estimates. While there does appear to be an increase over time in some districts (i.e. Kaliua), this is not consistent for all districts, and the within-district measurements lack precision. The estimates from the random effects model show that adjusted estimate for delivering with a skilled birth attendant was 76.3% (95% CI: 49.5, 100%) before the intervention and 80.9% (95%CI: 53.3, 100%) after the intervention. Comparing these two estimates suggests that the intervention increased the prevalence of delivery assisted by a skilled birth attendant by 4.5 percentage points (95% CI: -0.01, 10.0), corresponding to a 6% increase (-0.1%, 13.0%).

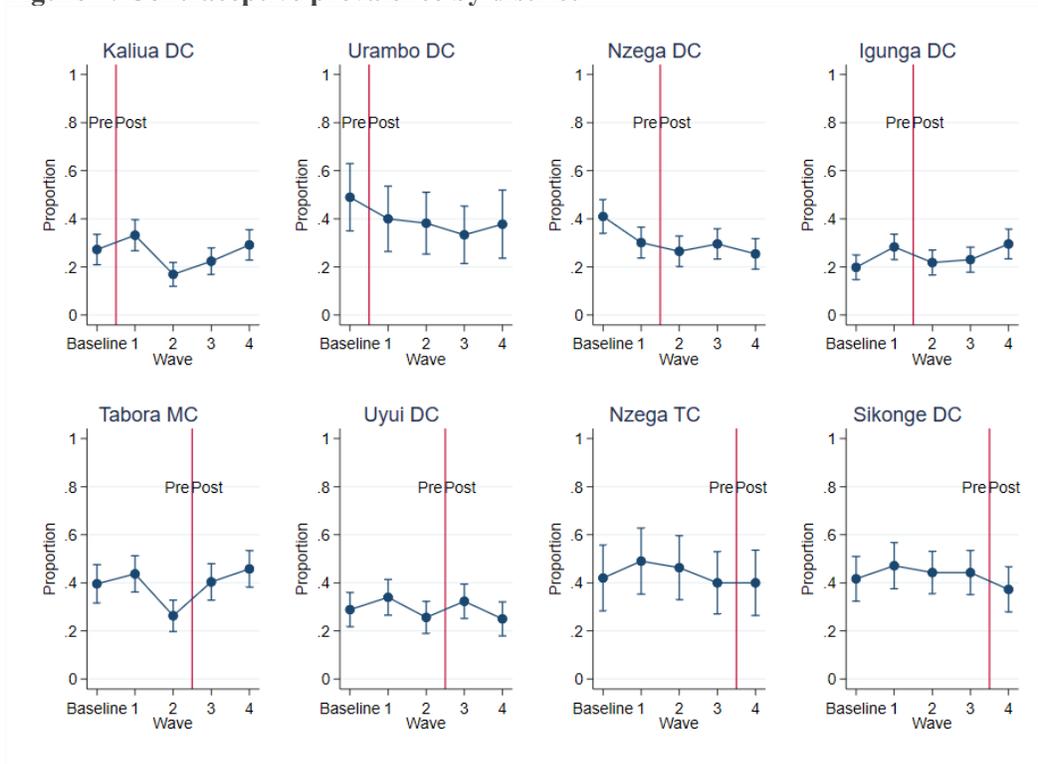
**Figure 6: Percentage of deliveries with a skilled birth attendant by district**



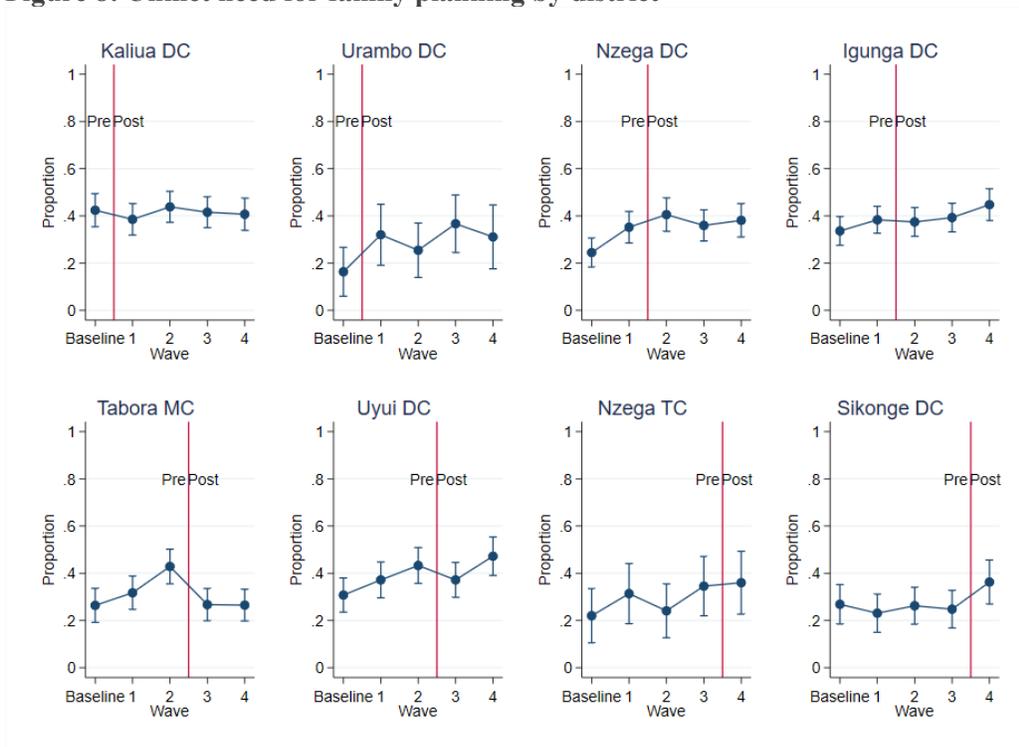
### 3.3 Contraceptive Prevalence Rate and unmet need for family planning

