

ORIGINAL RESEARCH ARTICLE

Challenges and Successes of Distributing Birth Kits with Misoprostol to Reduce Maternal Mortality in Rural Tanzania

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Gail C. Webber^{1*}, Bwire M. Chirangi² and Nyamusi J. Magatti²

Bruyere Research Institute, University of Ottawa, Canada¹; Shirati KMT District Hospital, Shirati, Rorya, Mara, Tanzania

*For Correspondence: Email: Gail.Webber@uottawa.ca; Phone: +1 (613) 738-9119

Abstract

The Saving Mothers Project was conducted from September 2015 to March 2017 in Bunda and Tarime Districts, Mara Region, Tanzania. The purpose of this project was to train community health workers (CHWs) to use mobile phones applications to register and educate pregnant women about safe deliveries and encourage them to access skilled health care providers for antenatal care and delivery, and to provide nurses and CHWs with clean birth kits with misoprostol to distribute to women. The birth kits were for use in case women could not access the health facility, or if the health facility was lacking supplies at the time of delivery. The overall goal of the study was to reduce the maternal mortality rate by increasing women's access to health services where possible, and to clean supplies when a non-facility birth was unavoidable. This paper reports on a mixed methods evaluation of the project including a survey of over two thousand four hundred women, and focus groups with women, community health workers, and nurses participating in the project. The results of the survey and focus groups demonstrate a high degree of satisfaction with the birth kits and misoprostol and an increase in facility birth rates where the project was implemented. Differences between the two districts illustrate that policy maker support is key to successful implementation. (*Afr J Reprod Health* 2019; 23[3]: 68-78).

Keywords: Birth kits, misoprostol, maternal mortality, access to health services, Community health workers, Tanzania

Résumé

Le projet *Saving Mothers* a été mené de septembre 2015 jusqu'au mois du mars 2017 dans les districts de Bunda et Tarime, dans la région de Mara, en Tanzanie. Ce projet visait à former des agents de santé communautaires (ASC) à utiliser des applications du téléphone mobile pour enregistrer et éduquer les femmes enceintes sur la sécurité des accouchements et les encourager à faire appel à des prestataires de soins de santé qualifiés pour les soins prénatals et l'accouchement, et pour fournir aux infirmières et aux ASC des bagages d'accouchement propres contenant misoprostol à distribuer aux femmes. Les bagages d'accouchement devaient être utilisés au cas où les femmes ne pourraient pas accéder au centre de santé, ou si le centre de santé manquait de fournitures au moment de l'accouchement. L'objectif général de l'étude était de réduire le taux de mortalité maternelle en améliorant, dans la mesure du possible, l'accès des femmes aux services de santé, ainsi qu'à nettoyer les fournitures lorsqu'un accouchement dans un autre lieu était inévitable. Cet article présente une évaluation du projet comportant plusieurs méthodes, notamment une enquête auprès de plus de deux mille quatre cent femmes et des groupes de discussion avec des femmes, des agents de santé communautaires et des infirmières participant au projet. Les résultats de l'enquête et des groupes de discussion montrent un degré élevé de satisfaction à l'égard des bagages d'accouchement et misoprostol et une augmentation du taux de natalité dans les établissements où le projet a été mis en œuvre. Les différences entre les deux districts montrent que l'appui des décideurs est la clé d'une mise en œuvre réussie. (*Afr J Reprod Health* 2019; 23[3]: 68-78).

