

## Strengthening service delivery for malaria in pregnancy: an mHealth pilot intervention in West Nile, Uganda



### Key messages

- Health worker training in low and middle income countries typically follows a cascade model, where a selected number of health workers attend classroom training and cascade relevant information to their colleagues. This approach is often ineffective as important information does not reach those who need it.
- Sending educational text messages to health workers in order to reinforce classroom training content and share information with those who were not trained is a feasible and acceptable alternative to providing classroom training only.
- Text messaging is simple to implement, inexpensive and does not disrupt service provision.
- In this study, text messaging improved health worker knowledge of intermittent preventive treatment for malaria in pregnancy (IPTp) and increased IPTp coverage.

### Introduction

#### Malaria in pregnancy

Pregnant women are more susceptible to malaria than non-pregnant women. They are more likely to get severely ill and die from the disease. Malaria infection during pregnancy is also harmful to the baby. It increases the risk of miscarriage, as well as pre-term delivery and low birth weight<sup>[1]</sup>. To prevent and treat malaria in pregnancy, the World Health Organization (WHO) recommends a package of interventions in all areas with moderate to high malaria transmission in Africa<sup>[2]</sup>:

- Prompt diagnosis and effective treatment of malaria infections
- Use of long-lasting insecticidal nets
- Intermittent preventive treatment for malaria in pregnancy

## **Intermittent preventive treatment for malaria in pregnancy**

Intermittent preventive treatment (IPTp) entails administration of a curative dose of an antimalarial drug to all pregnant women, regardless of whether or not the recipient is infected with malaria. It is typically delivered to pregnant women as part of routine antenatal care (ANC) visits. WHO currently recommends administration of IPTp at each ANC visit, except during the first trimester and provided that doses are given one month apart<sup>[3]</sup>.

While coverage of ANC is high in most African countries, uptake of IPTp has remained comparatively low. In Uganda, for example, over 90 percent of women attend ANC at least twice<sup>[4]</sup>, while only 45 percent of women receive at least two doses of IPTp<sup>[5]</sup>, suggesting that opportunities for the provision of IPTp at ANC are missed.

### **Formative research**

To explore the reasons why women who attend ANC in Uganda might not receive or take IPTp, Malaria Consortium conducted formative research in two regions of Uganda (Eastern and West Nile) in 2013-14. The study employed a qualitative design, involving a total of 45 in-depth interviews with district health staff, health workers, community leaders and pregnant women/mothers. It concluded that women and communities have largely positive views of ANC and IPTp. There are some concerns over mild side effects and taking the drug on an empty stomach, but women tend to accept IPTp if it is offered and encouraged by a health worker<sup>[6]</sup>.

It is, therefore, likely that the majority of missed opportunities for the provision of IPTp is due to challenges relating to the supply side, i.e. the health service provider. The study found that health workers' knowledge of the IPTp provision guidelines was inadequate and that health workers frequently failed to encourage women who were initially reluctant to take IPTp. Moreover, at the time of the formative research, Uganda had not yet adopted the latest WHO policy recommendation of monthly IPTp administration after the first trimester. Many of the existing policy and training materials on IPTp were found to be inconsistent or unclear, with many implying that the maximum number of doses a pregnant woman should receive was two<sup>[7]</sup>.

## **Pilot study aim and objectives**

Based on the formative research findings, Malaria Consortium developed a pilot intervention designed to address the key barriers to IPTp uptake that had been identified. This involved providing classroom training to health workers on malaria in pregnancy and following up the training with text messages reinforcing the training content, with a focus on IPTp provision according to the WHO recommendation. The aim of the intervention was to improve health worker knowledge of the IPTp guidelines and thereby contribute towards minimising missed opportunities for the provision of IPTp during ANC.

## **Methods**

### **Study design**

The pilot study compared classroom training plus text messaging ('intervention') with classroom training only ('control'). The overarching research question was whether complementing classroom training with sending text messages is a feasible and acceptable intervention which has the potential to improve health worker performance and increase coverage of IPTp.

### **Setting**

The pilot study was conducted in two districts of West Nile: Moyo (intervention) and Adjumani (control) (Figure 1). In both districts, eight health facilities were selected, including all types of facilities delivering ANC under the supervision of Uganda's Ministry of Health. Health workers with responsibility for at the eight participating health facilities in Moyo received malaria in pregnancy training followed by text messages reinforcing the training content ('intervention'), while health workers in Adjumani only received malaria in pregnancy training ('control').