Contraceptive prevalence was measured by the percentage of married women using any method of contraception or family planning. Contraceptive prevalence over time and by district can be seen in Figure 7. The prevalence appears to increase over time in some districts but decrease over time in others. The adjusted estimated prevalence across the districts remained the same across treated and untreated time at 34.1% with an estimated risk ratio of 1.00 (95%CI: 0.84, 1.16) and marginal effect of 0.00 (95%CI: -0.01, 0.01). The unmet need for family planning can be seen in Figure 8. This was measured as the women who (1) were not pregnant and not postpartum amenorrhoeic and wanted to postpone their next birth for 2 or more years or stop childbearing altogether, but were not using a contraceptive method, or (2) had a mistimed or unwanted current pregnancy, or (3) were postpartum amenorrhoeic and their last birth in the last 2 years was mistimed or unwanted. This also remained essentially unchanged after accounting for district and time effects, with an estimated 35.0% (95%CI:24.8, 45.2%) unmet need in untreated time, and a 33.3% (95%CI:23.9, 42.7%) in treated time.

**Figure 7: Contraceptive prevalence by district**



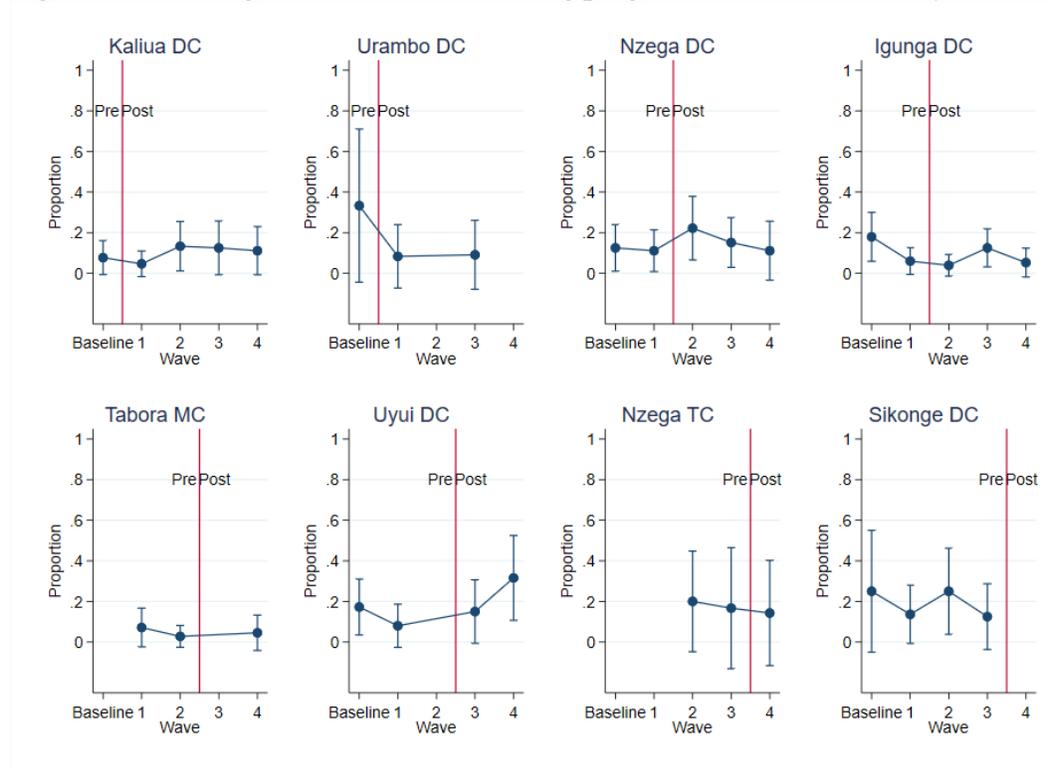
**Figure 8: Unmet need for family planning by district**