Mots-clés: Trousses de naissance, Misoprostol, mortalité maternelle, Tanzanie

Introduction

Primary health care for women is not complete without access to quality antenatal care and safe childbirth. In many areas of the world, pregnancy

and childbirth continue to be very high-risk periods in women's lives, particularly if they reside in a region where obstetric health care services are difficult to access or poor in quality. Unfortunately, this remains the case for women

living in rural Tanzania. Despite the efforts of the government and other stakeholders, many Tanzanian women still die in childbirth; the maternal mortality ratio remains very high at 556 per 100,000 women¹. Women who deliver outside of a health care facility are most at risk, as they lack access to life-saving medications and skilled birth attendants. There is evidence that for years to come, millions of women will not have access to skilled birth attendance in Sub-Saharan Africa, thus interventions to reduce deaths in non-attended births are required². In the Mara region of Tanzania, about 40 percent of women deliver in their villages with no skilled attendants¹. Barriers to accessing health facilities in this rural region are numerous and include long distances to the health facilities, accessibility and affordability of transportation, costs of informal health facility fees, dissatisfaction with care at the health facility, and cultural beliefs about home births being superior³. These barriers are not unique to Tanzania but are also common to low and middle-income countries around the globe⁴.

The most common cause of maternal mortality is postpartum hemorrhage, accounting for about one third of maternal deaths in Africa⁵. For the women who deliver in the villages or on the way to a health facility without skilled birth attendants, oral misoprostol is an effective alternative to injectable medications to prevent postpartum hemorrhage⁵⁻⁷. The World Health Organization and International Federation of Obstetricians and Gynecologists have recommended the use of oral misoprostol in situations where injectable medications cannot be provided^{8,9}. Misoprostol does not require refrigeration and can be self-administered; thus, it is particularly suitable for use in rural communities. The Tanzania Food and Drug Authority have approved misoprostol for use in the prevention of postpartum hemorrhage (PPH)¹⁰. In the literature, traditional birth attendants (TBAs)¹¹, dispensary nurses¹², and both community health workers (CHWs) and dispensary nurses^{13,14} have been successfully used to distribute misoprostol to women for PPH prevention in Tanzania. While postpartum hemorrhage is the highest cause of maternal deaths globally, puerperal sepsis is also a

significant factor, contributing about 15 percent of deaths¹⁵.

Sepsis is a risk for those women who cannot access the clean supplies provided at the health facilities. To address the risks of postpartum hemorrhage and sepsis, we conducted the Saving Mothers Project in Tarime and Bunda Districts of Mara Region, Tanzania, near the eastern shores of Lake Victoria and Tanzania's northern border with Kenya. The overall objective of the project was to reduce maternal mortality through increasing women's access to safe delivery at health care facilities and providing supplies for women to make their deliveries safer.

Methods

Ethical approval for this research was sought and obtained from the Ottawa Health Science Network Research Ethics Board and Bruyere Continuing Care Research Ethics Board in Canada, and the National Institute of Medical Research in Tanzania. To address the gaps in primary care services in this region, we trained CHWs to support the health system by using mobile phone applications to register pregnant women from their villages. Once registered the CHWs then educated the women about healthy pregnancies and safe birthing practices, warned them about danger signs, encouraged them to attend health facilities for antenatal care and delivery, and provided them with a clean delivery kit with misoprostol for prevention of postpartum hemorrhage and sepsis if the woman had not already received the kit from a nurse at the health facility. The birth kit contained soap for the woman to wash, a clean mat for delivery, two pairs of gloves, two cord clamps and a blade to cut the cord, a pad for postpartum use and 600 mcg of misoprostol (to be taken orally immediately after delivery). Women were recruited if they were pregnant, lived in the study districts and were willing to receive a birth kit. There were no exclusion criteria. The CHWs and nurses were encouraged to distribute as many kits as possible during the study. The project also included regular meetings with policy makers at the district and regional levels, as there is good evidence for the need for policy maker engagement to improve program sustainability of

misoprostol distribution^{16,17}. As per the direction of the local government partners, the study was conducted in Tarime Rural District and the whole of Bunda District (which as later split into Bunda Rural and Bunda Town Districts).

To evaluate this project, we conducted a survey with a proportion of the women who had been registered by the CHWs. Information letters were provided to all survey participants in Swahili and the letters were read to them if they were unable to read the letter themselves. Each participant was asked to provide signed consent. Women under the age of eighteen were requested to have a family member also sign the consent form. We randomized all the pregnant women who were registered by the CHWs using the m-health application. We then interviewed 20 percent of the group using a structured interview to evaluate the success of the project. The interview was conducted using paper surveys and then entered on tablet computers into a computer database. The survey was conducted for a 12-month period from October 2015 to September 2016 (while the project continued on to March 2017).