### **Pilot intervention – classroom training**

In May 2015, 48 health workers (24 each in intervention and control) received a three-day classroom training on malaria in pregnancy. The training followed the standard approach of selecting a group of health workers to attend the training and tasking them with cascading information to colleagues who did not attend. It included updated IPTp provision guidelines in line with the most recent WHO policy recommendation of monthly administration of IPTp after the first trimester.

### Pilot intervention – text messaging

A total of 24 text messages were sent to all health workers who were responsible for ANC (n=49) in the eight participating health facilities in the intervention district. Text messaging started in June 2015, with one message sent every weekday over a period of five weeks. The text messages reinforced the content of the malaria in pregnancy training, with a focus on the updated IPTp provision guidelines (Figure 2).

The messages were sent by the District Health office’s biostatistician, using an existing short message service (SMS) platform called mTrac, which is owned by the Ministry of Health and typically used to report facility data to the district level via SMS. However, mTrac can also be used to send out bulk text messages.

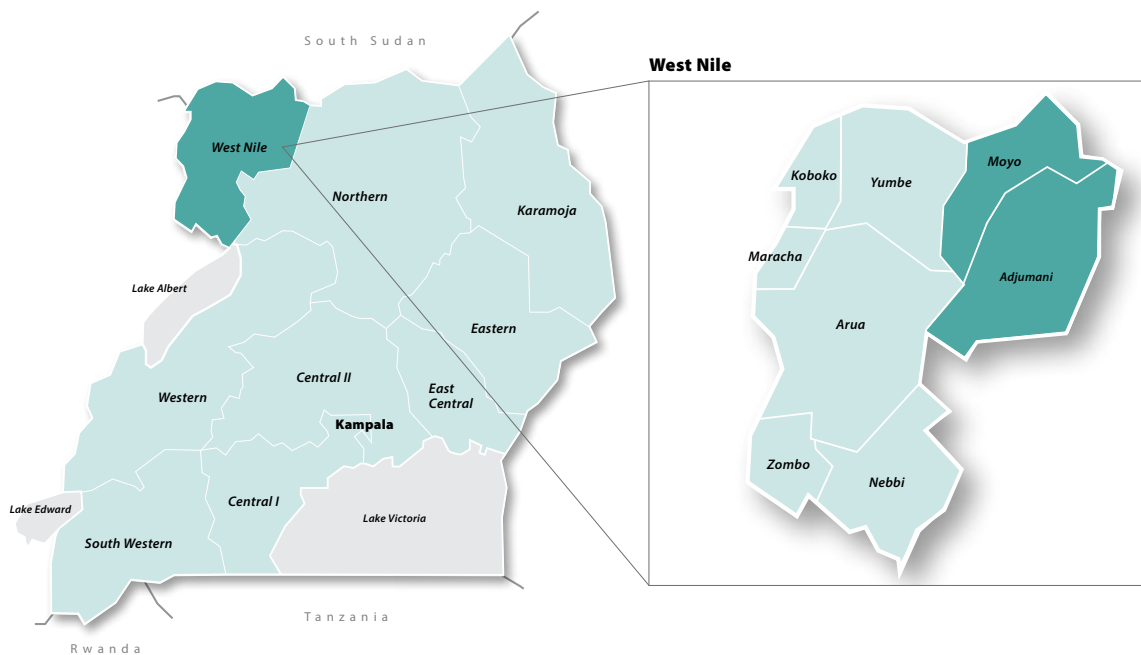


Figure 1: Location of pilot study in Uganda



Figure 2: Sample text messages used in the study

## Evaluation

The study used a convergent mixed-methods evaluation design, comparing intervention and control with regard to three evaluation foci:

### 1. Health worker knowledge

A multiple-choice questionnaire testing health worker knowledge of malaria in pregnancy and IPTp was administered in June 2015, one month after the training ('baseline', just before sending the text messages), to all health workers with responsibility for ANC at the participating health facilities in both districts (n=90). The same questionnaire was administered to all relevant health workers (n=89) in December 2015, six months post-training ('endline').