### 3.4 Adolescent Pregnancy

Adolescent pregnancy was measured as the percentage of adolescents who became pregnant for the first time at any given wave of data collection. Although the percentage of adolescents who were pregnant or already mothers at any given wave of data collection was approximately 40%, only a small proportion became pregnant for the first time during the course of the intervention. This can be seen in Figure 9, which shows first time adolescent pregnancies by wave and district. Note that some waves are blank because no adolescents surveyed became newly pregnant during that wave. The random effects model adjusted estimated for first time adolescent pregnancy was 10.2% (6.3, 14.0) during untreated time and 9.9% (95%CI: 4.9, 14.8%) during treated time. This corresponds to a risk ratio of 0.97 (95%CI: 0.32, 1.62) or a marginal risk difference of 0.3 percentage points (95%CI:-7.0, 6.4). These results suggest that the first time adolescent pregnancy rate remained essentially unchanged over the course of the intervention.

Figure 9: Percentage of adolescents becoming pregnant for the first time by district



### 3.5 Respectful Maternal Care

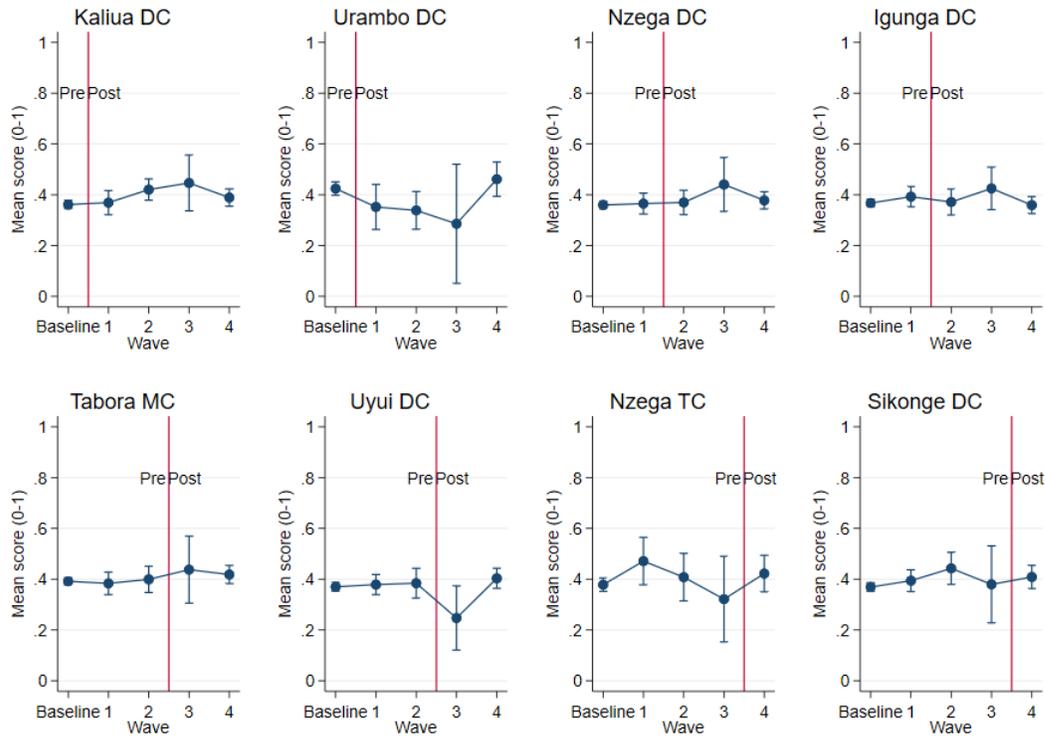
Women were interviewed about their experiences delivering their most recent child. An index was created from the eight questions about respectful maternal care, resulting in a summary score from 0-1 with higher levels indicating higher levels of respect. The breakdown of the components of the score in treated and untreated time can be seen in Table 4. The index overall (Figure 10) remains relatively stable over time in each of the districts, but the breakdown of indicators shows that while respectful maternal care increased in some areas (confidence in healthcare workers respecting privacy and being allowed to choose

a birth companion), it decreased in others (being able to move around and ask questions). After accounting for district and secular time, the average score was virtually unchanged from 0.38 in untreated time and 0.37 in treated time.