To understand the experiences of the women and health care providers participating in the project, we also conducted focus groups separately with women, nurses and CHWs. We used a convenience sample to choose these participants, with representation from both districts. Signed consent was sought from all participants of the focus groups. The discussions focused on barriers to accessing health facilities at delivery, their experiences during the project, challenges with distribution of the kits, alternative distribution strategies, and issues with the m-health applications. Focus groups were conducted in Swahili by a trained research assistant. The discussions were digitally recorded and then the recordings were transcribed and translated from Swahili to English. The transcriptions were subjected to thematic analysis using N-Vivo software.

Results

Survey results

A total of 2,406 women were surveyed, 1,540 in Bunda District (64 percent) and 866 in Tarime

District (36 percent). (The population of Bunda District was 335,061 and the population of Tarime District was 339,693 according to the 2012 Tanzanian census data, however, we did not include Tarime town in this study as the focus was on rural populations.). The results from the survey data are shown below in Tables 1 to 3. Table 1 provides the demographic information about the women who were surveyed. The average age of the women was 25.6 years, and the average number of children they had was 3.4. Over 80 percent of the women reported living within 10 km of the nearest dispensary or health centre, while the majority lived more than 20 km from a hospital, particularly in Bunda District.

Table 2 describes women's experiences at the time of childbirth and their use of the materials found in the birth kit. The facility delivery rate overall amongst the surveyed women was 83 percent (77 percent in Bunda District and 93 percent in Tarime District). Safety of both mother and baby were the favoured reasons for choice of delivery location. While most births were attended by skilled birth attendants, there were still a significant number of women who were attended by a traditional birth attendant, and several others had only a family member, friend or neighbour present or were alone at their delivery. The proportion of women who did not have a skilled birth attendant at their delivery varied from 7 percent in Tarime District to 22 percent in Bunda District (greater than 16 percent overall). In Bunda District, proportionately more women received the birth kits directly from the nurses. The District Reproductive Health Nurse in Bunda was not supportive of the CHWs distributing the kits and early in the project she sent a letter to all dispensary nurses advising them not to permit the CHWs to distribute the kits. This was not the case in Tarime, where the support from the project at the District Medical Office was strong. Thus, the proportion of women from Tarime District receiving their kits from the CHW was much higher at 41 percent versus 11 percent in Bunda District. Of the women who received the kit, almost all used all components of the kit and no one declared problems using it. The CHWs in both districts were active at promoting antenatal care

Table 1: Socio-demographic Characteristics of Pregnant Women in Mara Region, Tanzania

Question	Bunda (%) n=1540 (64)	Tarime (%) n=866 (36)	Total (%) n=2,406 (100)
Average Age	25.8	25.4	25.6
Average number of Pregnancies including losses	3.6	3.6	3.6
Average number of Live Children	3.43	3.25	3.4
Distance from nearest Dispensary/HC*:	n=1,540	n=863*	n=2,403*
0-5 km	724 (47)	525 (61)	1249 (52)
6-10 km	552 (36)	294 (34)	846 (35)
11-20 km	235 (15)	42 (5)	277 (12)
More than 20 km	29 (2)	2 (0.2)	31 (1)
Distance from nearest Hospital: *	n=1,540	n=808*	n=2,348*
0-5 km	33 (2)	149 (18)	182 (8)
6-10 km	99 (6)	121 (15)	220 (9)
11-20 km	242 (16)	126 (16)	368 (16)
21-30 km	607 (39)	227 (28)	834 (36)
More than 30 km	559 (36)	185 (23)	744 (32)

* Missing responses from Tarime District to indicated questions.

clinics, though a minority of women in Tarime did not recall being told to go for postpartum care.