The questionnaire comprised ten questions, each with four answer options, which could be true or false. They were scored by awarding one point for each answer option correctly ticked as true or false, and deducting one point for each answer option incorrectly ticked as true or false. The minimum score was -40, while the maximum score was +40. Mean scores and 95% confidence intervals (CI) were calculated and a difference-in-difference (DID) multivariate linear regression analysis using a random effects model was used to determine whether knowledge was significantly different between groups over time. A two-sided p-value of <0.05 was considered to be significant for all tests.

### 2. IPTp coverage

IPTp data were extracted from all participating health facilities' ANC registers (n=16), covering the six months before the classroom training (December 2014 to May 2015) and six months following the classroom training (June 2015 to November 2015). Data were collected during visits to each participating health facility at endline. IPTn<sup>1</sup> was calculated for each month, using the following formula:

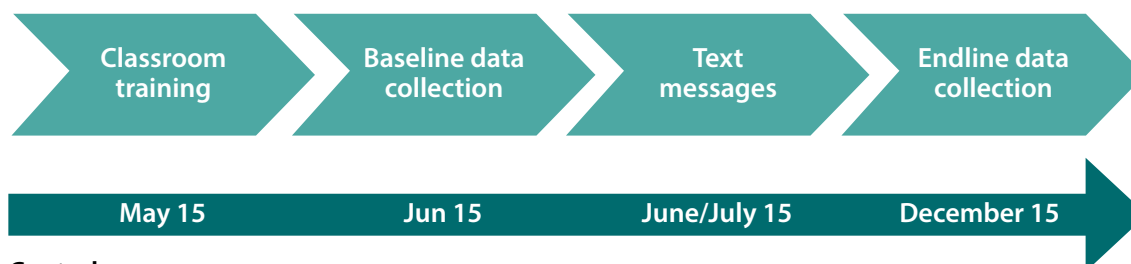
$$\text{IPTn coverage} = \frac{\text{Number of IPTn recorded}}{\text{Number of ANC1 recorded}}$$

### 3. Feasibility and acceptability

Two focus group discussions were conducted with health workers in each district (n=31), including a mix of those who had and those who had not attended the classroom training. In addition, three in-depth interviews with district health officials were conducted. All data were collected at endline. Interviews were transcribed verbatim, while detailed reports were produced for focus group discussions. Data were analysed by thematic content analysis and summarised by theme.

Figure 3 illustrates the timeline of activities in intervention and control.

## Intervention



## Control



Figure 3: Timeline of activities in intervention and control

<sup>1</sup> n denotes the number of the IPTp dose, i.e. IPT1, IPT2 etc. ANC1 is the first ANC visit.

## Results

### Health worker knowledge

At baseline, there was no statistically significant difference between intervention and control. At endline, however, the mean score in the intervention had improved compared with the baseline and was now significantly ( $p < 0.05$ ) higher than in the control, where it had decreased compared with the baseline (Figure 4). The DID between intervention and control at baseline and endline was also statistically significant ( $p < 0.001$ , Table 1). This suggests that the combining classroom training and text messaging resulted in better knowledge and knowledge retention compared with classroom training only.