**Table 4: Respectful maternal care**

Respectful Maternal Care	Untreated time		Treated Time	
Option to choose preferred birthing position	6.9%	(226/3262)	6.3%	(49/779)
Allowed to move around while in labour	52.9%	(1728/3267)	46.0%	(359/781)
Told everything about the care being received	20.4%	(668/3281)	18.9%	(148/782)
Given the time to ask questions and voice opinions	7.1%	(231/3276)	4.6%	(36/782)
Did you have confidence in the health facility and HCW keeping information private?	68.9%	(2267/3289)	78.8%	(616/782)
Treated with respect and not insulted/physically hurt or coerced into something you didn't want to do	89.9%	(2957/3289)	92.5%	(723/782)
Allowed a birth companion?	16.4%	(540/3288)	24.2%	(189/781)
Allowed to choose who the birth companion is	55.0%	(297/540)	60.8%	(115/189)

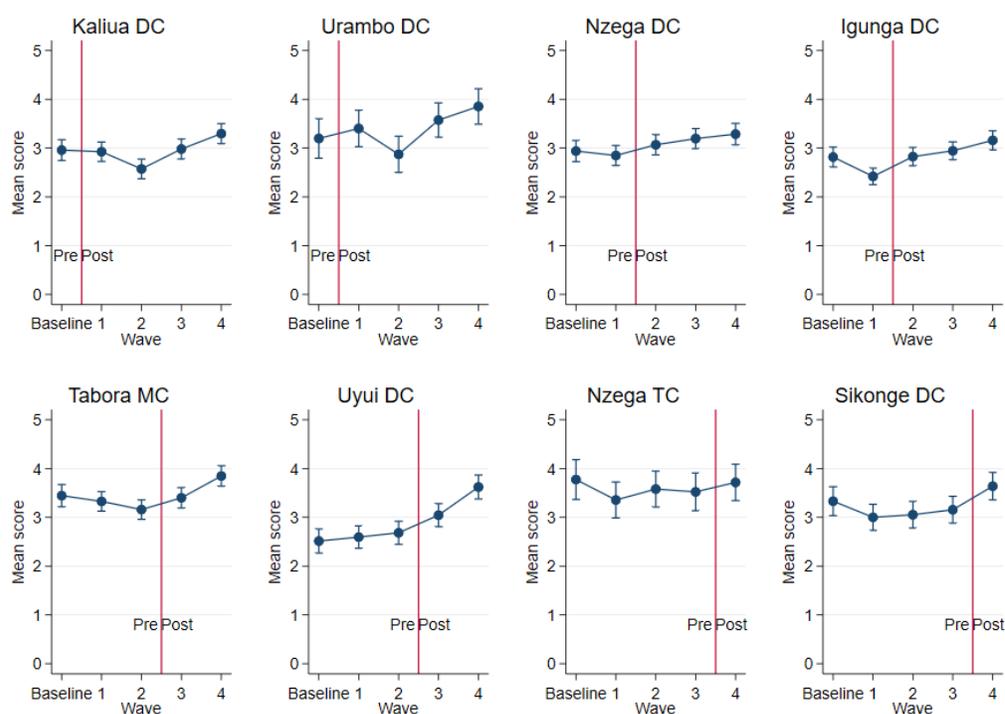
**Figure 10: Respectful maternal care index by district**



### 3.6 Women’s Autonomy in Healthcare Decision-Making

Women’s autonomy in healthcare decision-making was measured using one question about whether a woman agreed that she should be able to visit a health facility without her husband’s permission. This was answered on a five-point Likert scale with higher scores corresponding to more agreement (“Strongly disagree”, “Disagree”, “Neutral”, “Agree”, “Strongly Agree”). This question was asked twice in the survey, and these results reflect the responses from the women’s empowerment module. These responses are very similar to a similar question in the family planning module about a women’s level of confidence in going to a health facility if her husband objected. Across all districts, there appears to be a general increase over time (Figure 11). After accounting for district and secular time effects, the average score was 3.05 in untreated time and 3.23 in treated time. By breaking down each response category (Table 5), it is possible to see that most of the change in the average score was due to movement on the lower end of the scale. In other words, in untreated time, women were more likely to choose a “strongly disagree” response, and in treated time, they were more likely to select the “disagree” response. Specifically, after accounting for differences by region and secular trends over time, 32.6% of women selected strongly disagree before treatment, while only 27.0% chose this response after treatment; 13.6% chose “disagree” in untreated time compared to 16.7% after the intervention.