Table 3 describes the acceptability and use of misoprostol by the surveyed women. Seventeen percent of the women who received the birth kits did not use the misoprostol, however, almost all these women acknowledged that they had received an injection. An intramuscular injection of oxytocin for prevention of postpartum hemorrhage is medically superior to misoprostol when available. Over 80 percent of the surveyed women used the misoprostol. Reassuringly, none of the women using misoprostol took it before delivery as this is potentially dangerous for the fetus as it can cause strong contractions. While over 30 percent of the women reported the common side effects of shivering and abdominal pain with misoprostol, the women universally agreed that they would recommend the use of misoprostol to a friend. Most surveyed women claimed they would be willing to pay for the birth kit or use a voucher to get it from a pharmacy, however, the focus group responses did not confirm this.

Table 4 illustrates the facility delivery rates according to the District Medical Office data. The DMO facility birth rates are based on the actual number of women delivering in a health facility divided by the expected number (estimated

as 20 percent of the women of child bearing age). Such estimation is necessary because many women do not access care, hence there is no way to accurately know the numbers of pregnant women at a given time. The DMOs in both districts did show an increase in facility births from 2015 to 2016. Note that facility birth rate for the surveyed women participating in the project was 74.8% (n=1,590) in Bunda and 92.8% (n=866) in Tarime from October 2015 to September 2016. The project ran from October 2015 to March 2017. The increase in the facility deliveries was particularly noticeable in Tarime District (rise of 19%) and Bunda Rural (rise of 14%).

Focus group discussion results

A total of sixteen focus group discussions were analyzed: eight with women (three in Tarime and five in Bunda), five with CHWs (two in Tarime and three in Bunda) and three with dispensary nurses (two in Tarime and one in Bunda). There was a high degree of consistency of themes amongst the different groups of respondents and between both districts. The themes centred on three areas: 1. barriers for women to access health care services, 2. the benefits of birth kits, and 3. recommendations for scaling up the project.

Table 2: Delivery Experience and Use of Birth Kit by Pregnant Women in Mara Region, Tanzania

Question	Bunda (%) n=1,540 (64)	Tarime (%) n=866 (36)	Total (%) n=2406 (100)
Location of Delivery?			
Hospital	586 (38)	30 (3.5)	616 (26)
Health Center	279 (18)	406 (47)	685 (28)
Dispensary	325 (21)	368 (42.5)	693 (29)
Home/TBA's Home	344 (22)	51 (6)	395 (16)
On the Road	3 (0.2)	11 (1)	14 (0.6)
Other location	3 (0.2)	0	3 (0.3)
Reason for choice of delivery location?*			
Safety of Mother			
Safety of Baby	1,197 (78)	801 (92)	1,998 (83)
No Transport	1,199 (78)	804 (93)	2,003 (83)
No Time to Travel	256 (17)	30 (3)	286 (12)
Prefers Home Birth	217 (14)	58 (7)	275 (12)
Women did not choose this location	3 (0.2)	0	3 (0.1)
Other reasons	3 (0.2)	0	3 (0.1)
	3 (0.2)	2 (0.2)	5 (0.2)
Attendance at Delivery**			
Hospital/HC Staff	n=1,538**	n=858**	n=2,396**
Dispensary Nurse	877 (57)	396 (46)	1,273 (53)
TBA	327 (21)	401 (47)	728 (30)
Other HCP	276 (18)	17 (2)	293 (12)
Family member	1 (0.1)	1 (0.1)	2 (0.1)
Friend/neighbour	39 (2.5)	30 (3)	69 (3)
Woman was alone	9 (0.6)	11 (1)	20 (1)
	9 (0.6)	2 (0.2)	11 (0.5)
Birth kit provided by?			
Dispensary nurse	1,377 (89)	511 (59)	1,888 (78)
Community Health Worker	163 (11)	355 (41)	518 (22)
Who used the birth kit?			
	n=1,540	n=866	n=2,406
	1,536 (99.7)	866 (100)	2,402 (99.8)
What parts of the birth kit were used?			
Plastic Sheet	n=1,536	n=866	n=2,402
Gloves for Assistant	1,536 (100)	862 (99.5)	2,398 (99.8)
Cord Clamps	1,535 (99.9)	864 (99.8)	2,399 (99.9)
Surgical blade	1,534 (99.9)	860 (99.3)	2,394 (99.7)
Soap	1,535 (99.9)	863 (99.7)	2,398 (99.8)
	1,516 (98.7)	854 (98.6)	2,370 (98.7)
Any problems with birth kit?			
No	n=1,536	n=866	n=2,402
	1536 (100)	866 (100)	2,402 (100)
Did CHW remind you to go for antenatal visits?			
Yes	1538 (99.9)	859 (99.2)	2,397 (99.6)
Did CHW visit you during the postpartum period and ask about baby?			
Yes	1540 (100)	760 (87.8)	2,302 (95.7)

