



## Wired Mothers

Mobile phones as a health communication tool to improve maternal and perinatal health

**T**here are now more people in Africa with access to mobile phones than access to basic water and sanitation. The potential to use this general information technology development to improve the health of women and children when they are most vulnerable, during pregnancy and delivery is enormous.

The purpose of this policy brief is to present the results of the *Wired Mothers* study conducted in Zanzibar in 2009-2010 and to assemble evidence on the use of mobile phone interventions to strengthen health systems. It is intended to inform Danida staff, parliamentary members, and others who want an enlarged evidence base for their own work on programme, policy and advocacy.

### Introduction

Antenatal care and skilled attendance at delivery have the potential to reduce maternal mortality and improve perinatal survival. Benefits of these services may not be realised in sub-Saharan Africa where the attendance and quality of care is a challenge. Mobile phones are increasingly used in health systems in low- and middle-income countries and innovative technical solutions have great potential to overcome barriers of access to maternal and perinatal health care. However, research evidence of effectiveness is weak and health outcomes particularly need more robust reporting. We evaluated the association between a mobile phone intervention and use of

essential maternal health care services and perinatal health in a resource-limited setting. The specific objectives of the study were

- To assess the impact of the *Wired Mothers* mobile phone intervention on attendance to antenatal care (4 visits or more as recommended by WHO)
- To assess the impact of the *Wired Mothers* mobile phone intervention on skilled attendance at delivery.
- To assess the impact of the *Wired Mothers* mobile phone intervention on perinatal mortality.

The study was an open label pragmatic cluster-randomised controlled trial and included 2550 pregnant women (1311 interventions and 1239 controls). Pregnant women who attended antenatal care at selected primary health care facilities



Figure 1. A wired mother with her child

were included at their first antenatal care visit and followed until 42 days after delivery. Twenty-four primary health care facilities in six districts were randomised to either standard care or the *Wired Mothers* mobile phone intervention described below.

### The *Wired Mothers* intervention

The *Wired Mothers* mobile phone intervention was designed with the aim to link pregnant women to their primary health care provider throughout their pregnancy, childbirth and post-partum period. The intervention was developed in Tanzania using simple low cost technology. It consists of two components: an automated short messaging service (SMS) system providing wired mothers with unidirectional text messaging and a mobile phone voucher system providing the possibility of direct two-way communication between wired mothers and their primary health care providers.

The aim of the SMS component was to provide simple health education and appointment reminders to encourage attendance to routine antenatal care and skilled delivery care. Women in the intervention group were registered at their first antenatal care visit with date, phone number and gestational age. The phone number was either their own or an access phone number of a husband/relative/friend who could relay the messages. Specially-designed software was developed to create an individual pregnancy timeline for each woman and automatically send text messages to the registered phone number. The content and the frequency of the messages varied throughout the pregnancy and were intensified during the four weeks before delivery. Messages focused on health education on topics such as danger signs in pregnancy and the importance of skilled delivery attendance as well as appointment reminders for next antenatal care visit. To avoid breaking any confidentiality message content was standardized with neutral phrasing, conventional wordings and provided in the local language, Swahili.



Figure 2: The *Wired Mothers* intervention

Because the *Wired Mothers* intervention was developed in the context of the Ministry of Health in Zanzibar prioritizing to reduce maternal mortality, a voucher system was added to improve access to emergency obstetric care and improve referral mechanisms. Each intervention woman received the phone number of her local midwife and a voucher that allowed her to communicate directly with the midwife and to access emergency obstetric care through improved communication and referral links from primary health care facilities to hospitals.

### Results

The mobile phone intervention was associated with an increase in antenatal care attendance. In the intervention group 44 per cent of the women received four or more antenatal care visits versus 31 per cent in the control group (OR, 2.39; 95% CI, 1.03-5.55). There was a trend towards improved timing and quality of antenatal care services across secondary outcome measures such as presumptive treatment for malaria and tetanus vaccination although not statistically significant. The mobile phone intervention was also associated with an increase in skilled delivery attendance: 60 per cent of the women in the intervention group versus 47 per cent in the control group delivered with skilled attendance. The intervention produced a significant increase in skilled delivery attendance amongst urban women (OR, 5.73; 95% CI, 1.51–21.81), but did not reach rural women. Two thousand four hundred and eighty-two children were born alive, 54 stillborn and 15 died an early neonatal death within the first seven days of life. The overall perinatal mortality rate in the study was 27 per 1000 total births. The rate was lower in the intervention clusters, 19 per 1000 births, than in the control clusters, 36 per 1000 births. The intervention was associated with a significant reduction in perinatal mortality with an odds ratio of 0.50 (95% CI, 0.27-0.93).

### Conclusions, implications and recommendations

In conclusion, the *Wired Mothers* mobile phone intervention significantly increased the number of women receiving the recommended four antenatal care visits during pregnancy and urban women delivering with skilled attendance. Perinatal mortality was reduced.

The real test for mHealth in general and *Wired Mothers* specifically is scalability and integration into existing systems. Based on the positive experiences and results of the *Wired Mothers* study the Ministry of Health in Zanzibar in 2012 decided to scale up the wired mothers to national level. Since

then the Ministry has appointed an mHealth coordinator and entered a public-private partnership with a local telecommunication company. Funding to the national scale-up has been obtained from the mHealth Alliance and work commenced in January 2014. The University of Copenhagen will continue to monitor, document and disseminate the process for the benefit of policy makers in low- and middle-income countries.

The major concerns when going from study to scale up are sustainability, equity and the capacity of the health system to maintain quality with increased utility of services. Therefore the core principles of the strategy for scale up of *Wired Mothers* on Zanzibar is

- to ensure sustainability through a phased approach and integration into existing plans and budgets and partnership with private contributors.
- to further increase equity through using voice messages as well as text messages, and maintaining the possibility of *all* women to call the health system on a toll free number and access emergency referral when needed.
- to maintain quality of health services by enhancing integrated supportive supervision.
- to conduct implementation research on key process and outcome health indicators supplemented by qualitative research to identify barriers to program participation, implementation, determinants and describe solutions.

The policy implication of the *Wired Mothers* study is that mobile phone interventions should be considered as a strategy to improve utilisation of antenatal care and delivery services, which are essential for maternal and perinatal health. mHealth interventions for maternal health should however consider the specific needs of rural women. There are opportunities for expanding SMS based systems such as *Wired*

*Mothers* to enhance linkages, both of time and place, along the continuum of care. Technical strategies such as use of voice messages, mobile banking systems to improve access to emergency transport and distribution of focal phones among traditional birth attendants could be explored for promoting skilled delivery attendance in these vulnerable groups.

A policy framework for coordination and guidance of mHealth activities is essential particularly in low- and middle-income countries. The number of actors is increasing and some countries have a large number of mHealth pilots but there is little government involvement or control, weak evaluation mechanisms and lack potential to move beyond the pilot phase. An increasing number of countries have a framework in place with national mHealth policies prioritising thematic and technical areas and providing guidance to non-governmental, academic and government sectors.

Despite the global progress in reducing deaths of children younger than five years there is little reduction in the global perinatal mortality rates. The causality of maternal deaths, stillbirths and early neonatal deaths are interlinked. Therefore, monitoring and policies should be integrated. We suggest including reduction of perinatal mortality in the global agenda to further reduce child mortality in low- and middle-income countries. Furthermore, our study indicates that measurement of development after the MDGs should include use of technologies such as mobile phones.

This study is a small contribution towards the growing number of evidence-based approaches to make pregnancy and childbirth a safe event for both mother and child, and towards the achievement of MDGs 4 and 5.

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