**Figure 11 Women endorsing opinion of autonomy regarding decisions to visit a health facility**



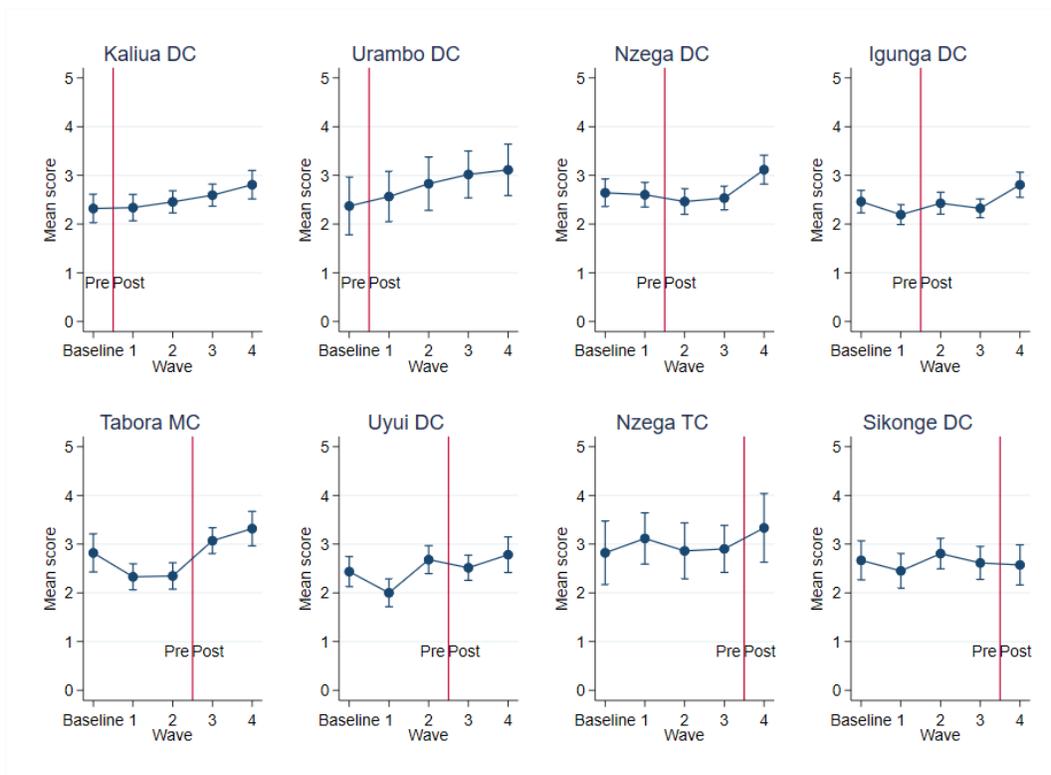
**Table 5: Women's Autonomy by response category**

Strongly Disagree	Untreated	0.326	(0.274, 0.378)	Risk ratio	0.828	(0.727, 0.929)
	Treated	0.270	(0.223, 0.317)	Risk diff	-0.056	(-0.092, -0.020)
Disagree	Untreated	0.136	(0.120, 0.152)	Risk ratio	1.249	(1.041, 1.456)
	Treated	0.169	(0.150, 0.189)	Risk diff	0.034	(0.008, 0.059)
Neutral	Untreated	0.030	(0.022, 0.037)	Risk ratio	1.022	(0.623, 1.420)
	Treated	0.030	(0.023, 0.037)	Risk diff	0.001	(-0.011, 0.012)
Agree	Untreated	0.158	(0.140, 0.177)	Risk ratio	1.119	(0.948, 1.289)
	Treated	0.177	(0.158, 0.196)	Risk diff	0.019	(-0.007, 0.044)
Strongly Agree	Untreated	0.350	(0.318, 0.383)	Risk ratio	1.008	(0.910, 1.106)
	Treated	0.353	(0.325, 0.381)	Risk diff	0.003	(-0.031, 0.037)