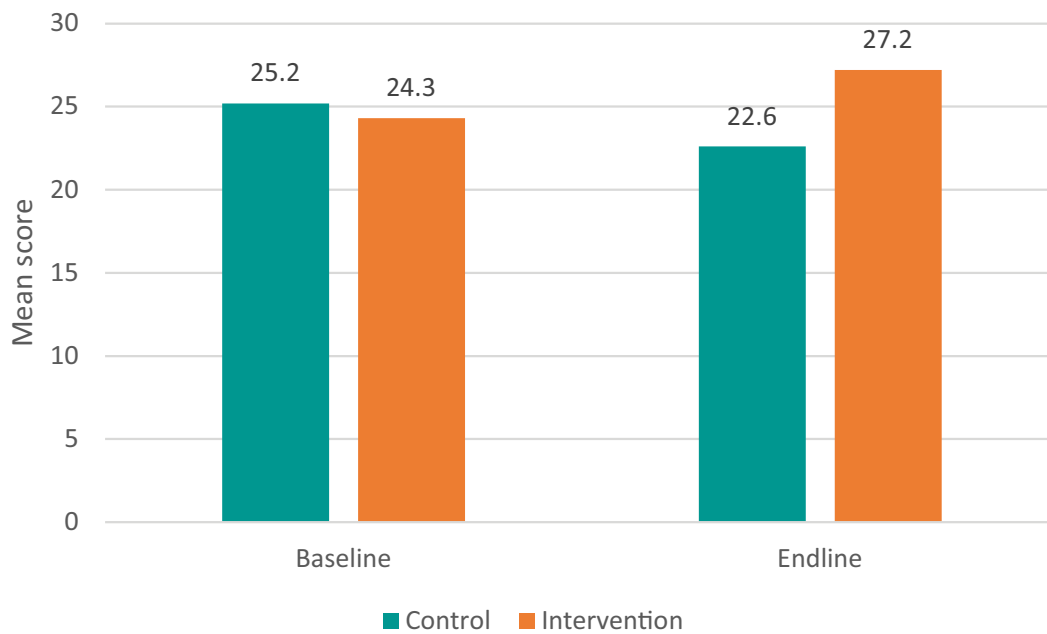


Figure 4: Mean knowledge scores at baseline and endline in intervention and control

Table 1: Difference-in-difference analysis of mean scores in intervention and control at baseline and endline

	Baseline			Endline			DID	p
	Control	Intervention	Difference	Control	Intervention	Difference		
Mean score	24.3	25.2	-0.9	22.6	27.2	4.6	5.5	<0.001

## IPTp coverage

IPTp coverage rates before the classroom training were similar in intervention and control. For the first and second dose of IPTp (IPT1 and IPT2), coverage was already very high before the training and improved slightly in both districts after the training. Coverage of the third and fourth dose of IPTp (IPT3 and IPT4) was very low before the classroom training, as the guidelines in use at the time did not require provision of more than two doses. The new guidelines introduced as part of the classroom training resulted in an increase in coverage of IPT3 and IPT4 in both districts, but the increase was noticeably greater and more constant in the intervention district (Figure 5). This suggests that classroom training plus text messaging resulted in better IPTp coverage than classroom training only.

## Feasibility and acceptability

The classroom training was generally regarded positively and focus group discussion participants recalled the training contents correctly. However, the information cascade approach did not appear to be effective, with many health workers who had not attended the classroom training indicating that while they had been informed of the training, detailed information on the training contents had not been shared with them.

*“Those who attended the training just told us they had a training, but details about it were not discussed.” Health worker, Adjumani*

All relevant health workers in the intervention district owned a mobile phone and reported having received and read the text messages. They generally stated that the messages were helpful in reinforcing the training content.

*“They are a good idea because most times, people after the training, they tend to forget. But once the messages are forwarded to them, they remember – ‘ah this was taught’. So it [was] helpful.” Health worker, Moyo*