*Can choose more than 1 response.

** Missing responses in both districts.

Table 3: Use of Misoprostol and Acceptability by Pregnant Women in Mara Region, Tanzania

Question	Bunda (%) n=1540 (64)	Tarime (%) n=866 (36)	Total (%) n=2406 (100)	N responses (excludes missing data)
1. WHO DID NOT USE MISOPROSTOL?	238 (15)	162 (19)	400 (17)	n=2,402
Why did you not take misoprostol?				
Given injection	235 (99.6)	157 (97.5)	392 (98.7)	n=397
Chose not to take it	1 (0.4)	0	1 (0.3)	
Forgot to take it	0	2 (1)	2 (0.5)	
Other reason	0	2 (1)	2 (0.5)	
2. WHO USED MISOPROSTOL?	1298 (84)	704 (81)	2,002 (83)	n=2,402
When did you take the misoprostol?				
Before Delivery of the baby	0	0	0	n=2,002
After Delivery of the baby before placenta delivery	4 (0.3)	160 (23)	164 (8)	
After delivery of the placenta	1293 (99.6)	543 (77)	1836 (92)	
Other time	1 (0.1)	1 (0.1)	2 (0.1)	
Side effects from misoprostol?				
Yes	594 (39)	32 (4)	626 (31)	n=2,002
What side effects?				
Shivering/feeling chilled	298 (19)	17 (2)	315 (16)	n=2,002
Abdominal pain	336 (22)	12 (1)	348 (17)	
Other side effects	0	0	0	
Would you recommend misoprostol to a friend having a baby?				
Yes	704 (100)	672 (100)	1,376 (100)	n= 1,376
In a future pregnancy, would you pay 10,000 Tsh at a pharmacy for a birth kit and misoprostol?				
Yes	1536 (99.8)	718 (93)	2,254 (98)	n= 2,308
In a future pregnancy, would you use a free voucher to obtain a birth kit with misoprostol at a pharmacy?				
Yes	1533 (99.6)	760 (99)	2,293 (99)	n= 2,308

Table 4: Comparison of Facility Delivery Rates from DMO Data 2015-2016

Source of Data	2015 Facility Deliveries (%)	2016 Facility Deliveries (%)
Bunda Town DMO	4,895 (87%)	5,214 (93%)
Bunda Rural DMO	3,403 (70%)	4,584 (84%)
Tarime Rural DMO	5,691 (48%)	7,986 (67%)

Barriers for women accessing health care services

The respondents from the FDGs described five main barriers to women accessing health care services. Cultural practices were one significant reason for women preferring a home birth as women are praised for their courage if they deliver in the community.

“One of the main reasons that cause Mara women to deliver at home is due to their traditions and beliefs. Women are considered brave when they deliver at home and they get rewards from the family after the delivery. It is a big ceremony for the whole family.”(CHW, Bunda)

A second reason for avoiding facilities was the lack of knowledge about the importance of a facility birth. Women were not all aware that a home birth is riskier for both them and their child than a facility birth.