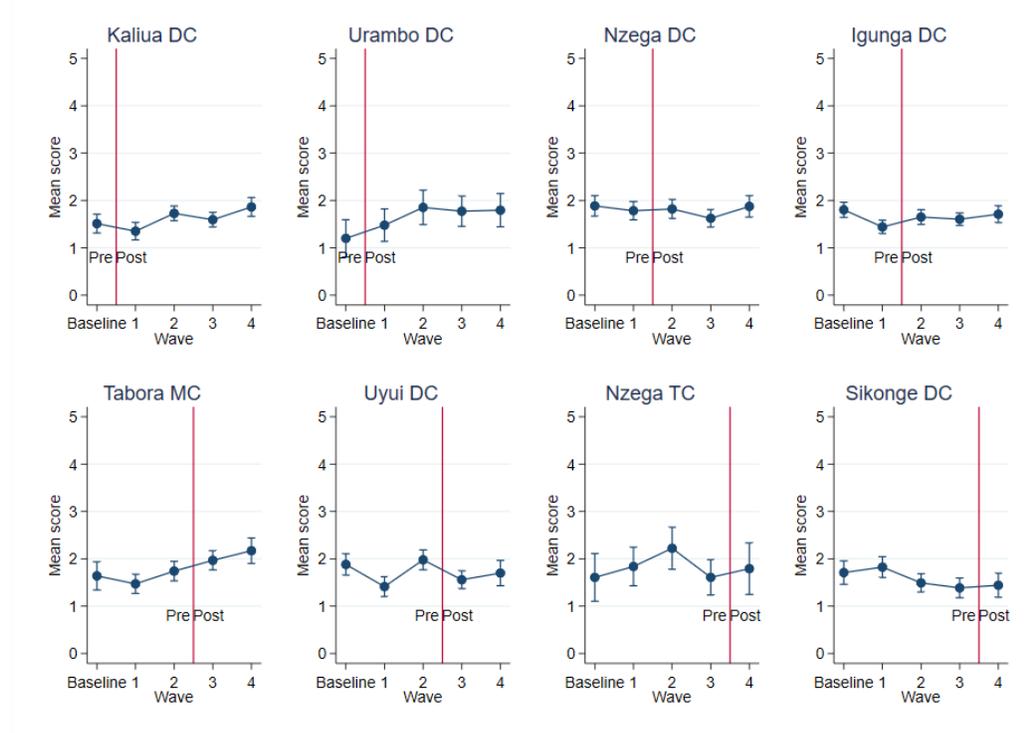
### 3.7 Men's support for women's reproductive and health rights

Men's support for women's rights were measured using their responses to statements about whether they agreed that a woman could go to a health facility without her husband's permission or use family planning without her husband's permission. Responses were given on a five-point scale with higher scores indicating higher levels of agreement. After accounting for time and district effects, men's scores remained very similar during treated and untreated time.

Figure 12: Men's endorsement of women's rights: permission to visit a health facility



**Figure 13: Men’s endorsement of women’s rights: permission to use family planning**



### 3.8 Summary of outcome indicators

Figure 13 contains the adjusted outcomes for each indicator in treated and untreated time. Table 6 contains a summary of the random effects models for each of the outcomes. For each outcome, there is an estimate of the marginal probability of the outcome in treated and untreated time accompanied by an estimate of the relative and absolute differences in the estimates.

**Table 6: Summary of adjusted outcomes for all indicators with relative and absolute differences**

		Marginal estimate	95% CI			95% CI
4 or more antenatal visits	Untreated	0.639	(0.467, 0.811)	Risk ratio	1.021	(0.917, 1.125)
	Treated	0.652	(0.474, 0.830)	Risk difference	0.013	(-0.053, 0.079)
Skilled birth attendant	Untreated	0.764	(0.495, 1.032)	Risk ratio	1.059	(0.991, 1.128)
	Treated	0.809	(0.533, 1.085)	Risk difference	0.045	(-0.005, 0.096)
Contraceptive prevalence rate	Untreated	0.341	(0.274, 0.408)	Risk ratio	1.001	(0.841, 1.161)
	Treated	0.341	(0.290, 0.393)	Risk difference	0.000	(-0.054, 0.055)
Unmet need for family planning	Untreated	0.350	(0.248, 0.452)	Risk ratio	0.951	(0.727, 1.175)
	Treated	0.333	(0.239, 0.427)	Risk difference	-0.017	(-0.098, 0.064)
Adolescent pregnancy	Untreated	0.102	(0.063, 0.140)	Risk ratio	0.970	(0.320, 1.621)
	Treated	0.099	(0.049, 0.148)	Risk difference	-0.003	(-0.070, 0.064)
RMC index	Untreated	0.383	(0.370, 0.395)	% change	-0.036	(-0.105, 0.032)
	Treated	0.369	(0.348, 0.390)	Risk difference	-0.014	(-0.040, 0.013)

Autonomy in Decision making	Untreated	3.065	(2.813, 3.317)	% change	0.054	(0.007, 0.101)
	Treated	3.230	(3.063, 3.398)	Risk difference	0.165	(0.031, 0.299)
Men's perception: health facility	Untreated	2.619	(2.470, 2.767)	% change	-0.006	(-0.099, 0.087)
	Treated	2.602	(2.419, 2.785)	Risk difference	-0.017	(-0.260, 0.227)
Men's perception: family planning	Untreated	1.690	(1.569, 1.811)	% change	-0.006	(-0.116, 0.105)
	Treated	1.681	(1.574, 1.787)	Risk difference	-0.010	(-0.197, 0.178)