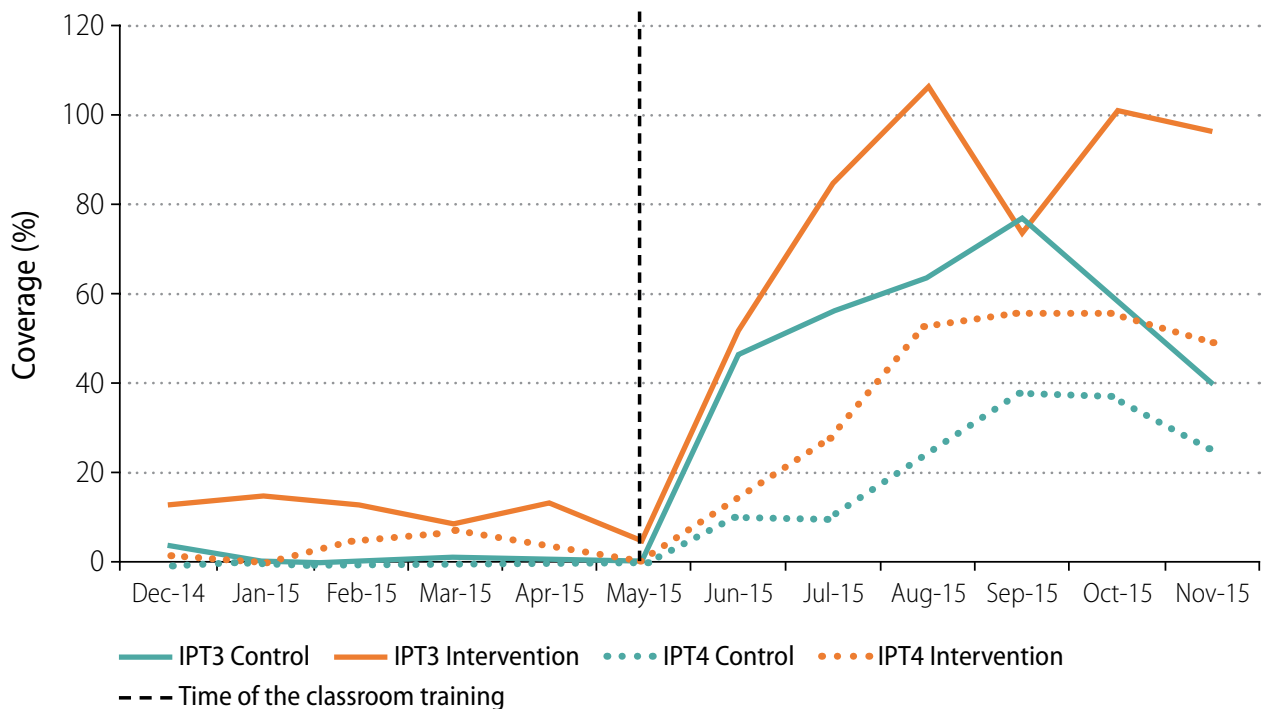


Figure 5: IPT3 and IPT4 coverage before and after the classroom training



Health workers also felt that the messages helped to overcome the limitations of the cascade training approach through delivering important information to those who did not attend the classroom training.

The text messages were considered not disruptive to service provision, and the number of messages and timing were considered appropriate.

The biostatistician in charge of sending the messages reported that the process of sending text messages was simple and did not add significantly to workload.

*"It is part of what I do, so I feel that I was doing my due responsibilities. So I feel it didn't do any additions to this." Biostatistician, Moyo*

The main technical challenge related to mobile internet access. At times, when the biostatistician travelled to the field, a modem was used to connect to the internet from a laptop in order to access the mTrac system remotely. For this purpose, the biostatistician was provided with an airtime allowance of 80,000 Ugandan Shillings (approximately USD\$20). This was the only cost associated with sending the text messages for this intervention.

## Conclusion

The increase of mobile phone networks in recent years has transformed communications in sub-Saharan Africa, with mobile phone use becoming more affordable and accessible, even among the poorest populations and in rural areas. Seeking to capitalise on this trend, mobile health (mHealth) interventions have seen a rapid increase in popularity over recent years. mHealth is broadly defined as the "use of mobile and wireless technologies to support the achievement of health objectives"<sup>[8]</sup>. Common examples include the use of text message reminders to encourage follow-up appointments, healthy behaviours and data gathering<sup>[9]</sup>.

This study found that complementing conventional health worker training on malaria in pregnancy with sending educational text messages was a feasible approach which was very well accepted by health workers and district officials. There are also strong indications that the approach resulted in improved health worker performance and increased coverage of IPTp. The results of the study support those from two similar studies conducted in low and middle income countries:

- In China, health workers' knowledge of viral infections affecting the upper respiratory tract increased significantly after receiving text messages, compared with traditional continuing medical education<sup>[10]</sup>.
- In Kenya, sending text messages about malaria case management to health workers significantly increased correct management<sup>[11]</sup>.

This suggests that text messaging, in combination with other capacity building tools and approaches, can be effective in achieving health worker behaviour change in resource-poor settings. The key strengths of the approach are that text messages do not disrupt service provision and can reach large numbers of health workers. The intervention is well received by health workers and district health staff. It is inexpensive and simple to implement, especially where suitable SMS platforms already exist. If applied to other training areas and at scale, a strategic and coordinated approach will be needed in order to ensure consistent messaging and maintain health workers' positive attitude towards the messages.

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## Acknowledgements

The study was conducted through COMDIS-HSD, a Research Programme Consortium funded by the UK government. It also received Programme Partnership Arrangement funding from the UK government. However, the views expressed do not necessarily reflect the UK government's official policies.

Cover photo: An antenatal care clinic at Moyo hospital

## Published by Malaria Consortium / March 2017

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UK Registered Charity No: 1099776 US EIN: 98-0627052

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