“Most women, especially those living in the rural Tanzania, lack health education to know why they need to attend antenatal care services and deliver at the facility” (CHW, Tarime)

Thirdly, the costs involved in a facility birth are prohibitive for many families in rural Tanzania. While delivery care is officially free, transportation costs and unofficial facility costs such as paying for supplies is beyond what families can afford. In the focus group discussions, the women, CHWs and nurses stated that many families could not afford to buy the supplies, and this was a reason for avoiding a facility birth in the past.

“Poverty can cause mothers to deliver at home; for example, no money for transportation and no money for buying gloves.”(Woman, Bunda)

Health facilities in rural Tanzania are often far from where women live, and the challenges to access the health facilities are great, particularly as they do not own cars or even motorbikes to facilitate their transport. Geographical barriers are particularly problematic for women with rapid labours.

“Some facilities are located very far from these women. Due to this distance it becomes difficult for some women to make it to the facility for delivery, especially when the labor is too fast, and they can't afford to pay for transportation charges.”(Nurse, Tarime)

Finally, the negative attitudes of health care providers can also be a barrier to care for women. Overworked health care providers express their

frustration to women through scolding, delayed treatment, and sometimes even physical abuse. Disrespectful maternity care is clearly a disincentive to seek a health care facility for delivery.

“Some of us are afraid of the nurses who appear to be unfriendly and cruel to us. These nurses even use abusive language when attending us. This discourages us from attending the facilities for delivery.” (Woman, Tarime)

Benefits of the distribution of birth kits with misoprostol

All three groups of respondents were enthusiastic about the benefits of access to free birth kits for pregnant women. Nurses and CHWs reported that the use of health care facilities for antenatal care and delivery dramatically increased as the free birth kits became an incentive to access care.

“Women were so grateful for receiving the birth kits at the facility. Their happiness could not be hidden from their faces and that's why they turned up in large numbers for the birth kits.”(Nurse, Tarime)

“These services have brought so much change; they have transformed people, especially pregnant women. Before they were so lazy to go to the clinic, but after these delivery kits being there, it gives them more morale for going to the clinic from the beginning until the time of delivery. All in all, this service is so good.” (CHW, Bunda)

While women sought care for the free supplies, they benefitted from the health education they received while at the health facility, and from establishing a positive relationship with the health care providers. This made it more likely they would return for future antenatal care and at the time of their delivery. Not only were the women pleased with the free birth kits; the nurses were quick to express their satisfaction with the program as well. One of the frustrations for nurses providing prenatal and delivery care at government health facilities is lack of supplies. Commonly, nurses request the families to go out and purchase needed supplies such as gloves and

even cords clamps. The provision of the birth kits meant that nurses no longer had to demand this purchase from family members of labouring women, making their job easier.

“The government should understand that the nurses want the women to have the birth kits at a free cost so that they don't have to ask the women to buy the maternity supplies when they come for delivery at the facilities.” (Nurse, Tarime)

“This project has made pregnant women be aware about their health, and in the facilities, it has made it very easy for the nurses to offer their services. Also, this bag has helped the women to get important things during delivery like gloves and cord clamps which at times you may not find at the dispensary.”

(Nurse, Bunda)

The birth kits were particularly helpful for those women who were not able to reach the health care facility for their delivery. Delivering without a skilled health care provider and any means of keeping the birth clean or preventing postpartum hemorrhage is considerably risky in the rural Tanzanian context. Having a clean birth kit with misoprostol made this experience a little safer for mother and baby.

“I had delivered my baby at home because the labor was too fast, and I couldn't make it to the hospital. I was lucky that I had the birth kit and misoprostol with me. My family member assisted me deliver safely with the supplies. This allowed my baby to be born using sterile supplies. I did not experience any problem with misoprostol after swallowing them immediately after delivery. I was very happy with the drug because I did not experience much bleeding after delivery.”
(Woman, Tarime)

Recommendations for sustaining the program and scale up

In the focus groups, we discussed alternative methods of distributing birth kits such as through a local pharmacy. The participants did not support a change in distribution method as they felt continuing to offer birth kits through the health care facilities provided opportunities for health

education to women and encouraged women to return to the health facility for delivery. Misoprostol is not legal for use in abortions in Tanzania, however, participants felt that if the pharmacists sold it as part of a birth kit, the market for its use would increase, limiting its availability for use in birth kits.