**Figure 13: Adjusted outcomes for each indicator**

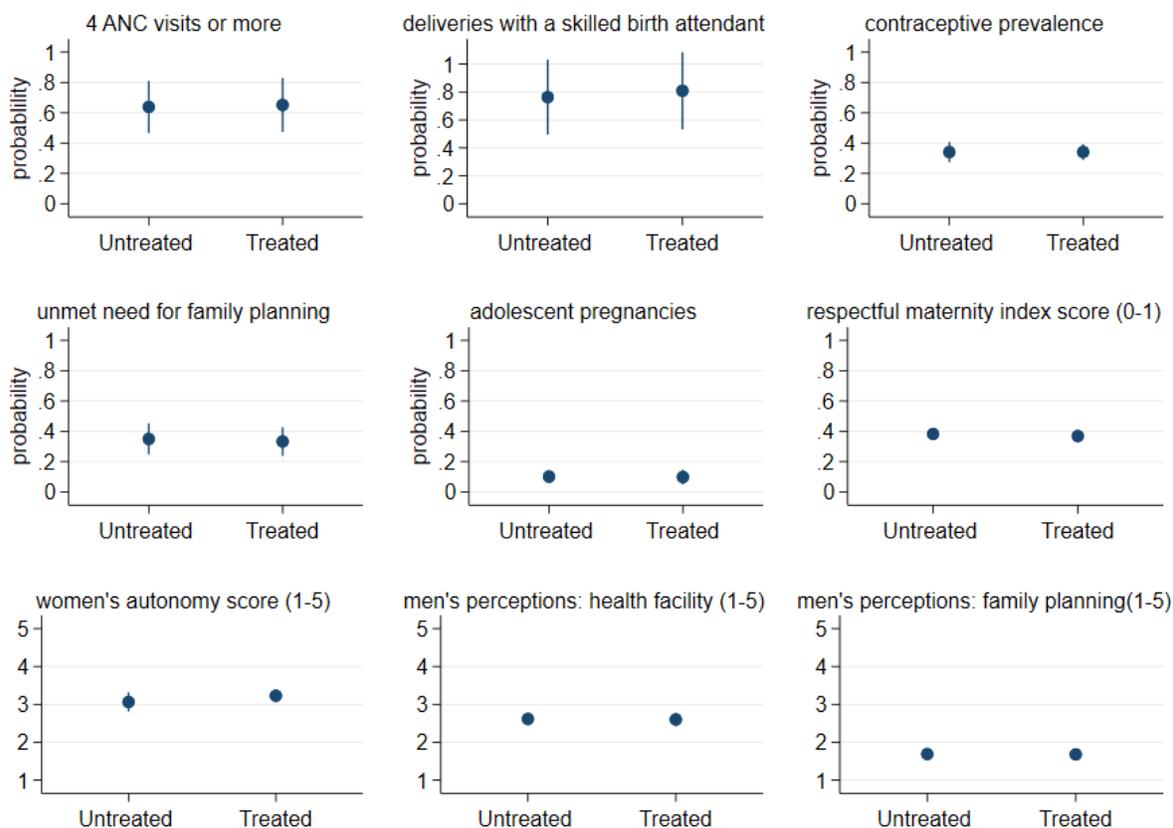


Figure shows marginal predicted probabilities of each outcome in untreated and treated time from mixed effects models. All outcomes are adjusted for district and secular time.

## 4 Discussion

Overall, there was little change in most of the outcome indicators after adjustment for district effects and secular time. These estimates reflect the impact of the Basic and Comprehensive EMOC trainings, as well as the Community Health Worker trainings. The estimates do not capture possible changes due to other parts of the project, such as purchase of ambulances or upgrading facilities, that were rolled out at the same time across the entire region. There was evidence of an increase in women's autonomy in decision-making. Women reported their own feelings of autonomy in decision-making 5.4% higher after the intervention, accounting for differences in districts and secular time. For skilled birth attendance, there

was modest evidence of an increase from 76.4% in untreated time to 80.1% in treated time. This measure lacked precision and there was considerable variation between districts and over time. Each indicator is discussed in detail below.

Regarding ANC and deliveries with a skilled attendant, the trends over time appear to show a modest increase, but there was a lack of precision in estimates due to low numbers of deliveries and pregnancies in some waves. Kaliua showed the most consistent increase in deliveries with a skilled attendant, but this was not evident in other districts. Across all districts and accounting for secular time, the estimated increase in the percentage of deliveries by a skilled attendant was 4.5% (95%CI: -0.1, 9.6%).

There was very little change in contraceptive prevalence or unmet need for family planning. This may have been impacted by the former Tanzanian President's strong anti-contraception stance which could have swayed public opinion.(11-13)

Adolescent first pregnancies remained largely unchanged, though this indicator was challenging for several reasons. There were only 95 adolescents who became pregnant for the first time during the study period. While overall 652 adolescents became pregnant or were already mothers, a large portion of these pregnancies occurred before the study began, which led us to examine first pregnancies as a better indicator of this outcome. However, low numbers of first-time pregnancies among adolescents limited our ability to measure the impact of the intervention on this outcome with precision.