“Keeping the kits at the pharmacy would lead to illegal use of misoprostol. Some pharmacists are not honest, and they would even sell the kits at more than the recommended amount to make huge profits from the kits.” (CHW, Tarime)

Despite the challenges with the m-health application, there was support from the CHWs for the continuation of this aspect of the program as well. These CHWs reported that the m-health application improved access for women to health facilities, increased communication between women and CHWs and reduced the CHW's workload.

“It [the m-health application] has led to efficient and proper antenatal clinic attendance before delivery and postnatal clinic attendance after delivery, because an SMS [text message] comes into our phone telling us to remind mothers to attend clinic.”(CHW, Bunda)

“Phones have improved communication between mothers and CHWs: whenever there is any problem or emergencies the mother calls the CHW for help.” (CHW, Bunda)

“It has made work easy and reduced the load CHWs could encounter while doing the work manually. It has also helped in record keeping.”
(CHW, Bunda)

The CHWs did have suggestions for improvement of the m-health program for the future. They requested more stability to the network with prompt feedback and some provision for recharging phones in a timely way.

“It wasn't difficult working with the system, however, there were times when the system was really down and could not give feedback. This needs to be improved in the future.”(CHW, Tarime)

“I was happy that the system could make our work much easier, but there should be a good way of recharging our phones with credit in time, other than waiting for monthly allowances to recharge them.” (CHW, Tarime)

There were many suggestions about other supplies that could be added to the kits. Some wanted more gloves and pads, while others felt the addition of clothes for the baby were warranted. Cotton and sutures were also requested by some health care providers. At times in the project there were brief gaps in the supply of birth kits. This is another area for improvement in the future.

“For me I think the government should continue to do the distribution of the delivery kits even after the project ends, but the main thing that they should add to the pack is at least four pairs [of gloves] because there were times we asked our patients to add more gloves.” (Nurse, Bunda)

“The provision of the birth kits and misoprostol has acted as incentives for women to go to the facility for antenatal care, getting the birth kits and for delivery. This is due to the free supplies in the kits. An observable change that needs to be made is ensuring that there is a constant supply of the kits to the health care facilities.” (CHW, Tarime)

Thus, there was significant enthusiasm for the distribution of birth kits with misoprostol amongst the women, nurses and CHWs from both districts participating in the focus groups. Most agreed that the birth kits were an incentive for women to have a facility birth. Clearly birth kits do not address all the challenges women face; however, they do provide women with free supplies removing the barrier of having to purchase these supplies at the time of delivery. They also relieve nurses of the burden of having to ask family members to purchase these supplies.

Discussion

There are several limitations to both the survey data and the government statistics. First, because of the multiple duplicate entries in Medic Mobile’s

database for women, we randomized more than 20 percent of the enrolled population from October 2015 to September 2016. Also, a small proportion of the Tarime data (less than 10 percent) was not entered before the survey closed so this was lost. Despite this limitation, the quality of the data should not be affected as the sample was randomized. There were missing responses to some questions, however, our sample size was high so again the quality of the results should be retained. There was an opportunity for data entry errors as the paper surveys were input into the tablet computers. Finally, the survey relied upon self-report. Some women may not have been honest in their responses to please the research team. This may have been the case in Tarime District where the surveyed women reported a significantly higher rate of facility births than the government data. On the other hand, the impressive improvement in facility birth rate in Tarime in 2016 is almost certainly attributable to this project, thus a higher rate of facility births in the surveyed group is expected.