Respectful maternal care overall remained stable, but this was due to different components of the indicator moving in different directions. For example, the proportion of women who said they were allowed a birth companion was 16.4% in untreated time, but 24.2% during treated time. Similarly, the proportion of women who said they were confident in the healthcare workers keeping their information private increased from 68.9% in untreated time to 78.8% in treated time. However, the ability to choose a birth position or ask questions decreased. The RMC questions were only asked of women who delivered at a facility, and cannot be compared to how respected women felt if they delivered at home. The proportion of women delivering in a health facility increased over the course of the intervention from 70.1% at baseline, and 81.6% at the end of the intervention.

Women's autonomy in decision-making increased over the course of the intervention. The increase was relatively small: a 0.17 point increase (95%CI: 0.03, 0.30), or a 5.4% percent increase (95%CI 1.0, 10.1%) and captured by a single indicator. Most of that increase is attributable to fewer "strongly disagree" responses, which may suggest that there is still an opportunity to increase women's sense of autonomy, but this change can potentially be seen as an initial step in moving away from more extreme opinions.

Men's support for women's health and rights remained virtually unchanged after the intervention. While there was generally higher support for a woman's right to visit a health facility without her husband's permission, there was little support for a woman using family planning without her husband's permission.

## 4.1 Complementary Reports

Descriptive and qualitative reports evaluating the TAMANI intervention generally show larger changes than this impact evaluation, possibly because elements of the program that were implemented at approximately the same time across all districts (like facility upgrades) or other trends taking place across all of Tabora contributed to a greater degree.

In the descriptive study produced by the team at McGill comparing results of the baseline and endline surveys, the proportion of women receiving four or more antenatal care visits increased more, at 12.4%, than when comparing treated and untreated time for the EMONC training and CHW interventions.(14) The most common number of antenatal visits for pregnant women also increased according to data gathered directly by health facilities, although this would exclude women who never visited a facility for ANC care or delivery.(15) Qualitative interviews suggest that men are accompanying their partners to antenatal checkups more often, but that remaining deterrents are fear of judgement from health workers, distance from the facility and being too occupied with household chores.(16) Deliveries attended by a skilled birth attendant (SBA) also rose about 12% across Tabora, according to the descriptive report. Respondents to the qualitative study agree that more women are delivering at facilities after the TAMANI interventions, although some had the false impression that delivering at home had been made illegal.

In agreement with this impact evaluation, complementary reports find little evidence of any change in contraceptive prevalence among either married women or men, although some respondents to the qualitative interviews believed that contraceptive use had become more common for both youth and adults. Similarly, evidence from the descriptive report also shows little change in the rate of adolescent pregnancy. The health facilities surveys also show mixed success in upgrading confidentiality and accessibility for adolescent-friendly sexual and reproductive health services.

Indicators of Respectful Maternal Care followed the same pattern between the descriptive and impact evaluations: the overall RMC score remained steady, with confidence that information would be kept confidential improving, and a decrease in disrespectful treatment. The ability for patients to ask questions and to receive full information about procedures remained the same or declined.(14)

Women's autonomy, in terms of a woman's ability to visit a health facility without her husband's permission, increased moderately in the impact and descriptive evaluations. Qualitative interviews indicate an increase in communication and consultation within the family after TAMANI interventions, although the father/husband as head of household and ultimate decision-maker is still a strong norm. Men's support for a woman's right to visit a health facility without permission showed an increase according to the descriptive report in contrast to this impact evaluation, suggesting that other interventions such as community meetings may have been more impactful for this indicator. According to both reports, men's support for women using contraception without their husband's permission remained unchanged. The qualitative study showed greater discussion of health and contraceptive decisions between partners, but a mixed reaction among men to TAMANI's messaging on women's health and reproductive autonomy.

## **5 Conclusion and Next Steps**

This impact evaluation assessed the effect of two elements of the overall TAMANI project, specifically the Basic and Comprehensive Emergency Obstetric and Newborn Care training and deployment of Community Health Workers. This pragmatic evaluation has the capacity to examine the impact of these trainings, over and above any impacts due to the larger TAMANI intervention, including upgrading facilities, providing ambulances and community meetings. The evaluation takes advantage of the staggered roll out of the EMONC trainings and CHW deployment to estimate impact while accounting for district effects and secular time trends. Overall, most indicators showed little or no change between treated and untreated time. However, there were increases in the area of women's autonomy in decision-making, as well as deliveries attended by skilled birth attendants.

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