As noted earlier, the District Medical Office data are based on the actual number of women delivering in a health facility divided by the expected number, estimated at twenty percent of the women of child bearing age. This estimation is necessary because there is no way to accurately know the number of pregnant women at one time where many do not access care. In future projects we hope that the CHW registration of pregnant women in the villages will provide more complete data of the total number of pregnant women in each district.

For the focus groups, the women, CHWs and dispensary nurses were chosen based on a convenience sample; those working or living close together were asked to participate. We attempted to sample different areas of the two districts, and the consistency of the responses both within and between districts supports the trustworthiness of the findings. It was clear from the focus groups that the women, nurses, and community health workers were extremely pleased about the availability of birth kits and the positive impact on use of the health facilities. The CHWs were happy to be included in the health care system, contributing to improvements in the health of their

local population of women. The nurses appreciated the birth kit, allowing them to provide services to women without having to demand the family members go out and purchase needed supplies. Women who were unable to reach the health facility because of rapid labours had supplies to use at home or on route to the health facility. Because the women had the birth kit supplies in their possession, women no longer had the disincentive of missing supplies at the health facility to dissuade them to access care. The provision of the birth kit, for the relatively small cost of 12,000 Tanzanian Shillings per birth kit (6 USD), helped resolve many of the barriers preventing women to access the health care facility for delivery.

There were several key lessons learned during the Saving Mothers Project. The women of Bunda and Tarime used the birth kits appropriately. They all took the misoprostol at the correct time, and when injectable oxytocin was available, they appropriately did not use the misoprostol. We received reports from health care providers in both districts that the birth kits were a strong incentive for women to access the health care facilities for antenatal care (to get the kit) and for delivery as the family no longer had the barrier of needing to buy supplies. There is evidence of this in Tarime District where according to the DMO statistics the facility birth rate went from 48% in 2015 to 67% in 2016. As more women accessed antenatal care, this provided the opportunity for CHWs and nurses to do health education with women about safe deliveries. The nurses were very happy with the provision of birth kits as it simplified their job for, they no longer had to require families to purchase supplies. Ultimately, this is expected to lead to an improvement in the attitude's nurses have towards women. The provision of the birth kit builds a positive relationship between health care providers and women. Women feel that they are cared for by being provided with free supplies for their delivery. This builds the trust of women and their families in the health care system and will lead them to come to health care providers for other services such as immunizations and when a family member is ill, rather than relying on traditional providers.

Provision of birth kits with misoprostol can successfully engage women in the health care system and increase the facility birth rate; however, policy maker support is crucial. Some women living in Bunda District were not given access to the birth kits through the CHWs as per the instructions of the Bunda District Reproductive Health nurse, and this limited the effectiveness of the project. Alternatively, positive alliances with the District Medical Office in Tarime strengthened the project's reach as the District Medical Office staff even provided transport for the project team to deliver the kits to rural dispensaries during inclement weather.

Conclusion

While this study was conducted in two rural districts in Northern Tanzania, there are lessons which are applicable to other rural settings in Tanzania and elsewhere in Africa where women face barriers to accessing health care facilities at the time of delivery. The most important conclusion from the project is that rural women require birth kits prenatally at the end of pregnancy, so they have access to supplies in case they cannot or will not reach the health facility. The birth kits will also benefit the nurses at the health facility, as they are often lacking in supplies to provide quality care to their patients. Restricting the birth kit distribution to health facilities, as was done in much of Bunda District, limits access for some of the most vulnerable women: those who live far from the health facilities or who don't trust the health care system. District governments should be encouraged to scale up of this inexpensive intervention as soon as possible, particularly in rural communities where there are multiple barriers to accessing services. Access to birth kits with misoprostol will save the lives of women and ultimately their children, both a precious resource for Tanzanian society.

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Contribution of Authors

GW designed the research, assisted with data collection, analyzed the data and wrote the draft of the paper. BC contributed to research design and supervised the research. NM managed the research team and was directly involved in data collection. All authors approved the final draft of the paper.

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